Priest Rapids Fish Forum

White Sturgeon Subgroup Meeting

Conference Call

Wednesday, 5 November 2025
9:00 a.m. – 11:30 a.m.

FINAL MINUTES

PRFF Members

Michael Lucid, Emily Orling, USFWS
Ralph Lampman, Keely Murdoch, YN
Nathan and Clayton Buck, Wanapum
Jason McLellan, Bret Nine, CTCR
Mike Clement, Chris Mott, Grant PUD
Tracy Hillman, Chair
Patrick Verhey, Laura Heironimus, WDFW
Melissa Peterson, Chad Brown, Ecology
Aaron Jackson, Carl Merkle, CTUIR
Steve Lewis, BIA
Pete McHugh, CRITFC

Meeting Attendees

Mike Clement, Grant PUD
Jason McLellan, CTCR
Amber Jackson, Ecology
Chris Mott, Grant PUD
Tygh Schuster, YN
Joseph LeMoine, Grant PUD
Cory Kamphaus, YN
Chad Jackson, WDFW
Laura Heironimus, WDFW
Nate Patterson, YN
Paul Grutter, WSP
Tracy Hillman, Chair

Action Items:

- Laura Heironimus will compile adult White Sturgeon abundance and biomass data from Bonneville Reservoir. WDFW defines an adult sturgeon as >167 cm FL.
- Jason McLellan will compile adult White Sturgeon abundance and biomass data from the Rocky Reach project area.
    - For both Bonneville and Rocky Reach reservoirs, abundance and biomass will be reported as number per area (density) and weight per area (biomass).

- Jason McLellan and Laura Heironimus will research effective population size (N_e) for White Sturgeon. They will evaluate whether N_e can be estimated for the project area.
- Paul Grutter will provide separate growth figures for each brood year in each of the Priest Rapids and Wanapum reservoirs. The figures will show the lengths by age, the fit of the von Bertalanffy growth curve to the data, precision of the model (e.g., PI or CI), the parameter estimates (i.e., L_∞, K, and t_0), and sample size.
- Paul Grutter will evaluate the effects of juvenile sampling gear on growth data and consider ways to incorporate data from adult sampling gear.
- Paul Grutter will generate figures showing the relationship between length classes (X-axis) and mean annual growth rates (mean cm/yr on Y-axis) for sturgeon in the project area.
    - Laura Heironimus will provide Paul with an example figure.
- The Subgroup will familiarize themselves with the White Sturgeon life-cycle model.
- The Subgroup will consider different slot limits for harvest.

I. Welcome and Introductions

Tracy Hillman welcomed everyone to the PRFF White Sturgeon Subgroup meeting and identified all attendees.

II. Agenda Review

The PRFF reviewed and approved the White Sturgeon (WS) Subgroup agenda with no additions. Tracy noted that the objective of the meeting is to evaluate stocking levels in the project area based on monitoring and evaluation (M&E) data and life-cycle modeling. He reminded the group that the Subgroup is not a decision-making group. Rather, the PRFF convened the Subgroup to evaluate the best available information and make recommendations to the PRFF. Laura Heironimus added that this Subgroup will likely need to meet on several occasions to work through the existing information, conduct and evaluate model simulations, and identify recommendations for consideration by the PRFF. She said there should be enough information available from ongoing monitoring work to update the 2016 Statement of Agreement (SOA).

III. Review 2016 White Sturgeon SOA

Tracy Hillman provided an overview of the 2016 White Sturgeon SOA (see Attachment 1), which guided sturgeon broodstock collection, spawning, rearing, and juvenile releases into the project area from 2016 through 2020 and has been extended annually from 2020 to present. Tracy summarized the approach used in the development of the 2016 SOA and pointed out that adult sturgeon density (adults per river kilometer) within Bonneville Reservoir was used as the rebuilding target for the project area. The Bonneville sturgeon density of 40 adults per river kilometer equated to a target adult abundance of 2,440 and 1,200 in Wanapum and Priest Rapids reservoirs, respectively. A simple spreadsheet population growth model, largely developed by Ray Beamesderfer, was used to develop a stocking strategy. The model included inputs such as survival rates, harvest rates, and stocking levels. Based on this work, the PRFF Policy Committee recommended 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 Priest Rapids and Wanapum reservoirs is 1,250 and 2,000 yearling hatchery White Sturgeon, respectively.
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 1,250 for Priest Rapids and 2,000 for Wanapum reservoirs, respectively.
    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: 3,250 (Priest Rapids + Wanapum) fish/18 unique crosses = 180 fish/cross, thus if 10 unique crosses are produced the stocking rate would be 10 X 180 = <u>1,800 yearlings release between Priest Rapids and Wanapum reservoirs.</u>
    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 GPUD agree to fish the entire contracted length of time and collect as many potential broodstock as possible as opposed to ceasing collections once six males and six females have been collected.
5. GPUD will continue to implement the monitoring and evaluation activities as defined in the White Sturgeon Management Plan and 401 Certification, as modified via the annual white sturgeon report and study plan per the review and approval by the PRFF, and additional activities agreed to by the PRFF-PC (November 6, 2015).
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 Priest Rapids and Wanapum reservoirs is acknowledged by all PRFF-PC members as a beneficial outcome of this hatchery supplementation program.
7. Following termination of this SOA the PRFF and PRFF-PC will re-evaluate the model runs using empirical data collected from Priest Rapids and Wanapum reservoirs, in particular site-specific survival estimates, to determine if changes in stocking should be made.

The PRFF has implemented these recommendations since 2016.

Chad Jackson noted that during the preparation of the 2016 SOA, they developed a spreadsheet that combined all the model runs and evaluated which stocking scenarios would achieve the adult targets within 20%. That is, stocking rates that result in a long-term adult abundance within ±20% would be considered acceptable. Stocking rates that result in a long-term adult abundance within ±30% would be viewed with caution. Stocking rates that result in a long-term adult abundance greater than ±30% would be considered unacceptable. Chad uploaded the spreadsheet ("2016 PUD Sturgeon Modeling Exercise Ver 4") in the Teams Chat.

Jason McLellan indicated that for the 2016 SOA, an adult was defined as a fish equal to or greater than 138 cm fork length (FL). In addition, the 2016 SOA used a Bonneville density based on length (river mile) rather than surface area. Both the definition of an adult and density based on reservoir length rather than reservoir area were debated during the development of the 2016 SOA. Jason added that both Yakama Nation and CTCR provided letters describing the issues, and those letters are attached to the 2016 SOA. As noted in the CTCR letter, an adult sturgeon should be defined as a fish greater than 166 cm FL and target adult abundances should be based on area not length of the reservoir. Using these criteria would have resulted in roughly a 34% reduction in the target density. That is, adult abundance targets would have been 1,508 and 754 in Wanapum and Priest Rapids reservoirs, respectively.

Laura Heironimus agreed with Jason that an adult is greater than 166 cm FL. In Bonneville Reservoir, an adult is 167 cm FL or greater. She also agreed that using fish/area rather than fish/length makes sense.

IV. Review White Sturgeon M&E Results

Paul Grutter, WSP, gave a presentation titled "White Sturgeon Population Stock Assessment in the Priest Rapids Project Area" (see Attachment 2). The purpose of the presentation is to summarize stocking rates (2011-2015), describe what is known about population genetic structure and diversity, summarize the 2025 catch distribution, describe population size and survival, identify any evidence of density dependence in growth rates, and indicate whether the population is trending toward achieving adult abundance goals.

Paul started by describing stocking history and genetic structure. He identified the number of fish released into the project area and the mean lengths and weights of fish stocked. In total, 53,825 juvenile sturgeon have been stocked in the project area since 2003. He then identified the source of the adults used to produce the juveniles that were stocked into the project area each year. He added that there was a short-term fishery initiated to selectively remove progeny from Lower Columbia River adults (aka CRITFC fish). Although these fish were released into Rock Island Reservoir, some ended in the Priest Rapids project area. These fish were the result of crossing one female with two males. Paul noted that they have captured few "CRITFC" fish following the short-term selective fishery.

Paul described the distribution of juveniles within the project area based on juvenile indexing in 2025. He noted that more fish are captured in Wanapum Reservoir than Priest Rapids Reservoir and brood years 2012-2054, 2017-2018, and 2121-2023 contributed most to the catch. He also pointed out the number of juveniles by brood year from Wells, Rocky Reach, and "unknown" that were captured in the project area. For several brood years, some fish stocked in Wanapum Reservoir were captured in Priest Rapids Reservoir (i.e., some fish stocked in Wanapum emigrated to Priest Rapids Reservoir). Paul added that the highest catch rates were often at the upper ends of the two reservoirs. Fewer fish were captured in the lower reach of the two reservoirs. Paul then showed the specific locations on maps where juvenile sturgeon were captured in the project area. Although distributed through the reservoirs, they tend to aggregate in specific locations.

