A Review of Environmental Commitments and Restoration Measures for PennDOT's Bridge Program

For Threatened and Endangered Species

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Autumn Kelly PennDOT District 1-0
PennDOT’s Environmental Hot Spots: A Regional Resource

- **Mainly Upper-Ohio River Drainage**
  - Allegheny River
  - Conewango Creek
  - French Creek
  - Monongahela River
  - Ohio River

- **Ecological**
  - 6 Federally 10 State End. Mussels
  - 29 State End. Fish
  - Biological Refuge

- **Pennsylvania Infrastructure**
  - Top 10 State in # Bridges
  - Top 5 State in Deficient Bridges
  - Many Truss Bridges
  - Many Rail Lines
Northern Riffleshell, *Epioblasma t. rangiana*, (Federal and State Endangered). A male is on the left, a female is to the right, and a juvenile (center).
Clubshell, Pleurobema clava
(Federal and State Endangered)
Endangered Species Love Bridges!
Bridge Program Common Environmental / Design Conflicts:

- **Replacements**
- **Truss Bridges**
  - Historic Structures
  - FEMA / Floodplain
  - Adjacent Railway
  - Repair and Demolition
  - New / More Piers
  - Widening
- **New Alignments**
- **Maintaining Traffic**
  - Vehicles
  - Boat Traffic
- **Maintenance**
  - Log Jam Removal
  - Scour Repair

Niemeyer Road Bridge Rehab.
OH NO!!!!!

TOO MANY T&E Species?!?!?!?!

WHAT DO WE DO?
Key Conservation, Minimization and Mitigation measures:

- **Planning**
  - Baseline Surveys / Data Review
    - Avoidance
    - Seasonal Restriction (Fish)
    - Project Footprint
    - Construction Methods
  - Federal / State BAs
    - Programmatic or Stand-alone

- **Selected Alternative**
  - Federal / State BO / Permits
    - Mussel Relocation
    - Stream Baseline
    - Mitigation Fees

- **Construction**
  - Monitoring
    - Stormwater / Environ. Commitments
    - Water Quality
    - Mussel Relocation / Site
    - Stream Baseline

- **Post-Construction**
  - Monitoring / Reporting
T&E Mussel / Species Surveys

- **Qualitative**
  - Presence / Absence

- **Quantitative**
  - Supports BA / Alt. Analysis
  - Statistically Defensible
  - Provides Baseline

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**Detail: Phase II Mussel Survey (Quantitative)**

**Detail: Phase I Mussel Survey - Qualitative**

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French Creek Bridge Replacement
Mussel Relocations: Salvage

Mussel Relocation: Hunter Station

Figure 1: 2016 Sampling Grid.
Completed Grid Section

Average search effort of 25 minutes / m²

Mussel Relocation: Hunter Station

Mussel Relocations: Salvage
Mussel Relocation: Hunter Station

Mussel Relocations: Salvage
Mussel Relocations: Monitoring

- Tagging and Processing
- Moving to other Watersheds for Recovery
- Propagation Stock
- Long-Term Monitoring
T&E MUSSEL PILOT SITE PROGRAM

PennDOT/ FHWA and USFWS/ PFBC established relocation site parameters throughout historic range of target species using **Partner Network:**

- Genetic Testing
- Sites were Augmentations
- Destination Site Monitoring
  - 1st Event 50 individuals / species / site
  - 2nd Event if success 500 / species / site
  - All individuals PIT/ Hallprint tagged
- Partner Questionnaire
  - Site Size / Capacity
  - 11 receiving entities
- **QUARANTINE – a significant obstacle**
PennDOT / FHWA and USFWS / PFBC established relocation site parameters throughout historic range of target species:

- Pennsylvania
- West Virginia
- Kentucky
- New York
- Seneca Nation of Indians
- Ohio
- Indiana
- Illinois
<table>
<thead>
<tr>
<th>Reloc. Sites, Partners and Receiving Streams</th>
<th>Total Estimated Live Mussels Relocated 2015 to 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PennDOT Team Partner(s)</strong></td>
<td><strong>Reg.</strong></td>
</tr>
<tr>
<td>USFWS, WV DNR</td>
<td>WV</td>
</tr>
<tr>
<td>ODNR, USFWS, EnviroScience</td>
<td>OH</td>
</tr>
<tr>
<td>PAFBC/ WPC</td>
<td>PA</td>
</tr>
<tr>
<td>INDR</td>
<td>IN</td>
</tr>
<tr>
<td>INHS</td>
<td>IL</td>
</tr>
<tr>
<td>KDFW, USFWS (KY)</td>
<td>KY</td>
</tr>
<tr>
<td>OSU, Col. Zoo, USFWS, ODNR</td>
<td>OH</td>
</tr>
<tr>
<td>USFWS, ODNR</td>
<td>OH</td>
</tr>
<tr>
<td>Seneca Nation, ES</td>
<td>SN</td>
</tr>
<tr>
<td>USFWS (NV), Inc., NYS DEC</td>
<td>NY</td>
</tr>
<tr>
<td>Ohio River (Philis Island)</td>
<td>PA</td>
</tr>
<tr>
<td>EnviroScience</td>
<td>PA</td>
</tr>
<tr>
<td>Relocated US at HS</td>
<td>PA</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
</tr>
</tbody>
</table>

