Rocky Reach Reservoir
White Sturgeon Supplementation Program

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March 4th 2015
## Supplementation Releases

<table>
<thead>
<tr>
<th>Year</th>
<th>Released</th>
<th>Release Date</th>
<th>Mean Length</th>
<th>Mean Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>6,376</td>
<td>April 20-21</td>
<td>245</td>
<td>125</td>
</tr>
<tr>
<td>2012</td>
<td>137</td>
<td>May 16</td>
<td>189</td>
<td>49</td>
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![River map with dams and flats marked](image)
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<td>137</td>
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<td>189</td>
<td>49</td>
</tr>
<tr>
<td>2013</td>
<td>7,975</td>
<td>May 20-23</td>
<td>252</td>
<td>109</td>
</tr>
<tr>
<td>2014</td>
<td>4,962</td>
<td>May 8,14-15</td>
<td>246</td>
<td>98</td>
</tr>
<tr>
<td>Total</td>
<td>19,450</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Monitoring Program

• 3 year mark and recapture indexing study to look at survival, growth, and habitat use (2013 - 2015)

• 3 year acoustic telemetry study to inform indexing effort, determine emigration rates from the reservoir, and investigate behavior and habitat use (2012 – 2014)
Mark Recapture Setline Fishing

- 250 ft. lines with 80 hooks
- Circle and treble hooks
- Pickled squid, crickets and earth worms
Recaptures

2011  n = 62
2012  n = 89
2013  n = 473
2014  n = 621
Apparent Survival Probabilities

![Graph showing apparent survival probabilities with release years 2011, 2012, and 2013. The graph compares survival rates for different release years and hours intervals.]

- **2011**: Survival rates are approximately 40% for release hour intervals R-0.5, 0.5-1.5, and 1.5-2.5.
- **2012**: Survival rates are significantly higher, reaching about 80% for the same intervals.
- **2013**: Survival rates are comparable to 2011, around 40% for each interval.

Legend:
- φ R-0.5
- φ 0.5-1.5
- φ 1.5-2.5

Note: The survival rates are approximate and based on the graphical representation.
Survival Release to 0.5 years

Apparent Survival Rate

Release Site
- Gallagher Flats
- Daroga Launch
- Entiat

Survival 0.5 to 1.5 years ($\Phi_{0.5-1.5}$)

Legend:
- 2011 Marion Drain
- 2011 Chelan Hatchery
- 2013 Chelan Hatchery
- 2013 Columbia Basin
Survival Release to 0.5 years

- Gallager Flats
- Daroga Launch
- Entiat

Survival 0.5 to 1.5 years (Φ0.5-1.5)
Survival 0.5 to 1.5 years

- 2011 Marion Drain
- 2011 Chelan Hatchery

Release Site:
- Gallagher Flats
- Daroga Launch
- Entiat

Apparent Survival Rate
Growth

Release Year
- 2014
- 2013
- 2011

Change in Weight (g)

Change in Fork Length (mm)
Habitat Associations

Model Parameters

- Water Velocity
- Dominant Substrate
- Dissolved Oxygen
- Temperature
- Depth
- Fishing Session
- Reservoir Zone
- Hook Hours

2013 Release Year Sturgeon Caught in 2014 Systematic Sets

Catch per Setline vs. Velocity (m/s)
Habitat Associations

2013 Release Year Sturgeon Caught in 2014 Systematic Sets

- Graph showing catch per setline by depth category (m).
- Data points indicating catch variation across different depth categories.
Habitat Associations

2013 Release Year Sturgeon Caught in 2014 Systematic Sets

Catch per Setline

Fines: 0.75
Gravel: 0.61
Cobble: 0.53
Boulder+: 0.50

Dominant Substrate
Acoustic Monitoring
Receiver Locations

- Reservoir divided into four zones, 8-18 km
- Exit gate below Rocky Reach Dam
### Vemco Acoustic Tags

#### Tag Details

<table>
<thead>
<tr>
<th>Tag Model</th>
<th>Number Released</th>
<th>Weight in Air (g)</th>
<th>Estimated Tag Life (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V7</td>
<td>30</td>
<td>1.6</td>
<td>185</td>
</tr>
<tr>
<td>V9</td>
<td>120</td>
<td>4.7</td>
<td>838</td>
</tr>
<tr>
<td>V9-P</td>
<td>15</td>
<td>6.4</td>
<td>581</td>
</tr>
<tr>
<td>V13</td>
<td>4</td>
<td>11</td>
<td>1,462</td>
</tr>
</tbody>
</table>

