Constructing vernal pools for wetland mitigation: how well are we doing?

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BACKGROUND – *vernal pools*

- Seasonally-flooded, shallow depressions
- Timing and length of inundation
- Isolated waters, often associated with forests

*Critical breeding habitat for focal species!*

*NO FISH!*
BACKGROUND – creating vernal pools

• Creating vernal pools: mitigation, enhancing habitat

• “Among the most difficult wetland systems to create”*

• Limited monitoring; success criteria

• To date, research studies have not been holistic

*National Research Council 2001

http://jeffjosephwoodworker.com/2012/10/31/vernal-pools/
Study Sites – mixed deciduous-coniferous forests

Stewart International Airport

2006: 12 vernal pools created
• Mitigation for wetland impacts from access road

Monitoring (10 years); 5 pools with no water!
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Yale Myers Forest

Six vernal pools

Long history: wood frog & spotted salamander breeding
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2013 and 2014: physical, chemical, and biotia
RESULTS - physical

• Created pools:
  • Smaller size; more open canopy (leaf off)
  • 5 of 7 pools dried seasonally

• Similar substrate cover, leaf litter input

• Vegetation:* 
  • More duckweed, *Phragmites*, and cattail

Results – biota
• Algae (no difference)
RESULTS – water chemistry

Nutrients
• Seasonal increase in N, P, DOC; especially reference pools

Higher pH, conductivity; created pools

Water temperature
• Higher in created pools
RESULTS – macroinvertebrate (family)

- 39 families
- Similar richness
- Separated out by pool type (cluster, NMDS)

<table>
<thead>
<tr>
<th>Shared common families</th>
<th>Common in created pools</th>
<th>Common in reference pools</th>
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</thead>
<tbody>
<tr>
<td>Aeshnidae</td>
<td>Belostomatidae</td>
<td>Asellidae</td>
</tr>
<tr>
<td>Chaoboridae *</td>
<td>Coenagrionidae</td>
<td>Chirocephalidae</td>
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<tr>
<td>Chironomidae *</td>
<td>Crangonyctidae b</td>
<td>Corydalidae</td>
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<tr>
<td>Corixidae</td>
<td>Halipidae</td>
<td>Gyrinidae</td>
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<tr>
<td>Culicidae</td>
<td>Hydrophilidae b</td>
<td>Phryganeidae</td>
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<tr>
<td>Dytiscidae *</td>
<td>Physidae</td>
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<td>Gerridae *</td>
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<td>Lestidae</td>
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<td>Limnephilidae</td>
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<tr>
<td>Notonectidae *</td>
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<tr>
<td>Sphaeriidae</td>
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</tbody>
</table>

* denotes families found in all thirteen pools
b denotes families found exclusively in created pools
c denotes families found exclusively in reference pools

![NMDS plot showing community separation](image)
RESULTS – wood frogs & spotted salamanders

- Seven amphibian species
- No difference in species richness or composition

Reference pools:
- Higher densities of egg masses and larval abundance

Created pools:
- 4 of 7 pools (both species)
- 2 wood frogs only
- 1 pool had neither
IMPLICATIONS/ACKNOWLEDGMENTS

• Should include canopy cover and forest connectivity (affect temperature, food resources, species)

• Improve ability to predict pool duration

• Monitoring needs to be long-term and more holistic

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