

Statement of Agreement: Rocky Reach Project White Sturgeon Stocking Program for Population Rebuilding, Mitigation, and Enhancement

Background

In accordance with the Rocky Reach White Sturgeon Management Plan, beginning in year two (2011) of the new FERC license, Chelan Public Utility District (CPUD) released between zero to 6,500 yearling hatchery White Sturgeon into the Rocky Reach Project Area (RRPA) annually in years two to four (2011-2013). Disease issues prevented attainment of the desired front loaded stocking abundance by year four, and CPUD fulfilled its annual White Sturgeon stocking requirements in 2014. In 2015, CPUD stocked 6,492 white sturgeon in the RRPA under a one year Statement of Agreement. Subsequent years stocking (2016 and beyond) have been and will be determined by the Rocky Reach Fish Forum (RRFF).

To determine future releases of yearling hatchery White Sturgeon into the RRPA, the RRFF and RRFF Policy Committee (RRFF-PC) identified a target population size to rebuild towards and used a population growth model to develop a stocking strategy for Rocky Reach Reservoir. Described below is the approach used to identify a target population size and model inputs used to develop a stocking strategy.

Approach

The RRFF-PC identified adult abundance as the population metric upon which to develop a stocking strategy from. The RRFF-PC selected the 2012 White Sturgeon adult density (adults per river kilometer) estimate from Bonneville Reservoir to identify rebuilding targets for Rocky Reach Reservoir. Bonneville Reservoir was selected because the White Sturgeon population there is abundant, stable-aged, appears to exhibit some level of density dependence, and allows for a non-treaty and treaty harvest fishery. The 2012 adult density estimate for Bonneville Reservoir is 40 adults per river kilometer and the highest density estimate observed. Using this estimator, the adult abundance target for Rocky Reach Reservoir is 2,760 sturgeon.

With an adult abundance target identified and agreed to by the RRFF-PC, the RRFF used a population growth model to develop a stocking strategy. The population growth model uses age and growth, age-specific survival rates, existing wild population abundance, and past hatchery release data to evaluate the effects of different stocking and harvest rates on rebuilding White Sturgeon populations in Rocky Reach Reservoir. For age-specific survival,

stocking, and harvest rates, a variety of inputs were used in the model. Inputs used in the model are as follows:

1. Survival Rates: Upper estimate (86% year 1, 98% year 2, and 98% year 3+) based on data from sturgeon populations above Grand Coulee Dam, Lower estimate (70%, 80%, and 95%) based on data from sturgeon populations below McNary Dam, and a Median value (78%, 89%, and 96.5%) between the upper and lower estimates.
2. Harvest Rates: 10%, 20%, and 30% exploitation rates; Bonneville Reservoir-based slot length limit of 38-54 inches and “liberal” slot length limit of 31-54 inches
3. Stocking Rates: 500 to 6,500 fish per year (500 fish intervals) for Rocky Reach Reservoir

Using the model to develop a stocking strategy that perfectly builds the White Sturgeon population towards and sustains it at the Bonneville Reservoir-based adult abundance targets is nearly impossible. Past hatchery releases are projected to exceed those adult abundance targets for short period of time. Future releases are intended, in most instances, to slow the effects of natural mortality so the population eases and hopefully sustains itself around the adult abundance target. Interpreting the various model runs graphically can be difficult. To more easily identify an appropriate stocking strategy, a different approach was employed.

Each model run calculates the number of adults in the White Sturgeon population per year. To determine whether a specific stocking and harvest rate model run is achieving rebuilding objectives (i.e., meeting adult abundance targets), adult abundance averages from years 2035 to 2065 were calculated for each model run. This time period is when hatchery releases affect adult abundances. Year 2035 is when the first stocked fish (release year 2011) reaches maturity; whereas year 2065 is when the last stocked fish (release year 2040) reaches maturity. The assumption is stocking and harvest rate model runs that result in long-term average adult abundances “falling around” the Bonneville Reservoir-based adult abundance target are considered to be achieving White Sturgeon population rebuilding objectives. Specifically, long-term average adult abundances within $\pm 20\%$ of the Bonneville Reservoir-based adult abundance target are considered an acceptable stocking and harvest rate scenario. Long-term average adult abundances within $\pm 30\%$ are considered cautionary, and greater than 30% are considered inappropriate stocking and harvest rate scenarios. Further, long-term average adult abundances considered acceptable, cautionary, or inappropriate are also color coded as green, orange, and red, respectively. Over 400 model runs were completed, evaluated, summarized in matrices, and color coded to indicate appropriate stocking and harvest rate scenarios.

