



Massachusetts Department of Fish and Game
**Division of
Ecological
Restoration**

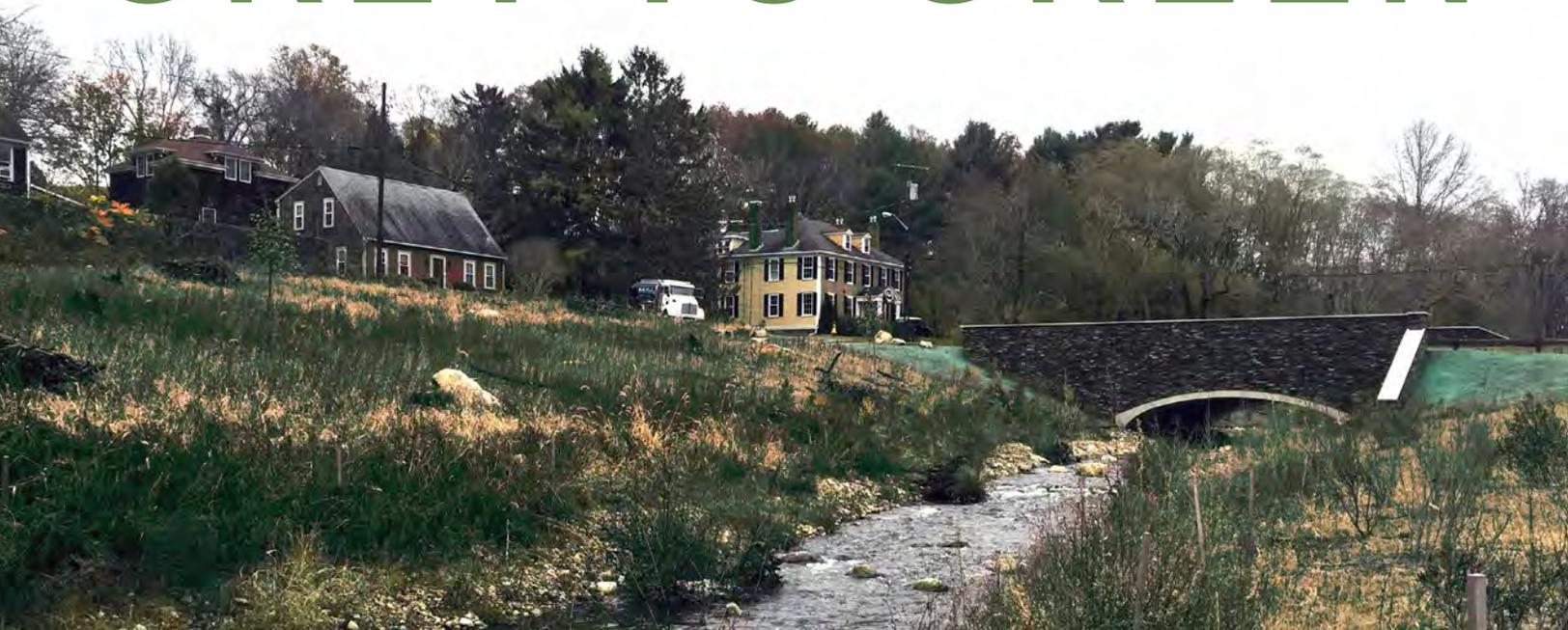
Invested in Nature and Community

2016 Annual Impact Report

Restoring Natural Infrastructure



GREY TO GREEN



Before and After, site of Plymco Dam Removal, Plymouth, MA (Photo courtesy of the Town of Plymouth)



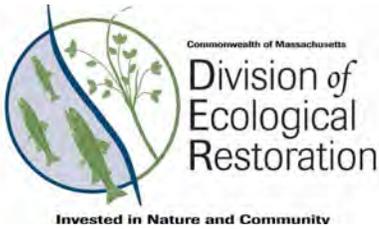
COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF FISH & GAME
DIVISION OF ECOLOGICAL RESTORATION

