Priest Rapids Fish Forum
Meeting

Wednesday, 6 March 2019
10:00 a.m. – 12:00 p.m.

MEETING MINUTES

PRFF REPRESENTATIVES
Steve Lewis, USFWS
Bob Rose, YN
Pat Wyena, Wanapum
Jason McLellan, CCT
Mike Clement, Grant PUD
Tracy Hillman, Facilitator

Patrick Verhey, Chad Jackson, WDFW
Breean Zimmerman, WDOE
Aaron Jackson, Carl Merkle, CTUIR
Keith Hatch, BIA
Chris Mott, Grant PUD
Erin Harris, Grant PUD

ATTENDEES
Paul Grutter, Golder (Via Phone)
Erin Harris, Grant PUD (Via Phone)
Patrick Verhey, WDFW
Steve Lewis, USFWS
Tom Skiles, CRITFC (Via Phone)
Breean Zimmerman, WDOE (Via Phone)

Chris Mott, Grant PUD
Jason McLellan, CCT (Via Phone)
Doris Squeochs, Wanapum (Via Phone)
Kirk Truscott, CCT
Laura Heironimus, WDFW (Via Phone)
Tracy Hillman, Facilitator

Action Items:

- Chris Mott will check with Donella Miller on the testing of juvenile sturgeon at Marion Drain for white sturgeon iridovirus and autoploidy and on the proposed fate of surplus production at the hatchery.
- PRFF will review the draft White Sturgeon 2018 Annual Report and provide comments to Chris Mott by 7 March 2019.
- CCT will identify their PRFF policy representative.
- Tracy Hillman will find a meeting day for the White Sturgeon Subgroup.
I. Welcome and Introductions - Tracy Hillman welcomed everyone and participants introduced themselves.

II. Agenda Review – Members reviewed and approved the agenda.

III. Approve November Meeting Notes – The February 2019 Meeting Minutes were reviewed, edited, and approved.

   A. Action Items from February Meeting:
      1. Steve Lewis will provide updates to the PRFF on the status of the invasive species draft action plan. Complete. Steve indicated that he will provide major milestone updates on the Action Plan. Steve also reminded members that they can check out the website to see when major updates are made to the Action Plan.
      2. Chris Mott will check with Donella Miller on the testing of juvenile sturgeon at Marion Drain for white sturgeon iridovirus and autopolyploidy, and on the proposed fate of surplus production at the hatchery. Ongoing. Chris said he is waiting for Donella to respond to his request for information.
      3. Jason McLellan will share with the PRFF an abstract prepared by UC Davis researchers on autopolyploidy. Complete. Jason shared the abstract with the PRFF following the meeting.
      4. PRFF will review the draft White Sturgeon 2018 Annual Report and provide comments to Chris Mott by 7 March 2019. Ongoing. Comments are due tomorrow (7 March).
      5. PRFF will provide questions to Tracy Hillman by 1 March for the consultants to address during the March meeting. Complete. Tracy reported that he received no questions from members.
      6. CCT, BIA, and CRITFC/Umatillas will identify their PRFF policy representatives. Ongoing. Tracy reported that CRITFC/Umatillas identified Jeremy Wolf and Bret Hall as their policy representatives and BIA identified Keith Hatch as their representative. Kirk Truscott said he is still waiting on CCT to identify their policy representative.
      7. PRFF will review the draft Pacific Lamprey 2018 Annual Report and provide comments to Mike Clement by 11 February 2019. Complete. Deb Firestone (GPUD) sent the final report to FERC.
      8. Steve Lewis will contact Tom Dresser about the possibility of monitoring bull trout passage during winter (15 November – 15 March) in the Priest Rapids and Wanapum fishways. Complete. Steve said he spoke with Tom and Tom will check into it. Tom noted his concern with monitoring the fishways given so few bull trout pass during the winter. However, Tom noted Grant PUD may try monitoring for one year and see if the result support monitoring additional years.

