Dam Removal: Data & Resources

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Connecting Our Streams Workshop
Outline

Initial Reconnaissance
Prioritization Tools
Ghost Dams
Existing Guidance
Dam Removal Costs
Funding Opportunities
Initial Reconnaissance

Dam or Nearby Property Ownership

- Dam Inventory – NYS GIS Data Clearinghouse & Google Earth
- Tax parcels – NYS GIS Data Clearinghouse; parcel viewers
- Deed search – County Clerk
- Ask NYSDEC for technical assistance
Initial Reconnaissance

Existing issues with the dam(s)

- NYSDEC Dam Safety: guidance documents
- NYSDEC Dam Safety: inspection reports
- Consult with dam owner and nearby property owners

Common Structural Issues

- Spalling and Cracking
- Seepage at abutment contact (groat)
- Rodent activity
- Low area in crest of dam
- Cracking
- Slump
- Boil
- Concrete failure
- Piping
- Erosion at outlet (scour hole)
- Stability failure (internal)
Initial Reconnaissance

Issues with nearby infrastructure

- Field recon and desktop analyses (overlay of streams, roads, utility networks, etc)
- Hydraulic modeling
Initial Reconnaissance

Impacts to Rare Species or Habitats

• Hudson Valley Natural Resource Mapper
• Biological Surveys of Site
Initial Reconnaissance

Impacts to Historic or Cultural Resources

- Cultural Resource Information System Web Tool
- Contact the State Historic Preservation Office
Initial Reconnaissance

Sediment Quality & Quantity

- **Upstream Contaminant Sources:** [DEC Info Locator]
- **Upstream Land Use:** GIS Data Clearinghouse; Model My Watershed
- **Existing WQ data:** [DEC Info Locator], Riverkeeper
- **Hudson mainstem sediment samples:** NYS GIS Data Clearinghouse
- **NYSDEC Guidance**
Prioritization Tools

Freshwater Network - Northeast Region

Northeast Conservation Planning Atlas
Ghost Dams

Automated approach to identify hidden dams in the Estuary Watershed

<table>
<thead>
<tr>
<th>Watershed</th>
<th>NYS Dams</th>
<th>Ghost Dams</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundry Brook</td>
<td>12</td>
<td>41</td>
<td>3.4</td>
</tr>
<tr>
<td>Lattintown Creek</td>
<td>4</td>
<td>53</td>
<td>13.3</td>
</tr>
</tbody>
</table>
NYSDEC Dam Removal Guidance

Step One: Consider Your Options and Who Can Help You
Step Two: Research, Plan and Design Project
Step Three: Prepare Permit Application Package
Step Four: File All Required Permit Application and Comply with Permit Review and Issuance Procedures
Step Five: Implement Project and Consider Any Post-Removal Mitigation Measures
Dam Removal Costs

Cost Estimator Spreadsheet

Figure 2. Scatterplot of dam removal cost (2006 dollars) versus dam height (ft, 3.28 ft = 1 m) and length (ft) (log transformed).

\[
\ln\left(\frac{c_{\text{rem}}}{c_{\text{rem0}}}\right) = 7.79 + 0.80 \ln(\text{Height}_i) + 0.33 \ln(\text{Length}_i) \\
+ 1.49 \ln(\text{DamSize})
\]

- S.E.: 0.52
- (0.7)
- (0.26)
## Northeast U.S. Cost Breakdowns

<table>
<thead>
<tr>
<th>Phase</th>
<th>Range</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility</td>
<td>$15,000 - 145,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Engineering Design</td>
<td>$10,000 - 100,000</td>
<td>$33,000</td>
</tr>
<tr>
<td>Permitting*</td>
<td>$4,000 - 80,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Construction†</td>
<td>$35,000 - 290,000</td>
<td>$150,000</td>
</tr>
</tbody>
</table>

*estimated range because work often done in-house with staff time, for significantly less than consultant costs
† includes construction oversight
## Cost of Repair vs. Removal