Paul then talked about population size and survival within the project area. He showed a figure identifying the length frequency (cm FL) of sturgeon captured on juvenile sampling gear for brood years 2010-2024. The earlier brood years show more variability in length than more recent brood years. Paul said this is expected. He then showed the survival rates for age-1 and age-1+ fish by brood year and reservoir. In general, except for brood year 2010, survival rates of age-1+ fish are high (>90%). Survival rates for age-1 fish are much lower (<50%) and tend to be lower in Priest Rapids Reservoir than in

Wanapum Reservoir. Paul indicated that this could be a result of density dependence in Priest Rapids Reservoir. Paul estimated the abundance of sturgeon in the project area based on the CJS model (omitted fish that immigrated) and the multi-state model, which analyzed the full dataset. Based on the multi-state model, brood years 2012-2014 and 2017-2018 contributed most to the abundance of juvenile sturgeon in the project area. Paul noted that estimates for older brood years are more variable because of low catch numbers with juvenile gear (i.e., most of the fish from those early brood years have recruited out of the juvenile gear). The numbers of sturgeon (based on sampling with juvenile gear) have been variable over time in both reservoirs. Numbers in Priest Rapids Reservoir have ranged from about 2,000-4,500, while number in Wanapum Reservoir have ranged from about 5,000-9,000 sturgeon. Numbers in Priest Rapids Reservoir appear to have stabilized between 4,000 and 4,500 fish.

Next, Paul talked about the growth of sturgeon in the project area and identified some evidence of density dependence. Paul addressed the following three questions:

1. Are we seeing density dependent growth within the White Sturgeon population in either Priest Rapids or Wanapum reservoirs?
2. If so, can removal of older over-abundant brood years result in increased growth and improved condition of younger brood years?
3. Did past harvest efforts during 2016-2018 on brood year 2002 fish result in a change in growth and condition of younger brood years?

In response to question 1, Paul showed figures identifying the relationship between age and mean FL at age. By fitting von Bertalanffy growth curves to the data by brood year, Paul showed that growth of sturgeon in the Priest Rapids Reservoir is reaching an asymptote between 75-85 cm FL, which suggests density-dependent effects there. Growth of sturgeon in Wanapum Reservoir does not show an asymptote; although, growth is slowing with age, especially with the older brood years. This could be related to older fish recruiting away from the juvenile gear. Paul also showed the relationship between brood year and absolute growth rate (cm/year) for each age group (ages 1-6). In general, absolute growth rates have been relatively constant within Wanapum Reservoir; absolute growth rates within Priest Rapids Reservoir are more variable and have shown a decline in the most recent brood years.

Responding to questions 2 and 3, Paul described some of the fish culling and harvest activities within the project area during 2016-2018. He noted that there was a combination of selective removal by Grant PUD personnel in 2016, recreational angling, and Tribal food fisheries (using set lines). Harvest targeted fish between 96.5 and 183.0 cm FL. Although the goal was to target brood year 2002 sturgeon (CRITFC fish), other brood years and natural-origin fish were captured. Unfortunately, PIT tags were not recorded. Paul showed the growth rates (cm/d) and relative weight (%) by age and year in relation to the 2016-2018 harvest. In both reservoirs, there was no apparent response in growth rates or relative weight to the selective harvest. Paul indicated that possible harvest strategies should include a conservative slot size to reduce effects on large subadults that will contribute to future spawners, avoid conducting a fishery during the spawning season, conduct creel surveys and scan harvested fish for tags, regulate the duration of the fishery based on catch per effort, and develop a stocking model to better estimate the effects of harvest on future population size and natural recruitment.

Lastly, Paul talked about model development. He recommended adapting the LGL/Chelan PUD/CTCR model for the Priest Rapids project area. Here is a link to the model:

https://analytics.lglsidney.com/chelan-sturgeon/

Based on a conversation with Wendel Challenger (LGL), Paul provided thoughts on adapting the model to the project area. He identified the following required inputs:

- Identify the reservoirs that will be included in the model.
- Identify key metrics to monitor (e.g., adult fish counts by reservoir).
- Identify management actions to model (e.g., hatchery releases and management removals by slot limit).
- Provide records of hatchery releases and removals (these are used to simulate population changes between the last assessment and the start of the simulation).
- Develop a database with catch and release records.
- Estimate probabilities of fish movement between reservoirs.
- Estimate survival rates by age or length.
- Estimate annual growth rates (used to predict future growth trends).

Paul was asked whether all results presented were from juvenile indexing. Paul said yes. No results from sampling with adult gear were included in the presentation. Laura Heironimus asked when spontaneous autopolyploidy testing began for sturgeon released into the project area. Chris Mott responded that all fish were screened starting in 2020; however, samples (n = 100) were sent to a lab for screening beginning in 2017. Laura suggested that spontaneous autopolyploidy may be present in some of the fish released into project area prior to 2017. Thus, a targeted harvest may help remove some of those fish before they spawn. She added that an updated SOA will need to define the size of an adult, identify an appropriate exploitation rate, and identify an appropriate adult target abundance.

Jason McLellan stated that if we are overstocking the project area, the overstocking can delay or negatively affect the goal of developing a self-sustaining population commensurate with the available habitat. For example, in the Upper Columbia in Canada, stocking has occurred annually since 2002. The fish grow to about 120 cm FL and growth then stalls (growth asymptotes and the population stunts). Females mature at a median size of 166 cm FL. Thus, maturation is delayed. Looking at the same brood years in the US portion of the Upper Columbia, where densities have been reduced through harvest, fish continue to grow (growth has not asymptoted for those fish). Jason added that growth is beginning to slow in the US portion and may be related to continued stocking of relatively high numbers to support harvest and density dependence may be occurring. In short, overstocking can delay growth, which then delays maturation. Implementing a harvest program that targets fish larger than 120 cm FL will not help the situation. He noted that a recovery action such as supplementation may actually have unintended consequences and implementing a harvest on a range of fish sizes (slot limit) may cause other issues such as not equalizing family size. Laura agreed with Jason and added that some of the fish from earlier releases may be autopolyploidy. The presence of autopolyploidy fish in the population could reduce the goal of establishing a self-sustaining population in the project area.

Given the results from index monitoring within the project area, Jason said there are two management actions that could be evaluated: (1) reducing stocking rates and (2) targeted removals. These actions may be necessary in Priest Rapids Reservoir where it appears there may be density dependence. He said the survival rates also seem to suggest some level of density dependence in Priest Rapids Reservoir. He said the survival rates were relatively high initially and then dropped off with later releases. He added that the drop off could be related to emigration. Jason said he would like to see more information on the growth of sturgeon in the project area.

When asked about released sturgeon migrating out of the project area, Paul said they have not looked at that in any detail. He said some PIT tags have been detected downstream from the project area. Laura agreed and said their (WDFW) sampling down river (e.g., Ice Harbor, McNary, and John Day) identified sturgeon that were released in the project area. During a sampling event in 2011 in McNary Reservoir, about 30% of the population consisted of upriver hatchery-origin fish.

Tracy asked what additional information the group would need to make an informed recommendation to the PRFF. Jason responded that running some stocking scenarios with agreed-upon adult abundance targets, various stocking rates, and realistic harvest rates would be useful. The model will need accurate growth and abundance information from the project area. He noted that the inputs to the model are fixed and "management levers" include size of fish at release, number of fish released, and removals. Because the river system is dynamic, it will be important to rerun scenarios every few years with updated monitoring data. Laura agreed with Jason and said this is what she was hoping the Subgroup would do.

Tracy said we can begin the process by defining what we mean by "adult" and identifying an appropriate adult abundance target for the project area. Jason indicated that using a reference adult abundance is appropriate and is consistent with efforts in the Wells and Rocky Reach project areas. He suggested using the Bonneville adult density as the reference density but added that the reference density should be based on area (i.e., fish/area) rather than length (i.e., fish/river mile). Laura agreed with using Bonneville and basing it on fish/area and noted that here are several years of additional data from Bonneville Reservoir that can be included in the calculation. Jason also recommended looking at biomass, which is something they have been doing in the Upper Columbia. He said they are evaluating the effects of biomass on growth rates. Having information on biomass (mean, median, and range) from Bonneville Reservoir may be useful. In addition to having information from Bonneville Reservoir, Jason thought it would be useful to look at density and biomass data from Rocky Reach Reservoir. These could be compared to Bonneville data, and we should be able to identify a realistic adult abundance target for the Priest Rapids project area. He reminded everyone that we also need to consider how overstocking can cause stunting, which reduces or delays recruitment of juveniles to adults. Laura added that because of the size of the reservoirs in the project area, we should also consider effective population size. This is important when establishing a self-sustaining population in the project area. Jason said he will share some published papers on effective population size with the group.

