Exeter Great Dam Removal: 
A Blueprint for Successful Fish Passage 
Restoration on the Exeter River 

Maine Sustainability and Water Conference 2019 | Migratory Fish Passage 

Presented by 
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March 28, 2019
The Dam Removal Process

- Identify project
- Feasibility Study
- Design and Engineering
- Dam Removal
- Channel Restoration
- Post-Construction Monitoring
Project Goals: Post-Removal Riverbed Design

- Fish Passage Channel Geometry
  - Channel Slope and Slope Length
  - Jump Height
  - Boulder Features, Overflow Channel
- Stabilize channel and banks
- Maintain water intake functionality
- Prevent channel head cutting (High Street bridge scour)
Post-Removal Riverbed Design - Plan

<table>
<thead>
<tr>
<th>Flow Scenario</th>
<th>Average Velocity (fps)</th>
<th>American Shad</th>
<th>Alewife</th>
<th>Blueback Herring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr/June 95 %</td>
<td>32</td>
<td>3.3</td>
<td>97%</td>
<td>43%</td>
</tr>
<tr>
<td>Apr/June 5%</td>
<td>609</td>
<td>6.7</td>
<td>84%</td>
<td>1%</td>
</tr>
<tr>
<td>April Median</td>
<td>327</td>
<td>5.8</td>
<td>89%</td>
<td>3%</td>
</tr>
<tr>
<td>May Median</td>
<td>162</td>
<td>4.9</td>
<td>93%</td>
<td>13%</td>
</tr>
<tr>
<td>June Median</td>
<td>105</td>
<td>4.4</td>
<td>90%</td>
<td>1%</td>
</tr>
</tbody>
</table>

1 Average velocity between HEC-RAS STA 3+20 and 4+05 (85 ft riffle section)
2 Water temperature assumed to be 55°F (12.8 °C)
3 American Shad fork length assumed to be 17 in (432 mm)
4 Alewife & Blueback Herring fork length assumed to be 9.4 in (239 mm)
Post-Construction Monitoring

- Funding/Permit requirement
- Annual Report – 5 years (3 if conditions met)
  - Photo Documentation
  - Cross-Section Surveys - Channel Depth & Slope
  - Vegetation recovery – 75% in 3 years
  - Fish Counts - Alewife Presence (NHFGD)
  - Spring Migration Survey
  - (If needed) Channel micro-revisions
### Monitoring – Photos

<table>
<thead>
<tr>
<th>Photo #1:</th>
<th>Photo #2:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Photo #1" /></td>
<td><img src="image2.jpg" alt="Photo #2" /></td>
</tr>
</tbody>
</table>

**Description:** Pre-Construction, taken 7/6/2016  
**Description:** Post-Construction, taken 9/21/2016

<table>
<thead>
<tr>
<th>Photo #3:</th>
<th>Photo #4:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.jpg" alt="Photo #3" /></td>
<td><img src="image4.jpg" alt="Photo #4" /></td>
</tr>
</tbody>
</table>

**Description:** 1-year Monitoring, taken 10/25/2017  
**Description:** 2-year Monitoring, taken 5/16/2018
Monitoring – Cross-Section Surveys

Cross Section 1

Cross Section 3

Cross Section 2

Cross Section 4

Cross Section 5

Legend:
- 2016 Cross Section
- 2017 Cross Section
- 2018 Cross Section

UNABLE TO ACCESS DUE TO WINTER CONDITIONS (2016)
Monitoring – Fish Counts. This should be easy!

- 2016: No data (too late in season)
- 2017:
- 2018:
- 2019:
## Post-Construction Monitoring: Tracking Success Criteria

<table>
<thead>
<tr>
<th>Streambank Stability &amp; Vegetation Cover</th>
<th>2017</th>
<th>75% Vegetative Cover</th>
<th>0%</th>
<th>&gt; 75% Vegetative Cover</th>
<th>&gt; 75% Vegetative Cover</th>
<th>As-Built survey indicates constructed project is consistent with design.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Passability: Channel Width</td>
<td>Dam in Place</td>
<td>2017</td>
<td>4 feet (min)</td>
<td>5.9 feet</td>
<td>11.7 feet</td>
<td>35 feet</td>
</tr>
<tr>
<td>Site Passability: Channel Depth</td>
<td>Dam in Place</td>
<td>2017</td>
<td>6-9 inches (min)</td>
<td>6 inches</td>
<td>10 inches</td>
<td>15 inches</td>
</tr>
<tr>
<td>Site Passability: Average Channel Slope – Lower Ripple (Main Channel)</td>
<td>Dam in Place</td>
<td>2017</td>
<td>3.0% (max)</td>
<td>2.78%</td>
<td>~2.8%</td>
<td>~2.8%</td>
</tr>
<tr>
<td>Site Passability: Average Channel Slope – Upper Ripple (Main Channel)</td>
<td>Dam in Place</td>
<td>2017</td>
<td>3.0% (max)</td>
<td>2.23%</td>
<td>2.11%</td>
<td>2.05%</td>
</tr>
<tr>
<td>Site Passability: Max Jump Height</td>
<td>Dam in Place</td>
<td>2017</td>
<td>9 inches (max)</td>
<td>&lt; 6 inches</td>
<td>&lt; 6 inches</td>
<td>&lt; 6 inches</td>
</tr>
<tr>
<td>Alewife Presence/ Absence (Adult)</td>
<td>Absent</td>
<td>2018</td>
<td>Present</td>
<td>n/a</td>
<td>Present</td>
<td>Present</td>
</tr>
</tbody>
</table>
Monitoring – Lessons Learned

- Success Standards:
  - Quantifiable
  - Multiple data sources
- Timing:
  - Survey – low-flow
  - Field visit – fish passage
- Consistency:
  - Monitoring Photos
  - Field Survey
- Budget for monitoring BEFORE construction