<table>
<thead>
<tr>
<th>Dam (removal date)</th>
<th>Repair ($)</th>
<th>Cost ($)</th>
<th>% More Expensive to Repair</th>
<th>Times More Expensive to Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Christopher Dam, CA (1994)</td>
<td>$160,000</td>
<td>$100,000</td>
<td>60%</td>
<td>1.6</td>
</tr>
<tr>
<td>Edwards Dam, ME (1999)</td>
<td>$9,000,000</td>
<td>$2,100,000</td>
<td>329%</td>
<td>4.3</td>
</tr>
<tr>
<td>Grist Mill Dam, ME (1998)</td>
<td>$150,000</td>
<td>$56,000</td>
<td>168%</td>
<td>2.7</td>
</tr>
<tr>
<td>Sandstone Dam, MN (1995)</td>
<td>$1,000,000</td>
<td>$208,000</td>
<td>381%</td>
<td>4.8</td>
</tr>
<tr>
<td>Two-Mile Dam, NM (1994)</td>
<td>$4,100,000</td>
<td>$3,200,000</td>
<td>28%</td>
<td>1.3</td>
</tr>
<tr>
<td>Rat Lake Dam, WA (1989)</td>
<td>$261,000</td>
<td>$52,000</td>
<td>402%</td>
<td>5.0</td>
</tr>
<tr>
<td>Waterworks Dam, WI (1998)</td>
<td>$694,600</td>
<td>$213,770</td>
<td>225%</td>
<td>3.2</td>
</tr>
<tr>
<td>Mounds Dam, WI (1998)</td>
<td>$3,300,000</td>
<td>$500,000</td>
<td>560%</td>
<td>6.6</td>
</tr>
<tr>
<td>Newport No.11 Dam, VT (1996)</td>
<td>$783,000</td>
<td>$550,000</td>
<td>42%</td>
<td>1.4</td>
</tr>
<tr>
<td>Pilchuck Diversion Dam (2020)</td>
<td>$2,000,000</td>
<td>$1,500,000</td>
<td>33%</td>
<td>1.3</td>
</tr>
<tr>
<td>Bartlett Pond Dam, MA (2014)</td>
<td>$671,000</td>
<td>$325,000</td>
<td>106%</td>
<td>2.1</td>
</tr>
<tr>
<td>Condit Dam, WA (2012)</td>
<td>$52,400,000</td>
<td>$24,800,000</td>
<td>111%</td>
<td>2.1</td>
</tr>
<tr>
<td>Whittenton Pond Dam, MA (2013)</td>
<td>$1,900,000</td>
<td>$447,000</td>
<td>325%</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Repair/Replace 1.3 – 6.6 times more expensive
# Funding Opportunities

<table>
<thead>
<tr>
<th>Grant Name</th>
<th>Funder</th>
<th>Brief Description</th>
<th>Funding Range</th>
<th>Match Requirement</th>
<th>Deadline</th>
<th>Eligibility</th>
<th>Website</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYSDEC Hudson River Tributary Restoration Grant</td>
<td>NYSDEC</td>
<td>Grants support restoration of free-flowing waters by funding planning and construction projects to remove dams and remove/right-size culverts. Eligible projects must conserve or restore habitat connectivity for American eel or river herring in tributary streams of the Hudson River.</td>
<td>$10,500 - $1,025,000</td>
<td>None</td>
<td>Typically Jan-Feb.</td>
<td>Non-profits, conservation groups/agencies, municipalities</td>
<td><a href="https://www.dec.ny.gov/enb/20180214_not0.html">https://www.dec.ny.gov/enb/20180214_not0.html</a></td>
<td>Implementation</td>
</tr>
<tr>
<td>Hudson River Estuary Program - Local Stewardship Planning</td>
<td>NYSDEC</td>
<td>Grant projects must benefit the estuary ecosystem and can include resilience planning, habitat restoration planning, green infrastructure planning and others.</td>
<td>$10,500 - $50,000</td>
<td>15% Local Match</td>
<td>Typically July</td>
<td>Non-profits, private consultants, conservation groups/agencies, municipalities</td>
<td><a href="http://www.dec.ny.gov/lands/5091.html">http://www.dec.ny.gov/lands/5091.html</a></td>
<td>Planning</td>
</tr>
<tr>
<td>Water Quality Improvement Project (WQIP) Program</td>
<td>NYSDEC</td>
<td>WQIP funds projects that directly address documented water quality impairments and/or barriers to aquatic passage (bridges, culverts, dams).</td>
<td>$0 - $250k</td>
<td>25% match for habitat restoration</td>
<td>--</td>
<td>Non-profits, conservation groups/agencies, municipalities</td>
<td><a href="https://www.dec.ny.gov/pubs/4774.html">https://www.dec.ny.gov/pubs/4774.html</a></td>
<td>Planning &amp; Implementation</td>
</tr>
<tr>
<td>Community-based Habitat Restoration Project</td>
<td>NOAA</td>
<td>Provides funds to restore coastal ecosystems, support species recovery and help rebuild fish populations, and likely yield community and economic benefits.</td>
<td>$75k - $3mil</td>
<td>none</td>
<td>01/14/19</td>
<td>Non-profits, state &amp; local govt., universities, nonprofits and for-profits</td>
<td><a href="https://www.fisheries.noaa.gov/feature-story/noaa-seeks-applications-community-based-habitat-restoration-project-funding">https://www.fisheries.noaa.gov/feature-story/noaa-seeks-applications-community-based-habitat-restoration-project-funding</a></td>
<td>Planning &amp; Implementation</td>
</tr>
<tr>
<td>FEMA Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA) grant programs</td>
<td>FEMA</td>
<td>Provides pre- and post-disaster funds to address Localized Flood Risk Reduction, Floodplain and Stream Restoration, and Infrastructure Retrofits, including dam removal and culvert right-sizing.</td>
<td>max = $4mil</td>
<td>25%</td>
<td>--</td>
<td>Individuals, industry, communities &amp; nonprofits may apply via a local/state/tribal govt/t that must have an FEMA-approve Hazard Mitigation Plan</td>
<td><a href="https://www.fema.gov/hazard-mitigation-grant-program">https://www.fema.gov/hazard-mitigation-grant-program</a>; <a href="https://www.fema.gov/flood-mitigation-assistance-grant-program">https://www.fema.gov/flood-mitigation-assistance-grant-program</a>; <a href="https://www.fema.gov/pre-disaster-mitigation-grant-program">https://www.fema.gov/pre-disaster-mitigation-grant-program</a></td>
<td>Planning &amp; Implementation</td>
</tr>
<tr>
<td>Green Innovation Grant Program - New York State Environmental Facilities Corporation</td>
<td>NYSEFC</td>
<td>Provides grants to projects that improve water quality and demonstrate green infrastructure practices in New York. GIGP has supported dam removals and stream restoration projects.</td>
<td>-- 10% - 60%</td>
<td>July</td>
<td>state &amp; interstate agencies, local govt.; nonprofits, private entities, soil and water conservation districts</td>
<td><a href="https://www.efc.ny.gov/GIGP">https://www.efc.ny.gov/GIGP</a></td>
<td>Implementation</td>
<td></td>
</tr>
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</table>
The Water Quality Improvement Project (WQIP) program is a competitive, statewide reimbursement grant program that funds projects that directly address documented water quality impairments or protect a drinking water source. This funding is for construction/implementation projects, not projects that are exclusively for planning.
Water Quality Improvement Project (WQIP) Program

