Yakama Nation position on 2014 stocking of
White sturgeon in Wells and Rocky Reach reservoirs

Issue: The current Management Plans for White sturgeon mitigation in the Mid-Columbia reservoirs call for stocking juveniles annually for three or four years in each reservoir to begin examining survival and carrying capacity-related density responses of the juvenile population. A wild broodstock-based stocking program was initially intended to provide the juveniles for this effort. However, recent efforts by the CCT have demonstrated the potential for also providing juveniles caught as larvae and reared in capacity over-winter. Recently, CCT has cited genetic concerns with releasing juveniles from a restricted set of families represented in the broodstock collection and suggests that juveniles collected as larvae in Lake Roosevelt represent a better cross-section of families that should be stocked instead of, or in combination with, broodstock-origin juveniles. The CCT also contends that a reduced number of individuals represented from the broodstock collected families is desired as this will reduce an unacceptable risk of moving future populations towards decreased genetic diversity and domestication.

Under the CCT recommendations, the total available release of juveniles would be substantially reduced from the initial planned releases the Parties recently agreed to in each of the three Management Plans in each of the three PUD reservoirs. Although the YN understands these arguments, we are not wholly in agreement and do not support the CCT 2014 management recommendations. Additionally, the Yakama Nation maintains that unless there is consensus within the respective forum, as agreed to in the various Management Plans, 2014 stocking levels cannot be changed from what was previously agreed.

Proposal: For 2014, Yakama Nation advocates for juvenile releases that incorporate all available larval-origin juveniles and as many broodstock-origin juveniles as needed, or is available, to achieve the White Sturgeon Management Plan goals of:

- 5,000 total juveniles released in the Wells reservoir,
- 6,500 total juveniles released in the Rocky Reach reservoir, and
- 6,500 total juveniles released in the Wanapum and Priest Rapids reservoirs.

Rationale: The rationale for this position is as follows:

1. Genetic risk is one of several considerations in deciding an appropriate stocking level. We are not convinced that identified genetic risks are fully understood, irreversible, or rise to the level that they justify compromising other aspects of the mitigation program.

2. The plan goals for juveniles/reservoir was based on the consensus of plan parties that a robust stocking level would allow follow-up M&E to actively probe the carrying capacity and production of harvestable fish in the reservoirs. Carrying capacity can only be determined when density effects are expressed in the population, and this only happens when sufficiently large numbers of juveniles are released and survive. As population abundance approaches carrying capacity, density effects should be expressed as reduced growth rates, condition factors, or as the accumulation of biomass becoming

asymptotic. If release numbers are well below carrying capacity, these density effects do not occur or are small and difficult to measure. We submit that this remains an important purpose of juvenile stocking. We also suggest that a higher stocking level is likely to produce fishery benefits sooner if harvest opportunity is determined to be an additional benefit of the mitigation program.

3. The genetic implications of different hatchery strategies are ultimately determined at the adult stage rather than the juvenile stage. The real question is how well genetics are represented in the reproductive adult survivors of stocked juveniles, and this may be related to, but not necessarily determined by, how well they are represented in the juveniles. Genetic representation is determined across a generation (20+ years), not just a single year. The two juvenile strategies might ultimately produce the same outcome from a diversity perspective. The larval strategy represents many families in every year (good for diversity at capture), but only a small number of individuals/family (bad for diversity at adulthood). The broodstock strategy represents few families in every year (bad for diversity at capture), but larger numbers of individuals from each family (good for diversity at adulthood). After one sturgeon generation we may well get to exactly the same place with either option in terms of diversity in the broodstock population. Best available science cannot yet project the genetic consequences of one-year samples of wild larvae and one-year samples of hatchery-spawned broodstock, so assertions about the superiority of one approach or the other are speculative at best. Obviously, we can get a more diverse juvenile sample from wild larvae in one year than broodstock in one year, but that is not the ultimate determinant of genetic diversity or reproductive success of the future broodstock population.

4. A hatchery strategy should optimize the capture of both a complete spectrum of the available genetic diversity and the phenotypic expression of that diversity. Current genetic analysis methods provide an index of how much diversity is captured but do not represent the full range of phenotypic, physiological, life history, or behavioral traits. The analyses provide only a very gross picture of genetic representation that may depict evolutionary lineages rather than individual variation whose expression is key to the production of fish that are successful in the current environment. Maximizing phenotypic expression of the available diversity is just as important as capturing diversity. Both are related to numbers - more fish produce more genetic combinations that have a higher probability of producing successful survivors and reproductively successful adults. It isn't enough to capture diversity if it is not expressed phenotypically. Recombination of types is important because all progeny of a family are not identical and will not be equally successful (for example, you don't look, sound, or behave exactly like your siblings). The benefit of the broodstock method is that it expresses very high genetic variation of the available material through the mixing, recombination, and expression of the genome.

5. Larval collection may offer a larger number of families but, to be effective, it requires that a sufficient number of fish per family are released for those families to be represented in the breeding population. Small numbers of fish from a large number of families does not necessarily gain more diversity in the adult population (where it

matters for the next generation) if the majority of those families do not survive to reach the breeding population or don't survive in sufficient numbers to make a difference.

6. The larval collection method is not without genetic risk. The high mortality rates associated with holding larval-origin fish in the hatchery may increase artificial selection and domestication. Mortality rates of ~60% for larval collections in the hatchery may result in the release of only families or individuals that were best suited for survival in the hatchery environment and not necessarily in the river.

7. The effective breeding populations in Wells and Rocky Reach reservoirs are likely to increase dramatically as a result of this program regardless of the origins of stocked juveniles. Broodstock-origin juveniles stocked in each year will come from completely unrelated family lines, therefore the population in the reservoirs will be an aggregate of many different family lineages. Juveniles surviving to become reproductive adults, where ancestry really matters, are likely to reflect a broad diversity of family origins from within the reservoirs, from the lower Columbia, and from Lake Roosevelt. Further, adults within a year class likely will mature at different ages and spawn in aggregate with adults of different origins and year classes to increase mixing and diversity. Ultimately, when fish stocked over the next few years reach maturity, effective size of the breeding population will not be an issue.