IV. White Sturgeon Management Plan
   A. Update on Juvenile Rearing – Chris Mott reported no new updates on juvenile sturgeon rearing at Marion Drain. He said fish will be released about the same time in 2019 as they were in 2018.
   B. Population Assessments and Future Tagging – Paul Grutter with Golder provided a presentation titled, “Grant County White Sturgeon Monitoring & Evaluation Program: 2018 Summary” (see Attachment 1). Paul started by presenting an outline for his presentation and then described the brood year 2017 juvenile sturgeon tagging and release efforts, including size (length and weight) at release. He also described the flows and temperatures of the river during the time of
release and indicated the level of fin deformities on released fish. Paul noted the locations of telemetry interrogation stations and described post-release movements of juvenile sturgeon following release within Wanapum and Priest Rapids reservoirs. He then showed numbers of tagged sturgeon entrained at Wanapum and Priest Rapids dams.

Paul described the juvenile index sampling design and monitoring efforts conducted in 2018. In general, the design was similar to past years (2014, 2016, and 2017). Sampling in 2018 occurred from 6-29 August. Paul identified the sampling gear (and gear lost and damaged during sampling), described flows and temperatures during sampling, and noted the number of overnight sets within each reservoir. He then described the catch (proportion of positive catch or Ep) of juvenile sturgeon by brood year, reservoir, and section within the reservoirs. He also showed the catch by river mile for 2016, 2017, and 2018. He then showed the length frequency by brood year of fish captured during index monitoring. Finally, he showed abundance estimates, including the assumptions of the model used to estimate abundance. He noted they used a simple model because of a lack of data and model convergence. Abundance estimates in both reservoirs appeared to increase rapidly over time and then reached an asymptote around 12,000 in Wanapum Reservoir and about 3,000-3,500 in Priest Rapids Reservoir. Since 2014, numbers in both reservoirs have not increased as much as they did during 2012-2014. Paul also showed losses due to avian predation, which ranged from 0.1-15.3% (percentage of released fish lost to bird predation). He noted that predation varied depending on where fish were released.

Next, Paul described the 2018 adult indexing efforts. He talked briefly about the sampling design and flows and temperatures during the surveys. He showed the numbers of adults captured (including CRITFC fish) by size class, year, reservoir, and origin (wild v hatchery). He also talked about the harvest of sturgeon in the tribal (Yakama Nation Commercial Fishery) and sport fisheries and showed the sizes (length frequencies) of fish harvested in the fisheries (recall there was a slot-size limit for harvest). Paul then described the effort (hook hours) spend conducting the adult index surveys. Finally, he showed abundance estimates by reservoir for CRITFC and wild sturgeon. Overall, numbers have declined over time (from 2010 to present). Abundance of CRIFTC fish declined from 3,767 to 75 in Wanapum Reservoir and from 1,514 to 20 in Priest Rapids Reservoir from 2010 to present. Harvest does not appear to explain these large reductions in abundance of CRITFC fish.

Paul concluded with the following summary:

- **2017BY fin deformity rate was similar to 2016BY (~42%).**
- **2017BY exhibited upstream movement after release and low entrainment based on acoustic telemetry.**
- **Juvenile population indexing**
  - Juvenile population estimate was lower than previous model estimates.
  - 2018 estimate included effects of brood year and time since release (first year of release, subsequent years) on survival.
  - Previous models assumed constant survival for all brood years over time.
  - A proportion of the larger 2010BY and 2012BY within the slot limit were likely harvested.
- **Adult population indexing**
  - There was substantial change in catch composition between 2015 and 2018 indexing efforts.
  - Catch of 2002BY in 2018 was roughly 4-6% of the 2002BY catch in 2015.
• Catch of wild sturgeon in 2018 was about 14% of the catch of wild fish in 2015.
• 2002BY removal effort was highly effective, but catch effort was not accurately recorded or documented.