Tracy said we also need to define what we mean by "adult." In the 2016 SOA, an adult was any sturgeon larger than 138 cm FL. In their letter attached to the 2016 SOA, CTCR indicated that a more realistic definition would be a fish greater than 166 cm FL. Laura said 138 cm FL is too small. In Bonneville Reservoir, they use a size value of >167 cm FL to define an adult. Paul noted that they have used 150 cm FL as the cutoff.

Recalling Jason's comment about having more information on growth in the project area, Tracy asked the Subgroup what additional growth information would be useful. Jason responded that he would like to see values for the von Bertalanffy equation (e.g., L_∞, K, and t_0) for each brood year. These could be provided in figures showing the relationship between age and mean FL at age. A separate figure for each brood year may be appropriate. In addition, the figures should show the variability about each mean value and the variation associated with the fitted growth curve. Sample sizes would also be useful information. Laura asked to see figures that show growth rates (cm/year) across different brood years or length classes. Laura will send Paul an example figure showing the relationship between growth rates (Y-axis) and length class (X-axis).

Jason noted that because the information contained in the presentation was based only on sampling with juvenile gear, he questioned whether information from adult sampling could be combined with juvenile sampling to provide a more realistic picture of abundance, growth, and survival. Paul indicated that he believes he can do that. Because adult monitoring occurs every three years, there will be gaps in adult data. Nevertheless, Paul will try to combine the data.

Tracy said everyone should have access to the model (the link to the model is provided above). Jason noted that the model has not been parameterized for the Priest Rapids project area; therefore, running various scenarios with the existing model may provide misleading results (see Paul's last few slides). Nevertheless, it may be useful to explore the model and become familiar with it.

Regarding harvest goals, Tracy said it may be too early to dive deep into those. Laura agreed and said it would be useful to first run the parameterized model with an agreed-upon adult abundance target and accurate growth and survival data. Then we can decide what harvest rates we want to include in the model. Laura said she also wants to give more thought to use of slot limits to reduce the abundance of earlier release groups because of the possibility of autopolyploidy in the population. Jason said the model can be used to run various harvest scenarios, but he cautioned that using harvest to target a specific group of fish (e.g., 2002 brood) can have negative effects on wild fish and the effects can be large.

The Subgroup thanked Paul for the presentation. Tracy will share the presentation with the PRFF (it is also attached to these notes; Attachment 2).

V. Next Steps

Tracy Hillman summarized next steps and identified the following action items:

- Laura will compile adult White Sturgeon abundance and biomass data from Bonneville Reservoir. WDFW defines an adult sturgeon as >167 cm FL.
- Jason will compile adult White Sturgeon abundance and biomass data from the Rocky Reach project area.
    - For both Bonneville and Rocky Reach reservoirs, abundance and biomass will be reported as number per area (density) and weight per area (biomass).
- Jason and Laura will research effective population size (N_e) for White Sturgeon. They will evaluate whether N_e can be estimated for the project area.
- Paul will provide separate growth figures for each brood year in each of the Priest Rapids and Wanapum reservoirs. The figures will show the lengths by age, the fit of the von Bertalanffy growth curve to the data, precision of the model (e.g., PI or CI), the parameter estimates (i.e., L_∞, K, and t_0), and sample size.
- Paul will evaluate the effects of juvenile sampling gear on growth data and consider ways to incorporate data from adult sampling gear.
- Paul will generate figures showing the relationship between length classes (X-axis) and mean annual growth rates (mean cm/yr on Y-axis) for sturgeon in the project area.
    - Laura will provide Paul with an example figure.
- The Subgroup will familiarize themselves with the White Sturgeon life-cycle model.
- The Subgroup will consider different slot limits for harvest.

Depending on when everyone can complete their action items, our next Subgroup meeting could be as early as December, but more likely sometime in the new year.

VI. Adjourn

With no additional business to discuss, Tracy Hillman adjourned the meeting at 11:33 am.

VII. Next Meeting

The White Sturgeon Subgroup will meet after action items are complete.

Attachment 1

2016 White Sturgeon Statement of Agreement

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

Background

In accordance with the Priest Rapids Project White Sturgeon Management Plan, beginning in year three (2011) of the new FERC license, Grant Public Utility District (GPUD) released between zero to 6,500 yearling hatchery White Sturgeon into the Priest Rapids Project Area (PRPA) annually in years three to seven (2011-2015). Subsequent years stocking (2016 and beyond) will be determined by the Priest Rapids Fish Forum (PRFF). In 2015, GPUD fulfilled its annual White Sturgeon stocking requirements for years three through seven.

To determine future releases of yearling hatchery White Sturgeon into the PRPA, the PRFF and PRFF Policy Committee (PRFF-PC) identified a target population size to rebuild towards and used a population growth model to develop a stocking strategy for Priest Rapids and Wanapum reservoirs. Described below is the approach used to identify a target population size and model inputs used to develop a stocking strategy.

Approach

The PRFF-PC identified adult abundance as the population metric upon which to develop a stocking strategy from. The PRFF-PC selected the 2012 White Sturgeon adult density (adults per river kilometer) estimate from Bonneville Reservoir to identify rebuilding targets for Priest Rapids and Wanapum reservoirs. 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, adult abundance targets for Priest Rapids and Wanapum reservoirs are 1,200 and 2,440, respectively.

With an adult abundance target identified and agreed to by the PRFF-PC, the PRFF 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 Priest Rapids and Wanapum reservoirs. 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 5,000 fish per year (500 fish intervals) for Wanapum and 500, 1,000, 1,500, 3,000, and 4,500 for Priest Rapids reservoirs.

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 ±20% of the Bonneville Reservoir-based adult abundance target are considered an acceptable stocking and harvest rate scenario. Long-term average adult abundances within ±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 PRFF-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 Priest Rapids and Wanapum reservoirs is 1,250 and 2,000 yearling hatchery White Sturgeon, respectively

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 1,250 for Priest Rapids and 2,000 for Wanapum reservoirs, respectively.
    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: 3,250 (Priest Rapids + Wanapum) fish/18 unique crosses = 180 fish/cross, thus if 10 unique crosses are produced the stocking rate would be 10 X 180 = <u>1,800 yearlings release between Priest Rapids and Wanapum reservoirs</u>
    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 GPUD 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. GPUD will continue to implement the monitoring and evaluation activities as defined in the White Sturgeon Management Plan and 401 Certification, as modified via the annual white sturgeon report and study plan per the review and approval by the PRFF, and additional activities agreed to by the PRFF-PC (November 6, 2015).

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 Priest Rapids and Wanapum reservoirs is acknowledged by all PRFF-PC members as a beneficial outcome of this hatchery supplementation program.

7. Following termination of this SOA the PRFF and PRFF-PC will re-evaluate the model runs using empirical data collected from Priest Rapids and Wanapum reservoirs, 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 PRFF through December 31st, 2020

2. This SOA reflects an entirely voluntary commitment between members of the PRFF. 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.

4. There will be a three year check in during the life of the SOA in order that Parties to this agreement may introduce significantly new information that may alter the reasoning or intent of the SOA. If the parties agree, the SOA may then be amended or replaced.

Submitted to Priest Rapids Fish Forum – Policy Representatives on: **March 9, 2016**

Approved by the Priest Rapids Fish Forum – Policy Representatives on: **March 11, 2016**

Yakama Nation Fisheries

Columbia River
Honor. Protect. Restore.

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Yakamafish-nsn.gov

March 17, 2016

Dr. Tracy Hillman, Chair
Priest Rapids Fish Forum

Re: Letter for the record regarding the PRFF sturgeon SOA

Dear Tracy,

Thank you for your skillful facilitation of the process leading to a successful conclusion of the Statement of Agreement regarding sturgeon stocking levels in the Priest Rapids Project Area for 2016-2020. The willingness of parties to collaborate in developing a consensus model is a long step in moving to a rational decision-making process that considers the interests of all parties, especially those of the resource we are charged to preserve.

These comments are not an attempt to reinterpret or alter any terms of the SOA. I am writing only to clarify my understanding of certain terms of the SOA and what they imply for its implementation. This seems advisable to avoid potential future disagreements over what was meant or understood by Forum members when a decision was taken. Documented understandings serve as a record of the assumptions under which a party agreed to a proposed action, and they may also illuminate a need to further reconcile what other parties took to be implicit in a decision.