Recommendation

The RRF-PC recommends the following:

1. The most appropriate stocking rate is based off a model run using the median survival rates, a 20% exploitation rate, and the Bonneville Reservoir slot length limit
2. Based off this model run, maximum stocking rates that best achieve the Bonneville Reservoir-based adult abundance targets for Rocky Reach Reservoir (2,760) is 2,250 yearling hatchery White Sturgeon.
3. Recommended stocking rates will be in effect for release years 2016 through 2020
4. White sturgeon brood stock (and/or wild larvae) collection, spawning, and release guidelines affecting release years 2016 through 2020 include:
 - a. If white sturgeon larvae are available for stocking, they will be used first towards the yearling release target to the extent possible. Brood stock origin yearlings would then be used to make up the program balance if necessary and in accordance with guidelines (b.) through (f.) listed below.
 - b. A minimum of 18 unique (one male and one female) crosses, produced from a partial or full factorial breeding strategy, must be achieved during spawning in order to release the maximum number yearlings.
 - c. If >18 unique crosses are produced, the number of yearling white sturgeon released will not exceed 2,250 for Rocky Reach Reservoir.
 - d. If only brood stock origin fish are available and <18 unique crosses are produced then a reduced and pro-rated release strategy will be employed as described below: Example: $2,250 \text{ fish} / 18 \text{ unique crosses} = 125 \text{ fish/cross}$, thus if 10 unique crosses are produced the stocking rate would be $10 \times 125 = \underline{1,250 \text{ yearlings in the Rocky Reach Reservoir}}$.
 - e. Regardless of how many unique crosses are produced, family (cross) equalization will be reflected in the release to the greatest extent possible.
 - f. All entities involved in brood stock collection on behalf of CPUD agree to fish the entire contracted length of time and collect as many potential brood stock as possible as opposed to ceasing collections once six males and six females have been collected.
5. CPUD will monitor and evaluate White Sturgeon age structure, survival rates, abundance, density, diet, condition, growth rates, emigration and immigration, distribution, and habitat use annually from 2016 through 2020.

6. A healthy sturgeon population commensurate with the available habitat includes a population sustaining a reasonable level of harvest of hatchery White Sturgeon released into Rocky Reach Reservoir and is acknowledged by all RRFF-PC members as a beneficial outcome of this hatchery supplementation program.
7. Following expiration of this SOA, the RRFF and RRFF-PC will re-evaluate the model runs using empirical data collected from Rocky Reach Reservoir, in particular site specific survival estimates, to determine if changes in stocking should be made.

Terms and Conditions:

1. Effective dates of this SOA begin the month and day in 2016 of unanimous approval by the RRFF through December 31st, 2020.
2. This SOA reflects an entirely voluntary commitment between members of the RRFF. However, all parties agree to work in good faith to adhere to the guidelines listed above.
3. Post 2020 stocking may be increased or decreased depending on then-current information including relevant survival estimates, ecological impacts, and potential harvest capabilities.

Submitted to Rocky Reach Fish Forum – Policy Representatives on: **March 7, 2016**

Approved by the Rocky Reach Fish Forum – Policy Representatives on: **March 11, 2016**



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March 21, 2016

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RE: LETTER FOR THE RECORD Regarding The 11 March 2016 Approved White Sturgeon SOA.

