Restoring Alewife to the Bronx River, NYC

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Northeast Aquatic Biologists Conference

NYC Parks
Division of Forestry, Horticulture and Natural Resources
New York City Land Cover

<table>
<thead>
<tr>
<th>GREY 59.5%</th>
<th>GREEN 40.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>114,200 acres</td>
<td>55,360 acres</td>
</tr>
<tr>
<td>BUILT</td>
<td>LANDSCAPED 28.9%</td>
</tr>
<tr>
<td>22,220 acres</td>
<td>NATURAL 11.6%</td>
</tr>
</tbody>
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Source: Natural Areas Conservancy Ecological Cover Type Map Level 2, 2017.
New York City Natural Areas

NYC Parks
Natural Areas
Nature in NYC Parks

- 1,444 acres grasslands
- 5,000 acres wetland
- 60 miles streams
- 3,500+ volunteers
- 2,479 bioswales
- 7,300 acres forest
The Bronx River

- Bronx River originates near Kensico Reservoir in Valhalla, NY
- Travels south for 23 miles, flows into western Long Island Sound
- Eight miles of the River flows through one of the most urban and diverse areas in the country—The Bronx:
  - 1.45+ million people
  - 42 square miles, ~25% open space

Source: Westchester County Department of Planning and Bronx River Alliance
History of Restoration on the Bronx River

- 1974: Local activists formed Bronx River Restoration Group
- 2001: Bronx River Alliance formed
- 2000s: WCS-NOAA funded ecological restoration, education, and recreation projects
- 2005: Bronx Forest floodplain and stream restored, including boardwalks along Bronx River
- 2007: Oyster Reef Pilot Project began
- 2010: Bronx River Intermunicipal Watershed Plan produced
- Today: 1,500 paddlers, 2,000 students, and 500 stewards engaged annually

Left: Restoration and community engagement efforts. Right: Bronx River Blueway Map, a National Water Trail.
River Herring: Alewife (*Alosa pseudoharengus*) and Blueback Herring (*Alosa aestivalis*)

- Anadromous fish (spawn in freshwater then migrate to the ocean)
- Reach sexual maturity after 3-6 years and return to natal waters to spawn
- Iteroparous (repeat spawning)
- Important forage fish for a range of species including commercial and recreational fish and birds of prey
- Cycle nutrients between freshwater and saltwater ecosystems
- Once plentiful in rivers and tributaries in the northeast – streams described as “running silver”
- Threats include habitat alteration (dams), habitat degradation (pollution), bycatch (Atlantic Herring fishery)

Top: River herring captured during electroshocking. Bottom: Osprey catching river herring as prey (credit: Vic Zigmont).
Diadromous Fish Restoration Efforts

Project Goals

• Reconnect access to spawning habitat
• Jumpstart native population & establish self-sustaining fish run
• Engage community partners in community-based science monitoring

Timeline

• 1600s: Man-made dams limit upstream migration
• 2004: Fish restoration feasibility study
• 2006: First Alewife fish stocking
• 2015: River herring and eel fishways opened at first dam, monitoring began
• 2017: First river herring observed using fishway
• 2017-present: Annual fish stocking and monitoring

Top: E. 182nd St. Dam pre-fishway installation. Bottom: Underwater video footage of river herring using the fishway to migrate upstream.
The First Barrier:
East 182<sup>nd</sup> Street Dam

East 182<sup>nd</sup> St. Dam with Alaska steep-pass fishway and eel ladder installed in 2015.
East 182\textsuperscript{nd} St. Dam Fishway

East 182\textsuperscript{nd} St. Dam, before the fishway was installed. 

Construction of the East 182\textsuperscript{nd} St. Dam fishway.
Fishway Monitoring Equipment

Metal fyke gate guides fish to swim through a monitoring box equipped with an underwater video camera and fish counter equipment.
Fishway and Eel Ladder Use 2015-2019

312 River herring
> 1,300 American eel
161 Sunfish spp.

69 Largemouth bass
27 White sucker
19 Common carp
13 Brown bullhead

Total Fish > 1,900
Annual Fishway Use

Note: Low river herring numbers in 2019 may have been a regional trend. Herring runs in Long Island Sound tributaries were low.
2018 Fishway Use
April 4th – June 30th

Note: Gaps in data due to video camera/fish counter malfunction.
Annual Fish Stocking Since 2017

- Approximately 400 river herring are collected from Bride’s Brook, CT, transported, and stocked in the Bronx River annually

