Prioritizing Mini-Hydroelectric Development At Existing Dams in Massachusetts

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Urban + Environmental Policy + Planning
Projection: North American Datum 1983 State Plane Massachusetts, Mainland
Data: MassGIS

Project Overview

Massachusetts recently passed legislation to fund the decommissioning of dams which no longer serve their original purpose. The Massachusetts Division on Ecological Restoration (DER) is currently developing a GIS-based analytical framework to prioritize dam removal based on environmental degradation. Whereas DER is interested in finding out which dams should be removed, I am interested in looking at which dams should be preserved for their hydroelectric power potential. My project will use GIS to explore the potential for mini-hydroelectric development in existing dam facilities in Massachusetts.

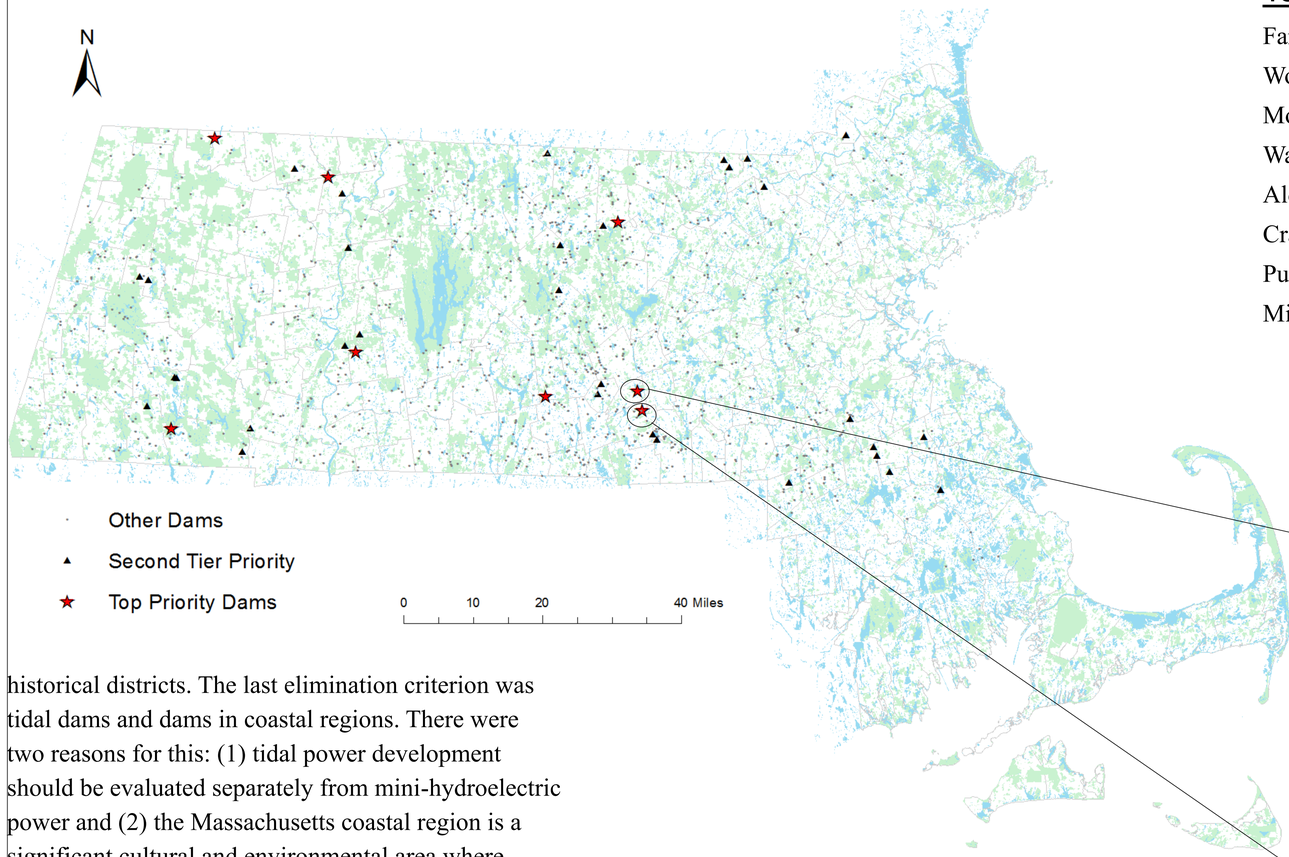
Methodology

To determine a dam's potential for mini-hydroelectric retrofitting, I developed two screenings for each dam assessment: (1) elimination and (2) ranking.