Tom Skiles asked about fin deformity and whether fish with fin deformities had lower survival rates than fish without deformities. Paul responded they found no difference in survival between fish with and without fin deformities. Tom asked if deformed fins regenerate. Jason McLellan said no. Laura Heironimus asked if fin deformity causes changes in fish behavior or distance traveled. Paul said only juveniles with no fin deformities were radio tagged; therefore, they cannot assess that effect. Jason noted that they have evaluated differences in movement of fish with and without deformities and found no difference in behavior. Steve Lewis asked if there is a way to reduce fin deformity. Jason said increasing feed when fish transition to exogenous feeding will reduce fin deformity. That’s because fish at that time have teeth and if there is not enough to eat, they nip on each other’s fins. Tom pointed out that harvest on CRITFC fish has been low. Therefore, he questioned how or why the numbers of CRITFC fish has declined so rapidly. Some thought it is because the original population estimates of CRITFC fish were biased high. Thus, there were not as many CRITFC fish in the Project Area as originally thought.

C. Plan Three-Year Check-in with the Policy Committee – Tracy Hillman said the Forum needs to prepare a three-year check-in report for the Policy Committee that explains the status of the white sturgeon population and offer a recommendation on stocking levels for the remaining years of the SOA. He noted the recommendation can be to decrease stocking levels, increase stocking levels, or propose no change in stocking levels. Tracy added that the Forum needs to provide justification for any proposed recommendation including documenting the presence or absence of density dependence.

Steve Lewis asked if there is a target juvenile survival rate that needs to be achieved. Chris Mott said no but we need to determine if survival rates decrease over time (as abundance increases). Laura Heironimus asked if the reduced abundance increase is related to earlier brood years recruiting into larger size classes. Paul Grutter said yes and added that we expect abundance increase to decline as numbers of juvenile sturgeon approach carrying capacity. Jason McLellan added that as numbers of juvenile sturgeon increase to carrying capacity, growth and survival rates will decrease, while movement/entrainment will increase. He said we need to evaluate these density-dependent effects. Paul indicated that he does not believe sturgeon in the Project Area are at carrying capacity. Jason asked if the abundance estimates included tag recaptures of older, larger fish. Paul said no. Jason asked if survival estimates accounted for size at release. Paul said no. Jason suggested there may be density dependence effects. Patrick Verhey noted that the Wanapum Dam fracture, which resulted in very low reservoir levels, may have reduced food (molluscs) for sturgeon. This reduction in food may explain any apparent density dependence in sturgeon.

Tracy said he will find a suitable day for the white sturgeon subgroup meeting. The purpose of the meeting is to evaluate the available information and make a recommendation to the PRFF. Tracy recommended that Paul attend the meeting. Paul indicated that he will also ask Sima Usvyatsov (mark-recapture modeler) to attend the subgroup meeting. Tracy asked members to review the annual report and identify questions for Paul and Sima. Members thought the subgroup meeting should take no longer than four hours.

Tracy identified the following Policy Committee members:

- Yakama Nation: Paul Ward and Steve Parker
- Colville Tribes: Unknown (Kirk Truscott and Jason McLellan are checking)
• Umatilla/CRITFC: Jeremy Wolf and Brent Hall
• Wanapum: Rex Buck, Jr. and Alyssa Buck
• BIA: Keith Hatch
• USFWS: Jeff Krupka
• WDFW: Jim Brown
• Grant PUD: Tom Dresser

D. **Other White Sturgeon Items** – None.

V. **Pacific Lamprey Management Plan**

A. **Pacific Lamprey Annual Report** – Chis Mott said he believes the final report was submitted to FERC. He said they received comments from Ralph Lampman, but because they were received late, Grant PUD was not able to address all of Ralph’s comments. Ralph said the comments can be addressed in the 2019 report.

B. **Other Pacific Lamprey Items** – Chris Mott noted that adult trapping in 2019 will be similar to 2018. Grant PUD will provide additional information as we get closer to the trapping period. Ralph Lampman said he will coordinate with Grant PUD on any need for extra adults for translocation efforts. Chris also reported that representatives from Douglas PUD attended the Wanapum and Priest Rapids fishway tour on Friday, 22 February 2019.