- Partnership with Connecticut Dept. of Energy & Environmental Protection (CTDEEP), Wildlife Conservation Society (WCS), Bronx River Alliance (BxRA)

- Stocked in spawning habitat in impoundment between E. 182nd St. Dam and Bronx Zoo Double Dams

Fish are released from stocking tank via hose into the Bronx River.
Post-Fish Stocking Monitoring

Objectives:
• Evaluate success of stocking
• Monitor presence of adults and juveniles post stocking

2018 Results:
• Four dead Alewife recovered
• 668 potential juvenile “pops” (difficult to verify)
• Zero juveniles captured

2019 Results:
• Zero dead Alewife observed
• Zero juveniles captured

2020 Planned Monitoring:
• Visual surveys via canoe & underwater ROV
• eDNA sampling upstream & downstream of stocking area and fishway
• Evaluate crowd sourcing video data

Upstream Impediments: Bronx Zoo & Stone Mill Dams

Bronx Zoo Double Dams

Stone Mill Dam
Bronx Zoo Double Dams Fish Passage Assessment

Project Goals

• Assess dam removal feasibility
• Conduct alternatives analysis (engineered fishway vs. dam removal)
• Choose a fish passage alternative and move forward either with updated fishway designs or a dam removal Scope of Work

Project Team

• NYC Parks (lead)
• HDR & Princeton Hydro (consultants)
• Wildlife Conservation Society & Bronx River Alliance (stakeholders)
Task 1: Dam Removal Feasibility Assessment

Considerations

• Dam condition & safety
• Sediment quantity, quality, and management
• Impacts to utilities and infrastructure
  o Upstream and downstream bridges
  o Zoo exhibits & operations
• Ecological impacts
  o Existing wetlands
  o Tree removals
  o Spawning habitat
• Aesthetics
• Costs

Top: Sediment depth measurements above the eastern spillway. Bottom: Upstream floodplain.
Task 2: Updated Fishway Cost Estimate

Engineered Fishway Design

Engineered fishway rendering by Milone & MacBroom (MMI). Costs estimate anticipated to be ~$5M.
Task 3: Alternatives Analysis

Considerations

• Zoo operations & aesthetics
  o Bison exhibit, visitor entrance

• Constructability and cost

• Passage efficiency
  o Bunt et al (2011) found steeppass fishways to be on average 51% effective at passing fish
    ▪ “The vast majority of fishway structures do not effectively mitigate the effects of barriers…”

• Ecological impacts (eg. spawning grounds & wetlands)

• Permitting
  o Cautious regulatory environment for dam removal in New York State

• Management and risk
  o Dam removal requires no operational costs post-construction

Top: Flooding at the Bronx Zoo Double Dams in 2007. Bottom: Cross section of engineered fishway requiring bedrock excavation 8 feet in depth
Task 4: Based on Chosen Fish Passage Alternative

Option 1: Update fishway designs

• Apply improvements or modifications to update engineered fishway designs
• Update contract documents at 100% design

Option 2: Dam Removal Scope of Work

• Develop dam removal scope of work that includes:
  o Preparing final design and construction documents for dam removal
  o Preparing cost estimates for construction & construction management
  o Securing permits and approvals

Canoeing at the base of the Bronx Zoo Double Dams in search of juvenile river herring (2019).
Next Steps

**Design Contract**
- Two-year contract
- Sediment sampling Spring 2020
- Tree assessment Spring/Summer 2020

**Construction Funding**
- Funds in-hand:
  - $1,500,000 from NYSDEC WQIP Grant Program
  - $250,000 from Bronx Borough President (funding the design contract)
- Fishway costs >$4M, and dam removal will likely be more expensive
- Future partnership with USACE through Hudson Raritan Estuary Ecosystem Restoration Program
  - Cost share: Fed 65%, Local 35%
  - Earliest construction 2025

Conclusions

- Our efforts will continue to restore river herring populations in the Bronx River within one of the most densely populated areas of NYC
- Restoring connectivity upstream is the next step in establishing a native, self-sustaining herring run
- The first dam removal feasibility study in NYC will provide a wealth of information to inform future restoration practices
- We look forward to collaborating with restoration practitioners and aquatic biologists across the Northeast coast on best practices & lessons learned!

Underwater video footage of stocked Alewife in the Bronx River (2019). Courtesy of the Jake Labelle, WCS.
Questions?

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