In the first screening, dams were eliminated from my analysis based on multiple criteria. Dams under Federal Energy Regulatory Commission (FERC) authority were removed because they are already producing hydroelectric power. Additionally, dams with no jurisdiction were removed as these structures are typically less than 6 feet in height and have poor potential for power development. Next, I eliminated dams that were in areas with strict development regulations. Any dam in protected open space and preservation land was removed. Using cultural resource data from the Massachusetts Historical Commission, I eliminated historical dams and dams in historical districts. The last elimination criterion was tidal dams and dams in coastal regions. There were two reasons for this: (1) tidal power development should be evaluated separately from mini-hydroelectric power and (2) the Massachusetts coastal region is a significant cultural and environmental area where resources such as river spawning fish habitats are targeted for restoration. This phase eliminated two-thirds of Massachusetts's 3000 dams.

With about 900 dams remaining in my analysis, I developed a second screening. This stage ranked each dam's suitability for mini-hydroelectric power development based on distance to transmission lines and access roads and also slopes of the land at the dam site. A short distance to transmission lines is important for getting electric power to the grid. A short distance to roads is important for access to the dam for construction vehicles to carry out the retrofit. A higher slope does not necessarily equate to higher energy potential, however due to insufficient data on dam size and potential capacity, slope was selected as the best available criteria to judge energy potential. Attributes were ranked on a scale of 1 to 4 with 4 being most suitable for development. Dams with the highest scores on each of the criteria were prioritized for mini-hydroelectric power development.

Dams by Hydroelectric Retrofit Priority

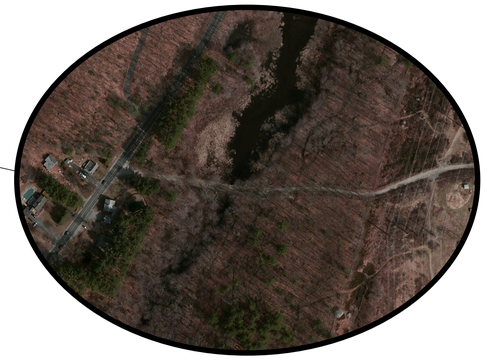


Results

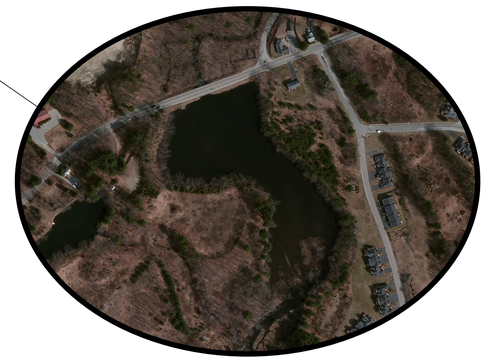
The analysis concludes with the top prioritization of eight dams in the state. Furthermore, I have identified thirty-three additional dam targets for mini-hydroelectric power retrofitting. These dams are located out of strict regulatory and environmental sensitive areas. Dams and their removal have become controversial. This analysis is intended to avoid the common conflict points. Next steps for this analysis will be to conduct site visits to these dams to access their condition and potential capacity. This will begin the process to determine the economic feasibility of mini-hydro. The true potential of mini-hydro in Massachusetts will be evident when combined with this additional data.

Top 8 Priority Dams

Farm Pond Dam—Millbury, MA
Woodbury Pond Dam—Sutton, MA
Monroe Bridge Reservoir Dam—Monroe, MA
Wards Pond Dam—Tolland, MA
Aldrich Lake Dam—Granby, MA
Cranberry Meadow Pond Dam—Spencer, MA
Pumping Station Dam—Greenfield, MA
Mirror Lake Dam—Fitchburg, MA



Farm Pond Dam



Woodbury Pond Dam