Case Study in Full Delivery Permittee-Responsible Mitigation

Pond Brook, Liberty Park Metro Park, Summit County, Ohio

OTEC 2015
## Project Partners

<table>
<thead>
<tr>
<th><strong>Ohio Department of Transportation:</strong></th>
<th>funded project, project management, tech support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summit Metro Parks:</strong></td>
<td>local partner and landowner</td>
</tr>
<tr>
<td><strong>Wetlands Resource Center:</strong></td>
<td>mitigation provider; general contractor</td>
</tr>
<tr>
<td><strong>EMH&amp;T:</strong></td>
<td>environmental assessment, mitigation plan, and wetland design</td>
</tr>
<tr>
<td><strong>Oxbow River and Stream Restoration:</strong></td>
<td>stream restoration</td>
</tr>
<tr>
<td><strong>Davey Resource Group:</strong></td>
<td>monitoring and reporting; adaptive management</td>
</tr>
</tbody>
</table>
Background

• 164 acre tract within the then 1,500 acre Liberty Park, part of the Summit Metro Parks park system

• The restoration project was originally established by agreement between Wetlands Resource Center and Summit Metro Parks to serve as a formal wetland bank. The mitigation concept was eventually modified to allow for large scale permittee responsible mitigation instead of a bank site

• ODOT was in need of large amounts of stream and wetland mitigation for the SUM-8-13.30/15.63 PIDs 24507/24508 and identified this site (via a stream/wetland mitigation opportunities inventory report) as having potential to provide all mitigation in one location
Background

Project Goals:

1. Restore previously drained and degraded existing wetlands though hydrologic modifications and eradication of invasive species

2. Restore channelized Pond Brook using natural channel design – restoring channel sinuosity and a floodplain
Project Timeline

Metro Park/WRC Agreement: Nov. 2004
ODOT/WRC Agreement: Nov. 2005
Final Mitigation Plan: April 2006
Site Assessment and Design: Nov. 2006
Construction: 2007 - 2008
Monitoring: 2008-2013 (Wetland)
          2009-2014 (Stream)
Project Release: USACE  Feb. 2015
               Ohio EPA   March 2015
During the early stages of design, ODOT agreed to fund the mitigation work to meet mitigation requirements for construction of the SUM 8 project. Stream impacts totaled 4,063 linear feet. To mitigate for these impacts, ODOT proposed to restore 6,095 linear feet of Pond Brook within the mitigation area.
ODOT Involvement

Wetland impacts totaled 14.446 acres. OEPA required that ODOT restore 14.556 acres of wetlands and enhance an additional 34.904 acres.

ODOT entered into a full delivery agreement with Wetlands Resource Center to provide all aspects of mitigation services. This was the first full delivery permittee responsible stream and wetland mitigation project for ODOT (conducted by others on the behalf of ODOT).
ODOT Involvement – ODOT Website summary

- County: Summit
- 404 Authorization Date/ID#: 8/7/2006 - 200500588
ODOT Involvement – ODOT Website summary

• Watershed: Cuyahoga River (HUC 04110002)
• Mitigated Resources: Stream and Wetland
• Service Area: Wetland and stream: Cuyahoga River (04110002) or with justification and approval from the OEPA and COE Black River and Rocky River (04110001), Chagrin River and Ashtabula River and Lake Erie trib. (04110003), Grand River (04110004), Mahoning River (05030103), Tuscarawas River (05040001)
• Pooled Mitigation Available: Yes
• Types of Mitigation Available: Stream and Wetland (case by case)
• Owner: City of Twinsburg, Summit County Metroparks
Significant coordination on various site constraints, design elements permitting and restoration goals with:

- Summit Metro Parks
- City of Twinsburg, Village of Reminderville
- Federal and state regulatory agencies
- Local HOA

Significant discussions on performance standards

- IBI, ICI, Invasive Species, etc.
Permitting Authorities

- US Army Corps of Engineers (404 Permit)
- Ohio EPA (401 Water Quality Certification)

Issued for ODOT Project (SUM 8) on June 22, 2006 (401) and August 7, 2006 (404); this encompasses all of the restoration/enhancement activities on the east side of Pond Brook. Final Mitigation Plan dated April 6, 2006.