**GRAND TOTAL = 131,494**
Stream Morphology Monitoring

French Creek Longitudinal Profile
August 24, 2017

- Top of left descending bank at each cross section
- Water surface elevations at each cross section
- Location of scour in-fill
- Deepest point of channel 1043.8 (4.5 ft at baseflow)
- Stream channel thalweg points at each cross section

Stream Channel Morphology Monitoring

XS4 2017

- Bankfull
- Water Surface Points
- XS4 2016

Pennsylvania Department of Transportation
District 1-0

EnviroScience
Mitigation / Commitments:

Is it Too Much?
Post-High Water Event French Creek

Figure 1 – USGS gauge flow record at Meadville, PA for the period of May 28 to June 5, 2015. The peak flow was approximately 7,400 cfs on June 1.

Figure 2 – USGS gauge flow record at Meadville, PA for the period of June 14 to June 21, 2015. The peak flow was approximately 5,600 cfs on June 15.
Post-High Water Event French Creek
- 250ft scour, max depth 22 feet
- 600ft gravel bar deposition
- Much greater impacts than anticipated
Post-High Water Event French Creek

- Emergency Restoration
- Emergency Coordination
- Ongoing Mitigation / Commitments
PennDOT/Consultant Designed for Avoidance and Minimization Measures:

- Timing / Duration
- Footprint
- Demolition
- River Use

**Design Had to Assume Probable Flows**
Post-High Water Events Allegheny River

- Emergency Flood Plan
- Emergency Coordination
- Emergency Restoration
- Ongoing Mitigation / Commitments
Post-High Water Event Allegheny River
- Scour at Temp. Bridges and Pads
- Downstream Deposition
Post-High Water Event Allegheny River

- Emergency Restoration Plan

Notes:

1) Restoration activities will generally be timed with contractor’s nearby causeway section removals. River access will be via existing causeway.

2) During critical tasks, a qualified environmental inspector will be on site to guide/observe restoration activities and check elevations.

3) Nineteen (19) in-situ sediment monitoring locations (painted patio blocks) will be placed 100ft upstream, 100ft downstream and 500ft downstream from restoration activities and approximately 30ft, 100ft and 300ft from the right descending bank but corresponding to flow direction. Due to high flow velocity on the left descending bank, we do not recommend sediment monitoring in that location. Where accessible during normal flows locations will be visually monitored before, during and after each restoration task, or at a minimum every week during in-stream construction.
Post-High Water Event Allegheny River
• Effects to T&E Mussels
Post-High Water Event Allegheny River

- Emergency Restoration
- Emergency Mussel Relocation
- Water Quality / Sediment Mon.
Post-High Water Event Allegheny River
- Scour and Gravel Bar Repair
- Post-Construction Debris Check
- Long-term Monitoring
**Under Bridge Average Mussel Densities (DROP ZONE)**

<table>
<thead>
<tr>
<th></th>
<th>E. t. rangiana</th>
<th>P. clava</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presalvage mussels/m-2</td>
<td>6.624</td>
<td>12.480</td>
<td>8.256</td>
<td>27.360</td>
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<tr>
<td>Postsalvage mussels/m-2</td>
<td>0.343</td>
<td>0.952</td>
<td>0.610</td>
<td>1.905</td>
</tr>
<tr>
<td>% efficiency</td>
<td>94.8%</td>
<td>92.4%</td>
<td>92.6%</td>
<td>93.0%</td>
</tr>
</tbody>
</table>

**Cranepad Average Mussel Densities (TEMPORARY FILL)**

<table>
<thead>
<tr>
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<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presalvage mussels/m-2</td>
<td>8.941</td>
<td>19.094</td>
<td>6.574</td>
<td>34.545</td>
</tr>
<tr>
<td>Postsalvage mussels/m-2</td>
<td>0.431</td>
<td>2.503</td>
<td>0.472</td>
<td>3.405</td>
</tr>
<tr>
<td>% efficiency</td>
<td>95.2%</td>
<td>86.9%</td>
<td>92.8%</td>
<td>90.1%</td>
</tr>
</tbody>
</table>

**Over 92% Of Mussels Recovered (Goal >50%)**
PennDOT / FHWA and USFWS / PFBC established relocation site parameters throughout historic range of target species:

- Pennsylvania
- West Virginia
- Kentucky
- New York
- Seneca Nation of Indians
- Ohio
- Indiana
- Illinois
SUCCESS!!!

- Most Projects Exceed Environmental Commitments
- Overall Bridge Program Has Made Great Strides Towards Species Delisting
- Lessons Learned Incorporated into Future Projects
SUCCESS!!!

- PennDOT District 1-0 2016 Governor’s Award
- AASHTO Award for the Best Use of Technology & Innovation, Medium category, for Hunter Station Bridge
CONCLUSIONS

• Consider Conservation Measures that Support Species Recovery

• Baseline Data of Habitats & Resources is Important

• Maintain Key Partnerships

• Utilize Adaptive Management to Improve Processes / React

• Develop a QA/QC Process to Support Results

• Monitor Construction