**Commonwealth of
Massachusetts**
Charles D. Baker, Governor
Karyn E. Polito, Lieutenant
Governor

**Executive Office of Energy and
Environmental Affairs**
Matthew A. Beaton, Secretary

Department of Fish and Game
George N. Peterson, Jr.,
Commissioner
Mary-Lee King, Deputy
Commissioner

**Division of Ecological
Restoration**
Tim Purinton, Director
Hunt Durey, Deputy Director



Dear Partners,

Ecological restoration provides the opportunity to revive damaged natural assets that protect communities and support economic prosperity. Strengthening natural infrastructure is a centerpiece of the Commonwealth's approach to climate change preparedness and is being utilized more frequently as communities work to meet ambitious water quality targets and sustain vital industries such as fishing and shellfishing.

We face some formidable obstacles in protecting communities from sea level rise, flood damage, and threats to adequate and clean water supplies. "Soft solutions" like salt marsh restoration and floodplain re-connection are important tools in the toolbox. DER promotes the use of these tools wherever possible and in the process helps local communities become better prepared for extraordinary weather events such as the 2016 drought and Tropical Storm Irene.

While no amount of soft engineering can stave off dramatic sea level rise or extreme weather events, smart engineering solutions integrated with healthy natural infrastructure will help protect and enhance the climate change resilience of Massachusetts' communities and economy.

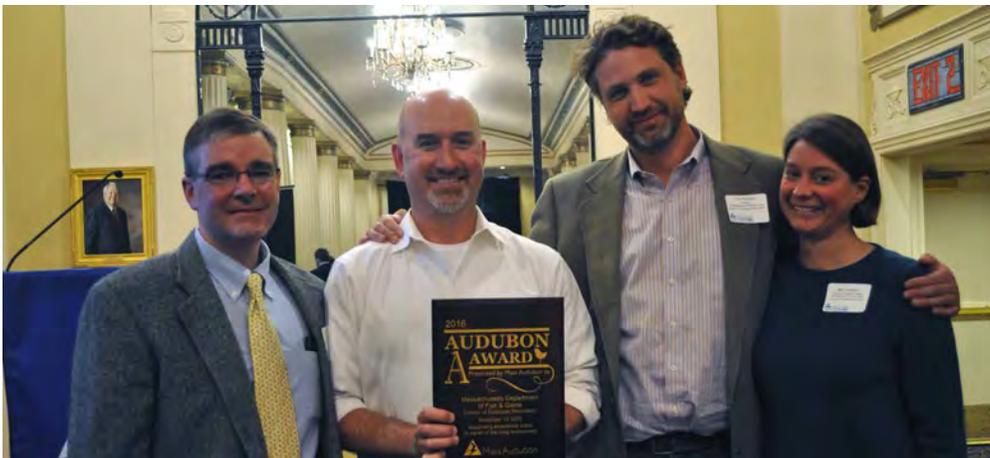
Sincerely,

Tim Purinton, *Director*

George N. Peterson, Jr., *Commissioner*

Hunt Durey, *Deputy Director*

Mary-Lee King, *Deputy Commissioner*



DER receives the Audubon A Award

"The Division serves as a facilitator of restoration – working to identify new projects, organize project teams, provide technical assistance, secure project funding, and help manage and coordinate restoration activities from start to finish."

Gary Clayton, President, Mass Audubon

BY THE NUMBERS 2016 ACCOMPLISHMENTS

In 2016 DER continued to advance restoration across the state. Highlights include: the 225 acre restoration of Tidmarsh Farms in Plymouth; leveraging over \$10 million in newly awarded external funds; providing technical support to more than 170 communities on issues such as water quality assessments and culvert replacements; and continuing to help communities restore more natural streamflow.

\$10M LEVERAGED

Using Commonwealth funds to the fullest, DER leveraged **\$10 million** in newly awarded external funds.

157K

TWITTER IMPRESSIONS

13 MILES

We removed **2** dams and completed **2** wetland restoration projects, restoring **285** acres and opening up **13** river miles.