My understandings pertain to the Recommendations and are **bolded** below:

1. **The location of larval collection is not specified.** Part 4.a. indicates that larval collection will be used first towards meeting release targets to the extent possible. It is not specified where suitable larvae can be collected. It is my understanding that some Forum members are reluctant to release fish from Lake Roosevelt into the PRPA. This should be clarified in follow-up discussions. As an aside, the members assume that larval collections incorporate a broad diversity of families, but this is not regularly verified to my knowledge – another topic for discussion.
2. **Grant will continue to fund brood stock collection at an adequate level to ensure more than 18 unique crosses are produced.** Part 4.d. describes how juvenile releases may be reduced pro-rata if fewer than 18 unique crosses are produced by brood stock collection. Given the greatly diminished stocking levels agreed to in the SOA and the

harvest interests of the fishery co-managers, collecting an adequate number of brood stock to support full stocking is a priority. The SOA does not describe whether and how brood stock collection will be implemented to back up larval collection. Part 4.f. indicates that Grant's agents will fish the "entire contracted length of time", but there is no commitment to what that time period is. It is assumed that brood stock collection will be adequate to reliably provide enough juveniles to fill any deficit in the larval collection up to the full juvenile stocking level.

3. **Grant ensures that M&E will produce the information needed to determine population status and condition in 2020.** Removal of the qualifier, "annually", from the statement in Part 5 creates ambiguity in Grant's commitment to produce all data that may be needed to address the technical questions raised in the deliberation of this SOA. As much of the difficulty in reaching agreement was based on the absence of empirical data, it is assumed that Grant commits to an M&E program that is sufficient to produce the empirical data needed by Forum members to determine new stocking levels in 2020.

4. **The check-in at year 3 is advisory only and does not alter the terms of the SOA unless agreed to by all members.** The term of the SOA is five years and continues for that duration unless new information obtained at year 3, or any other time, warrants a change in terms that is agreed to by all Forum members.

Thanks for the opportunity to offer these thoughts and clarifications. I welcome any responses to the record if it is thought I have misunderstood or mischaracterized the terms of the sturgeon SOA.

Sincerely,

Steven S. Parker, Policy Committee representative
Yakama Nation Fisheries

Colville Confederated Tribes
Fish and Wildlife Program
P.O. Box 150
Nespelem, WA 99155
Phone: (509) 634-2110 / Fax: (509) 634-2126

March 21, 2016

Tracy Hillman, Ph.D.
Priest Rapids Fish Forum Chair
4725 N. Cloverdale Rd; Ste 102
Boise, ID 83714

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

On March 11, 2016 the Priest Rapids 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 Priest Rapids Fish Forum (PRFF) utilized the population model to generate adult abundance and harvest estimates for consideration by the Committee during their dialogues 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 PRFF-PC selected the 2012 White Sturgeon adult density (adults per river kilometer) estimate from Bonneville Reservoir to identify rebuilding targets for Priest Rapids and Wanapum reservoirs* [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 adult[1] White Sturgeon densities to calculate target abundances for the project reservoirs during the modeling exercises[2], it did not provide guidance as to the

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[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.*

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

- 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 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 density[3]. 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 FL[4] 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 Priest Rapids (29 km) and Wanapum (58 km) reservoirs, the abundance targets would have been 754 and 1,508 adults, respectively.
- Further examination of the 2012 Bonneville Reservoir White Sturgeon abundance values in Cox and Schade (2014)[5], suggest that the SOA adult abundance targets were 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 greater release numbers. There is no record of discussion within either the PRFF 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 Memo[6] incorrectly indicate that the low survival rate values that the PRFF 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 Reservoir[7]. The low year two survival rate value was the approximate BY2012 (82%) year two 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

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[3] 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.
[4] Maximum length group in Cox and Schade (2014) abundance estimates and corresponds with mean size at maturity in Beamesderfer et al. (1995).
[5] Table A-6 in Cox and Schade (2014).
[6] 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.
[7] See Table 1 in Beamesderfer and Anders Technical Memorandum to Yakama Nation Fisheries dated January 8, 2016.

generate the mean extends beyond the period after which fish are recruiting to the population, the cumulative abundance declines[8]. 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 PRFF or Committee.
- The abundance of hatchery White Sturgeon originating from the Columbia River Inter-Tribal Fish Commission releases conducted in 2003 in the Rock Island Reservoir that are currently residing in the Wanapum and Priest Rapids reservoirs were not accounted for in model runs. Had they been included, the projected abundance values would have been reached with lower release numbers. They were excluded from the modeling because WDFW intends to remove substantial numbers of them within the near future. There is considerable uncertainty associated with the implementation and effectiveness of this program.
- 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 Priest Rapids project will address our concerns.

Respectfully,

William T. Towey
PRFF Policy Representative

[8] See Figures 3-5 in Hildebrand Memo.

Confederated Tribes of the Colville Reservation- Letter for the record-PRFF Sturgeon SOA

Attachment 2

Presentation by Paul Grutter on White Sturgeon Population Stock Assessment in the Priest Rapids Project Area

White Sturgeon Population Stock Assessment in the Priest Rapids Project Area

Paul Grutter
5 November 2025
PRFF White Sturgeon Subgroup Meeting

Agenda

- Actual Stocking Rates – 2011-2025
- Population Genetic Structure/Diversity – What is Known?
- 2025 Catch Distribution
- Population Size Structure, Survival and population estimates (2024/2025)
- Growth Rates – Evidence of Density Dependence?
- Modeling Exercise – Trending Towards Achieving Adult Abundance Goals?

2

PRPA White Sturgeon Stocking History and Genetic Structure

Stocking Rates in PRPA from 2011 to 2025
CRITFC 2003 Release Rock Island Reservoir

Release Year	Year Cross	Number Released	WR/PR Release Proportion	Mean Fork Length (mm)	Mean Weight (g)
2003	2002	20600	Rock Island Res	192	45
2011	2010	9116	77/23	294	177
2013	2012	3981	77/23	291	154
2014	2013	6592	77/23	275	130
2015	2014	6502	77/23	313	198
2016	2015	3258	77/23	303	171
2017	2016	3248	62/38	272	126
2018	2017	3224	62/38	285	144
2019	2018	2657	62/38	267	128
2020/21	2019a&b	2157	62/38	443	631
2022	2021	3269	62/38	289	154
2023	2022	3243	62/38	257	114
2024	2023	3227	62/38	281	140
2025	2024	3251	62/38	285	156
		53825		304	205

Initial higher release numbers to front-load the system to provide enough spawners to replace loss of wild spawning population due to senescence.

1yr 672 2019aBY and 2yr 2019bBY 1,485 released

Small compared to PRPA release and lower expected survival

4

Hatchery Release Genetic Composition

Brood year	F	M	Genetic Families	Origin
2002	1	2	2	LCol
2010a	1	2	2	MCol
2010b	3	2	6	LCol Captive
2010c	7	10	19	UCol
2012a	1	4	4	MCol
2012b	1	3	3	MCol
2013a	1	2	2	PRPA
2013b	3	3	8	Mcol?
2014a	5	5	25	MCol
2014b	3	5	15	MCol
2015a	8	10	80	MCol
2015a	1	5	5	MCol
2016	6	6	36	MCol
2017	6	6	33	MCol
2018	5	5	25	MCol
2019a and b	5	5	24	MCol
2021	6	6	32	MCol
2022	6	6	36	MCol
2023	6	6	36	MCol
2024	6	6	34	MCol
2025	6	6	36	MCol

Unequal numbers of each genetic family released 3,597 2010a, 2,600 2010b, 2.919 2010c

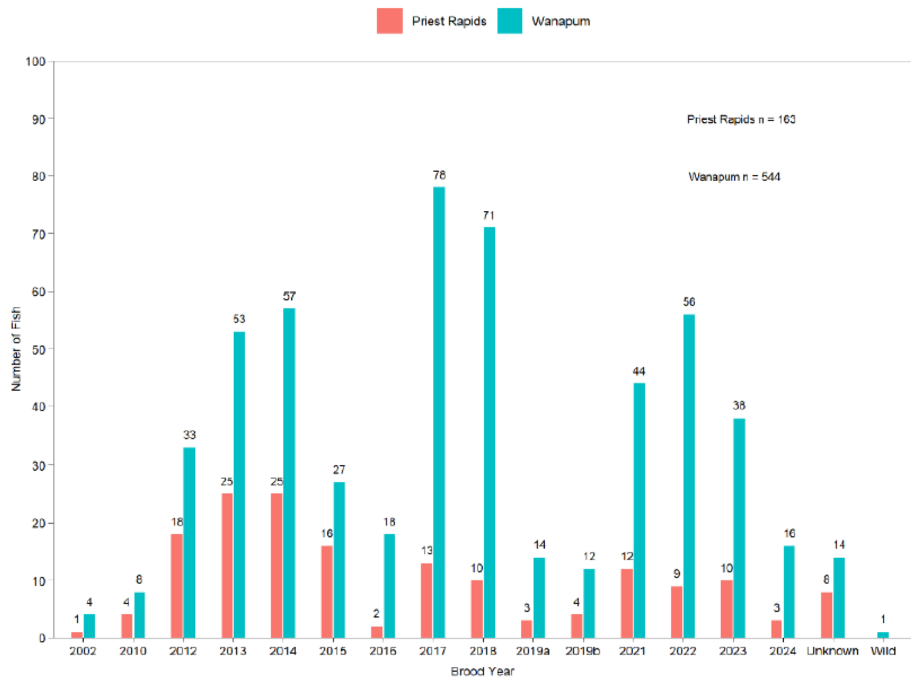
Trying to selectively remove fish above red line using slot size will not work due to substantial overlap in length frequency among BY's