VI. **Next Meeting:** The next PRFF meeting will be on Wednesday, 3 April 2019 at the Grant PUD Natural Resources Office in Wenatchee, WA.
Presentation Outline

MONITORING & EVALUATION PROGRAM: 2018 SUMMARY

- 2017BY Juvenile Marking and Release
- VR2W Telemetry and 2017BY Movement and Entrainment
- Juvenile White Sturgeon Indexing
- Adult White Sturgeon Indexing Summary

2017BY White Sturgeon Juvenile Tagging and Release

MONITORING & EVALUATION PROGRAM: 2018 SUMMARY

- 2017 broodstock capture efforts resulted in 8Fx8M spawning matrix; 30 genetic crosses (5 unique crosses, 25 half-sib crosses)
  - Genetic testing (August 2017): 12N female identified; 6 genetic crosses culled
  - Water pump failure (August 2017): 6 genetic crosses lost
- 2017BY release consisted of progeny of 18 genetic crosses (4 unique, 14 half-sib crosses)
- 3,224 fish PIT-tagged and scale marked over three days from April 9 to 11, 2018
- 32 fish (1%) received a V0 acoustic tag
  - 2016BY (6Fx8M), 36 genetic crosses
  - 2015BY (9Fx10M), 85 genetic crosses.
2017BY White Sturgeon Juvenile Tagging and Release

**RELEASE LOCATION, LENGTH AND WEIGHT**

- Released May 1, 2018, 2017BY release by reservoir: Wanaum (62%); Priest Rapids (38%)
- SOA (March 11, 2016)

<table>
<thead>
<tr>
<th>Release Location Reservoir (River Mile)</th>
<th>2018 White Sturgeon 2017BY Release</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Fish (examined-perc.)</td>
<td>Mean FL (± SD) mm</td>
<td>Mean Weight (± SD) g</td>
</tr>
<tr>
<td>Wanaum (424.5)</td>
<td>1,083 (20)</td>
<td>289 (43)</td>
</tr>
<tr>
<td>Priest Rapids (415.6)</td>
<td>1,241 (12)</td>
<td>279 (41)</td>
</tr>
<tr>
<td>Total</td>
<td>3,324 (32)</td>
<td>285 (43)</td>
</tr>
</tbody>
</table>

| 2018BY | 3,248 (32) | 272 (31) | 126 (45) |
| 2015BY | 3,286 (32) | 303 (28) | 171 (46) |

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**Discharge and Temperature**

**ROCK ISLAND DISCHARGE AND TEMPERATURE**

- 2017BY Release
- Rock Island Dam Mean Daily Temp
- Rock Island Dam Mean Daily Temperature

![Graph showing discharge and temperature over time]
### 2017BY Primary Fin Deformity

<table>
<thead>
<tr>
<th>Fin Deformity Sub-type</th>
<th>No. of fish with Primary Deformity</th>
<th>No. of fish with Sub-type Deformity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Caudal deformity only</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deform, cut, or damaged fin</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td><strong>Both caudal and pectoral deformity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two deformed, cut, or damaged fins</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>One deformed, cut, or damaged fin, no missing fin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Three deformed, cut, or damaged fins</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Two deformed, cut, or damaged fins, no missing fin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Pectoral deformity only</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One deformed, cut, or damaged fin</td>
<td>1,313</td>
<td>830</td>
</tr>
<tr>
<td>One missing fin</td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Two deformed, cut, or damaged fins</td>
<td>334</td>
<td>53</td>
</tr>
<tr>
<td>One deformed, cut, or damaged fin, no missing fin</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Two missing fins</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Dorsal, pelvic, or anal fin deformity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deformed, missing fin</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

**Total fish with fin deformities**: 1,398 (44%)

**Total fish without fin deformity**: 1,826 (57%)

**Total 2017BY Release**: 3,224

Past fin deformity rates: 2016BY (42%); 2015BY (14%); 2014BY (78.5%)

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### VR2W Telemetry and 2017BY Movement and Entrainment

**TELEMETRY STATION LOCATIONS**
Acoustic Telemetry and Juvenile Movement

**POST-RELEASE 2017 BY: ENTRAINED FROM WANAPUM**

4,522 m$^3$/s (159,700 cfs) at 20:00 h

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2018 Juvenile Indexing

**SAMPLING DESIGN AND EFFORT**

- 2018 Sample Design was similar to the 2014, 2016, and 2017 approaches
- Unstratified, Unequal Probability GRTS Survey Design,
  - Wanapum Reservoir partitioned into three sample areas (three
    multidensity categories) defined as the Upper, Middle, and Lower
    Reservoir sections
  - Allocate more catch effort/unit area to the upper and middle portions
    of each reservoir suspected of moderate to high use by White
    Sturgeon
- August 6 to 29, 2018
2018 Hydrograph