285 ACRES

Completed
2016

We advanced work on multiple river and wetland restoration projects that have recently initiated construction or will begin construction next year. Once complete, these projects will remove **8** dams, reconnect more than **76** river miles, and restore nearly **280** acres of degraded wetlands.

76 MILES

280 ACRES

Planned
2017 Construction

\$100,000

Volunteers worked in **72** communities, devoting more than **\$100,000** worth of labor towards protecting and restoring our rivers and wetlands.

DER provided technical support and guidance in more than **170 communities** across all **27** major watersheds.

170

Restoring Natural Infrastructure

Our ecological work benefits citizens, businesses, and communities that rely on the flood protection and clean water provided by healthy aquatic ecosystems.



From Left to right: Muddy Creek Bridge Restoration in Chatham/Harwich after completion. DER's Kris Houle talks to students about restoration in a DER led practicum on dam removal (Photo by Patricia J. Murphy). Tidmarsh Farms in Plymouth after restoration.

In 2016, DER advanced 30 ecological restoration projects through design and permitting towards construction. Each project contributes to the restoration and protection of the Commonwealth's natural infrastructure: our rivers, floodplains, freshwater wetlands and coastal salt marshes. Project-specific highlights from 2016 include:

- The Muddy Creek restoration project, which began construction in 2015, wrapped up in May of 2016. Muddy Creek is a 55-acre tidal wetland that borders **Harwich** and **Chatham**. The tidal wetland had long been disconnected from full tidal flow by two undersized, deteriorated culverts. DER, **Harwich**, **Chatham**, and other partners worked together, funded by a Sandy Coastal Resiliency grant from the US Department of the Interior (DOI) and the DOI/USFWS National Coastal Wetlands Conservation Grant Program, to replace the culverts with a 94-foot bridge.
- After a year of earth-moving, construction finished at the 225-acre Tidmarsh Farms/Beaver Dam Brook wetland and river restoration project in **Plymouth**, funded in part by the DOI/USFWS

National Coastal Wetlands Conservation Grant Program. Future conditions at this former commercial cranberry farm will include a mosaic of wetland habitat types, free movement of fish from ocean to headwaters, and restored connectivity with the surrounding forests. The restoration work will allow the site to evolve with climate change and sea level rise. Collaborations between the landowner, MIT Media Lab, MIT Sea Grant, University of Massachusetts, and Environmental Protection Agency have developed into the Living Observatory, a unique ecological research and monitoring partnership.

- DER, the **City of Fall River**, The Nature Conservancy, and other partners removed Rattlesnake Brook Dam in **Freetown**. Removal of the dam reconnects seven miles of Rattlesnake Brook to the Taunton River and eliminates a flood damage threat to Narrows Road, located just downstream from the dam. The project was funded in part by the Massachusetts Dam and Seawall Repair or Removal Program and the DOI/National Fish and Wildlife Foundation's (NFWF) Hurricane Sandy Coastal Resiliency Program.



- Excavators broke ground in late December on three more dam removals; these will wrap up in early 2017. Balmoral and Marland Place Dams are located on the Shawsheen River in **Andover**; together, their removal will open 5.5 miles of habitat for migratory and resident fish and reduce flood hazards. These two removals were also partially funded by the DOI/NFWF's Hurricane Sandy Coastal Resiliency Program.
- And, after many years of planning and fundraising, the Cardinal Cushing School of **Hanover** began removal of the Tack Factory Dam, partially funded by the DOI/USFWS National Fish Passage Program. This project removes the first dam from the ocean on Third Herring Brook and removes a liability that diverted much-needed resources from the non-profit school.

All of these projects stem from strong partnerships between DER, property owners, municipalities, watershed organizations, and other local, state, and federal agencies.

"We see [Tidmarsh] as a landscape of hope – land conservation in a climate changing world that revives degraded landscapes into beautiful, regenerative ecosystems."

