



IPSWICH RIVER
WATERSHED ASSOCIATION
The Voice of the River



GREAT MARSH BARRIER MITIGATION

A comprehensive program to mitigate aquatic barriers
in the Great Marsh Area of Critical
Environmental Concern region

TECHNICAL REPORT

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INTRODUCTION

As the Great Marsh region has become more developed, waterways and coastlines have been dotted with more infrastructure and more aquatic barriers. We use the term “aquatic barriers” to refer to human-made structures that may impede flow, fluvial and coastal processes. These structures include dams, non-tidal stream/river crossings, tidal crossings, and coastal stabilization structures. The interruption of important physical, chemical and ecological processes can reduce the overall resilience of our coastal watersheds, making our communities more vulnerable to extreme weather events and our ecological resources less sustainable. Many of these structures have aged past their design life and are in need of replacement or removal, while others were not designed to effectively pass wildlife or to manage high flows associated with extreme weather. New England has experienced more frequent floods since 1970 (Armstrong et al. 2011), increasing the risk of failure for aging and/or undersized structures. The extreme damage caused by large storms, including the Mother’s Day Storm (2006), Hurricane Irene (2011) and Hurricane Sandy (2012) has highlighted these risks.

These weather events have also drawn attention to the importance of ecosystem services provided by naturally functioning aquatic systems, including flood attenuation

and protection against storm surge. The presence of aquatic barriers limits the ability of the system to serve some of these functions. As outlined in the MassBays 2015 Comprehensive Conservation and Management Plan (CCMP), aquatic barriers are among the leading causes of ecological impairment to the state’s coastal embayments. Barriers to streamflow and tidal flushing are specifically listed as key environmental stressors in the 2018 Great Marsh Barriers Assessment. This project was supported by a Healthy Estuaries Program grant from the Massachusetts Bays National Estuary Partnership (www.massbays.org), under U.S. Environmental Protection Agency Grants CE-00A00436 and CE-00A00464.



Project purpose

- Prioritize barriers through municipal engagement
- Reduce the impact of aquatic barriers
- Increase the pace of on-the-ground restoration
- Improve resilience to flooding
- Improve public safety

Tools & Resources

- available at
- <http://www.pierivers.org/restoration/great-marsh-barriers-mitigation/>



GOALS & ANTICIPATED OUTCOMES

GOAL

Reduce the impact of aquatic barriers on ecological health and migratory fish in the Plum Island Sound and Essex River/Essex Bay Assessment Areas by working with communities to implement the recommendations of the Great Marsh Barriers Assessment. Develop a model training tool for barrier prioritization and restoration implementation.

ANTICIPATED OUTCOMES

Short-term (1-2 years)

- o Municipalities and other barrier owners are engaged and informed about recommendations of the 2015 CCMP and the 2017 Great Marsh Barriers Assessment
- o Municipal Teams are formed with the skills and knowledge to further these efforts in each community
- o Barrier owners are trained on effective approaches for continued restoration work in the future
- o Implementation plans developed for 15-20 high priority sites and next achievable step toward implementation taken at each site

Medium-term (2-5 years)

- o Priority barriers are upgraded or removed
- o Habitat connectivity and ecosystem processes improve at and near project sites
- o Barrier owners in project area identify and pursue projects at other sites
- o Barrier owners across the state utilize this methodology to make their projects more efficient
- o Community vulnerability to infrastructure failure during storms is reduced

Long-term (5-10 years)

- o Problem structures upgraded or removed throughout much of target area
- o Habitat connectivity and ecosystem processes improved system wide
- o Estuarine and diadromous fish populations increased and more resilient

PROJECT APPROACH

**Refine Barrier Maps/
Identify Ownership**



**Engage Barrier Owners/
Prioritize Barriers**

**Engage Restoration
Partners/ Finalize List**



**Implementation Plan
Development**

**Identify and Pursue
Next Steps**



**Training Materials/
Workshop**

PROJECT BENEFITS

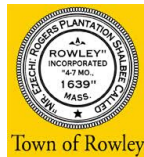
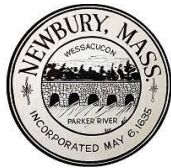
- **Improved habitat conditions in target assessment areas of Plum Island Sound and Essex Bay.**
- **Barrier mitigation education, training and technical support provided to municipal staff and communities within target assessment areas.**
- **Model approach to barrier mitigation provided to Parker-Ipswich-Essex (PIE)-Rivers partner towns.**
- **Enhanced stewardship of shared coastal resources.**

PROJECT PARTNERS

"INDIVIDUALLY, WE ARE ONE DROP. TOGETHER, WE ARE AN OCEAN."
RYUNOSUKE SATORO



BARRIER OWNERS



RESTORATION PARTNERS



REFINE BARRIER MAPS

As part of the 2018 The Great Marsh Barriers Assessment, IRWA inventoried and assessed 1,026 potential barriers across the 280 square mile Parker-Ipswich-Essex watershed region. The inventory included an extensive desktop GIS analysis, thorough review of information from previous reports and on-the-ground surveys of more than 500 road-stream crossings to supplement existing IRWA data sets. The structures were then assessed and prioritized using screening tools that considered both ecological impact and infrastructure risk. The Barriers Report and the combined results of the screening analyses are intended to be used as tools for local governments, private owners and restoration practitioners to identify sites that warrant further investigation, especially where infrastructure and ecological risk appear to overlap. As such, the barriers framework allows municipal officials, restoration practitioners and others to identify and further pursue work at sites while considering the position of the site and relative importance within the landscape and watershed. As part of this project, existing NAACC and Barriers Report datasets were queried against local knowledge and a GIS desktop level review of satellite imagery was performed. Additional barriers that had not previously been identified were then added to the database for further review. During field site visits, additional barriers were identified and added to the appropriate tidal, non-tidal or dam database.

The North Atlantic Aquatic Connectivity Collaborative (NAACC) trains observers to collect and upload data on non-tidal stream crossing structures to assess Aquatic Organism Passage (AOP). In 2019, the Massachusetts Environmental Trust funded IRWA and the NAACC to develop a protocol specific to tidal crossings. The Tidal Crossing Protocol was used to survey 65 barriers within the Plum Island Sound/Essex Bay Target Assessment Area.



PLAN YOUR PROJECT

- For communities without a comprehensive barriers report, the NAACC database is the first place to find information about the barriers in your region. Follow the instructions provided below to download available barrier data and use the MassGIS Online Mapping Tool to identify previously un-surveyed barriers.
- ArcMap or GoogleEarth are useful for mapping NAACC datasets and overlaying MassGIS data layers, however they are not required to conduct this desktop level review.
- Instructions available in Appendix and Links available at:
<http://www.pierivers.org/restoration/great-marsh-barriers-mitigation/>

TOOLS

- [Great Marsh Barriers Assessment](#)
- [NAACC Database](#)
 - [Instructions to download Town specific Non-tidal and Tidal road-stream crossing data](#)
- [GoogleEarth](#)
- [MassGIS Oliver](#)
 - [Instructions to query roads, trails and railway datasets](#)

IDENTIFY OWNERSHIP

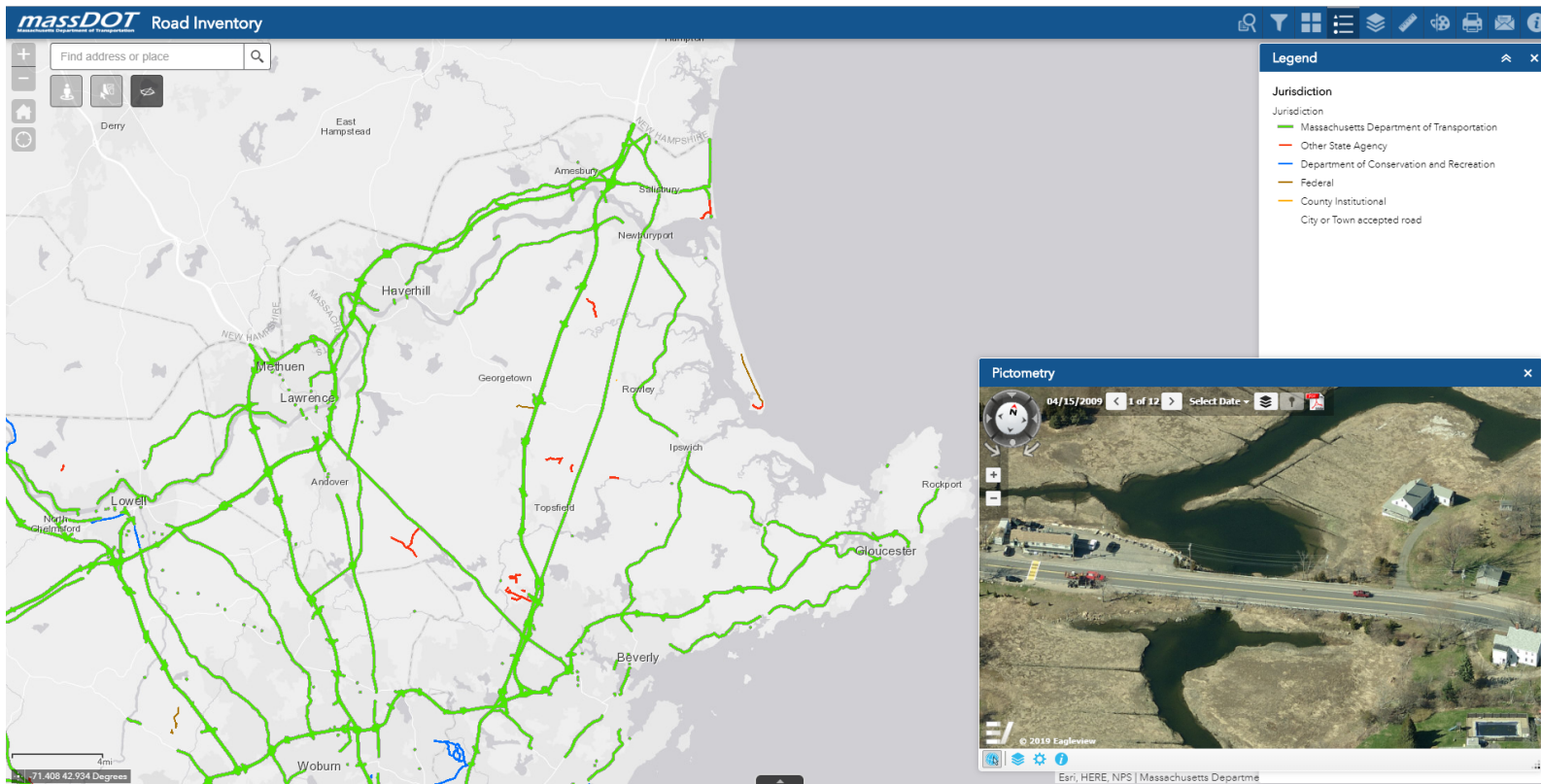
Identifying roadway ownership can be accomplished through discussions with municipal staff or through the use of online viewers. Using MassDOT Road Inventory can identify if the road is State, Town or privately owned. MassDOT uses mile markers to identify positions along roadways, therefore if questions arise about a structure along a State road, it is useful to identify the nearest mile marker for ease of identification. MassGIS Oliver contains numerous layers that can also be useful when identifying ownership.

PLAN YOUR PROJECT

The following Tools are useful when identifying ownership of barriers.

TOOLS

- [Great Marsh Barriers Assessment](#)
- [MassDOT Road Inventory](#)
- [MassGIS Oliver](#)
 - [Instructions to query property ownership](#)
- [National Inventory of Dams](#)
- [Dam Removal and Ecological Benefit Tool](#)



The MassDOT Road Inventory is one tool that can be used to identify road ownership and view aerial photography with the Pictometry viewer tool.

ENGAGE BARRIER OWNERS & LOCAL PARTNERS

Municipal partners are one of the most common barrier owners engaged through this process. Meetings with municipal staff involved looking at the study region map for their town and identifying problematic barriers. Not surprisingly, town priorities are areas where flooding occurs or has occurred in the past, or where structures are in disrepair. The key to selecting mutually beneficial projects is to find the commonality between town priorities and ecological/ aquatic passage benefits. This can be accomplished through barrier prioritization, as described below. While most partners recognize the benefit of collaboration, others may be hesitant.

Therefore, it is important to understand perspectives on barrier ownership. Local partners such as planning agencies, researchers and conservation/ watershed groups are excellent resources to identify priorities and should be engaged early in the process.

PLAN YOUR PROJECT

- The following resources outline the socio-political context of barrier removal:
- [Up Against the Wall, Barriers and Incentives for Dam Removal. Tufts Field Project](#)
 - [“You kill the dam, you are killing a part of me”. Fox, Magilligan, & Sneddon, 2016.](#)

PRIORITIZE BARRIERS

Additional data were compiled to determine where owner priorities aligned with potential funding sources aimed at improving resilience and wildlife passage. Data from core Biomap2 habitat, wetland change polygons, Northeast saltmarsh, impacted saltmarsh, NHESP estimated and priority habitats, FEMA National Flood Hazard Layer Polygons, Riverine Natural Community Systems and the Climate Action Tool were compiled for each site. For Dams, additional data from DER’s Restoration Potential Tool were compiled including the RPM4 Ecological Prioritization score, dam hazard level and potential # of miles of upstream habitat

connected from removal. Anadromous fish presence and additional fisheries resources were referenced. NFWF’s CREST (Coastal Resilience Evaluation and Siting Tool) can also be used to assess resiliency components.