ROCK ISLAND DISCHARGE AND TEMPERATURE

- Juvenile Indexing
- Rock Island Dam Mean Hourly Total Discharge
- Adulting Indexing s1
- Rock Island Dam Mean Daily Total Discharge
- Adulting Indexing s2

2018 Juvenile Indexing

SAMPLING DESIGN AND EFFORT

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Lower</th>
<th>Middle</th>
<th>Upper</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of GRITs that sampled</td>
<td>60</td>
<td>60</td>
<td>30</td>
<td>270</td>
</tr>
<tr>
<td>Sampling area (acres)</td>
<td>5,654</td>
<td>777</td>
<td>108</td>
<td>2,099</td>
</tr>
<tr>
<td>Samples/1.00 ft</td>
<td>7.4</td>
<td>17.4</td>
<td>28.2</td>
<td>31.0</td>
</tr>
<tr>
<td>Sample depths (m)</td>
<td>mean</td>
<td>23.8</td>
<td>34.8</td>
<td>38.7</td>
</tr>
<tr>
<td></td>
<td>max</td>
<td>49.0</td>
<td>22.0</td>
<td>42.0</td>
</tr>
</tbody>
</table>

- 270 overnight sets in Wanapum - 2 crews, Golder and BLE
- 90 overnight sets in Priest Rapids - 1 crew, Grant PUD biologists
- All fish scanned for a PIT-tag, measured for Fork Length & Weight, and assessed for fin deformities
- All data directly entered in the Juvenile Indexing Database
2018 Juvenile Indexing

**SAMPLING GEAR**

Assembled by Grant PUD staff.

- Line Length: 400 ft (122 m), ¼" Everson Aqua tanned line - 3 strand nylon - soft lay
- 40 hooks per line, attached at marked intervals ~ 9 ft (3 m) apart
- 2/0 and 4/0 Mustad Demon Circle Perfect 2X Strong. Twenty of each size hook per line
- Jinkai (or similar) monofilament leaders, 150 lb test, 12" in length excluding hook and clip
- Stainless snaps sized for main line being used with attached swivels.

Gilmour Pickled Squid

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**Juvenile Indexing**

**GEAR LOST/DAMAGE**

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Gear Inventory</th>
<th>Hook/Geag Size</th>
<th>Lost</th>
<th>Total</th>
<th>Geag Inventory With Lost</th>
<th>Gear Inventory With Lost or Damaged Hooks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wenahum</td>
<td>400</td>
<td>2/0</td>
<td>8</td>
<td>52</td>
<td>1.1%</td>
<td>15.5%</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>4/0</td>
<td>8</td>
<td>63</td>
<td>2.2%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Total</td>
<td>800</td>
<td>2/0</td>
<td>14</td>
<td>125</td>
<td>3.2%</td>
<td>15.8%</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>4/0</td>
<td>14</td>
<td>125</td>
<td>3.2%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Priest Rapids</td>
<td>2000</td>
<td>2/0</td>
<td>11</td>
<td>70</td>
<td>1.1%</td>
<td>16.0%</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>4/0</td>
<td>7</td>
<td>14</td>
<td>0.8%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Total</td>
<td>4000</td>
<td>2/0</td>
<td>18</td>
<td>159</td>
<td>0.9%</td>
<td>8.5%</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>4/0</td>
<td>16</td>
<td>159</td>
<td>0.9%</td>
<td>8.5%</td>
</tr>
</tbody>
</table>

