Pacific Lamprey

are you unknowingly harming them during your restoration activities?

Joe Skalicky

US Fish and Wildlife Service

Photo Credit: David Herasimtschuk
Dewatered Larvae
Objectives

1) Raise Awareness
2) Review Salvage Methods

Photo Credit: Kelly Reis, ODFW
Problem:
Lamprey are impacted by dewatering or removal of sediment from active channels, side channels and alcoves. Even though construction occurs during salmonid in-water work windows, there is no such window for lamprey.
Case Study:
Assess larval lamprey abundance and distribution before and after a reservoir drawdown.
Why Lamprey Matter

- Integral and founding part of the ecosystem
- We all want to do no harm
- Opportunity to salvage hundreds to thousands of lamprey
- Opportunity to learn – Lamprey science is still emerging!
Awareness - Larvae

- Densities up to 500 larval lamprey/ft$^2$
  - 20 X 20 ft. pool could have 200,000 larvae
  - Basketball court 2.3 Million

- Larvae - as small as an eyelash ~ 20 mm (3/4”)

- Multiple species can be present
# Pacific Lamprey Life History

<table>
<thead>
<tr>
<th>Life Phase</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
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<td>Juvenile Out Migration</td>
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</tbody>
</table>

- Adult Migration: Winter
- Winter Holding and Spring Migration: JAN, FEB, MAR
- Spawning: MAY, JUN
- Larval Rearing: APR, MAY, JUN
- Juvenile Out Migration: JUL, AUG, SEP, OCT, NOV, DEC
Including Lamprey in Pre-Project Planning

1. Review Pacific Lamprey distribution maps

2. Consult with Local, State, Federal and Tribal project biologists to determine if lamprey are present and if they will be salvaged

3. Conduct pre-project assessments: presence and abundance
Site Dewatering

- Slower the better
  - Increases self-rescue rates
- Daytime preferred – to salvage stranded larvae
- Most lamprey emerge in first 15 min (Liedtke et al. 2015)
- Time to conduct active hands on salvage of stranded lamprey
Slow dewatering = increased self-salvage
### Leaburg Reservoir Drawdown

<table>
<thead>
<tr>
<th></th>
<th>Pre Drawdown</th>
<th>Post Drawdown</th>
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<tbody>
<tr>
<td>Abundance</td>
<td>12,255</td>
<td>2,591</td>
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<tr>
<td>Average Density</td>
<td>10.7/m^2</td>
<td>2.3/m^2</td>
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<tr>
<td>Max. Density</td>
<td>82</td>
<td>23</td>
</tr>
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**Legend**

- **Pre Drawdown**
  - 0
  - 1 - 20
  - 20 - 40
  - 40 - 60
  - 60 - 90

- **Post Drawdown**
  - 0
  - 1 - 20
  - 20 - 40
  - 40 - 60
  - 60 - 90

**Meters**

0 5 10 20 30 40
Lamprey Responses to Dewatering

- No response to changing head pressure (Liedtke *et al.* 2015)
- Only about 50% emerge (Liedtke *et al.* 2015)
- Larger larvae have a greater chance to self rescue
- After finding water they don’t go far – re-stranding
- Can live out of water for many hours – so collect and rehydrate
- Vulnerable to predation
Larval response to dewatering
## Results: During de-watering

<table>
<thead>
<tr>
<th>METHOD USED</th>
<th>EXCAV.</th>
<th>OBSERV.</th>
<th>DRY SHOCK.</th>
</tr>
</thead>
<tbody>
<tr>
<td># to emerge first 15 min</td>
<td>66</td>
<td>36</td>
<td>63</td>
</tr>
<tr>
<td># recovered by method</td>
<td>80</td>
<td>4</td>
<td>69</td>
</tr>
<tr>
<td>Total # Lamprey emerging &amp; recovered</td>
<td>146</td>
<td>40</td>
<td>132</td>
</tr>
<tr>
<td>Total Recovered</td>
<td>100%</td>
<td>50%</td>
<td>94%</td>
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Leaburg: Length Distribution

No significant difference in size distribution or species composition
Gear

Photo Credit: Andrew Chione, ODFW
Electrofishing & “Dry” Electrofishing

**Standard Electrofishing**
- Use two-stage for in-water salvage -- slow-tickle & fast-stun
- Do not use Salmonid settings
- About 30% of lamprey emerge (Harris et al. 2016)

**Dry Electrofishing** – during dewatering on moist substrates
- Depletion sampling
- 90 seconds
- 15 minute rest periods
- Repeat
Electrofishers

<table>
<thead>
<tr>
<th>Bursted Slow Pulse Primary Wave Form</th>
<th>Standard Fast Pulse Secondary Wave Form</th>
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<tbody>
<tr>
<td>Voltage</td>
<td>125 v</td>
</tr>
<tr>
<td>Pulse Frequency</td>
<td>3 Hz</td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>25%</td>
</tr>
<tr>
<td>Burst Pulse Train</td>
<td>3:1</td>
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</table>
“Dry” electrofishing
Ideal Lamprey Salvage Protocol

1) Conduct pre-drawdown lamprey presence absence

2) Perform pre drawdown lamprey salvage

3) Perform pre drawdown salmonid salvage

4) Perform hands-on lamprey salvage during drawdown

5) Perform “dry” shocking on dewatered substrate with high density
Summary

- Lamprey can be present in very high densities
- Dewater slowly when possible: 1-2 inches/hour
- Conduct salvage before, during, and after dewatering
- Use lamprey specific shocking settings
- Since only about 50% of lamprey emerge during dewatering, use “dry” shocking to remove lamprey trapped in dewatered sediments
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