PLAN YOUR PROJECT

- These resources can be used to refine priorities or bolster grant applications:
- [MassGIS Oliver](#)
 - [Instructions to assess ecological priorities using MassGIS data layers](#)
 - [Dam Removal and Ecological Benefit Tool](#)
 - [Mass Wildlife Climate Action Tool](#)
 - [NFWF Climate Resilience Tool CREST](#)

PRIORITY BARRIERS SUMMARY

This project builds upon the work of the Barriers Study. Additional prioritization metrics can be found in the Barriers Report. This project, funded through a MassBays Healthy Estuaries Grant focuses on the Plum Island Sound and Essex Bay EDA 2.0 watersheds, located in Newbury, Rowley, Ipswich, Essex and Gloucester. This project considered the Barriers Study priorities, infrastructure needs of municipalities, site-specific information on the hurdles to implementation, new tidal barrier assessment data and PIE-River's partners input. Through this process, missing barriers were accounted for, barrier owners were engaged, data was collected and training materials were developed. One outcome of this project is that local barrier owners are now engaged and informed about the importance of barrier upgrades, as indicated in the Barriers Study

and the MassBays Comprehensive Conservation and Management Plan. In addition, local barrier owners and regional watershed groups have access to the tools necessary to identify barrier ownership and prioritize barriers. Barrier owners are knowledgeable in the types of funding available for culvert upgrades and have already begun applying for, and receiving funding for barrier upgrades. In addition, implementation plans for twenty-seven sites were developed, which can be used to strategically address priority barrier upgrades. Meetings with MassDOT connectivity specialists have indicated that MassBays priorities will be included in the MassDOT project siting tool, and therefore will be considered when determining priorities for State roadway upgrades.



Stream crossing field technician Kristen Thiebeault assesses an undersized stone crossing.

PRIORITY BARRIERS

Table 1a. Priority barriers within the Massbays Plum Island Sound and Essex River/Essex Bay Target Assessment Area.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Stream Name	Ownership	Road	Latitude	Longitude	Town
MB1	MA00241		Dam	Parker River	Town of Newbury	Parker River Dam #1	42.750	-70.929	Newbury
MB2	1094	10169	Single Culvert	Unnamed Tributary to Parker River	Town of Newbury	Orchard Street	42.751	-70.929	Newbury
MB3	17332	ts30	Single Culvert	Cart Creek	Town of Newbury	Orchard Street	42.761	-70.914	Newbury
MB4	1054	9168	Single Culvert	Unnamed Tributary to Parker River	Town of Newbury	Coleman Rd.	42.742	-70.918	Newbury
MB5	17336	ts70	3 cell Stone culverts	Little River	MBTA	MBTA	42.780	-70.873	Newbury
MB6	MA01604		Dam	Mill River	Private owner (see IRWA for details)	Jewel Mill Dam	42.739	-70.900	Rowley
MB7	1040	9585	Bridge	Mill River	Town of Rowley	Glen Street	42.739	-70.900	Rowley
MB8	990	10221	Culvert	Sand Creek	MA DOT	Route 1A	42.728	-70.865	Rowley
MB9	17456	ts52	No data	West Creek	MADOT	Route 1A	42.737	-70.859	Rowley
MB10	17458	ts119	No data	Sand Creek	MBTA	MBTA	42.733	-70.861	Rowley
MB11	17460	ts118	No data		MBTA	MBTA	42.740	-70.863	Rowley
MB12	MA00165		Dam	Ipswich River	Town of Ipswich	Ipswich Mills Dam	42.678	-70.838	Ipswich
MB13	691	7043	Bridge	Saltonstall Brook	MA DOT	County Rd	42.673	-70.837	Ipswich
MB14	17241	ts123	Stone culvert	Rowley River tributary	MBTA 30.591	MBTA	42.716	-70.856	Ipswich
MB15	111	ts81	Culvert	Treadwell's Island creek	Private	Labor in Vain 3	42.679	-70.799	Ipswich
MB16	112	ts80	Culvert	Labor in Vain Creek Tributary	Private	Labor In Vain 2	42.680	-70.810	Ipswich
MB17	113	ts82	Culvert	Labor in Vain Creek Tributary	Private	Labor In Vain 1	42.682	-70.811	Ipswich
MB18	6610	42688	Culvert	Castle Neck River	Towns of Ipswich & Essex	Chebacco Road	42.647	-70.816	Ipswich/Essex
MB19	17107	ts28	Steel pipe	Castle Neck River	MA DOT	Route 133	42.654	-70.808	Ipswich/Essex
MB20	17108	ts29	Stone Culvert	Castle Neck River	Towns of Ipswich/Essex	Old Essex Road	42.655	-70.807	Ipswich/Essex

PRIORITY BARRIERS

Table 1b. Priority barriers within the Massbays Plum Island Sound and Essex River/Essex Bay Target Assessment Area.

MB21	339	67373	Single Culvert	Unnamed Trib to Essex River	Town of Essex	Eastern Apple Street	42.617	-70.773	Essex
MB22	436	ts92	Stone Culvert	Ebben Creek	MA DOT 35.5	Eastern Ave	42.633	-70.762	Essex
MB23	439	10304	Single Culvert	Unnamed Trib to Alewife Brook	Town of Essex	Story St.	42.633	-70.788	Essex
MB24	449	9874	Single Culvert	Lufkin Creek	Town of Essex	Lufkin Rd.	42.634	-70.749	Essex
MB25	127	70950	Box Culvert	Walker Creek	MA DOT 36.9	Eastern Ave	42.624	-70.737	Gloucester
MB26	489	11243	Single Culvert	Unnamed creek	City of Gloucester	Concord Street	42.642	-70.726	Gloucester
MB27	17168	ts53	Bridge	Unnamed Creek	City of Gloucester	Concord Street	42.635	-70.736	Gloucester

PRIORITY BARRIER MAP

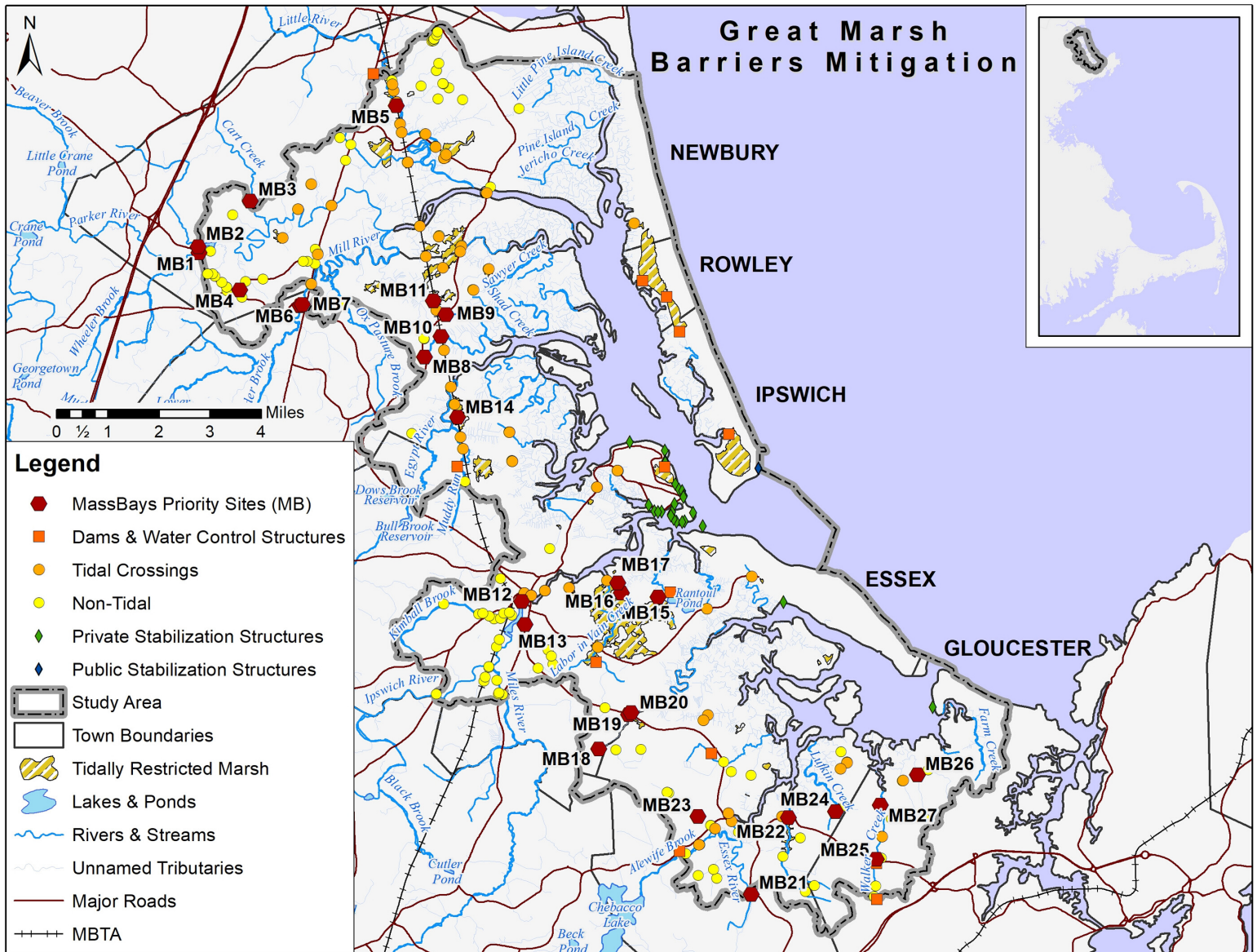


Figure 1. Great Marsh Barrier Mitigation Project.

Of the known barriers within the Plum Island Sound, Essex Bay study area (grey outline), 27 were selected as near-term priorities for implementation plan development. The map above depicts the MassBays priority sites, as well as the location of dams & water control structures, tidal crossings, non-tidal crossings, private and public stabilization structures. Next steps for implementation have been determined and initiated.

ADDITIONAL RESOURCES

MassBays datasets and shapefile available in zipped file:

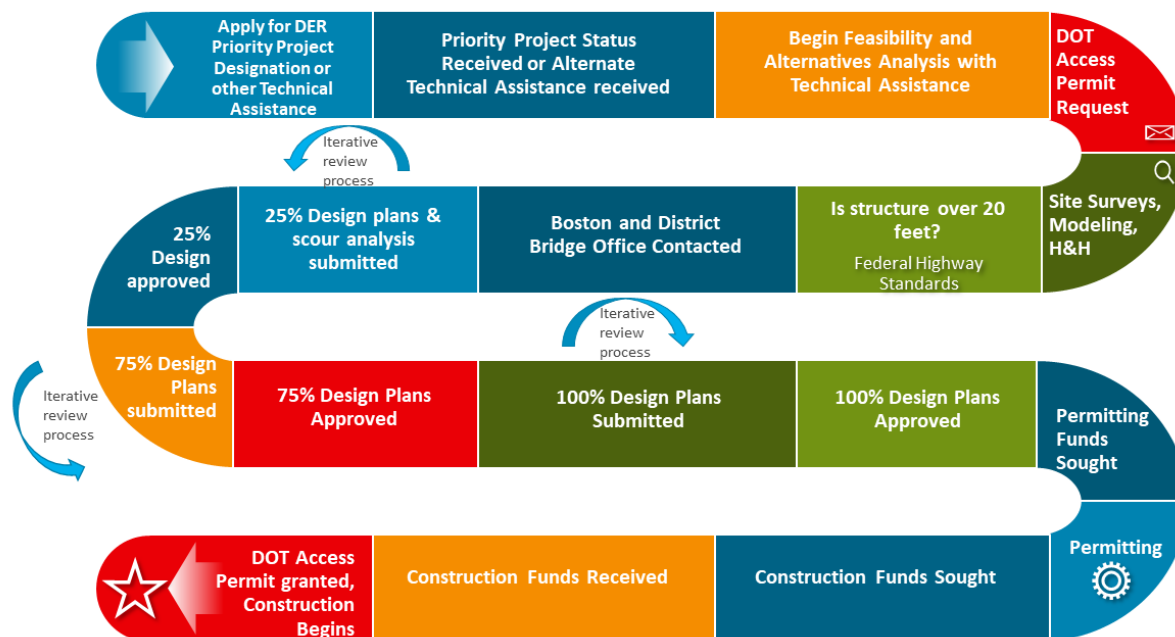
- [public_stabilization](#)
- [private_stabilization](#)
- [NAACC_crossings_detailed2](#)
- [umass_nontidal_crossings_Select](#)
- [tidal crossings naacc study clip](#)
- [dam and water control structures](#)

IMPLEMENTATION PLANS & NEXT STEPS

All priority sites were surveyed using the appropriate NAACC protocol (tidal and previously un-surveyed non-tidal sites). Data and images for each site were uploaded into the NAACC database and can be accessed by following the 'Instructions to download Town specific Non-tidal and Tidal road-stream crossing data' available on the website project page. These tables, include links to the NAACC data and images.