#### Yearly Acoustic Tag Release

<table>
<thead>
<tr>
<th>Year</th>
<th>Acoustic Tags Released</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>35</td>
</tr>
<tr>
<td>2013</td>
<td>69</td>
</tr>
<tr>
<td>2014</td>
<td>65</td>
</tr>
<tr>
<td>Total</td>
<td>169</td>
</tr>
</tbody>
</table>
Acoustic Tag Releases

- 2012: Total 35
- 2013: Total 69
- 2014: Total 65
Acoustic Detections

- 1,189,468 detections, 83% in top 19 km of the reservoir
- Largest number of individuals detected in upper reservoir
- Longest residence times in the upper reservoir
- Predominantly upstream movements with 63% released below Beebe bridge moving into upper 18 km of reservoir
Number of Sturgeon Moving Over Time

Number of Movements by Direction

-60  -40  -20  0  20  40

Date

Number of Individuals Moving
0  10  20  30  40

2012  2013  2014

Graph showing the number of sturgeon moving over time. The graph is labeled 'Number of Sturgeon Moving Over Time' and includes a line graph with three lines representing different years:
- Black line for 2012
- Red line for 2013
- Green line for 2014

The x-axis represents the dates from April 2012 to October 2014, and the y-axis represents the number of individuals moving, ranging from 0 to 50.
## Emigration

<table>
<thead>
<tr>
<th>Year</th>
<th>Tags Detected Below Rocky Reach Dam</th>
<th>Acoustic Tags Released</th>
<th>Percent Emigration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>2</td>
<td>35</td>
<td>5.7%</td>
</tr>
<tr>
<td>2013</td>
<td>4</td>
<td>69</td>
<td>5.8%</td>
</tr>
<tr>
<td>2014</td>
<td>2</td>
<td>65</td>
<td>3.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>169</strong></td>
<td><strong>4.7%</strong></td>
</tr>
</tbody>
</table>

### Acoustic ID 28051

- **Wells Tailrace**
- **Airport**
- **Beebe Bridge**
- **Duck Tail Rock**
- **Enitiat**
- **Rocky Reach Dam**
- **Turtle Rock**

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**Release Location:**

- **Acoustic ID 28051**
- **Detection:**
- **Release Location:**

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**Year**

- 2012
- 2013
- 2014

**Tags Detected**

- Below Rocky Reach Dam: 2, 4, 2

**Acoustic Tags Released**

- 35, 69, 65

**Percent Emigration**

- 5.7%, 5.8%, 3.1%

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**Total**

- 8 tags detected below Rocky Reach Dam
- 169 acoustic tags released
- Total percent emigration: 4.7%
Conclusions

- ‘Typical’ survival pattern not observed

- Fish released in 2013 surviving better than 2011 fish

- Steady growth observed post-release

- Habitat model: highest catch where low velocity, over fines, between 10-30 m or below 40 m.

- High use of upper reservoir and predominant movement upstream with settling over time

- Relatively low emigration from reservoir of acoustically tagged individuals to date
• 4 days of fishing each year, 6 in late June 2 in Early August
• Captured and tagged 7 Adults in 2013 and 5 in 2014
Length Frequency

![Graph showing the distribution of fork length bins. The x-axis represents fork length bins in centimeters (0-25, 25-50, 50-75, 75-100, 100-125, 125-150, 150-175, 175-200, 200-225, 225-250). The y-axis represents relative frequency as a percentage. The graph shows that the majority of the data falls in the 175-200 cm bin, with relative frequencies of 30% and 25% in the 150-175 cm and 200-225 cm bins, respectively. All other bins have lower relative frequencies.]
Movements Between Detection Arrays

- Mean of 9 upstream and 12 downstream
- Mean km of movement 228.2 (range =10.6 - 688.1km)
- Longest residence times in upper reservoir
Seasonal Movements

The chart illustrates the movements throughout the months. The highest movements are observed in August and October, while the lowest movements are in February, March, April, May, and December. The movements are measured in increments of 0.05, with the highest peak reaching 0.25.
- 8 of 12 (67%) moved at least as far downstream as Entiat

- 7 of 8 (88%) that made reservoir transects overwintered near Entiat
• 3 males returned to upper reservoir during peak temperatures
- Only one of these five moved out of the upper reservoir

- 5 of 12 overwintered in upper reservoir
Adult Conclusions

- Population appears stable but little evidence of recruitment in past ~19 years.
- Adults move substantial distances in some cases making multiple transects of the reservoir.