Equal numbers of each genetic family released

5

Juvenile Indexing 2025 Catch Distribution

2025 Juvenile Indexing Catch by Brood Year



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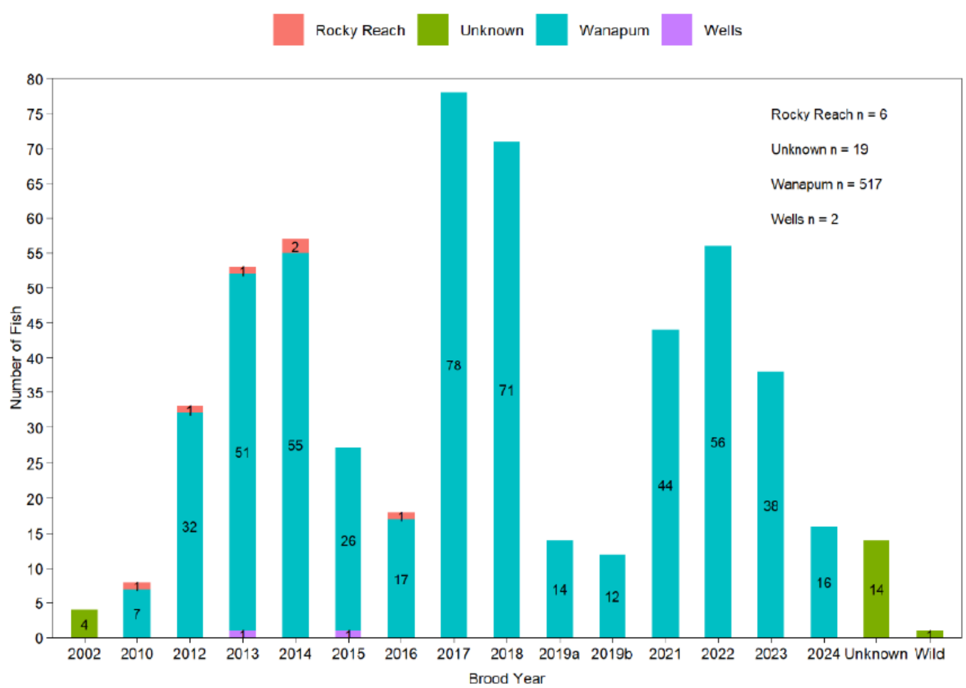
Wanapum 2025 Catch by Brood Year and Origin



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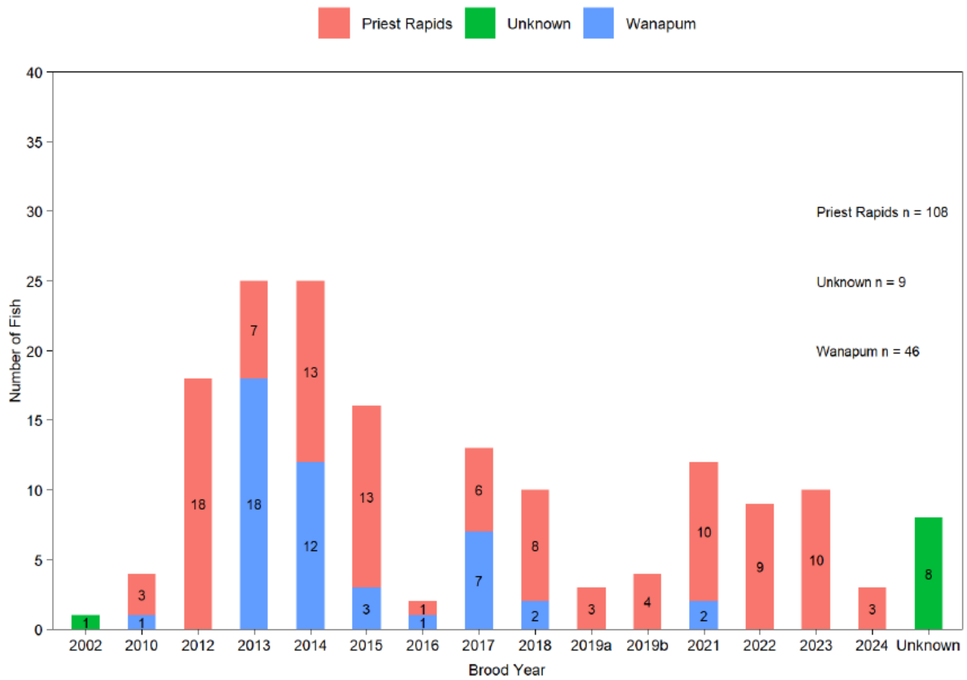
Priest Rapids 2025 Catch by Brood Year and Origin



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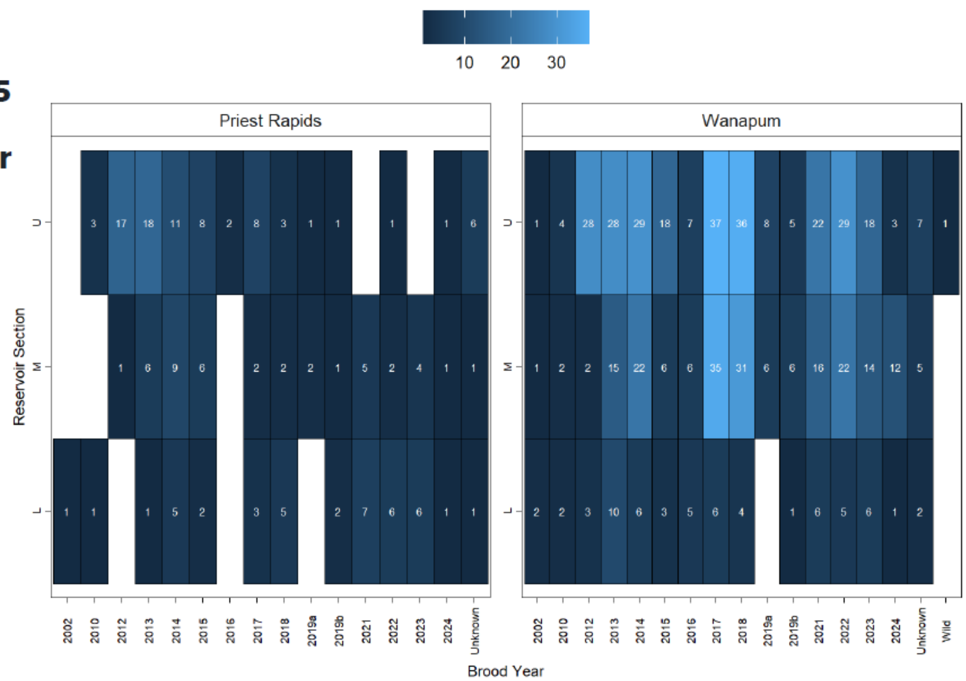
PRPA 2025 Catch by Brood Year and Reservoir Section