**PRFA**

<table>
<thead>
<tr>
<th>Year</th>
<th>Geag Inventory</th>
<th>Hook/Geag Size</th>
<th>Lost</th>
<th>Total</th>
<th>Geag Inventory With Lost</th>
<th>Gear Inventory With Lost or Damaged Hooks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>1200</td>
<td>2/0</td>
<td>129</td>
<td>50</td>
<td>1.1%</td>
<td>15.3%</td>
</tr>
<tr>
<td>2017</td>
<td>1200</td>
<td>4/0</td>
<td>50</td>
<td>159</td>
<td>1.1%</td>
<td>15.3%</td>
</tr>
<tr>
<td>2016</td>
<td>1200</td>
<td>4/0</td>
<td>50</td>
<td>159</td>
<td>1.1%</td>
<td>15.3%</td>
</tr>
</tbody>
</table>
### Juvenile Indexing

**BROOD SOURCE, RELEASE SITE, RELEASE TIMING**

<table>
<thead>
<tr>
<th>Year</th>
<th>Release Location</th>
<th>Brood Source</th>
<th>Date</th>
<th>Number Released</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Wapawepa</td>
<td>LLC</td>
<td>26-Apr-11</td>
<td>2,620</td>
<td>59</td>
<td>23</td>
<td>17</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Columbia Siding</td>
<td>LLC</td>
<td>29-Apr-11</td>
<td>2,938</td>
<td>62</td>
<td>22</td>
<td>9</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LCW</td>
<td>27-30-Apr-11</td>
<td>2,000</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Columbia Siding</td>
<td>LCW</td>
<td>14-May-12</td>
<td>1,235</td>
<td>55</td>
<td>94</td>
<td>63</td>
<td>204</td>
</tr>
<tr>
<td></td>
<td>Columbia Cliffs</td>
<td>LCW</td>
<td>14-May-12</td>
<td>1,129</td>
<td>55</td>
<td>94</td>
<td>63</td>
<td>204</td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>Wapawepa</td>
<td>MCW</td>
<td>06-May-14</td>
<td>3,331</td>
<td>228</td>
<td>105</td>
<td>136</td>
<td>599</td>
</tr>
<tr>
<td></td>
<td>Rocky Coulee</td>
<td>MCW</td>
<td>18-Sep-14</td>
<td>1,762</td>
<td>41</td>
<td>35</td>
<td>35</td>
<td>111</td>
</tr>
</tbody>
</table>

**H1:** Suspected genetic or behavioral difference between UCW and MCW compared to LLC origin fish resulted in greater migration of LLC from Wapawepa Reservoir.

**H2:** Survival (reduced avian predation) of fish released in deep water habitat (Columbia Cliffs), further downstream from Columbia Siding was higher compared to fish released in the lower water habitat (Columbia Siding) upstream nearer the reservoirs.

**H3:** Survival of fish released in spring (May) is higher compared to fall (September) releases.

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### Juvenile Indexing

**E_\text{p} BY PRIEST RAPIDS RESERVOIR SECTIONS**

![Graph showing proportion of positive catch (E_p) by brood year and reservoir section for 2002 to 2017.](image)

- E_p Priest Rapids Lower
- E_p Priest Rapids Middle
- E_p Priest Rapids Upper
- E_p Priest Rapids (all sections)
Juvenile Indexing

R Mark Abundance Estimate Assumptions

2017 Model – more simple model due to lack of data and model convergence

The model assumed no difference between survival for first year and subsequent years. Models were constructed using all combinations of the following survival and recapture specifications:

a) Survival as constant, as function of age, and as function of release reservoir;

b) Recapture as constant, as function of sampling year, and as function of release reservoir.

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Parameter</th>
<th>Estimate</th>
<th>Lower 95% Confidence Limit</th>
<th>Upper 95% Confidence Limit</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Median</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrewsbury - 2018</td>
<td>Fixed</td>
<td>0.0095</td>
<td>0.0076</td>
<td>0.0125</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrewsbury - 2016</td>
<td>Fixed</td>
<td>0.0481</td>
<td>0.0457</td>
<td>0.0508</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrewsbury - 2017</td>
<td></td>
<td>0.037</td>
<td>0.035</td>
<td>0.042</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worcestershire</td>
<td>Survival (1st year)</td>
<td>0.500</td>
<td>0.480</td>
<td>0.520</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worcestershire</td>
<td>Survival (2nd year)</td>
<td>0.650</td>
<td>0.617</td>
<td>0.689</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Juvenile Indexing