- 14.56 acres wetland restoration (Cell 1)
- 34.90 acres wetland enhancement (Cell 2/3)
- 6,900 linear feet stream restoration (Pond Brook)

* Cells 1, 2, and 3 constitute the ODOT sponsored mitigation site
Pond Brook Stream & Wetland Restoration

- Tributary to Tinker’s Creek
- Cuyahoga Watershed
- 1.6-3.3 square mile watershed
- 2 miles of ditch with Liberty Park
  - 4,650 LF
- Berms or Levees
- 3 Significant Wetland Areas
Existing Biological Condition

Modified Warm Water Habitat

- QHEI – 28
- IBI – 22
- ICI 6

Negative Attributes

- Low Dissolved Oxygen
- High Nutrient Levels
- Unionized Ammonia
- Heavy Siltation
- High Sediment Metals
Impairment

- Initial Hydromodification for Agricultural Drainage
- Later Dredging for Urban Development
- Rosgen F6 Stream
- Low Biological Diversity
- Low Stream Energy
Will it Recover Naturally?

• Recovery as measured by the OEPA
  • Biological improvement
  • Water quality improvement
  • Habitat improvement
• Factors limiting recovery
  • Low gradient
  • Channel shape
  • Poor sediment transport
  • Turbid waters
  • Exotic carp

*Little recovery has occurred since the last known disturbance*
Other Site Considerations

- Existing low quality wetlands
- Extensive invasive species
- Loss of hydrology
Adjacent Urban Influence

- Presence of Aurora Lake Dam
- Adjacent to Residential Neighborhood
- Downstream of WWTP
Positive Attributes

• Ecological diversity of surrounding area is exceptional
  • Large wetland areas
  • Headwater tributaries spring fed/forested
  • Headwater biology able to help recovery

• Significant opportunity for improvement
  • Existing poor habitat and biological condition

• Significant project length with potential for more downstream

• Restoration could significantly improvement water quality

• Perennial hydrology

• Recreational area

• Educational opportunities
Stream Restoration Goals

• To return the Pond Brook ditch to a **functional stream** with an accessible floodplain.

• To provide an ecosystem that would meet a use designation of **WWH water quality criteria**.
Priority 2 Restoration

- Re-establishes floodplain and stable channel at current channel invert elevation
- No grade controls
- May decrease flood elevations
Design Plan

Channelization Problems
- Inability to recover naturally
- Flooding and drainage concerns
- Bank erosion
- Poor habitat quantity & quality

Manipulation of shape
- Improve morphological function
- Improve habitat condition
- Improve water quality potential
Design Plan

• Based on Natural Channel Design techniques
• Intent to improve habitat or QHEI metrics
## Water Quality Improvement Prediction

<table>
<thead>
<tr>
<th>Metric</th>
<th>Existing</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substrate</td>
<td>0</td>
<td>Increase</td>
</tr>
<tr>
<td>In Stream Cover</td>
<td>7</td>
<td>Same/Increase</td>
</tr>
<tr>
<td>Channel Morphology</td>
<td>6</td>
<td>Increase</td>
</tr>
<tr>
<td>Riparian</td>
<td>8.5</td>
<td>Same</td>
</tr>
<tr>
<td>Pool/Glide Riffle/Run</td>
<td>5</td>
<td>Same/Increase</td>
</tr>
<tr>
<td>Gradient</td>
<td>4</td>
<td>Same</td>
</tr>
<tr>
<td>Total</td>
<td>30.5</td>
<td>52-56</td>
</tr>
</tbody>
</table>
Design and Construction Challenges

- Adjacent Subdivision
- Petition Ditch
- Peat Soils
- Waste Water Treatment Plan Flows
- Dam Safety
Site Conditions

• Groundwater Monitoring Program
• Data was collected regularly and compiled for Northern Wetland Cells
• Cell 1 data was used to compare groundwater elevations within and outside of the cell, pre construction.
• Data was also used to satisfy regulatory monitoring requirements
Wetland Design

- Contain Groundwater
- Collect Surface Water
- Eliminate Invasive Species
Wetland Connections

Problem
• How to restore hydrology to Cell 1
• Ditched on 3 sides

Solution
• EMH&T designed interconnecting pipe that allows water in Cell 2 to flow under the ditch and then resurface in Cell 1.
Connecting Pipe

• System has worked flawlessly since construction in 2008.
Core Trench/Berm Construction

• Berms were designed and constructed using a two foot by two foot keyway filled with clay in order to insure long-term stability.
Cell 3 Outlet

- Agri-Drain flow control structure
- 15 foot rock reinforced overflow spillway
- Overflow spillway is utilized during Aroura Lake drawdowns. The drawdown pipe is 6 feet in diameter.
Cell 3 Normal Flow Condition
Cell 3 Lake Draw Down Condition
Floodplain Considerations