Round 16 (2019) WQIP project types:

- Wastewater Treatment Improvement
- Nonagricultural Nonpoint Source Abatement and Control
- Land Acquisition for Source Water Protection
- Salt Storage
- Aquatic Connectivity Restoration
- Municipal Separate Storm Sewer Systems (MS4)
Water Quality Improvement Project (WQIP) Program

Aquatic Connectivity Restoration

- Projects to replace culverts and bridges or remove dams;
- Purpose is to eliminate barriers to fish and other wildlife;
- Other benefits: reduce flooding and erosion;
- Projects of up to $250,000
- Match – 25% of the total award
- Municipalities, SWCDs, & Not-for-Profits
Water Quality Improvement Project (WQIP) Program

Nonagricultural Nonpoint Source

- Eight (8) project subtypes including “Culvert Repair and Replacement”
- Primary purpose must be to address erosion;
- AOP is not the primary goal although projects that also improve AOP, reduce flooding and protect infrastructure will receive additional points.
- Projects up to $1,000,000;
- Match – 25% of award total
- Municipalities and SWCDs
EXTRAS
Initial Reconnaissance

Community Concerns

• Interviews with stakeholders to document any social barriers to removal
Feasibility/Design/Permitting Costs

Median consulting costs from 20+ northeast U.S. projects (not all projects include each cost item)

- General project management: $4,700
- Meetings (per meeting consultant fees): $1,400
- Existing data collection & analysis: $3,500
- Surveying (structure, x-sections, profile, bathymetry, refusal depths): $10,100
- Hydrology & Hydraulics: $7,600
- Sediment characterization (quantity and grain size): $5,000
- Sediment quality (cost per core): $400-1,000
- Concept design drawings and narrative: $8,100
- Final design drawings and specs: $11,400
- Cost estimating: $2,300
- Permitting: $20,000
Construction Costs

Median costs from 10 northeast projects (actual project costs or engineer’s probable cost estimates)

Staging and mobilization $20,200
   (silt fencing, moving equipment, signage, staking, fencing, etc.)
Dewatering $13,200
   (pumping, piping, channeling, coffer dams, sandbagging, etc.)
Structure removal/disposal $22,200
Clean sediment removal/disposal (~4,000 c.y.) $50,000
Contaminated sediment removal/disposal (~4,000 c.y.) (at hazardous waste facility) $1,800,000
Channel/habitat work $10,500
   (channel construction, bioengineering, habitat features, grade control, etc.)
Planting/seeding $8,000
Construction oversight $21,000
Contingency (15-30%) $28,000
Potentially Expensive “Extras”

Contaminant management
- ex. $1.8 million for removal/disposal of 4,000 c.y. at hazardous waste facility

Replacing uses
- ex. $62,000 to replace fire protection water supply with two 20,000 gallon tanks

Infrastructure protection or replacement
- ex. $230,000 to replace bridge (~20-ft. span)

Relocating/protecting utilities
- ex. $32,000 to relocate sewer/water pipes