Implementation plan next steps varied depending on the barrier owner. For instance, to conduct work on MassDOT roadways that do not have work scheduled as part of a DOT project, there are a number of steps that must take place (see chart below). In addition, town owned structures that are greater than 10ft must undergo MassDOT structural reviews. Sites located on the MBTA rail line may not constitute priorities for MBTA, however these sites will be shared with the resiliency specialist in hopes of including them on long-term planning

documents. Next steps for most projects involve aiding municipalities with applying for funding for upgrades through programs such as the Municipal Vulnerability Action Grants, MassDOT Small Bridge Program and DER's Culvert Replacement Municipal Assistance Grants Program. Due to the time requirements to manage grants, municipal officials prefer to only have one active culvert grant and do not wish to apply for additional funding until that grant has been completed. Implementation plan next steps have been reviewed by PIE-Rivers and municipal partners. Implementation plan timelines for targeted funding and next steps are provided in Table 2a and 2b, with additional details provided in the Town specific report sections. Additional information and documentation for priority sites has been compiled into an Appendix and is also available on the PIE-Rivers Partnership website at <http://www.pierivers.org/restoration/great-marsh-barriers-mitigation/>



IMPLEMENTATION NEXT STEPS

Meetings with municipalities and Parker-Ipswich-Essex (PIE) Rivers partners identified priority barriers within the MassBays study region. Next, ecological priorities of the sites were compiled and lists of priority barriers for each Town were developed.

Three dams were selected for implementation plan development, the Parker River Dam in Newbury, the Jewel Mill Dam in Rowley and the Ipswich Mills Dam in Ipswich. These dams represent two head of tide dams (Parker and Ipswich) and one dam which ranks in the top 10% according to the Division of Ecological Restorations Dam Removal and Ecological Benefit Tool (Jewel Mill). A total of eleven non-tidal sites were selected for implementation plan development. Non-tidal sites are eligible for funding through DER's Culvert Replacement Municipal Assistance Grant

Program and MassDOT's Small Bridge Replacement Program.

A total of thirteen tidal sites were selected for implementation plan development. Tidal sites are not eligible for funding through DER's Culvert Replacement Municipal Assistance Grant Program. However, MassDOT's Small Bridge Replacement Program, DER's Priority Project Program and the Municipal Vulnerability Program are all viable funding options for tidal culvert replacements.

Tables 2a. and 2b. summarize implementation plan next steps for the twenty-seven priority barriers identified in this project.



Jacob Lehan of the Division of Ecological Restoration and Kaitlyn Shaw measure the outlet drop of a severely perched culvert in Gloucester.

IMPLEMENTATION NEXT STEPS

Table 2a. Summary of implementation next steps for high priority barriers.

Project Timeline	Targeted funding/ technical assistance	2019 July-Dec	2020 Jan - June	2020 July- Dec	2021 Jan - June	2021 July- Dec	2022 Jan- June	2022 July - Dec
MB1: Central Street Dam	None at this time: Head of tide, owned by Byfield Water Department		Apply for Priority Project for Larkin (upstream)					
MB2: Orchard Street at Central Street	DER CRMA				Apply for CRMA funding once MB3 complete			
MB3: Orchard Street at Martin Burns	MVP	Engage municipal staff and assist with MVP funding application						
MB4: Coleman Rd.	DER CRMA						Apply for CRMA funding once MB2 complete	
MB5: MBTA MM 35.063/ 35.05	None at this time	Engage with MBTA Resiliency Specialist					Site added to long-term planning documents	
MB6: Jewel Mill Dam	Work with DMF on fishway potential	Herring Habitat Assessment completed, owners and DMF engaged			Fishway project, dependent on previous engagement			
MB7: Glen St. Bridge	MassDOT Small Bridge Program	Town applied for funding					Bridge replaced	
MB8: MassDOT Route 1A over Sand Creek MM 81.6	None at this time	Engage with MassDOT team						
MB9: MassDOT Route 1A over West Creek MM 82.34	None at this time	Engage with MassDOT team						
MB10: MBTA MM 31.69	None at this time	Engage with MBTA Resiliency Specialist					Site added to long-term planning documents	

Table 2b. Summary of implementation next steps for high priority barriers.

Project Timeline	Targeted funding/ technical assistance	2019 July- Dec	2020 Jan - June	2020 July- Dec	2021 Jan - June	2021 July- Dec	2022 Jan- June	2022 July - Dec
MB11: MBTA MM 32.222	None at this time	Engage with MBTA Resiliency Specialist						Site added to long-term planning documents
MB12: Ipswich Mills Dam	DER, NOAA	Feasibility study complete, municipal decision making process begun. Follow up mitigation investigations.						Funding for removal sought, dependent on Town decision-making process
MB13: MassDOT Saltonstall Brook MM 76.17	None at this time	Engage with MassDOT Team						
MB14: MBTA MM 30.591	None at this time	Engage with MBTA Resiliency Specialist						Site added to long-term planning documents
MB15: Labor in Vain, Private	Aid in design development and funding availability for private sites					Work complete		
MB16: Labor in Vain, Private	Aid in design development and funding availability for private sites					Work complete		
MB17: Labor in Vain, Private	Aid in design development and funding availability for private sites					Work complete		
MB18: Chebacco Rd over Castle Neck River	Potential for DER CRMA funding					Apply for CRMA funding once Gravelly Brook complete		
MB19: MassDOT Route 133 over Castle Neck River MM 31.84	Potential for Priority Project status application/ MVP Action grants	Engage with MassDOT Team						

IMPLEMENTATION NEXT STEPS

Table 2c. Summary of implementation next steps for high priority barriers.

Project Timeline	Targeted funding/ technical assistance	2019	2020	2020	2021	2021	2022	2022
		July- Dec	Jan - June	July- Dec	Jan - June	July- Dec	Jan- June	July - Dec
MB20: Old Essex Rd. over Castle Neck River	Potential for Priority Project application/ MVP Action grants	Potential for road dead ending		Apply for funding				
MB21: Apple St.	DER CRMA	Applied for and received funding for engineering, design				Apply for construction funds & complete project		
MB22: MassDOT Route 133 over Ebben Creek MM 35.5	Potential for Priority Project application		Apply for Priority Project status, follow MassDOT access requirements.					
MB23: Story St.	DER CRMA						Apply for funding for engineering, design and permitting.	
MB24: Lufkin Rd over Lufkin creek	DER CRMA, apply upon completion of MB23							
MB25: MassDOT Route 133 over Walker Creek MM 36.9	Potential for PP status	Engage with MassDOT Team						
MB26: Concord St.	Potential for MVP Action grant funding or other program for tidal sites		Seek funding for engineering/ design.				Seek funding for construction	
MB27: Lawrence Parson Memorial Bridge over Walker Creek	MassDOT Small Bridge Program	Town received funding for engineering and design and replacement of bridge.					Bridge replaced	

TRAINING MATERIALS

Training materials were prepared to aid regional watershed groups in conducting watershed-scale barrier prioritization through engaging municipal staff.

Training materials and additional resources are available as an Appendix to this document and can also be found here: <http://www.pierivers.org/restoration/great-marsh-barriers-mitigation/>

Training materials:

- Instructions to download Town specific Non-tidal and Tidal road-stream crossing data
- Instructions to query roads, trails and railway datasets
- Instructions to assess ecological priorities



Scott Jackson during the Massachusetts Environmental Trust, Tidal Stream Crossing Training. Tidal Crossing data was collected for MassBays priorities and is now available on the NAACC database.

TRAINING WORKSHOP

On November 21, 2019 a training workshop was held at Essex Town Hall. An introduction to the MassBays National Estuary Partnership was given Pam DiBona. Ipswich River Watershed Association Restoration Manager, Kaitlyn Shaw and Essex Town Administrator Brendhan Zubricki, presented the MassBays project with a presentation entitled "Furthering on-the-ground restoration in the Great Marsh" which focused on the MassBays project and gave a case study of the Apple Street culvert replacement project. Sara Grady, North South Rivers Watershed Association Ecologist/ MassBays Southshore Coordinator presented on Dam Removal and River Restoration along Third Herring Brook.

NOAA Habitat Restoration Specialist Steve Block presented on the Stony Brook Salt Marsh and Fish Passage Restoration Project. Georganne Keer of the Division of Ecological Restoration presented numerous Case Studies in Barrier Removal. In addition, barrier owners and project partners participated in a round-table discussion on lessons-learned through engagement with the MassBays Barrier Mitigation project and from regional barrier work. In attendance were barrier owners from the Towns of Essex, Ipswich, Manchester and Newbury, as well as representatives from the MA Division of Fish and Game, Coastal Zone Management, MassDOT, the Division of Ecological Restoration, NOAA, MassBays Coordinators, watershed organizations and environmental consultants.



Workshop participants answer audience questions during the Barrier Mitigation Round-table discussion.

NEWBURY DATA

A total of two dams, sixteen non-tidal and seventeen tidal structures were located within the Newbury MassBays Target Assessment Area. There were no private or public water control structures within the study region.

Table 3. Newbury dams and water control structures.

MassBays ID	Name	National ID	Town	Hazard level	DER Percentile	Latitude	Longitude
1	Central Street Dam	MA00241	Newbury	Low Hazard	90	42.750	-70.929
	Mill Pond Dam	MA01211	Newbury	Low Hazard	90	42.787	-70.880

Table 4. Newbury non-tidal crossings.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Road	Latitude	Longitude	Town
MB2	1094	10169	Single Culvert		Orchard Street	42.751	-70.929	Newbury
MB4	1054	9168	Single Culvert	0.217	Coleman Road	42.742	-70.917	Newbury
	1049	10059	Single Culvert	0.417	Off Coleman Road	42.741	-70.917	Newbury
	1053	10060	Single Culvert	0.379	Elm Street	42.742	-70.921	Newbury
	1056	10799	Single Culvert	0.743	School Street	42.743	-70.921	Newbury
	1058	10062	Single Culvert	0.556	Off School Street	42.744	-70.923	Newbury
	1069	10063	Single Culvert	0.491	Off School Street	42.745	-70.925	Newbury
	1111	10173	Bridge	0.991	Middle Road	42.759	-70.901	Newbury
	1113	10075	Bridge	0.991	Newburyport Turnpike	42.760	-70.892	Newbury
	1138	10312	Bridge	1.000	Newman Road	42.772	-70.862	Newbury
	1147	10313	Bridge	0.869	Hay Street	42.774	-70.865	Newbury
	1178	9602	Single Culvert	0.785	Boston Road	42.785	-70.866	Newbury
	1189	10804	Single Culvert	0.733	Green Street	42.788	-70.862	Newbury
	7156	42689	Multiple Culvert	0.739	Elm Street	42.744	-70.916	Newbury
	171	71025	Partially Inaccessible		Middle Rd	42.774	-70.889	Newbury
	103	71026	Partially Inaccessible		Middle Rd	42.764	-70.897	Newbury

Table 5. Newbury tidal crossings.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Tidal Aquatic Organism Passage Score	Road	Latitude	Longitude	Town
MB3	17332	ts30	Bridge	0.6	Moderate AOP	Orchard Street	42.761	-70.914	Newbury
MB5	17336	ts70	Bridge	0.656	Moderate AOP	Boston Rd	42.781	-70.873	Newbury
	17329	ts31	Culvert		Moderate AOP	Route 1A	42.752	-70.855	Newbury
	17330	ts32	Culvert	0.592	Moderate AOP	Route 1A	42.750	-70.855	Newbury
	1113	ts47	Bridge Adequate	1	Good AOP	Newburyport Turnpike	42.760	-70.892	Newbury
	134	ts48	Culvert	0.615	Moderate AOP	Trail near Newman Rd	42.770	-70.859	Newbury
	133	ts49	Partially Inaccessible		Moderate AOP	Trail near Newman Rd	42.769	-70.860	Newbury
	103	ts50	Partially Inaccessible		no score - missing data	Middle Rd.	42.764	-70.897	Newbury
	100	ts51	Culvert	0	No AOP	Old Rowley Rd.	42.754	-70.861	Newbury
	17328	ts60	Culvert		Moderate AOP	Newburyport Turnpike	42.750	-70.896	Newbury
	17347	ts62	Culvert		No AOP	Walking path	42.753	-70.905	Newbury
	1111	ts63	Partially Inaccessible		Moderate AOP	Middle Rd	42.759	-70.901	Newbury
		ts65	Bridge Adequate		Good AOP	High Rd	42.762	-70.848	Newbury
	1147	ts66	Partially Inaccessible		Moderate AOP	Hay St	42.774	-70.865	Newbury
	1138	ts67	Partially Inaccessible		Moderate AOP	Newman Rd	42.772	-70.862	Newbury
	17343	ts68	Culvert	0.765	Moderate AOP	Newman Rd	42.771	-70.859	Newbury
	17334	ts69	Bridge		Moderate AOP	Boston Rd	42.781	-70.874	Newbury

NEWBURY IMPLEMENTATION

Meetings with the Town of Newbury included the Department of Public works director and Conservation agent. The following priorities were agreed upon based on meetings with the Town of Newbury, previous studies, engagement with barrier owners and pertinent PIE-Rivers partners.

MB1. Central Street Dam (MA00241)

The Parker River Dam #1 (Central St Dam) is a head of tide dam and there has been interest expressed by the Town of Newbury in removing the Larkin Mills Dam just upstream of this barrier. This dam is in the top 10% for removal according to the Massachusetts Division of Ecological Restoration (DER) Dam Removal and Ecological Benefit Tool, BioMap habitat exists upstream of the site and 12.6 miles of diadromous fish habitat would be opened up if it was removed. Further discussions with town staff are necessary to gauge the interest in pursuing removal at this location. This dam is owned by the Byfield water district who have a groundwater

well upstream yet no reservoir. Currently, this site is ranked as the #1 dam priority in the Town of Newbury, yet due to the location of wells and ownership, hydraulic analysis as part of a feasibility study would be required to investigate potential impacts to the groundwater well.

