WY 2022 Impact on Nooksack Salmon Recovery
Nooksack Watershed

Map showing the Nooksack Watershed with labels for the Middle Fork, South Fork, and North Fork. Locations include Bellingham, Mount Vernon, Everett, and Seattle.
WY 2022 was a Year of Extremes

November 2021 precipitation events led to record flooding on the Nooksack River.

September 2022 lack-of-precipitation events led to record low flow in the Nooksack Watershed.
Nooksack Salmon

Spring Chinook Life History

<table>
<thead>
<tr>
<th></th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
<th>N</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migration and Holding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spawning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incubation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rearing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
November 2021 Flood Impacts

Nooksack Overflow to Canada

- Overflow follows ancestral Nooksack River path to Sumas Lake and Fraser River
- Impacted communities of Everson, Nooksack and Sumas in US, and Abbotsford in B.C
Flood Response Habitat Impacts
Wild Chinook Outmigration

*Also influenced by previous low flow impacts

Nooksack smolt trap
South Fork Nooksack Discharge

Chinook Spawning
South Fork Summer Temperature

Temperature (7DADM)

Lethal Migration Temperature

Optimal Holding and Spawning Temperature
South Fork Chinook Mortality

• Typically a handful of fish lost every year to water temperature-related pathogens
• In 2021, ~2,500 mortalities over a few days in early September
• In 2022, several hundred fish lost over the late summer
• Confirmed three pathogens, all known to cause increased mortality if elevated temperatures
• Mortalities across all accessible areas of the river
• Other species affected, too
Improving our Understanding

• Developing a Life Cycle Model to evaluate specific impacts of habitat, water quality and flow on salmon
• Climate change and land use impact modeling
• Status and trends monitoring
Planning and Integration

- Integrated flood planning
- Salmon recovery adaptive management
- Climate change adaptation
- Water use - adjudication of water rights
Adaptation Actions

• Instream habitat enhancement
• Floodplain reconnection
• Riparian restoration
• Land and easement acquisition
• Changing land use