R Mark Abundance Estimate Assumptions

2018 Model – Sufficient data to year 1 survival and all subsequent years, by reservoir, by brood year

Models were constructed using all combinations of the following survival and recapture specifications:

a) Survival:
   a. constant,
   b. separate constant values for first year post-release and all subsequent years,
   c. as function of release reservoir,
   d. as function of brood year,
   e. as additive function of brood year and first year post-release and all subsequent years.

b) Recapture:
   a. constant,
   b. separate constant values for first year post-release and all subsequent years,
   c. as function of sampling year,
   d. as function of release reservoir,
   e. as function of age,
   f. as additive function of release reservoir and age, and
   g. as multiplicative function of release reservoir and age.
### Juvenile Indexing

#### MARK ABUNDANCE ESTIMATE ASSUMPTIONS

<table>
<thead>
<tr>
<th>Reservoir, Parameter</th>
<th>Estimate</th>
<th>Lower 95% Confidence Limit</th>
<th>Upper 95% Confidence Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival, 2010BF First-Year, Post Release</td>
<td>0.371</td>
<td>0.343</td>
<td>0.400</td>
</tr>
<tr>
<td>Survival, 2010BF All Subsequent Years</td>
<td>0.825</td>
<td>0.724</td>
<td>0.944</td>
</tr>
<tr>
<td>Survival, 2011BF First-Year, Post Release</td>
<td>0.494</td>
<td>0.416</td>
<td>0.604</td>
</tr>
<tr>
<td>Survival, 2012BF All Subsequent Years</td>
<td>0.844</td>
<td>0.771</td>
<td>0.937</td>
</tr>
<tr>
<td>Survival, 2013BF First-Year, Post Release</td>
<td>0.445</td>
<td>0.392</td>
<td>0.509</td>
</tr>
<tr>
<td>Survival, 2013BF All Subsequent Years</td>
<td>0.865</td>
<td>0.734</td>
<td>0.934</td>
</tr>
<tr>
<td>Survival, 2014BF First-Year, Post Release</td>
<td>0.371</td>
<td>0.313</td>
<td>0.435</td>
</tr>
<tr>
<td>Survival, 2014BF All Subsequent Years</td>
<td>0.783</td>
<td>0.653</td>
<td>0.886</td>
</tr>
<tr>
<td>Survival, 2015BF First-Year, Post Release</td>
<td>0.130</td>
<td>0.115</td>
<td>0.236</td>
</tr>
<tr>
<td>Survival, 2015BF All Subsequent Years</td>
<td>0.602</td>
<td>0.535</td>
<td>0.783</td>
</tr>
<tr>
<td>Survival, 2016BF First-Year, Post Release</td>
<td>0.012</td>
<td>0.006</td>
<td>0.035</td>
</tr>
<tr>
<td>Survival, 2016BF All Subsequent Years</td>
<td>0.291</td>
<td>0.041</td>
<td>0.548</td>
</tr>
</tbody>
</table>

---

### Juvenile Indexing

#### ABUNDANCE ESTIMATES OF HATCHERY FISH BY RESERVOIR

[Graph showing abundance estimates for Priest Rapids and Wanapum Reservoirs over the years 2011 to 2017.]
Juvenile Indexing

**AVIAN MORTALITY**

<table>
<thead>
<tr>
<th>Brood Year</th>
<th>Release Location (RM)</th>
<th>Wapapum Reservoir</th>
<th>Hatchery</th>
<th>Juvenile</th>
<th>PIT-Tags Detected at RSEWSC</th>
<th>Fork Length (mm)</th>
<th>Weight (g)</th>
<th>Percent of Wapapum Release PIT-Tag Detected at RSEWSC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>27,631</td>
<td>970</td>
<td>285</td>
<td>33</td>
<td>146</td>
<td>45</td>
<td>3.5</td>
</tr>
</tbody>
</table>