- Met with Town to discuss previous engagement at site and Byfield water district ownership of dam. Given proximity of the Larkin Street wells, a full Hydraulic and Hydrological analysis would need to be completed to determine if well impacts would take place.
- Engage Division of Marine Fisheries in project interest.
- Apply for Priority Project status for Larkin Mills Dam, as pre-cursor to engagement on Central Street, as it is Town owned and there is interest in removing it.

MB2. Orchard Street (#1094)

The 60 inch perched concrete culvert on Orchard Street has high ecological restoration value and crossing priority and experiences periodic over-topping as water becomes trapped on the upland side.

- Site reconnaissance and consultation with DER (suggested funding Lidar data collection or use of Sandy Neck ACEC protocol to collect data).
- Has design, encourage and assist Town with DER CRMA assistance for perched culvert in 2020 or upon completion of MB3.

NEWBURY IMPLEMENTATION

MB3. Orchard Street near Martin Burns entrance (#17332)

This site was identified as the #1 priority currently for the town as it is regularly overtopped and scour pools are present.

- Tidal Crossing Assessment conducted by IRWA on 05/16/19.
- Assist Town with application to MA Executive Office of Energy and Environmental Affairs Municipal Vulnerability Planning Action Grant program, Fall 2019. (Project proposal Appendix A).
- Consider application to DER's Priority Project Program.

MB4. Coleman Road (#1054)

This site was not identified as a high priority for water issues or roadkill, yet remains on the prioritized list as it represents the #1 Newbury priority due to elevated infrastructure risk and crossing priority according to the Great Marsh Barriers Assessment.

- Non-tidal crossing assessment conducted.
- Assist with application to DER CRMA funding program for upgrade in 2021, or upon completion of MB2).

MB5. MBTA Site MM 35.063/ 35.05 (#17336)

is an undersized stone culvert located South of Boston Rd. the site has evidence of ponded conditions and could inhibit fish passage due to flow impediments. The Boston Rd (IRWA 17334) culvert North of this location, would be a good fit for upgrading in combination with this site, when feasible.

- Work with local officials to support listing these sites as long-term MBTA priorities.
- Have Selectboard and 8 Towns and the Great Marsh send a letter in support of all high priority MBTA sites being considered for inclusion in long-term planning documents.
- Work with MBTA Resiliency Specialist to get high priorities on long-term planning documents.

Additional sites located on Route 1A near the Rowley line (IRWA 17329, 17330) were identified as high priorities for tidal crossings in the Great Marsh Barriers Assessment and were highlighted by project partners, due to roadway issues and salt marsh impacts. Discussions with connectivity experts indicated that due to the alternate pathways for connectivity, the sites are not as important from an aquatic organism connectivity standpoint.

These sites may be re-added to the priority list, based on ongoing partner engagement.

ROWLEY MAP

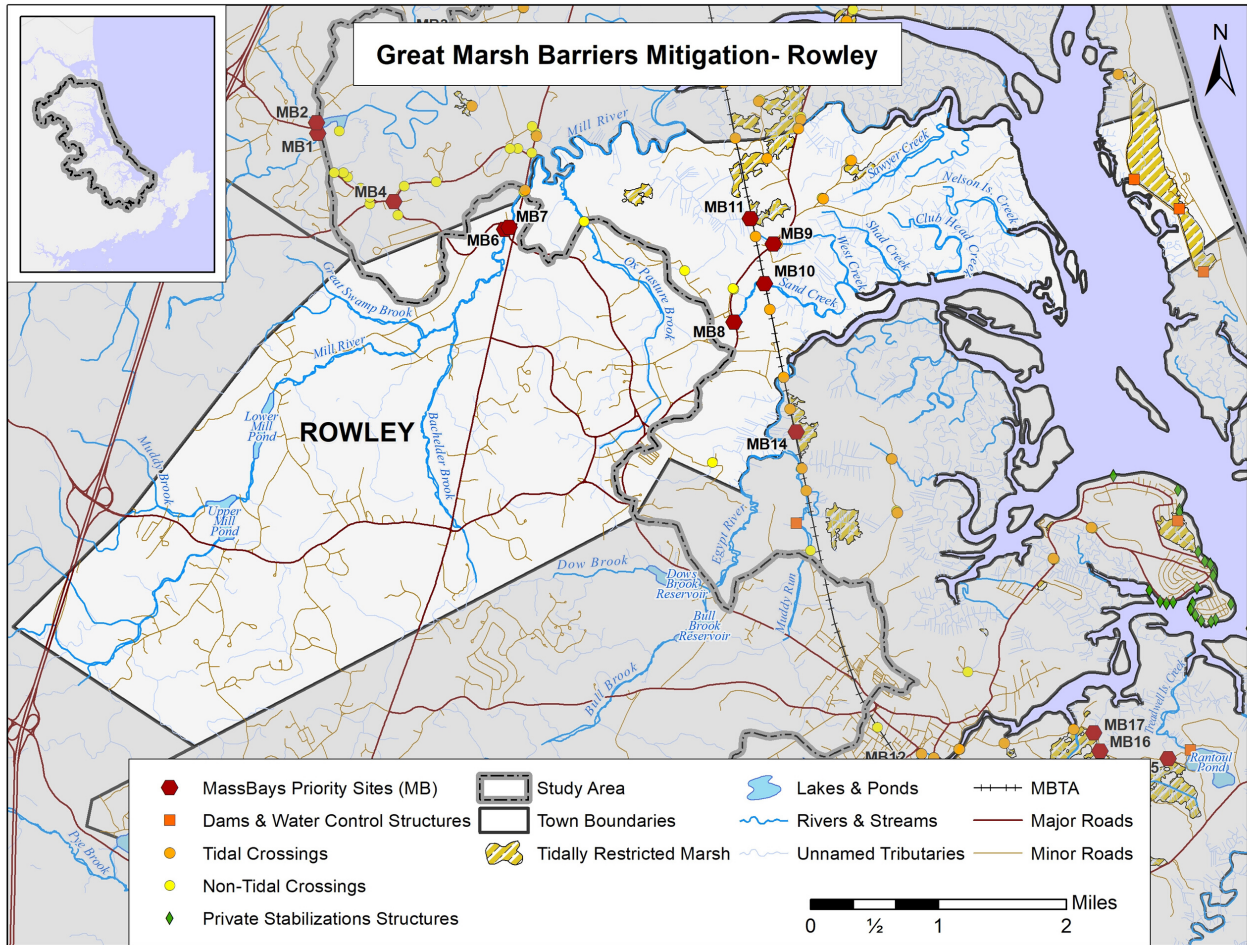


Figure 3. Great Marsh Barrier Mitigation Project, Rowley, MA

ROWLEY DATA

A total of four dams/ water control structures, four non-tidal and thirteen tidal structures were located within the Rowley MassBays Target Assessment Area.

There were no private or public shoreline stabilization structures within the study region.

Table 6. Rowley dams and water control structures.

MassBays ID	Name	National ID	Town	Hazard level	DER Percentile	Latitude	Longitude
6	Jewel Mill Dam	MA01604	Rowley	Significant Hazard	90	42.739	-70.900
	Bill Forward Pool Water Control		Rowley			42.741	-70.797
	Between North Pool and Bill Forward Pool Water Control		Rowley			42.734	-70.793
	North Pool Dike		Rowley			42.744	-70.804

Table 7. Rowley non-tidal crossings.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Road	Latitude	Longitude	Town
MB7	1040	9585	Bridge		Glen Street	42.739	-70.9	Rowley
MB8	990	10221	Single Culvert	0.060	Main Street	42.728	-70.865	Rowley
	1057	10311	Bridge	0.861	Newburyport Turnpike	42.743	-70.897	Rowley
	980	21041	Culvert	0.631	Weathersfield Road	42.726	-70.938	Rowley

Table 8. Rowley tidal crossings.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Tidal Aquatic Organism Passage Score	Road	Latitude	Longitude	Town
MB9	17456	ts52	Culvert	0.611	Moderate AOP	Route 1A	42.737	-70.859	Rowley
MB10	17458	ts119	Partially Inaccessible		Moderate AOP	Railroad	42.733	-70.861	Rowley
MB11	17460	ts118	Partially Inaccessible		Moderate AOP	Railroad	42.740	-70.863	Rowley
	143	ts110	Partially Inaccessible		no score - missing data	Trail	42.784	-70.874	Rowley
	145	ts116	Partially Inaccessible		no score - missing data	Railroad	42.755	-70.867	Rowley
	107	ts117	Partially Inaccessible		no score - missing data	Railroad	42.749	-70.865	Rowley
	147	ts120	Partially Inaccessible		Poor AOP	Railroad	42.730	-70.860	Rowley
	148	ts121	Partially Inaccessible		no score - missing data	Railroad	42.722	-70.858	Rowley
	17461	ts34	Culvert	0.641	Moderate AOP	Far Division Rd	42.747	-70.847	Rowley
	17459	ts35	No Upstream Channel		Moderate AOP	Patmos Rd	42.742	-70.852	Rowley
	1057	ts61	Bridge	0.743	Moderate AOP	Newburyport Turnpike	42.743	-70.897	Rowley
	17462	ts64	Culvert		Moderate AOP	Redgate Road	42.747	-70.860	Rowley
	128	ts94	No Crossing		Good AOP	Newburyport Turnpike	42.738	-70.862	Rowley

ROWLEY IMPLEMENTATION

According to meetings with the Town of Rowley Highway Supervisor and Conservation Agent, the Town is in the process of finalizing their Bridge and Culvert preventative maintenance plan, which should further clarify Town priorities.

MB6. Jewel Mill Dam

(MA1604) is in the top 10% for removal according to the Massachusetts DER Dam Removal and Ecological Benefit Tool. In addition, BioMap habitat exists upstream of the site and 18.96 miles of diadromous habitat would be opened up by its removal. Trout Unlimited Nor'East has just completed three year of Herring Habitat Assessments according to the DMF protocol and results will clarify next steps for this site.

- Project partners and dam owners will need to be engaged to further progress on this project.
- Removal is not an option for the owners, therefore a rock ramp could be suggested as part of comprehensive Glen St Bridge/ Jewel Mill Dam project.
- November 2018: Met with Trout Unlimited Nor'East to discuss fish passage at this site with Town of Rowley.
- October/ November 2019: Third year of Trout Unlimited Nor'East herring habitat assessment complete (IRWA trained TU in Herring Habitat Assessment protocol).
- November/ December 2019: Trout Unlimited completes report on habitat upstream of the Jewel Mill Dam.
- Pending Herring Habitat Assessment results:
 - Winter 2020: Engage Massachusetts Division of Marine Fisheries on fish passage at the site.
 - Spring 2020: With Trout Unlimited Nor'East, engage Jewel Mill Dam owners on fish passage project.

MB7. Glen St Bridge (#1040)

This site was added due to initial conversations with the Town of Rowley, who strongly recommended adding the site due to infrastructure issues.

- Additional field visits conducted 06/04/2019.
- Town of Rowley completed a Bridge/ Culvert preventative maintenance plan with VHB in 2018, which identified the Glen St Bridge as a high priority for repair.
- The Town applied for funding through MassDOT small bridge program. IRWA has offered assistance with the project.
- Lawrence Parson Memorial Bridge in Gloucester is a good comparator for costs required to upgrade this site.

MB8. Route 1A MassDOT MM 81.6 over Sand Creek (#990)

This site may have experienced road overtopping in 2006 and represents a priority for both ecological impact and crossing priority according to the Great Marsh Barriers Assessment.

- Encourage and aid Town in applying for funding for upgrade of this perched culvert.
- Engage with MassDOT Fish and Wildlife Supervisor.

ROWLEY IMPLEMENTATION

MB8. Route 1A MassDOT MM 81.6 over Sand Creek (#990)

This site may have experienced road overtopping in 2006 and represents a priority for both ecological impact and crossing priority according to the Great Marsh Barriers Assessment.

- Encourage and aid Town in applying for funding for upgrade of this non-tidal perched culvert.
- Discussed site with MassDOT team and Fish and Wildlife Supervisor.
- Work with MassDOT to get high priorities on long-term planning documents.

MB9. Route 1A MassDOT MM 82.34 over West Creek (#17456)

Site is an undersized 2 foot concrete culvert.

- Tidal Crossing Assessment conducted by IRWA on 05/02/19.
- Facilitate meeting with Town and MassDOT.
- Encourage Rowley's participation in CZM's Municipal Vulnerability Planning process such that future Action Grant funding may be used to address priority sites not able to be funded with DER's CRMA funding due to tidal nature.
- Discussed site with MassDOT team and Fish and Wildlife Supervisor.

MB10. MBTA Site MM 31.69 (#17458)

This site was recommended as a high priority during discussions with local salt marsh partners due to ponding leading to marsh impacts.

- Work with local officials to support listing these sites as MBTA priorities.
- Have Selectboard and 8 Towns and the Great Marsh send a letter in support high priority MBTA sites.
- MBTA sites being considered for inclusion in long-term planning documents.
- Work with new Resiliency Specialist to get high priorities on long-term planning documents.

MB11. MBTA Site MM 32.222 (#17460)

This site was identified as a moderate priority in the Great Marsh Barriers Assessment.

- Summarize images and available information for sites.
- Work with local officials to support listing these sites as MBTA priorities.
- Have Selectboard and 8 Towns and the Great Marsh send a letter in support high priority MBTA sites.
- MBTA sites being considered for inclusion in long-term planning documents.