10


Age (n)
15
13
11
9
7
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1 km
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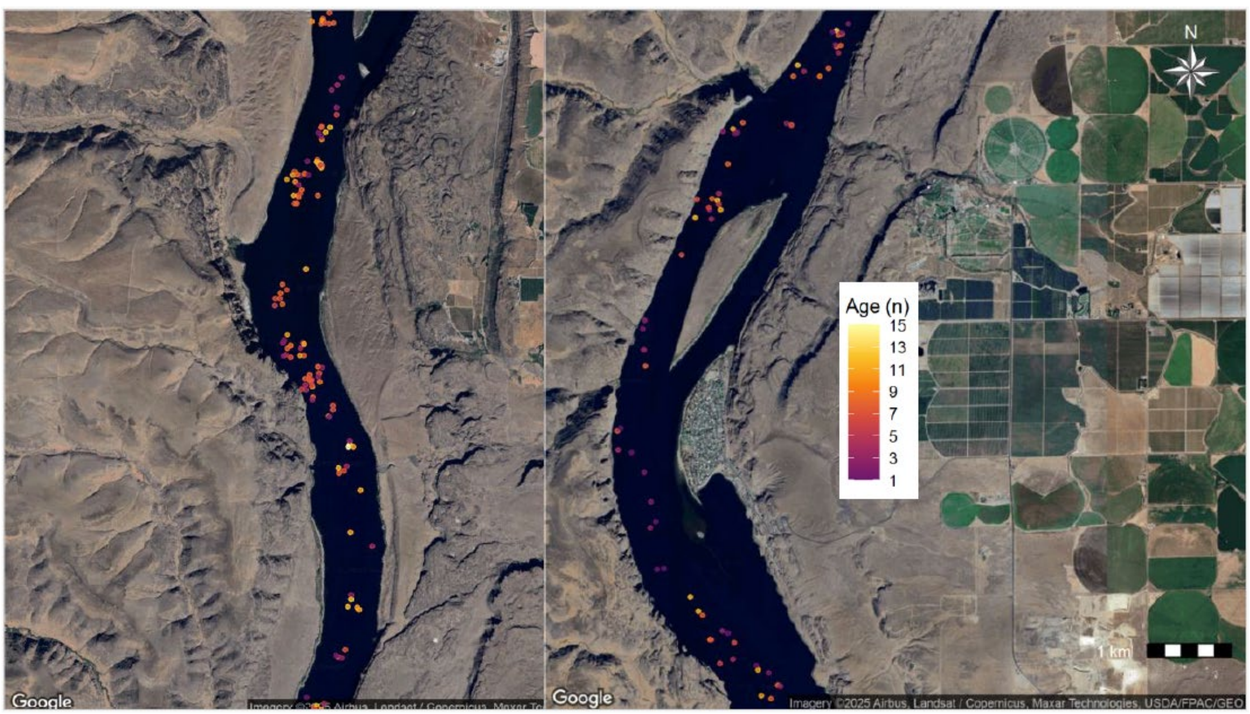
Imagery ©2025 Airbus, Landsat / Copernicus, Maxar Technologies, USDA/FPAC/GEO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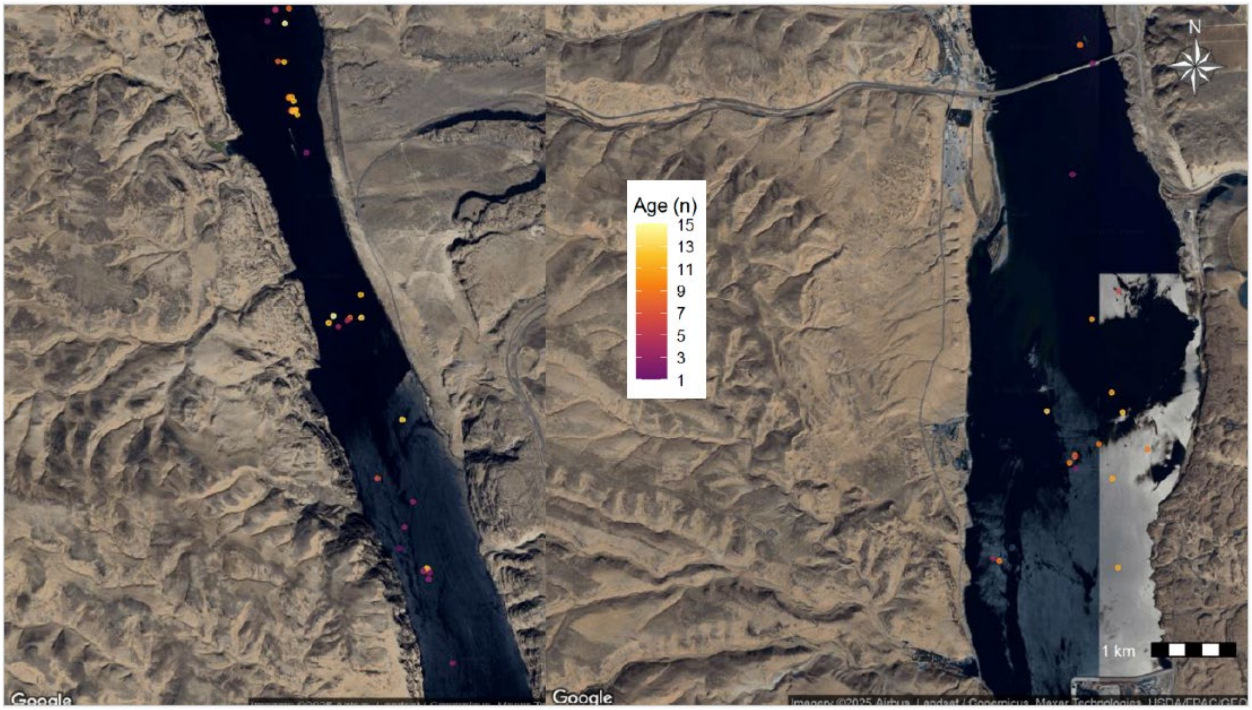
Imagery ©2025 Airbus, Landsat / Copernicus, Maxar Technologies, USDA/FPAC/GEO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Imagery ©2025 Airbus, Landsat / Copernicus, Maxar Technologies, USDA/FPAC/GEO


Age (n)
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Imagery ©2025 Airbus, Landsat / Copernicus, Maxar Technologies, USDA/FPAC/GEO
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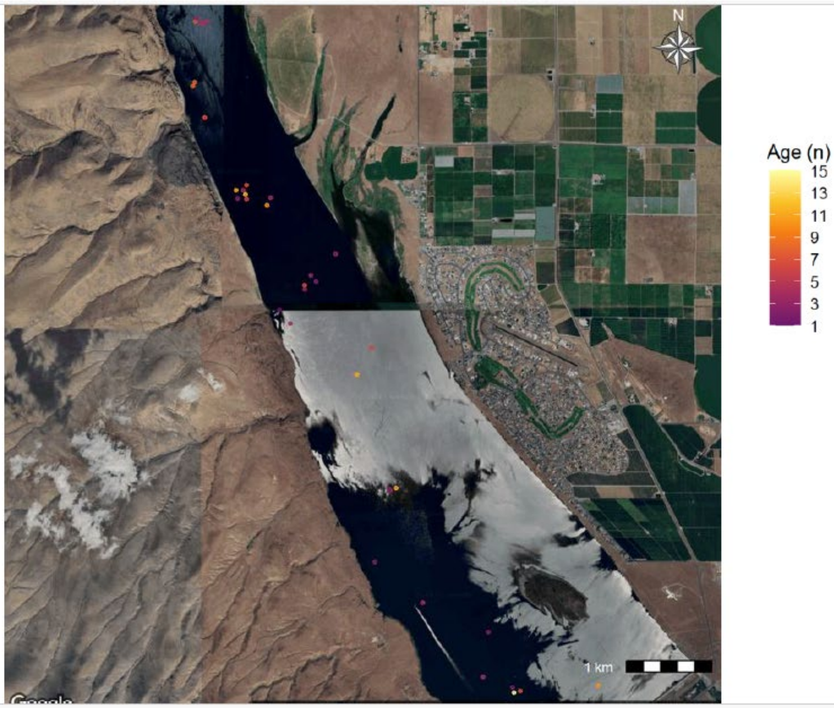
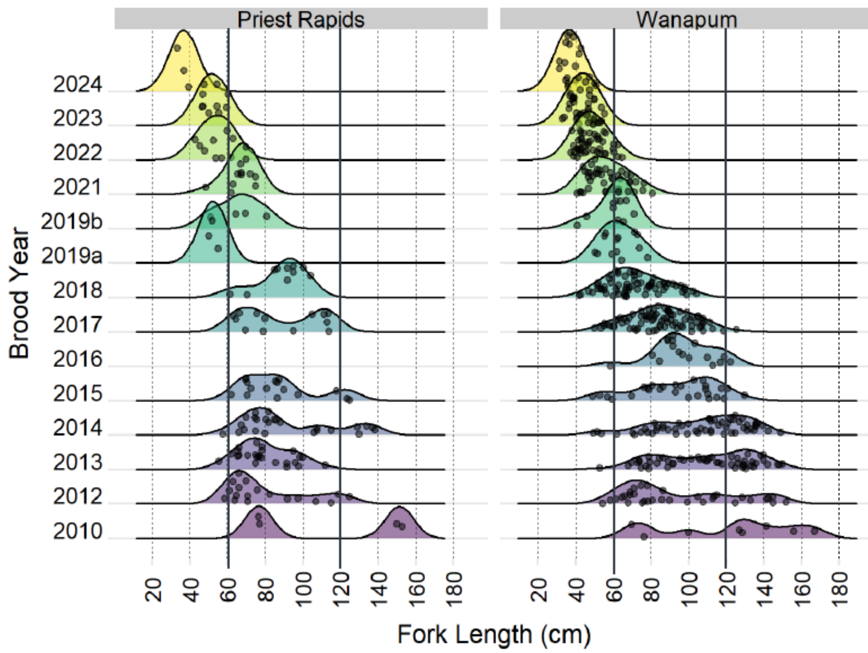
15