- FEMA-studied watercourse
- Detailed Hydrologic & Hydraulic Study
- Floodplain Use Permit Application to the Village of Reminderville and the City of Twinsburg
ODNR Division of Water

- Determined that wetland berms were exempt from Ohio’s dam safety/levee criteria.
- Determined that Wetland Cell 3 did not pose a significant threat to the existing Aurora Lake dam.
## Plan Approval and Permitting

<table>
<thead>
<tr>
<th>Entity</th>
<th>Action and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summit County Metro Parks</td>
<td>Reviewed engineering plans</td>
</tr>
<tr>
<td>Village of Reminderville</td>
<td>Approved engineering plans, Issued floodplain use permit</td>
</tr>
<tr>
<td>City of Twinsburg</td>
<td>Issued floodplain use permit</td>
</tr>
<tr>
<td>Ohio EPA</td>
<td>Issued Notice of Intent (NOI)</td>
</tr>
<tr>
<td>Summit County SWCD</td>
<td>Approved Erosion and Sediment Control Plans</td>
</tr>
<tr>
<td>USACE/Ohio EPA</td>
<td>Final Mitigation plan</td>
</tr>
</tbody>
</table>
Floodplain Excavation

100’ to 150’ Wide
Bankfull Channel

- Initial Channel Dimensions
  30-40’ wide x 10’ deep
- Bankfull Channel Dimensions
  12-15’ wide x 1.5’ deep

- Sinuosity & Pattern
  Based on Reference Reach
  ~ 1.5
Substrate

1,300 tons of sand & gravel
Vegetation Plan

30,000 plants
• Native Trees & Shrubs
• Container & Bare Root
Erosion & Sedimentation Control

Construction in the Dry
- Pump Around
- Floodplain Excavation & Channel Construction Isolated from Existing Ditch
Straw Wattles
Site Condition Challenges

- Wet
- Muddy
- Access Issues
- Compaction Concerns
Equipment Consideration

- Low ground pressure
- Non-toxic biodegradable hydraulic fluids
- Soy-diesel fuel
Restoration Results

• Eradication of invasive species
• Reestablishment of native plant community
• Restoring wetland hydrology throughout the project area
• Restoration of channelized Pond Brook
• Sensitivity to surrounding land uses
Monitoring and Adaptive Management

• Annual Monitoring
  • 5 years each for stream and wetland mitigation areas
    • Annual Permit Compliance reports submitted to USACE and OEPA

• Primary Invasive Species of Concern
  - *Typha angustifolia* (narrow-leaf cat-tail)
  - *Typha x glauca* (hybrid cat-tail)
  - *Phalaris arundinacea* (reed canary grass)
  - *Frangula alnus* (glossy buckthorn)

• Number of Sprays Needed
  - Spray work was conducted annually
  - High-volume foliar treatment using ATVs
  - Low-volume foliar treatment using backpacks.
## Summary of Stream Restoration Goal Attainment

<table>
<thead>
<tr>
<th>Monitoring Goals</th>
<th>Goals</th>
<th>2009 (Baseline)</th>
<th>2010 (Year 1)</th>
<th>2011 (Year 2)</th>
<th>2012 (Year 3)</th>
<th>2013 (Year 4)</th>
<th>2014 (Year 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restored stream channel length</td>
<td>6,095 lf</td>
<td>6,978 lf</td>
<td>7,006 lf</td>
<td>7,006 lf</td>
<td>7,006 lf</td>
<td>7,006 lf</td>
<td>7,006 lf</td>
</tr>
<tr>
<td>QHEI Score</td>
<td>52–56</td>
<td>56 and 60</td>
<td>56 and 60</td>
<td>56 and 60</td>
<td>57 and 61</td>
<td>57 and 61</td>
<td>57 and 61</td>
</tr>
<tr>
<td>IBI Score</td>
<td>28</td>
<td>calculated in 2010</td>
<td>22</td>
<td>32</td>
<td>26</td>
<td>20.5</td>
<td>32</td>
</tr>
<tr>
<td>ICI Score Range (average)</td>
<td>24–33</td>
<td>calculated in 2010</td>
<td>23</td>
<td>23</td>
<td>25</td>
<td>28</td>
<td>27.33</td>
</tr>
<tr>
<td>Survival rate of planted woody vegetation</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td>VIBI Score</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>74</td>
</tr>
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</table>
## Summary of Wetlands Restoration Goal Attainment