**2018 Adult Indexing**

**SAMPLING DESIGN AND EFFORT**

- Adult Indexing conducted every 3rd year; last conducted in 2015
- 2018 sample effort identical to 2015:
  - 132 Sample Sites in WP; 60 Sites in PR
  - Session 1: September 10-19; Session 2: October 1-10
- 2018 Sample Design Standardized
  - Unstratified, Unequal Probability GRTS Survey Design
  - Identical selection criteria as Juvenile Indexing Sample Design
  - 2015 design, GRTS, Stratified Design; Wapapum North (108 sites) and South (24) at 1-90

<table>
<thead>
<tr>
<th>Wapapum (1 km Bathymetric Contour)</th>
<th>Fread Rapids (1 km Bathymetric Contour)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of sample GRTS sites</td>
<td>Lower</td>
<td>Middle</td>
<td>Upper</td>
<td>All</td>
<td>Lower</td>
<td>Middle</td>
<td>Upper</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>44</td>
<td>44</td>
<td>132</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

28
Adult Indexing


![Graph showing fish counts by fork length for different years.]

2010 n = 158
2012 n = 87
2015 n = 58
2018 n = 8

Adult Indexing


![Graph showing fish counts by fork length for different years.]

2010/VR n = 53
2012/VR n = 59
2015/VR n = 54
2018/VR n = 8
Adult Indexing


![Graph showing fish length distribution for different years.]

2010 PR: n = 5
2012 PR: n = 3
2015 PR: n = 1
2018 PR: n = 1

Adult Indexing

YNSH CATCH LENGTH FREQUENCY 2018

![Graph showing fish length distribution for Wanapum and Priest Rapids.]

Wanapum Reservoir: n = 345
- 20-24 cm: n = 17
- 25-29 cm: n = 33
- 30-34 cm: n = 51
- 35-39 cm: n = 24
- 40-44 cm: n = 8
- 45-49 cm: n = 7
- 50-54 cm: n = 1
- 55-59 cm: n = 1
- 60-64 cm: n = 1

Priest Rapids: n = 51
- 20-24 cm: n = 10
- 25-29 cm: n = 23
- 30-34 cm: n = 12
- 35-39 cm: n = 1
- 40-44 cm: n = 1
- 45-49 cm: n = 1
- 50-54 cm: n = 1

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PRFF
Final Minutes
6 March 2019
Adult Indexing

**POPULATION ESTIMATE**

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Year</th>
<th>2002BY</th>
<th>Wild</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waskapum</td>
<td>2010</td>
<td>3,767 (2,447-5,087)</td>
<td>535 (306-767)</td>
<td>4,303 (2,753-5,804)</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>2,419 (1,471-3,319)</td>
<td>391 (222-561)</td>
<td>2,810 (1,692-3,327)</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>1,251 (904-2,288)</td>
<td>200 (134-462)</td>
<td>1,450 (1,034-2,759)</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>75 (22 - 137)</td>
<td>35 (5 – 55)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Year</th>
<th>2002BY</th>
<th>Wild</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priest Rapids</td>
<td>2010</td>
<td>1,514 (971-2,057)</td>
<td>45 (15-74)</td>
<td>1,559 (986-2,139)</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>672 (584-1,309)</td>
<td>33 (11-54)</td>
<td>1,005 (595-1,415)</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>593 (503-755)</td>
<td>21 (9-41)</td>
<td>614 (524-867)</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>20 (9-41)</td>
<td>&lt;10</td>
<td></td>
</tr>
</tbody>
</table>

### Grant PUD White Sturgeon Monitoring & Evaluation Program

**2018 SUMMARY**

- 2017BY fin deformity rate similar to 2016BY (~42%)
- 2017BY exhibited upstream movement after release and low entrainment based on acoustic telemetry
- Juvenile Population Estimate Lower than previous model estimates
  - 2018 estimate included effects of brood year and time since release (first year of release, subsequent years) on survival
  - Previous models assumed constant survival for all brood years over time
  - A proportion of the larger 2010BY and 2012BY within the slot limit were likely harvested
- Adult Population Indexing
  - Substantial change in catch composition between 2015 and 2018 indexing efforts
  - 2002BY 2016 catch ~ 4-6% of the 2002BY 2015 catch
  - Wild 2018 catch ~14% of the Wild 2016 catch
  - 2002BY removal effort highly effective, but catch effort not accurately recorded or documented
Questions?