IPSWICH MAP

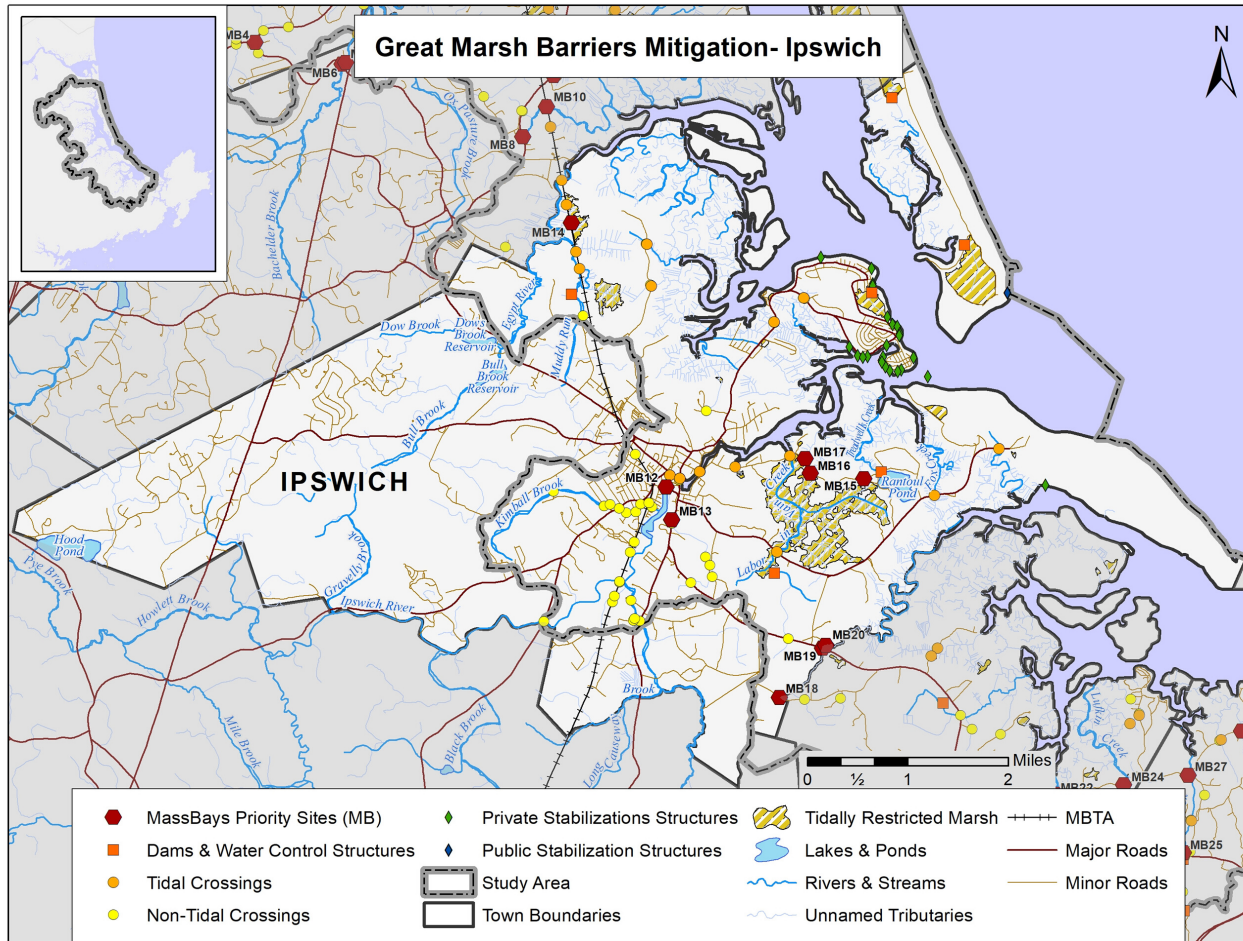


Figure 4. Great Marsh Barrier Mitigation Project, Ipswich, MA

IPSWICH DATA

A total of seven dams, forty-two non-tidal and twenty tidal structures were located within the Ipswich MassBays Target Assessment Area. There were twenty-four private and one public shoreline stabilization structures within the study region.

Table 9. Ipswich dams and water control structures.

MassBays ID	Name	National ID	Town	Hazard level	DER Percentile	Latitude	Longitude
12	Ipswich Mills Dam	MA00231	Ipswich	Low Hazard	95	42.678	-70.838
	Rantoul Pond Dam	MA01207	Ipswich	Low Hazard	70	42.680	-70.796
	Argilla Farm Pond Dam	MA02989	Ipswich	N/A	80	42.665	-70.817
	Stage Island Pool		Ipswich			42.712	-70.779
	Breached Dam		Ipswich			42.706	-70.856
	Clark Pond Dam		Ipswich			42.706	-70.797
	Private Dam		Ipswich			42.646	-70.784

Table 10. Ipswich private stabilization structures.

ID	Town	Type	Material	Shape Length	Latitude	Longitude
458	Ipswich	Groin/Jetty	Stone	19	42.711	-70.807
459	Ipswich	Revetment	Stone	44	42.709	-70.797
460	Ipswich	Bulkhead/Seawall	Concrete	49	42.707	-70.797
461	Ipswich	Bulkhead/Seawall	Concrete	20	42.707	-70.797
462	Ipswich	Revetment	Stone	304	42.702	-70.794
463	Ipswich	Bulkhead/Seawall	Concrete	20	42.701	-70.793
464	Ipswich	Revetment	Stone	146	42.701	-70.792
465	Ipswich	Bulkhead/Seawall	Concrete	40	42.700	-70.792
466	Ipswich	Bulkhead/Seawall	Wood	21	42.699	-70.792
467	Ipswich	Revetment	Stone	601	42.696	-70.789
468	Ipswich	Bulkhead/Seawall	Concrete	110	42.694	-70.794
469	Ipswich	Revetment	Stone	89	42.695	-70.795
470	Ipswich	Revetment	Stone	24	42.696	-70.796
471	Ipswich	Bulkhead/Seawall	Concrete	28	42.696	-70.795
472	Ipswich	Groin/Jetty	Stone	14	42.696	-70.798
473	Ipswich	Revetment	Stone	33	42.696	-70.800
474	Ipswich	Revetment	Stone	18	42.696	-70.799
475	Ipswich	Revetment	Stone	139	42.698	-70.802
476	Ipswich	Groin/Jetty	Stone	80	42.693	-70.786
477	Ipswich	Revetment	Stone	52	42.678	-70.764
2592	Ipswich	Revetment	Stone	18	42.695	-70.796
2593	Ipswich	Bulkhead/Seawall	Stone	55	42.694	-70.792
2594	Ipswich	Revetment	Stone	70	42.694	-70.792
2595	Ipswich	Bulkhead/Seawall	Concrete	30	42.698	-70.795

Table 11. Ipswich public stabilization structures.

ID	Town	Type	Material	Shape Length	Latitude	Longitude
964	Ipswich	Groin/ Jetty	Stone	128	42.705	-70.771

IPSWICH DATA

Table 12. Ipswich non-tidal crossings.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Road	Latitude	Longitude	Town
MB13	691	7043	Bridge	0.777	County Rd	42.673	-70.837	Ipswich
MB18	6610	42688	Culvert	0.820	Chebacco Road	42.647	-70.816	Ipswich
	601	2460	Bridge	0.915	County Road	42.658	-70.843	Ipswich
	600	7396	Open Bottom Arch	0.991	Mill Road	42.658	-70.862	Ipswich
	603	7365	Single Culvert	0.615	County Rd	42.658	-70.844	Ipswich
	608	7371	Single Culvert	0.568	County Rd	42.659	-70.844	Ipswich
	623	2459	Bridge	0.802	County Road	42.661	-70.845	Ipswich
	639	6718	Single Culvert	0.530	Essex Road	42.664	-70.833	Ipswich
	647	4755	Single Culvert	0.530	Heartbreak Road	42.665	-70.829	Ipswich
	657	6910	Single Culvert	0.671	Off Heartbreak Road	42.668	-70.830	Ipswich
	660	4754	Bridge	0.853	Argilla Road	42.668	-70.816	Ipswich
	696	5357	Single Culvert	0.840	Safford Street	42.674	-70.846	Ipswich
	698	4740	Multiple Culvert	0.745	Peabody Street	42.674	-70.844	Ipswich
	703	7044	Bridge	0.910	Topsfield Road	42.675	-70.847	Ipswich
	702	4741	Bridge	0.882	Kimball Street	42.675	-70.841	Ipswich
	703	10220	Single Culvert	0.773	Heard Drive	42.675	-70.850	Ipswich
	761	7062	Single Culvert	0.759	Hodgkins	42.675	-70.849	Ipswich
	706	4739	Bridge	0.767	Hayward Street	42.675	-70.843	Ipswich
	717	7066	Bridge	0.975	Pine Swamp Rd	42.677	-70.860	Ipswich
	750	10309	Bridge	0.759	Labor in Vain Road	42.682	-70.814	Ipswich
	861	9491	Ford	0.909	Paradise Road	42.702	-70.854	Ipswich
	623	23202	Bridge	0.909	unnamed	42.661	-70.845	Ipswich
	601	23298	Bridge	0.910	Route 1A	42.658	-70.843	Ipswich
	539	23325	Multiple Culvert	0.777	unnamed	42.650	-70.840	Ipswich
	9005	43711	Culvert	0.034	Off of Linebrook Road	42.684	-70.898	Ipswich
	680	43742	Culvert	0.719	Trail off of East Street	42.664	-70.917	Ipswich
	160	70962	Culvert	0.332	County Rd	42.673	-70.837	Ipswich
	161	71023	Culvert	0.880	County Rd	42.672	-70.837	Ipswich
	129	71024	Culvert	0.883	County Rd	42.673	-70.837	Ipswich
	167	72768	Partially Inaccessible		Railroad	42.699	-70.852	Ipswich
	152	72769	Partially Inaccessible		Railroad	42.696	-70.851	Ipswich
	151	72770	Partially Inaccessible		Railroad	42.696	-70.851	Ipswich
	153	72771	Partially Inaccessible		Railroad	42.682	-70.844	Ipswich
	154	72772	Partially Inaccessible		Railroad	42.675	-70.841	Ipswich
	168	72775	Partially Inaccessible		Railroad	42.670	-70.844	Ipswich
	156	72795	Partially Inaccessible		Railroad	42.664	-70.847	Ipswich
	169	72801	Partially Inaccessible		Railroad	42.664	-70.847	Ipswich
	157	72812	Inaccessible		Railroad	42.662	-70.848	Ipswich
	158	72832	Partially Inaccessible		Railroad	42.661	-70.849	Ipswich
	159	72835	Partially Inaccessible		Railroad	42.656	-70.851	Ipswich
	170	72836	Partially Inaccessible		Railroad	42.654	-70.851	Ipswich
	155	72837	Partially Inaccessible		Railroad	42.668	-70.845	Ipswich

IPSWICH DATA

Table 13. Ipswich tidal crossings.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Tidal Aquatic Organism Passage Score	Road	Latitude	Longitude	Town
MB14	17241	ts123	Partially Inaccessible		Moderate AOP	Railroad	42.716	-70.856	Ipswich
MB15	111	ts81	Culvert	0.613	Moderate AOP	Labor in Vain Rd	42.679	-70.799	Ipswich
MB16	112	ts80	Culvert	0.579	Moderate AOP	Labor in Vain Rd	42.680	-70.809	Ipswich
MB17	113	ts82	Culvert	0.599	Moderate AOP	Labor in Vain Rd	42.682	-70.811	Ipswich
MB20	17108	ts29	Bridge	0.608	Moderate AOP	Old Essex Rd	42.655	-70.807	Ipswich
	17240	ts122	Partially Inaccessible		no score - missing data	Railroad	42.719	-70.857	Ipswich
	126	ts124	Partially Inaccessible		no score - missing data	Railroad	42.712	-70.855	Ipswich
	125	ts125	Partially Inaccessible		no score - missing data	Railroad	42.709	-70.854	Ipswich
	17238	ts75	Culvert		Poor AOP	Labor in Vain Rd	42.681	-70.824	Ipswich
	17242	ts76	Multiple Culvert	0.517	Moderate AOP	Town Farm Rd	42.713	-70.841	Ipswich
	17243	ts77	Multiple Culvert	0.556	Moderate AOP	Town Farm Rd	42.707	-70.841	Ipswich
	6864	ts78	Partially Inaccessible		Moderate AOP	Labor in Vain Rd	42.682	-70.814	Ipswich
	660	ts79	Culvert	0.622	Moderate AOP	Argilla Rd	42.668	-70.816	Ipswich
	17239	ts83	Partially Inaccessible		Moderate AOP	Argilla Rd	42.676	-70.785	Ipswich
	17247	ts84	Culvert	0.614	Moderate AOP	Argilla Rd	42.683	-70.773	Ipswich
	17248	ts85	Multiple Culvert	0.569	Moderate AOP	Little Neck Rd	42.705	-70.811	Ipswich
	17236	ts86			Moderate AOP	S. Main St	42.679	-70.837	Ipswich
	138	ts87	Partially Inaccessible		Moderate AOP	Green Street	42.680	-70.831	Ipswich
	17237	ts90	Partially Inaccessible		Moderate AOP	County St	42.679	-70.835	Ipswich
	17245	ts91	Multiple Culvert		No AOP	Jeffreys Neck	42.701	-70.816	Ipswich

IPSWICH IMPLEMENTATION

Meetings took place with the Department of Public Works, Town Manager, Town Planner Selectboard to discuss prioritization of sites. The following priorities were agreed upon based on meetings with the Town, previous studies, engagement with barrier owners and pertinent PIE-Rivers partners.