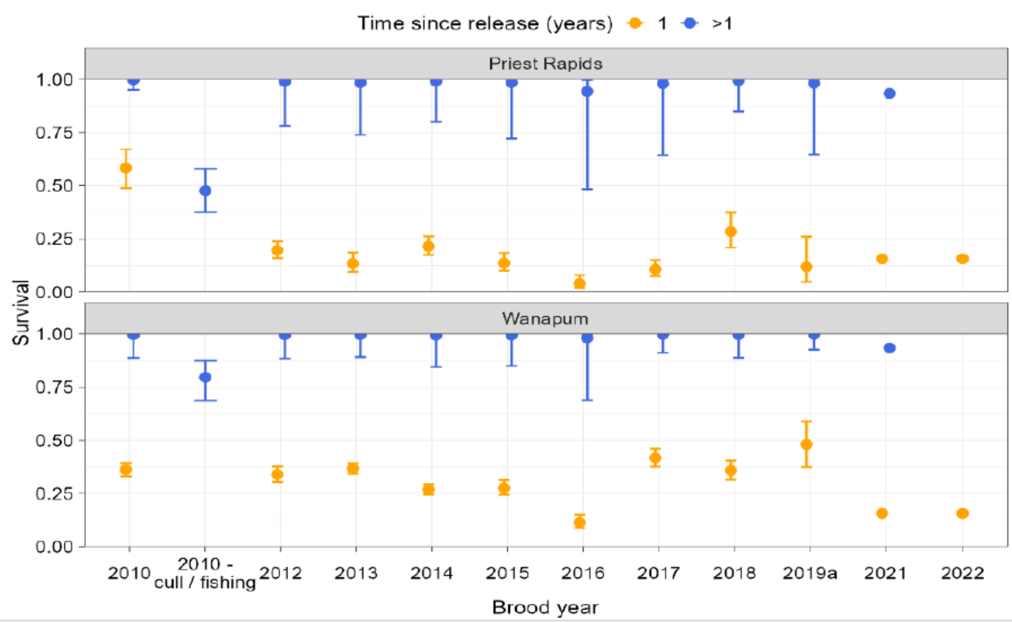
Population Size Structure (2025), Survival and population estimates (2024)

PRPA 2025 Length Frequency by Brood Year



17

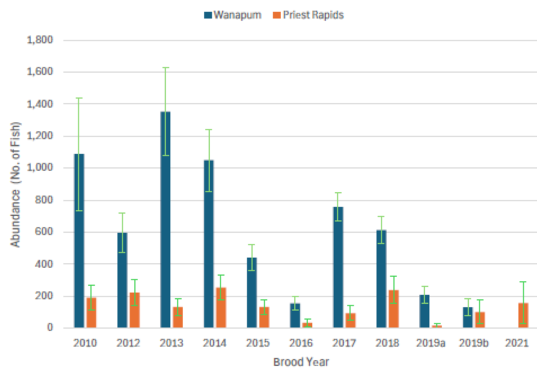
PRPA 2024 Brood Year Survival Year 1 and > Year 1 Survival Probabiliti in PRPA



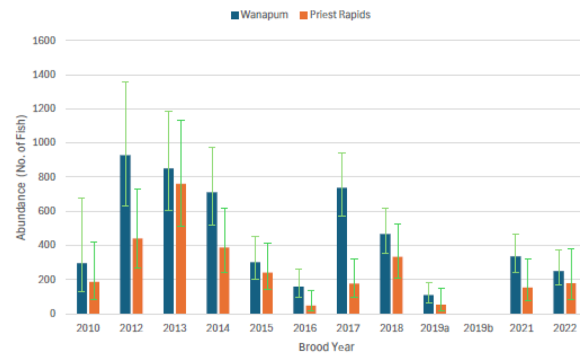
18

Abundance by Brood Year

2023 CJS Model – omitted fish that immigrated



2024 Multi State Model – full dataset analyzed

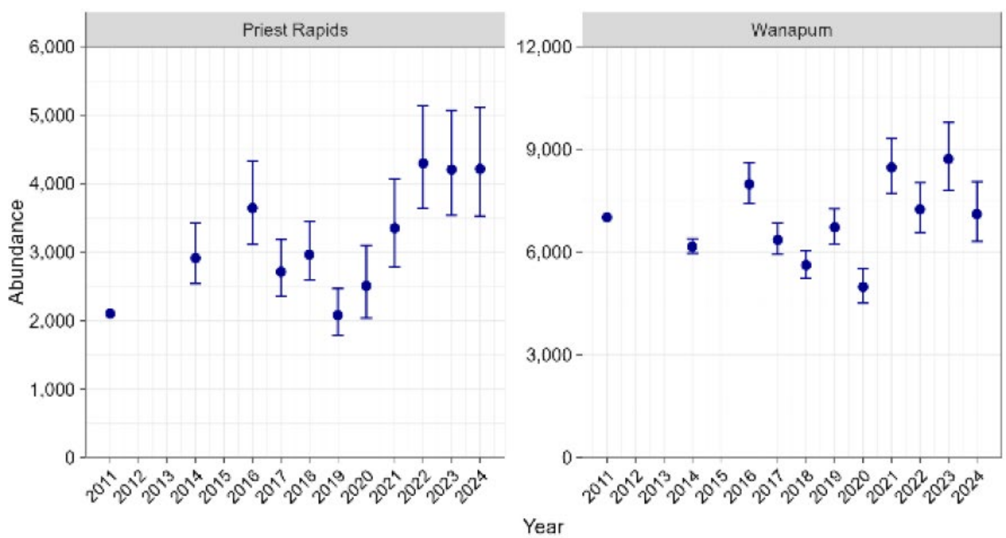


Estimates of older brood years more variable due to low catch number with juvenile gear, sensitive to recaptures

19

Total Abundance by Reservoir

2024 Multi-State Model – full dataset analyzed



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Growth and Evidence of Density Dependence

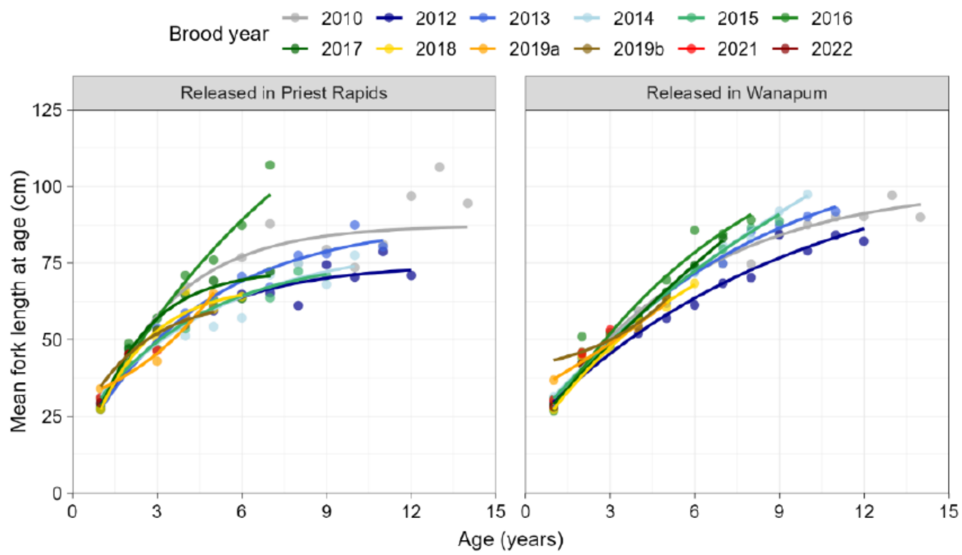
wsp

Questions:

1) **Are we seeing density dependent growth within the White Sturgeon population in either Priest Rapids or Wanapum reservoirs?**
2) **If so, can removal of older overabundant brood years result in increased growth and improved condition of younger brood years?**
    1) Is there evidence of intraspecific competition, overlap in diet, or behaviour interactions between older and younger brood years
3) **Did past harvest efforts of 2002BY from 2016 to 2018 result in a change in growth and condition of younger brood years?**