<table>
<thead>
<tr>
<th>Monitoring Goals</th>
<th>Goals</th>
<th>2009 (Year 1)</th>
<th>2010 (Year 2)</th>
<th>2011 (Year 3)</th>
<th>2012 (Year 4)</th>
<th>2013 (Year 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acreage of wetlands restored</td>
<td>14.446</td>
<td>14.377</td>
<td>12.079</td>
<td>18.965&lt;sup&gt;2&lt;/sup&gt;</td>
<td>18.097&lt;sup&gt;2&lt;/sup&gt;</td>
<td>15.391 (plus 17.417 additional Cell 2 and floodplains)</td>
</tr>
<tr>
<td>Acreage of wetlands enhanced</td>
<td>34.904</td>
<td>49.095</td>
<td>50.755</td>
<td>50.925</td>
<td>51.029</td>
<td>51.029</td>
</tr>
<tr>
<td>Percentage of dominant plant species with an indicator status of OBL, FACW, FAC&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Minimum 50%</td>
<td>75%</td>
<td>83%</td>
<td>75%</td>
<td>72%</td>
<td>77%</td>
</tr>
<tr>
<td>Invasive species cover&lt;sup&gt;4&lt;/sup&gt;</td>
<td>&lt;10%</td>
<td>&lt;6%</td>
<td>8.5%</td>
<td>7.3%</td>
<td>4.7%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Percent of unvegetated open water</td>
<td>&lt;10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>ORAM Score</td>
<td>High Quality Category 2, Cell 1: 64 (Cat 2-3), Cell 3: 60 (Cat 2-3)</td>
<td>Cell 1: 56 (Cat 2), Cell 3: 57 (Cat 2)</td>
<td>Cell 1: 60 (Cat 3), Cell 3: 60 (Cat 3)</td>
<td>Cell 1: 60 (Cat 3), Cell 3: 60 (Cat 3)</td>
<td>Cell 1: 60 (Cat 3), Cell 3: 60 (Cat 3)</td>
<td></td>
</tr>
<tr>
<td>VIBI score at Year Five&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Category 2</td>
<td>–</td>
<td>–</td>
<td>--</td>
<td>--</td>
<td>Category 2 (44.5)</td>
</tr>
<tr>
<td>Number of the 20 monitoring quadrats exhibiting soil saturation and/or inundation during at least a portion of the growing season&lt;sup&gt;1&lt;/sup&gt;</td>
<td>20</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>
## Summary of Project Credits and Costs

<table>
<thead>
<tr>
<th>Stream Restoration Credits</th>
<th>Wetland Restoration Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required 6,095 linear feet</td>
<td>14.56 acres of restoration (1:1 mitigation credit)</td>
</tr>
<tr>
<td>Delivered 7,006 linear feet</td>
<td>34.90 acres of enhancement (2:1 mitigation credit)</td>
</tr>
<tr>
<td>$232/linear foot</td>
<td>$40,000/acre</td>
</tr>
</tbody>
</table>
Lessons Learned: Public Land – Competing Land Use

• First project on public land
• Wetland and stream projects must conform to competing land uses such as trails, hunting and wetlands aimed for ducks and geese (birdwatching).
Lessons Learned: Invasive Species

• Did not spray for invasive species in some areas until the end of the first growing season after construction.

• This allowed the spread of Canada Thistle (especially in compacted areas), garlic mustard and cattails. If invasive species get ahead of you in monitoring year 2-3, eradication can cause extensive collateral damage to your new planting.

• Encourage invasive treatment prior to construction and again soon after construction is complete. After the second year only light maintenance should be required.
Lessons Learned: Urban Setting

• In an urban area you must be aware of both present conditions as well as planned future projects that may affect your project.

• We experienced a dam spillway replacement, a sewage treatment plant closing, and State Route 82 bridge replacement during the monitoring period. These changes can impact your project and its ability to meet performance standards.
Final Thoughts

- Large mitigation projects are not easy!
- Lots of moving pieces/parts
- Lots of customers to coordinate with and obtain approvals
- Various state, federal, and local laws/rules/regulations to satisfy
- Large scale mitigation efforts takes a team approach of many disciplines
- The end result was a successful full delivery permitting responsible mitigation project that met/exceeded all of the permit performance goals and allowed the SUM-8 project to proceed as scheduled
Final Thoughts

- Additional pooled stream and wetland credits for ODOT on future projects
- Set foundation for future similar full delivery permittee responsible mitigation efforts at ODOT
- Lots of experience gained by all parties involved
- Partnerships established
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