MB12. Ipswich Mills Dam (MA00231)

This site represents a continued priority. This head-of-tide dam is owned by the Town of Ipswich and a feasibility study was recently completed to investigate the costs, benefits and mitigation associated with removing the structure. Removal would alleviate Town liability and open up fish passage to 49.19 miles of river and tributary habitat. This dam is currently ranked in the top 5% for removal in Massachusetts, according to the DER Dam Removal and Ecological Benefit Tool and BioMap habitat exists upstream of the site. In late 2018 the Feasibility Study for the Ipswich Mills Dam was finalized by Horsley Witten Hegeman Inc. and a public presentation was delivered.

- IRWA will continue to meet with local stakeholders on this project, and presented the findings of the study to the Selectboard on August 19, 2019.
- Continued outreach, as identified in the 2019 Outreach plan includes the development of an outreach video detailing the results of the feasibility study.
- Community engagement to facilitate Town decision-making process with regards to this site will be ongoing.

MB13. MassDOT MM 76.17 Saltonstall Brook (#691)

This site was identified as a priority for elevated infrastructure risk in the 2012 Hazard Mitigation Plan. This site consists of a historic bridge and would be the first in a series of culverts that may need to be addressed over the next few years, according to Town staff.

The other privately owned culverts upstream of this site were recently assessed and uploaded to the NAACC database.

- Schedule meeting with Ipswich and MassDOT to discuss this site, which was identified by MassDOT as a priority given known issues.
- Discuss site with MassDOT team and Fish and Wildlife Supervisor.

MB14. MBTA Site MM 30.591 (#17241)

This site is an undersized stone culvert located on the MBTA line.

- Summarize images and available information for sites.
- Work with local officials to support listing these sites as MBTA priorities.
- Have Selectboard and 8 Towns and the Great Marsh send a letter in support of all high priority MBTA sites being considered for inclusion in long-term planning documents.
- Work with MBTA Resiliency Specialist to get high priorities on long-term planning documents.

IPSWICH IMPLEMENTATION

MB15, 16, 17. Privately owned sites along Labor in Vain Creek (#111, #112, #113)

Sites are currently experience flooding and are undersized. Owners are interested in re-sizing these sites.

- Tidal Crossing Assessment conducted by IRWA on 07/11/19.
- Currently work is being conducted to resize these structures with H.L Graham associates.
- Continue to aid in upsizing of structures and funding of replacements.

Dual ownership Essex/ Ipswich Sites

Castle Neck River (Ipswich/ Essex shared ownership)

MB18. Chebacco Rd. in Ipswich/ Essex (#6610)

This site poses an infrastructure risk and ranks high for ecological impact as well as crossing priority.

- Has design, assist Town with DER CRMA assistance or other funding opportunity for final designs and construction.

MB19. MassDOT MM 31.84 Route 133

This site is located on the Ipswich/ Essex line near Downriver Ice cream (#17107), it is a Northeast salt marsh site and was dredged in 2013. The state of the marsh in this region is degraded.

- Tidal Crossing Assessment conducted by IRWA on 04/12/19.
- Identify flooded conditions and document culvert clogging
- Encourage Ipswich and Essex to relay importance to MassDOT
- Apply for DER's Priority Project status, during next round of funding.

MB20. Old Essex Road in Ipswich/ Essex (#17108)

This site is a Northeast salt marsh site and was dredged in 2013. The state of the marsh in this region is degraded.

- Tidal Crossing Assessment conducted by IRWA on 04/12/19.
- Track flooded conditions and document culvert clogging.
- Meeting with Ipswich DPW to discuss potential for road dead-ending.
- Engage neighbors in potential road dead-ending.
- Apply for DER's Priority Project status, during next round of funding.

ESSEX & GLOUCESTER MAP

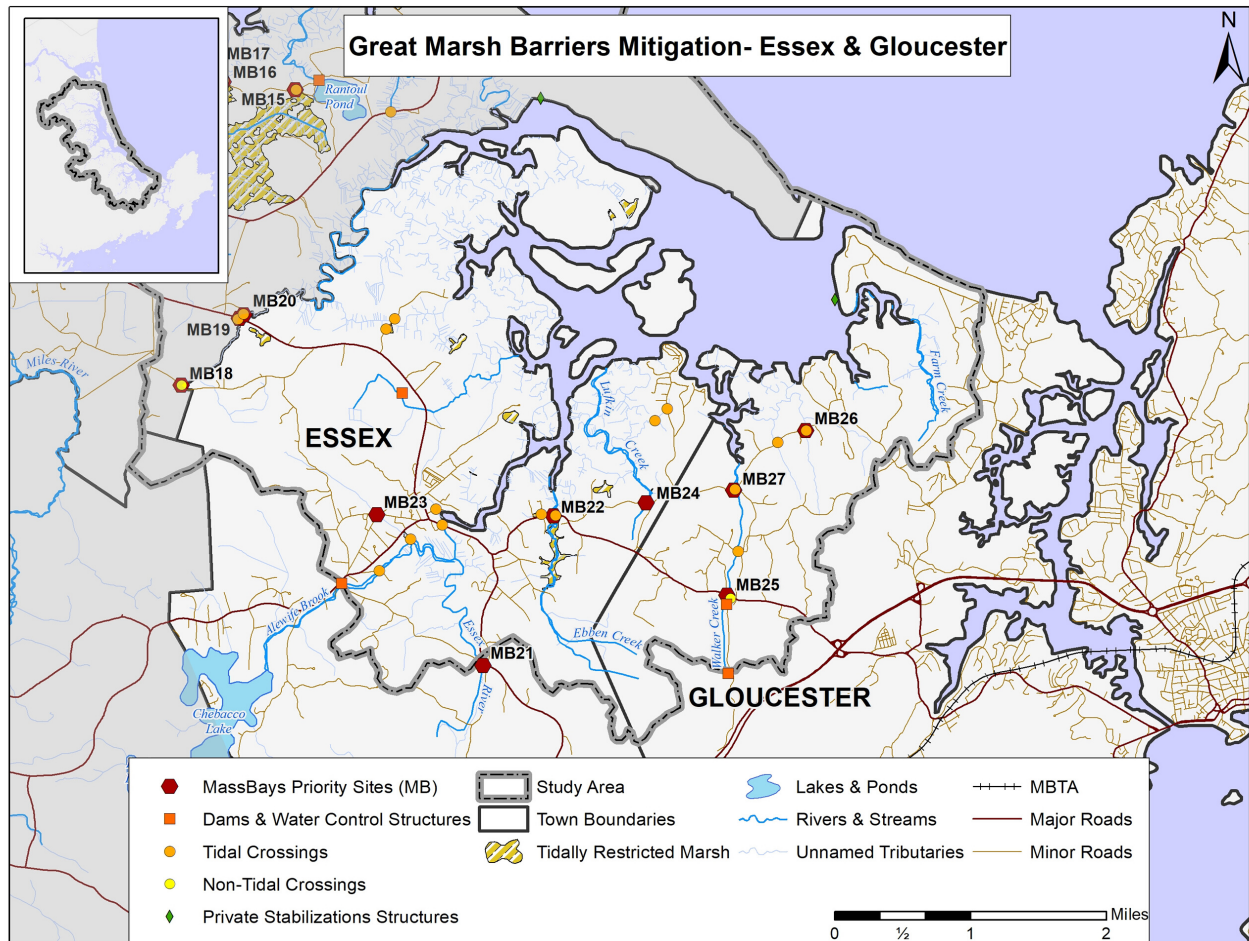


Figure 5. Great Marsh Barrier Mitigation Project, Essex & Gloucester, MA

ESSEX DATA

A total of one dam, seven non-tidal and eleven tidal structures were located within the Essex MassBays Target Assessment Area. There were twenty-four private and one public shoreline stabilization structures within the study region.

Table 14. Essex dams and water control structures.

MassBays ID	Name	National ID	Town	Hazard level	DER Percentile	Latitude	Longitude
	Apple St Dam		Essex			42.626	-70.793

Table 15. Essex non-tidal crossings.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Road	Latitude	Longitude	Town
MB21	339	67373	Culvert	0.725	Apple St	42.617	-70.773	Essex
MB23	439	10304	Single Culvert	0.255	Story Street	42.633	-70.788	Essex
MB24	449	9874	Single Culvert	0.686	Lufkin Road	42.634	-70.749	Essex
	382	9606	Bridge	0.861	Grove Street	42.625	-70.764	Essex
	390	8391	Open Bottom Arch	0.956	Apple Street	42.626	-70.793	Essex
	426	11245	Single Culvert	0.844	Martin Street	42.631	-70.784	Essex
	505	10219	Bridge	0.730	John Wise Avenue	42.644	-70.781	Essex

Table 16. Essex tidal crossings.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Tidal Aquatic Organism Passage Score	Road	Latitude	Longitude	Town
MB19	17107	ts28	Culvert	0.642	Moderate AOP	Route 133	42.654	-70.807	Essex
MB22	436	ts92	Bridge	0.592	Moderate AOP	Eastern Ave	42.633	-70.762	Essex
	430	ts38	Partially Inaccessible		Moderate AOP	Main St	42.632	-70.778	Essex
	17114	ts55	Culvert		Moderate AOP	ECGBA Driveway	42.633	-70.764	Essex
	17113	ts56	Culvert	0.404	Moderate AOP	Conomo Point Rd	42.644	-70.746	Essex
	17111	ts72	Culvert	0.488	Moderate AOP	Island Rd	42.654	-70.785	Essex
	17112	ts73	Partially Inaccessible		no score - missing data	Island Rd	42.653	-70.786	Essex
	17109	ts74	Culvert		Poor AOP	Trail	42.630	-70.783	Essex
	131	ts88	Partially Inaccessible		no score - missing data	Cogswell Rd	42.646	-70.747	Essex
	135	ts89	Partially Inaccessible		Moderate AOP	Burnham Ct	42.634	-70.779	Essex
	406	ts93	Partially Inaccessible	0.62	Moderate AOP	Landing Rd	42.627	-70.787	Essex

ESSEX IMPLEMENTATION

Meetings with the Town of Essex included the Department of Public works director and the Town Administrator. The following priorities were agreed upon based on meetings with the Town of Essex, previous studies, engagement with barrier owners and pertinent PIE-Rivers partners.

MB21. Apple Street (#339)

The Town Administrator and DPW director felt that this was a high priority since Apple Street is an alternate route when Route 133 experiences closures due to flooding. Currently, issues due to flooding at this culvert make the road difficult to use during winter storms and flooding events.

- Assisted Town with CRMA grant application & submission (Received August 2019).
- Continue to assist with project as necessary, including meetings with engineers regarding field data collection, engineering and design, and permitting.

MB22. MassDOT MM 35.5 Route 133

This site is located over Ebben Creek (#436) and is an undersized structure that was identified as a high local priority and tidal crossing priority and has clear ponding on both sides.

- Tidal Crossing Assessment conducted by IRWA on 04/30/19.
- Encourage Town, Selectboard, Conservation and
- Town Reps to promote upgrade of this site with MassDOT.
- Apply for DER priority project status when feasible, after initial meetings.

MB23. Story St (#439)

This site ranked #1 for the town as part of the Great Marsh Barriers Assessment due to its elevated crossing priority and high infrastructure risk.

- Has conceptual design plan through Barriers Report.
- Encourage and assist Town with application for funding.
- DER's CRMA program could be targeted.

MB24. Lufkin Rd over Lufkin creek (#449)

This site was identified as a high priority for infrastructure risk and as a crossing priority in the Great Marsh Barriers Assessment.

- Has conceptual design plan through Barriers Report
- Encourage and assist Town with application for funding.
- DER's CRMA program could be targeted.

GLOUCESTER DATA

A total of two dams, two surveyed non-tidal and four surveyed tidal structures were located within the Gloucester MassBays Target Assessment Area. There were no private or public shoreline stabilization structures within the study region.

Table 17. Gloucester dams and water control structures.

ID	Town	Type	Material	Shape Length	Latitude	Longitude
478	Gloucester	Groin/Jetty	Stone	10	42.656	-70.721

Table 18. Gloucester private stabilization structures.

ID	Town	Type	Material	Shape Length	Latitude	Longitude
478	Gloucester	Groin/Jetty	Stone	10	42.656	-70.721

Table 19. Gloucester non-tidal structures.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Road	Latitude	Longitude	Town
MB25	127	70950	Culvert	0.000	Essex Ave	42.624	-70.737	Gloucester
MB26	489	11243	Single Culvert	0.823	Concord Street	42.642	-70.726	Gloucester

Table 20. Gloucester tidal structures.

MassBays ID	IRWA ID	NAACC Survey ID	Crossing Type	Aquatic Score NAACC	Tidal Aquatic Organism Passage Score	Road	Latitude	Longitude	Town
MB27	17168	ts53	Bridge	0.65	Moderate AOP	Concord St	42.635	-70.736	Gloucester
	123	ts95	Culvert	0.66	Moderate AOP	Walker St	42.629	-70.736	Gloucester
	17167	ts54	Culvert	0	No AOP	Concord St	42.640	-70.730	Gloucester
	489	ts57	Culvert		Poor AOP	Concord St	42.642	-70.726	Gloucester

GLOUCESTER IMPLEMENTATION

Meetings with the City of Gloucester included the Department of Public works director and discussions with the Herring warden. The following priorities were agreed upon based on meetings with the Town, previous studies, engagement with barrier owners and pertinent PIE-Rivers partners.