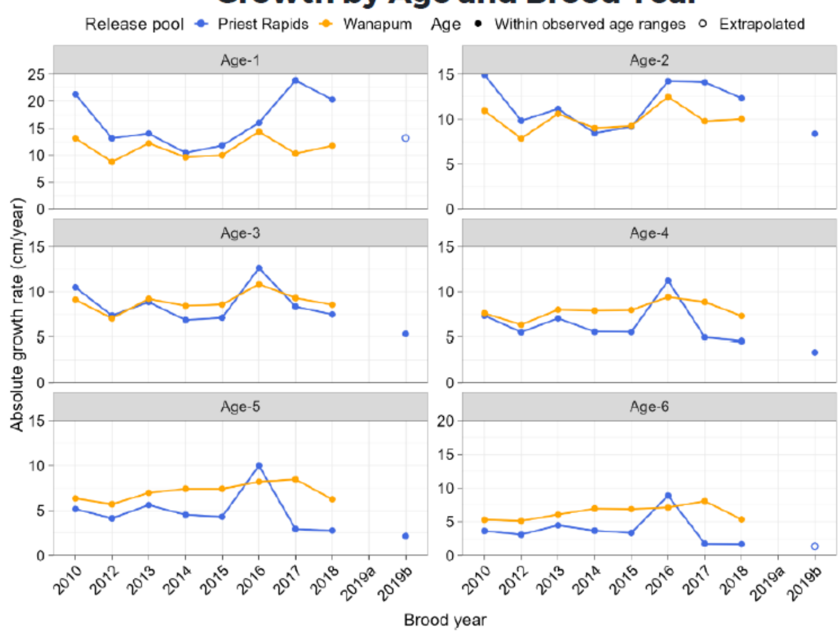
22

Growth by Reservoir



23

Growth by Age and Brood Year



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wsp

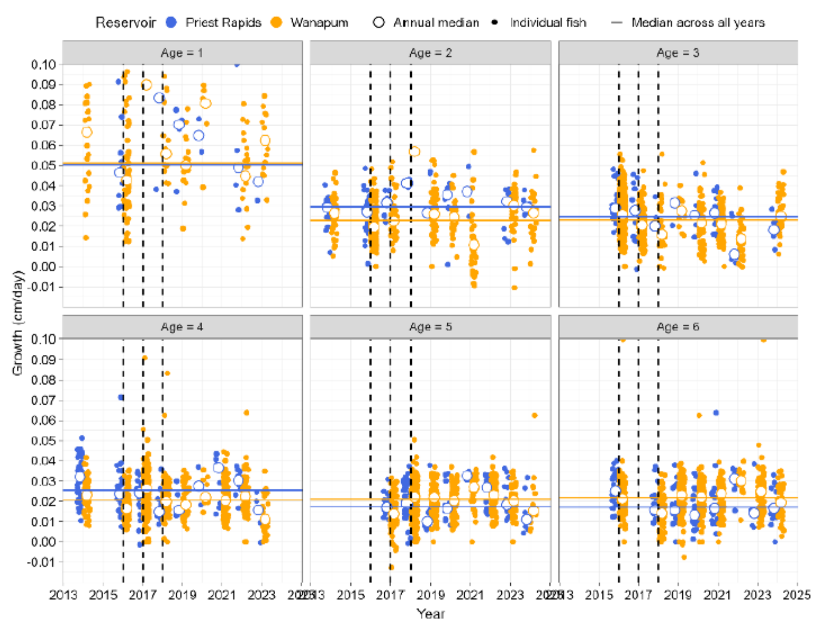
2016-2018 Fish Cull and Harvest Activities

- Combination of selective removal (2016 Grant personnel), recreational angling, and Tribal food fisheries (set lines)
- Slot size 38-72" (96.5 to 183 cm FL)
- 2016 1 Oct -30 Nov
- 2017 3 Jun - 30 Sep
- 2018 29 Apr - ?
- Set lines 8 - 24 Dec 2016, 2017 ?, 5 Nov - 1 Dec 2018
- Target 2002BY, but slot size encompassed other BY and Wild fish
- PIT tags were not recorded (tag loss)

25

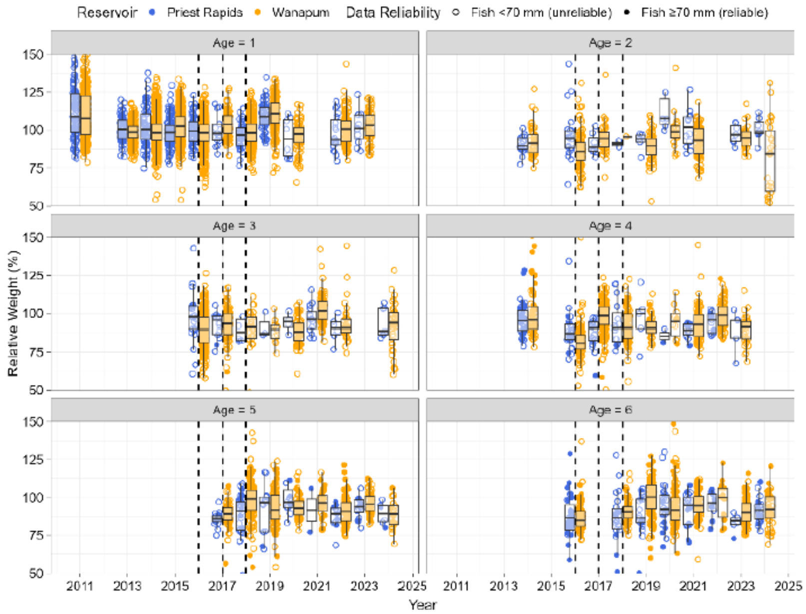
wsp

Growth (cmFL/day) by Age and Year in Relation to Harvest 2016-2018



26

Change in Condition (RW) by Age and Year in Relation to Harvest 2016-2018



27

Problem: Harvest activities at odds with FERC license objectives to establish a self-sustaining population

Possible Harvest Strategies to provide recreational/food fisheries opportunities.

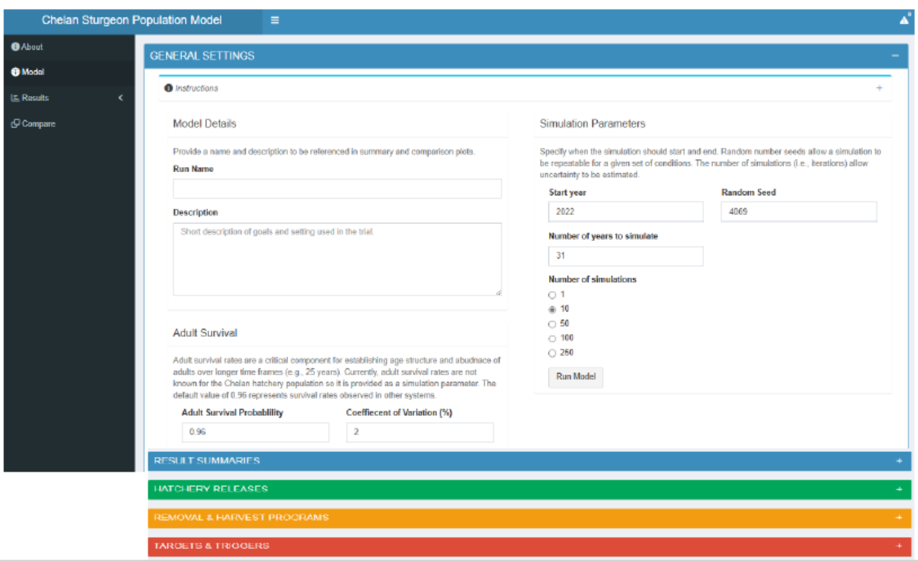
- **A conservative slot size should be select to reduce the impact on large subadults that will contribute to future adult spawning population.**
- **Select the timing of the fishery based on local interest and angler involvement. Avoid conducting fishery during the spawning season.**
- **Conduct creel surveys to record catch, equip guides, tribal fisherman with scanners to record tag numbers.**
- **Regulate the duration of the fisheries based on catch/effort.**
- **Develop a stocking model to allow better estimates of the effect of harvest on future population size and natural recruitment.**

28

Stock Model Development

Potential to adapt the LGL Chelan/Colville Stocking for the PRPA

- https://analytics.lglsidney.com/chelan-sturgeon/



30

Discussion with Wendel Challenger (LGL) about adapting the stocking model:

Required Inputs:
Reservoir Overview
A list of reservoirs you'd like included in the model.

Management Targets
Key metrics you want to monitor—e.g., adult fish counts by reservoir.

Management Actions to Model
Example:

- The Colville version supports hatchery releases and removals (management, tribal, and sport) by slot limit.
- The Chelan version supports hatchery releases and management removals by slot limit.

Please confirm actions are relevant to your system.

Historical Management Actions
Records of hatchery releases and removals. These are used to simulate population changes between the last assessment (e.g., 2023) and the start of the simulation (e.g., 2026).

31

Discussion with Wendel Challenger (LGL) about adapting the stocking model:

Database with Catch and Release Records
Primarily used to assess size distribution in your catch, which helps initialize the model to reflect the current population structure.

Movement Rates Between Reservoirs
Probabilities of fish moving between reservoirs in a given year —potentially derived from your multistate RMark analyses.

Survival Rates
First-year survival and annual survival thereafter, or survival by length—also potentially extracted from your RMark analyses.

Growth Rates
Annual growth rate analysis results to help predict future growth trends.

Incorporate the current indexing database and RMark analysis results.

32


Questions?
wsp.com