On March 11, 2016 the Rocky Reach Fish Forum Policy Committee (Committee) members unanimously approved the “Statement of Agreement: White Sturgeon Stocking Program for Population Rebuilding, Mitigation, and Enhancement” (SOA) drafted by the Washington Department of Fish and Wildlife (WDFW). We consider our vote in support of the SOA a compromise intended to promote consensus building. Our vote represents our acceptance of the release numbers and the stipulations associated with Recommendation section items 4a-f. However, we have outlined the following concerns with regard to the remainder of the SOA:

- The Background, Approach, and Terms and Conditions sections, as well as items 5, 6, and 7 of the Recommendations section, are not necessary to describe the terms of the agreement.
- The Recommendations section of the SOA is misnamed, as it consists of the agreement terms and not recommendations.
- The SOA suggests that the Committee used the model to develop the stocking strategy. For clarification, members of the Rocky Reach Fish Forum (RRFF) utilized the population model to generate adult abundance and harvest estimates for consideration by the Committee during their dialogs regarding the stocking strategy (see next bullet).
- The Approach section is not representative of the process employed to make our determination, nor does it reflect our rationale for agreeing to the SOA.
- The SOA language stating, [t]he RRFF-PC selected the 2012 White Sturgeon adult density (adults per river kilometer) estimate from Bonneville Reservoir to identify rebuilding targets for Rocky Reach reservoir [period deleted] implies the Committee explicitly selected the method by which the target density was calculated. While the Committee did agree to use the Bonneville Reservoir adult¹ White Sturgeon densities to calculate target abundances for the project reservoir during the modeling exercises², it did not provide guidance as to the method

¹ The Committee meeting notes do not explicitly state that the target referred to adults although it is implied throughout.

² Final November 6, 2015 Committee Meeting Notes (page 8) state: *The Forums will use densities of sturgeon in Bonneville Reservoir as an initial estimate for carrying capacity within the project areas.*

by which the density was to be calculated. Moreover, the density calculation method was not considered within the RRFF.

- Reservoir area should have been used instead of reservoir length to calculate the target density of adult White Sturgeon. Fish habitat is a function of the amount of area within the reservoir and not the reservoir's length, thus the most common method for calculating reservoir fish densities is to divide the abundance by the surface area of the reservoir (e.g., fish/ha). White Sturgeon densities have been generated for the lower Columbia River reservoirs (John Day, The Dalles, and Bonneville) using this method (Beamesderfer et al. 1995). The surface area (7,632 ha) based density of adult White Sturgeon in Bonneville Reservoir was 0.39 fish/ha³. Using the target density of 0.39 fish/ha, the adult White Sturgeon abundance target in Rocky Reach Reservoir (3,334 ha) should have been 1,301 fish – 1,459 fewer fish than the target derived by reservoir length. The CCT raised this issue with WDFW during a February 24, 2016 phone conversation regarding the draft SOA.
- The SOA lacks a description of the defining characteristics of an adult White Sturgeon in reference to the target density⁴. According to Beamesderfer et al. (1995), the mean FL of a mature female White Sturgeon in the Bonneville Reservoir was 168 cm FL. If White Sturgeon >166 cm FL⁵ were considered adults, the resulting target density would have been 26 fish/km – a roughly 34% reduction relative to the SOA target density. When applied to Rocky Reach Reservoir (68 km), the abundance target would have been 1,768 adults. If the area-based density of White Sturgeon >166 cm FL in Bonneville Reservoir (0.26 fish/ha) had been applied, the abundance target would have been 867 adults.
- Further examination of the 2012 Bonneville Reservoir White Sturgeon abundance values in Cox and Schade (2014)⁶, suggest that the SOA adult abundance target was derived with White Sturgeon 138 cm FL and larger. The abundance estimates provided in Cox and Schade (2014) are length group specific and do not specify life stage (i.e., juveniles, sub-adults, adults) or age. As demonstrated in the previous bullet, the more liberal length characterization of an adult resulted in a higher target density value and ultimately a greater release number. There is no record of discussion within either the RRFF or Committee regarding the appropriate consideration of what constitutes an adult within the context of deriving target densities despite these large implications. Future modeling efforts should clearly define what constitutes an adult White Sturgeon.
- For clarification, the SOA and the Hildebrand Memo⁷ incorrectly indicate that the low survival rate values that the RRFF agreed to use in the model were based on data from sturgeon populations below McNary Dam. The low year one survival rate value used in the modeling was the mid-point between the broodyear (BY) 2012 (75%) and BY2013 (65%) year one survival estimates for hatchery sturgeon released in Rocky Reach Reservoir⁸. The low year two

³ Based on the SOA density of 40 fish/km and a reservoir length of 75 km.