MB25. MassDOT MM 36.9 Route 133 Walker Creek (#127)

This site is located in the upper portion of Walker Creek. This area is a high road kill site and could be improved for wildlife passage.

- Non-tidal Assessment conducted on 04/17/19.
- Met with Town Staff to discuss restoration potential.
- Engaged DMF regarding restoration potential. Need to conduct site visit, Herring Habitat Assessment post Town engagement.
- Encourage Town to apply for DER's priority project status.
- Get DPW or volunteers to track roadkill at site.

MB26. Concord St (#489)

This site has been identified as a site that has experienced flooding and ranked as having poor aquatic organism passage in the NAACC Tidal Crossing Assessment.

- Tidal Crossing Assessment conducted by IRWA on 04/28/19.
- No passage due to rock piles/ undersized structures.
- Coordination with City officials and abutters.
- Identify funding for conceptual design plan.

MB27. Lawrence Parson Memorial Bridge Walker Creek (#17168)

This site is an all stone abutment with wide passing although ponding is evident. Astronomical tides caused the bridge to collapse and it currently has a temporary repair in place.

- Tidal Crossing Assessment conducted by IRWA on 04/22/19
- Meeting with DPW director on 07/24/19.
- Received funding for repair through MassDOT Small Bridge Program.
- Work with Bayside Engineering on upgrade specifications.
- Maintain communication with engineer through process.

GIS LAYER CITATIONS

Tidally restricted saltmarsh layer:

Data compiled from Great Marsh Coastal Wetlands Restoration Plan, MA Wetlands Restoration Program (2007).

North Atlantic Aquatic Connectivity Collaborative. (2019). NAACC Data Center [database]. Retrieved from https://naacc.org/naacc_search_crossing.cfm MassGIS. (2019).

OLIVER: MassGIS's Online Mapping Tool. [database]. Retrieved from http://maps.massgis.state.ma.us/map_ol/oliver.php

McGarigal K, Compton BW, Plunkett EB, DeLuca WV, and Grand J. 2017. Designing Sustainable Landscapes: Modeling Connectivity. https://scholarworks.umass.edu/designing_sustainable_landscapes_techdocs/10/ MassDOT. (2019).

Bridge Inspection Management System [database]. Retrieved from https://geomassdot.opendata.arcgis.com/datasets/8fa67bf47651417283813a29bfc31545_0

National Wild & Scenic River System. (2019). Massachusetts. Retrieved from <https://www.rivers.gov/massachusetts.php>

FISHERIES RESOURCE CITATIONS

Status of River Herring on the North Shore of Massachusetts
Tim Purinton, Frances Doyle and Dr. Robert D. Stevenson
2003

The Marine Resources of the Parker River-Plum Island Sound Estuary:
An Update after 30 Years
Robert Buchsbaum, Tim Purinton, Britta Magnuson

A Report Upon the Alewife fisheries of Massachusetts. David L. Belding,
Division of Fisheries and Game. 1921.

The Decline of Fisheries Resources in New England, Edited by: Robert
Bauchsbaum, Judith Pearson, William E. Robinson

A Study of the Marine Resources of the Parker-River Plum Island Sound
Estuary, DMF Monograph Series Number 6. William Jerome, Jr., Arthur P.
Chesmore, and Charles O. Anderson Jr. March 1968

APPENDIX A

Funding & Technical Resources for Barrier (Culvert, Dam, Bridge) Mitigation Projects.....	43-45
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Funding & Technical Resources for Barrier (Culvert, Dam, Bridge) Mitigation Projects

FUNDER	GRANT PROGRAM*	NON-TIDAL	TIDAL	DAM	BRIDGE
DFG Division of Ecological Restoration (DER)	Culvert Replacement Municipal Assistance (CRMA)	X			
DFG Division of Ecological Restoration (DER)	Restoration and Revitalization Priority Projects	X	X	X	X
MassDOT	Small Bridge Program	X	X		X
National Atmospheric and Oceanic Administration (NOAA), National Marine Fisheries Service (NMFS)	Habitat Restoration Grants , Coastal Resilience Grants	X	X	X	X
EEA Municipal Vulnerability Preparedness (MVP)	Action Grants	X	X	X	X
EEA Office of Coastal Zone Management	Coastal Resilience Grant Program		X	X	X
EEA	The Dam and Seawall Repair or Removal Program			X	
Department of Fish and Game (DFG)	In-Lieu Fee (ILF) Program	X	X	X	X
United States Fish and Wildlife Service (USFWS)	National Fish Passage Program	X	X	X	X
National Fish and Wildlife Foundation (NFWF)	Forest and Rivers Fund	X	X	X	X
FEMA, administered by MEMA	Hazard mitigation, pre-disaster mitigation, flood mitigation	X	X	X	X
EOHED	MassWorks Infrastructure Program	X	X	X	X
Division of Local Services	Community Compact Best Practices Program	X	X	X	X
Private & Corporate Foundations	Regional Foundations	X	X	X	X

*Refer to most current RFR for types of project funded.

Adapted from 10/30/19 DER Massachusetts Culvert Replacement Resources document

Funding & Technical Resources for Barrier (Culvert, Dam, Bridge) Mitigation Projects

TECHNICAL SUPPORT	DESCRIPTION	WEBSITE
DFG- Division of Ecological Restoration	Technical Assistance with culvert, dam & salt marsh restoration projects	https://www.mass.gov/orgs/division-of-ecological-restoration/Stream-Crossing-Handbook
DFG- Division of Marine Fisheries	Technical Assistance with diadromous fish passage projects	https://www.mass.gov/orgs/division-of-marine-fisheries
DFG- Office of Fishing and Boat Access	The Office of Fishing and Boating Access provides access to waterways.	https://www.mass.gov/fishing-and-boating-access
DFW- MassWildlife	Conservation of freshwater fish and wildlife, including endangered plants and animals.	https://www.mass.gov/orgs/division-of-fisheries-and-wildlife
US Fish and Wildlife Service	Endangered Species Act Technical Guidance	https://www.fws.gov/newengland/endangeredspecies/index.html
NOAA	Estuarine, coastal and river habitat restoration technical assistance	https://www.fisheries.noaa.gov/topic/habitat-conservation#how-we-restore
MVP Regional Coordinators	Work with city and town officials to support communities through the MVP process.	https://www.mass.gov/municipal-vulnerability-preparedness-mvp-program
Massachusetts Emergency Management Agency (MEMA)	FEMA grants are administered by MEMA	https://www.mass.gov/service-details/pdm-fma-grants
DEP Circuit Rider	Technical, administrative, and regulatory assistance on numerous wetland topics	https://www.mass.gov/orgs/eea-office-of-grants-and-technical-assistance
EEA Office of Grants and Technical Assistance	Conservation of natural resources and outdoor recreational programs	https://www.mass.gov/orgs/eea-office-of-grants-and-technical-assistance
Community Grant Finder	Mass.gov resource for finding grant opportunities	https://www.mass.gov/lists/community-grant-finder
MassDOT	Stream Crossing Handbook	https://www.mass.gov/massdot-environmental-services
Local Conservation Agents	Assistance on local wetland topics	Located on Town or City Conservation Commission Website Page

Adapted from 10/30/19 DER Massachusetts Culvert Replacement Resources document

Funding & Technical Resources for Barrier (Culvert, Dam, Bridge) Mitigation Projects

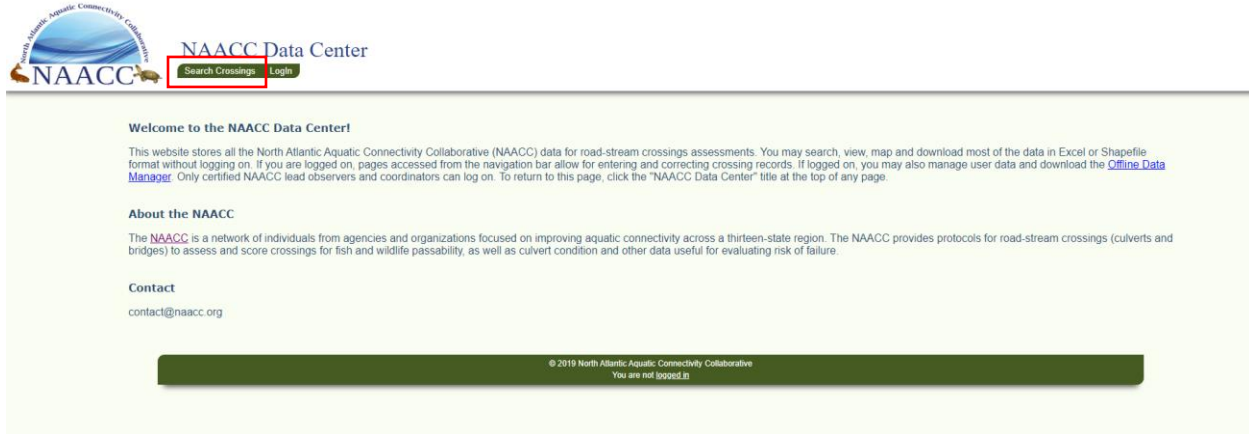
Inventory, Prioritization and Training Tools*

- [Great Marsh Barriers Mitigation Project Resources](#)
- Great Marsh Barriers Assessment - http://pie-rivers.org/documents/GM_BarriersAssessment_FullReport_IRWA2018.pdf
- North Atlantic Aquatic Connectivity Collaborative (NAACC)
 - Website (Non-tidal and Tidal Assessment Training)- <https://streamcontinuity.org/naacc>
 - Culvert database - <https://naacc.org/>
- Climate Change Clearinghouse- www.resilientMA.org
- Massachusetts GIS Viewer – http://maps.massgis.state.ma.us/map_ol/oliver.php
- [National Inventory of Dams](#)
- [Dam Removal and Ecological Benefit Tool](#)
- [MA Climate Action Tool](#) (culvert prioritization tool)
- MassDOT Roadway Inventory - <https://gis.massdot.state.ma.us/roadinventory/>
- Massachusetts Rivers & Roads Training - MassDOT Training offered through BayState Roads. Includes online and in-person training modules. <https://www.umasstransportationcenter.org/umtc/Rivers-and-Roads.asp>
- Example Culvert Replacement Documents and Guides - <https://www.mass.gov/service-details/replace-a-culvert>
 - Schedule a culvert training: brian.kelder@mass.gov

Adapted from 10/30/19 DER Massachusetts Culvert Replacement Resources document

How to Access Town-specific Images and Data on Road-stream Crossings

1. Go to https://naacc.org/naacc_data_center_home.cfm
2. Choose **Search Crossings**



3. Select your State and Town.
4. Non-tidal Crossing Data: Under **Aquatic Passability Assessments** select *Umass Stream Continuity Project (2005-2017)* and *NAACC (after 6/1/2015)*
5. Tidal Crossing Data: Under **Tidal Stream Assessments** select *NAACC (after 2018)*
6. Terrestrial Passage Assessments: Under **Terrestrial Passage Assessments** select *NAACC (after 2018)*

The screenshot shows the search interface. On the left, there are dropdown menus for 'Location' (set to 'All States [49900]'), 'Watersheds' (open to 'All NHD-HUC8 Watersheds'), and 'Personnel' (set to 'Any Observer'). In the center, there are input fields for 'Survey ID', 'Crossing Code', and a dropdown for 'All NAACC Evaluations'. On the right, there are date range selectors for 'Last updated from', 'Last updated until', 'Date observed from', and 'Date observed until', each with an 'All' button. At the bottom, there is a 'Choose Data Sets' dropdown (open to 'Aquatic Passability Assessments') and a 'Search' button highlighted in red.

7. Click Search to retrieve data.
8. Choose **Map Results** to access a map of all crossing in selected region.

Location (choose multiple towns, watershed):
 Massachusetts [83]
 Hudson [0]
 Hull [0]
 Huntington [0]
 Ipswich [20]
 All MA streams

Other:
 Survey ID:
 Crossing Code:
 Evaluation is not available for the dataset(s) you selected.

Choose Data Sets (choose multiple):
 New Hampshire (2006 - 2018)
 Culvert Condition Assessments
 Culvert Condition - 2018 NAACC Protocol
 Terrestrial Passage Assessments
 NAACC (after 2018)
 Tidal Stream Assessments
 NAACC (after 2018)

Personnel:
 Any Observer
 Any Coordinator

Dates:
 Last updated from ...
 All
 Last updated until ...
 All
 Date observed from ...
 All
 Date observed until ...
 All

25 per page

Search

Map results

Data Set	GIS	Excel Reports
Tidal Stream Assessments	shapefile	Not available detailed Not available

9. Click on a Green Triangle (Tidal Crossing Data) or a Colored Square/ Circle for Non-Tidal data, to access the **images** for that site.

Welcome to our search results mapping page. Please be patient when mapping large data sets.
 (Note that 20 of 20 surveyed records in your search results have been mapped. Only surveyed records having valid xy crossing codes or GPS information can be mapped. Only one record of records with duplicate crossing codes will be mapped.)

Map information Click to show/hide map information

Map Satellite

Display Naacc Tidal Stream Assessment - Google Chrome
 naacc.org/naacc_display_crossing_ts.cfm?tsId=ts29

NAACC Data Center

Data Set: Tidal Stream Assessments - NAACC (after 2018)
 Survey Id: ts29 Crossing Code: xy4265465670806904
 AOP Coarse Screen: Moderate AOP Tidal Stream Score: 0.6
 Data checked and accurate by Marie-Françoise Hatte on 06-12-2019

xy4265465670806904(downstreamTsId:12-2019.jpg) xy4265465670806904(inletTsId:12-2019.jpg)
 xy4265465670806904(outletTsId:12-2019.jpg) xy4265465670806904(upstreamTsId:12-2019.jpg)

10. Under **GIS** download a *Shapefile* to upload crossing data to your preferred mapping software.

11. Under **Excel Reports** download *Detailed* for an excel file with crossing data.

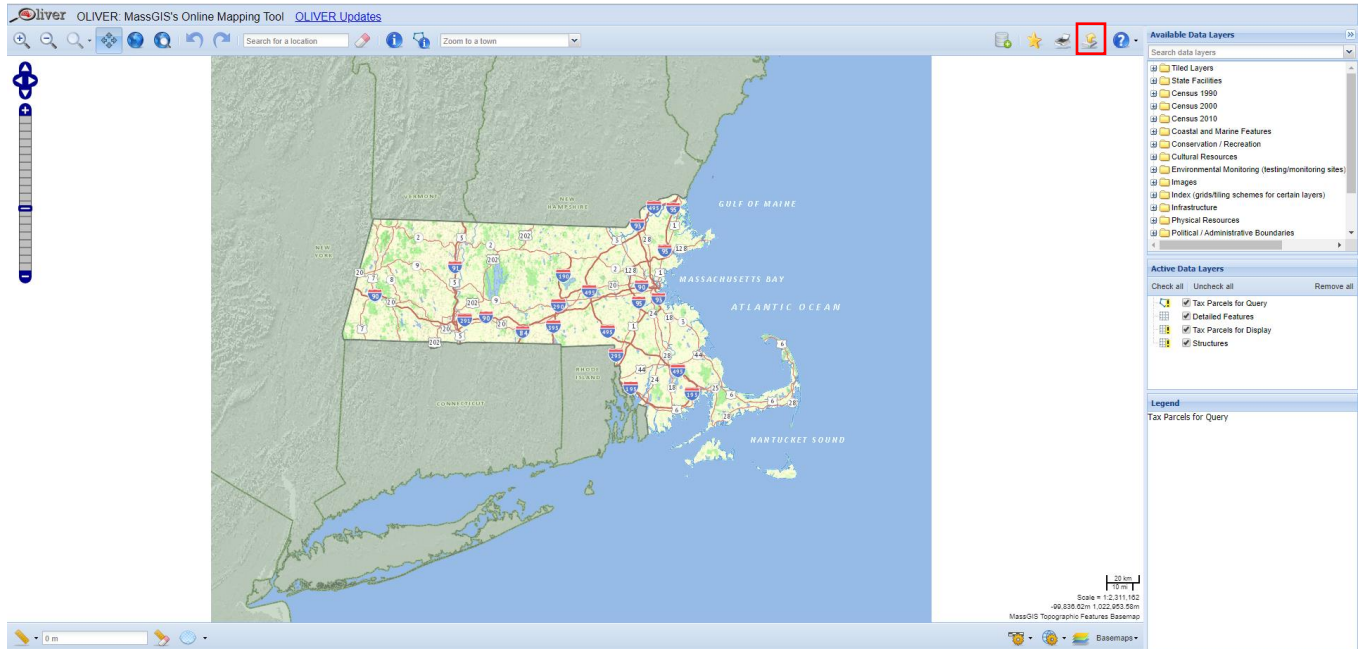
How to Query Roads Trails and Railway Datasets using Oliver

1. Follow instructions to download NAACC shapefiles for your region, then map data using GoogleEarth or ArcMap. In the absence of mapping software or GoogleEarth, toggle between the NAACC maps for the **Aquatic Passability Assessments: NAACC (after 2015), Umass Stream Continuity Project (2005-2017) and Tidal Stream Assessments: NAACC (after 2018)** and following resources to identify missing barriers.
2. Go to http://maps.massgis.state.ma.us/map_ol/oliver.php
3. Zoom in to area of interest using **Zoom to Town** drop down menu at top of page, or by typing in an address in the **Search for Location** box
3. Under Available Data Layers (right side of page)
 - a. Under **Tiled layers** folder double click **Detailed Features**.
 - b. Under **Census 2000** select **Base Layers** sub-folder, then **Census 2000 Town Boundaries** sub-folder then double click **Census 2000 Rivers and Streams** feature class.
 - c. In the **Conservation and Recreation** Folder Open Sub-Folder **Trails**, then double-click **DCR Roads and Trails** line feature class.
 - d. Under the **Infrastructure** folder select sub-folder **Highway Mile Markers**, then double-click **Highway Mile Markers** point feature class.
 - e. Under the **Infrastructure** folder select sub-folder **Trains**, then double-click **Commuter Rail Lines** line feature class.
 - f. Under the **Infrastructure** folder select sub-folder **MassDOT Roads** then double-click **MassDOT Roads Street Names** line feature class.
- 4a. If you do not have mapping software, you will need to toggle between the above Oliver and the NAACC layers for each assessment (**Aquatic Passability Assessments: NAACC (after 2015), Umass Stream Continuity Project (2005-2017) and Tidal Stream Assessments: NAACC (after 2018)**).

Turn on the following layer:

- a. Under the **Images** folder select sub-folder **Aerial Photos (Ortho imagery)** then double-click **Google 2018 Ortho-imagery** feature class.

4b. If you have mapping software or access to GoogleEarth, these layers can then be downloaded and overlaid onto the NAACC passability dataset to identify missing barriers. At the top of the Oliver screen, select the 4th icon from the left to launch the data export wizard.



6. In Data export wizard, select next, On Step 2, right click Tax parcels for query and then click remove layer. Click next again.

7. Step 4 of 4 will ask the format you would like to download the data in. Options are Shapefile (for ArcMap), Excel 2007, CSV, Google Earth file or Excel 97-2003. Select the format you would like. Shapefiles and Google Earth Files can be mapped against NAACC data files to identify missing crossings, whereas excel files will provide the source data. Download the combination of data files and layer files for your computer.

8. Select an output coordinate system, Google Earth uses WGS84.

9. Type a file name for the zipped folder, then click finish.

10. Save the file where other layer data is saved for use in GIS.

11. Overlay the downloaded layers and the three NAACC datasets to conduct desktop layer review of missing sites.

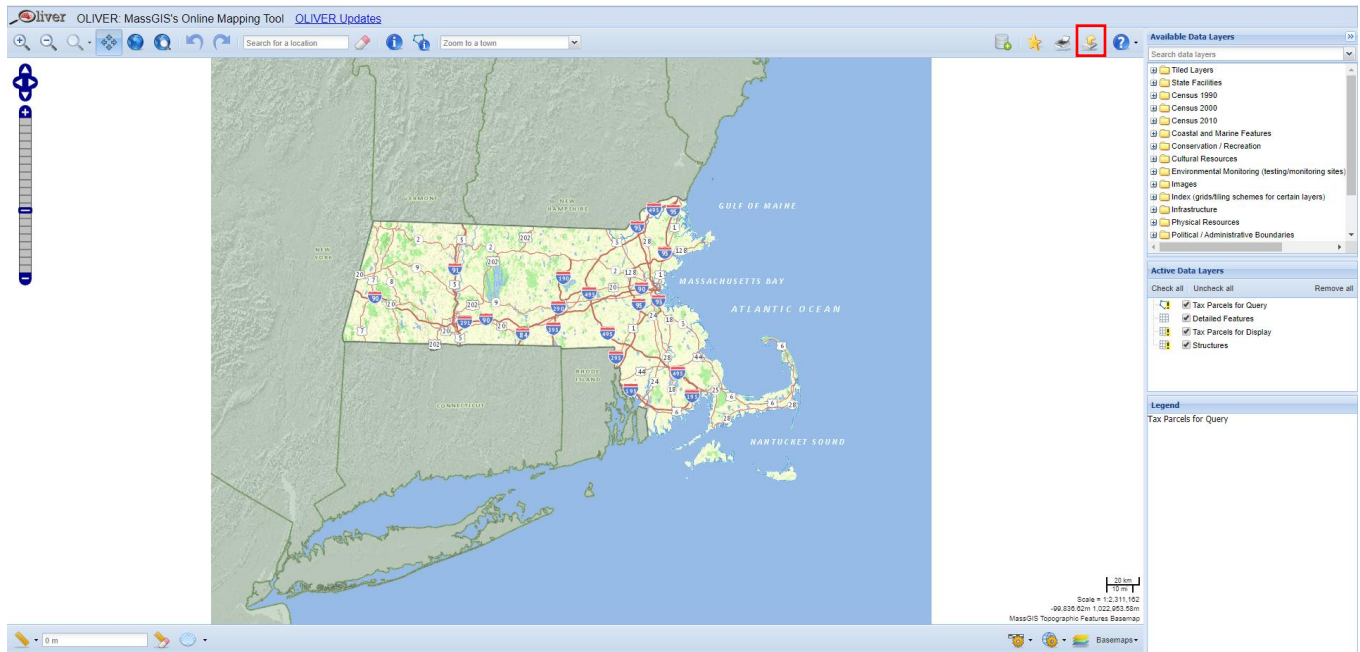
How to assess ecological priorities using MassGIS data layers

1. Follow instructions to download NAACC shapefiles for your region, then map data using GoogleEarth or ArcMap. In the absence of mapping software or GoogleEarth, toggle between the NAACC maps for the **Aquatic Passability Assessments: NAACC (after 2015), Umass Stream Continuity Project (2005-2017) and Tidal Stream Assessments: NAACC (after 2018)** and following resources to identify ecological priorities.
2. Go to http://maps.massgis.state.ma.us/map_ol/oliver.php
3. Zoom in to area of interest using **Zoom to Town** drop down menu at top of page, or by typing in an address in the **Search for Location** box
3. Under Available Data Layers (right side of page)
 - a. Under **Tiled layers** folder double click **Detailed Features**.
 - b. Under **Census 2000** select **Base Layers** sub-folder, then **Census 2000 Town Boundaries** sub-folder then double click **Census 2000 Town Boundaries Outlines** and **Census 2000 Rivers and Streams**.
 - c. In the **Physical Resources** Folder Open Sub-Folder **Anadromous Fish**, then select **Anadromous Fish Presence** point feature class.
 - d. In the **Physical Resources** Folder Open Sub-Folder **Outstanding Resource Waters**, then select **Outstanding Resource Waters Outlines** feature class.
 - e. In the **Physical Resources** Folder Open Sub-Folder **DFW Coldwater Fisheries Resources**, then select **DFW Coldwater Fisheries Resources** line feature class.
 - f. In the **Physical Resources** Folder Open Sub-Folder **Hydrography Water Features**, then select **DEP Wetlands** sub-folder and double-click **DEP Wetlands Detailed with Outlines** feature class.
 - f. Under the **Coastal and Marine Resources** folder select sub-folder **Tidelands Jurisdiction Chapter 91**, then double-click **Tidelands Jurisdiction Chapter 91 Marsh Boundary - landward** line feature class.
 - g. Under the **Conservation and Recreation** folder select sub-folder **Areas of Critical Environmental Concern ACECs** sub-folder then **Areas of Critical Environmental Concern ACECs** area feature class.
 - h. Under the **Conservation and Recreation** folder select sub-folder **Openspace** sub-folder then **All Openspace by Ownership Solid** sub-folder then **Openspace by Ownership solid** area feature class.
 - i. Under the **Conservation and Recreation** folder select sub-folder **Natural Heritage Data** then double-click **NHESP Estimated Habitats of Rare Wildlife, NHESP Priority Habitats of Rare Wildlife, Potential Vernal Pools** and **NHESP Certified Vernal Pools** feature classes.
 - j. Under the **Infrastructure** folder select sub-folder **Dams** then **Dams by Hazard Code** point feature class.

j. Under the **Images** folder select sub-folder **Aerial Photos (Ortho imagery)** then double-click **Google 2018 Ortho-imagery** feature class.

4. If you do not have mapping software, you will need to toggle between Oliver and the NAACC layers for each assessment (**Aquatic Passability Assessments: NAACC (after 2015)**, *Umass Stream Continuity Project (2005-2017)* and **Tidal Stream Assessments: NAACC (after 2018)**).

5. If you have mapping software or access to GoogleEarth, these layers can then be downloaded and overlaid onto the NAACC passability dataset to assess ecological priorities. At the top of the Oliver screen, select the 4th icon from the left to launch the data export wizard.



6. In Data export wizard, select next, On Step 2, right click Tax parcels for query and then click remove layer. Click next again.

7. Step 4 of 4 will ask the format you would like to download the data in. Options are Shapefile (for ArcMap), Excel 2007, CSV, Google Earth file or Excel 97-2003. Select the format you would like. Shapefiles and Google Earth Files can be mapped against NAACC data files to identify missing crossings, whereas excel files will provide the source data. Download the combination of data files and layer files for your computer.

8. Select an output coordinate system, Google Earth uses WGS84.

9. Type a file name for the zipped folder, then click finish.

10. Save the file where other layer data is saved for use in GIS.

11. Overlay the downloaded layers and the three NAACC datasets to conduct desktop layer review of ecological priorities.

12. Additional resources for prioritization are as follows:

[Great Marsh Barriers Assessment](#)

[MassDOT Road Inventory](#)

[National Inventory of Dams](#)

[Dam Removal and Ecological Benefit Tool](#)

[Mass Wildlife Climate Action Tool](#)

[NFWF Climate Resilience Tool CREST](#)



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The Division of Ecological Restoration

The Division of Marine Fisheries

Field Technicians: Kristen Thiebeault and Lauren Fitzgerald