⁴ Within the context of the modeling, adult sturgeon are age 25 and older. Using the model Life Table age 25 White Sturgeon are 192.5 cm FL.

⁵ Maximum length group in Cox and Schade (2014) abundance estimates and corresponds with mean size at maturity in Beamesderfer et al. (1995).

⁶ Table A-6 in Cox and Schade (2014).

⁷ Hildebrand Memo to Hillman titled Updated white sturgeon adult abundance projections in the Wanapum, Priest Rapids, and Rocky Reach reservoirs and dated February 4, 2016.

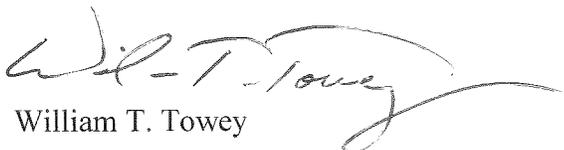
⁸ See Table 1 in Beamesderfer and Anders Technical Memorandum to Yakama Nation Fisheries dated January 8, 2016.

survival rate value was the approximate BY2012 (82%) year 2 survival estimate for hatchery sturgeon released in Rocky Reach Reservoir.

- The use of mean adult abundance between 2035 and 2065 under the model assumptions of consistent annual stocking for 25 years following program inception and no natural recruitment results in inflated annual release numbers. Since the range of adult abundance values used to generate the mean extends beyond the period after which fish are recruiting to the population, the cumulative abundance declines⁹. Their inclusion in the calculation drives the mean lower providing for higher release numbers.
- The yearly cumulative adult abundance values are not normally distributed and no statistical justification is provided for the use of arithmetic mean adult abundance.
- The SOA assumption that the proposed stocking will result in *...long-term average adult abundances "falling around" the Bonneville Reservoir-based adult abundance target...* will only happen if stocking is discontinued within 25 years of the program's start and natural recruitment is not restored. In addition, the decline to the target abundance occurs only after the abundance has peaked at levels substantially greater than the target.
- The SOA states that *... long-term average adult abundances within ±20% of the Bonneville Reservoir-based adult abundance target are considered an acceptable stocking and harvest rate scenario*. The appropriateness of this range was not agreed upon by the RRFF or Committee.
- The size of the fish at release and release timing (i.e., late spring) should be specified along with the release number in Item 2 of the Recommendations. The high survival rate value modeled was associated with a 200 g size at release.

This letter summarizes our primary concerns associated with the SOA. Despite all parties' best intentions, the SOA was crafted without a thorough discussion of some important factors that influenced the stocking rates. Our expectation is that future agreements related to the release numbers of hatchery White Sturgeon associated with the Rocky Reach project will address our concerns.

Respectfully,



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RRFF Policy Representative

⁹ See Figures 3-5 in Hildebrand Memo.

Literature Cited

- Beamesderfer, R.C., T.A. Rien, and A.A. Nigro (1995). Differences in the dynamics and potential production of impounded and unimpounded white sturgeon populations in the lower Columbia River. *Transactions of the American Fisheries Society* 124:857-872.
- Cox, B.S. and S.M. Schade. 2014. Report A. Evaluate the success of developing and implementing a management plan for enhancing production of white sturgeon in reservoirs between Bonneville and McNary dams. 1) An update of abundance, life history parameters, and population dynamics of white sturgeon in Bonneville Reservoir, and 2) a summary of annual recruitment of age-0 white sturgeon in four Columbia River reservoirs. Pages 6-40 *in* C. Mallette, editor. White Sturgeon mitigation and restoration in the Columbia and Snake Rivers upstream from Bonneville Dam. Available at <https://pisces.bpa.gov/release/documents/DocumentViewer.aspx?doc=P137941>
- ODFW (Oregon Department of Fish and Wildlife). 2004. Columbia Gorge Mainstem Subbasin Plan prepared for the Northwest Power and Conservation Council. Available at <http://www.nwcouncil.org/media/20033/ColumbiaGorgeInvAssPlan.pdf>.