~ Gary Clayton, President, Mass Audubon

DER, together with our partners, has restored in total over 1,800 acres of coastal wetlands and reconnected over 250 river miles.

Where We Work

Out West



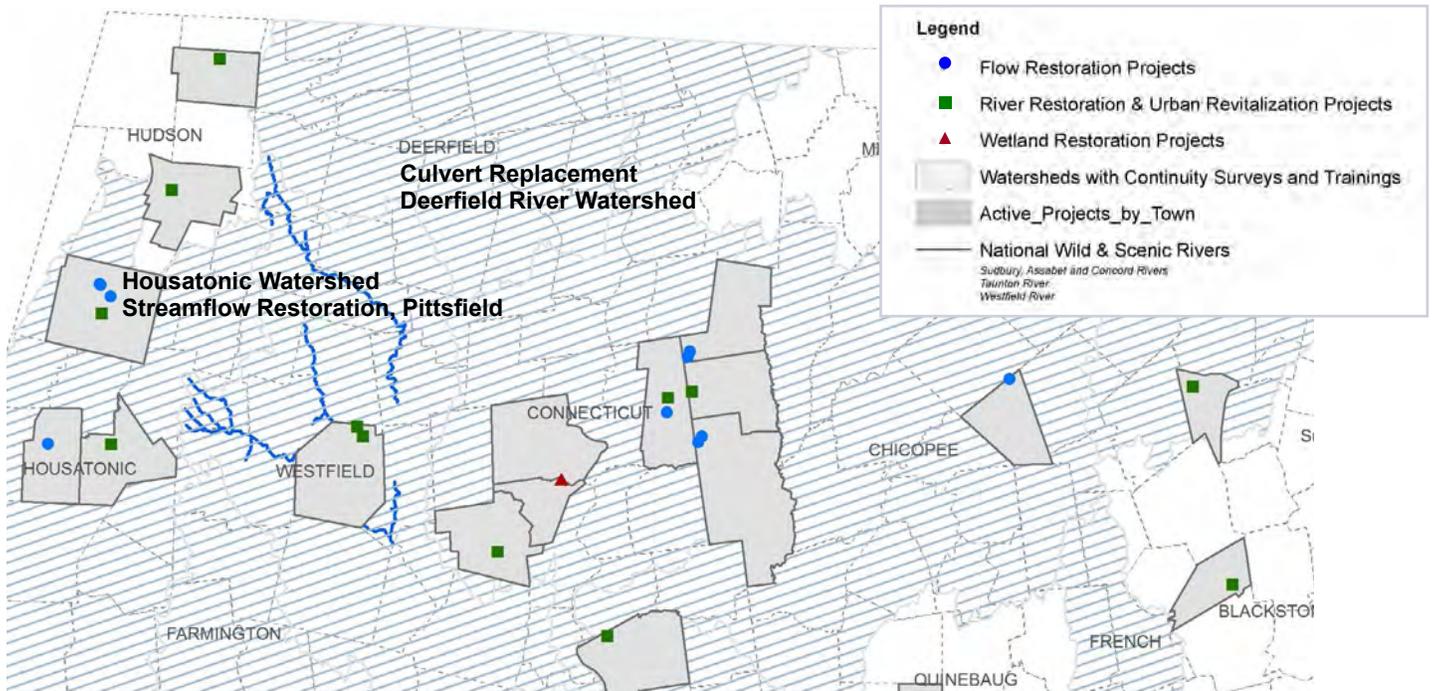
**Culvert Replacement
Deerfield River Watershed**

DER was awarded a \$179,620 grant from the National Fish and Wildlife Foundation. The grant will build municipal capacity to upgrade culverts and increase the pace of culvert replacement in the Deerfield River Watershed. The Deerfield River has an abundance of coldwater streams, which provide essential habitat for fish species, and in 2011 many towns were hard-hit in this region after Tropical Storm Irene. The grant, in conjunction with other DER funds, will immediately advance the design and/or construction of up to 6 culverts in the Deerfield River Watershed and, in time, will lead to many more replacements.



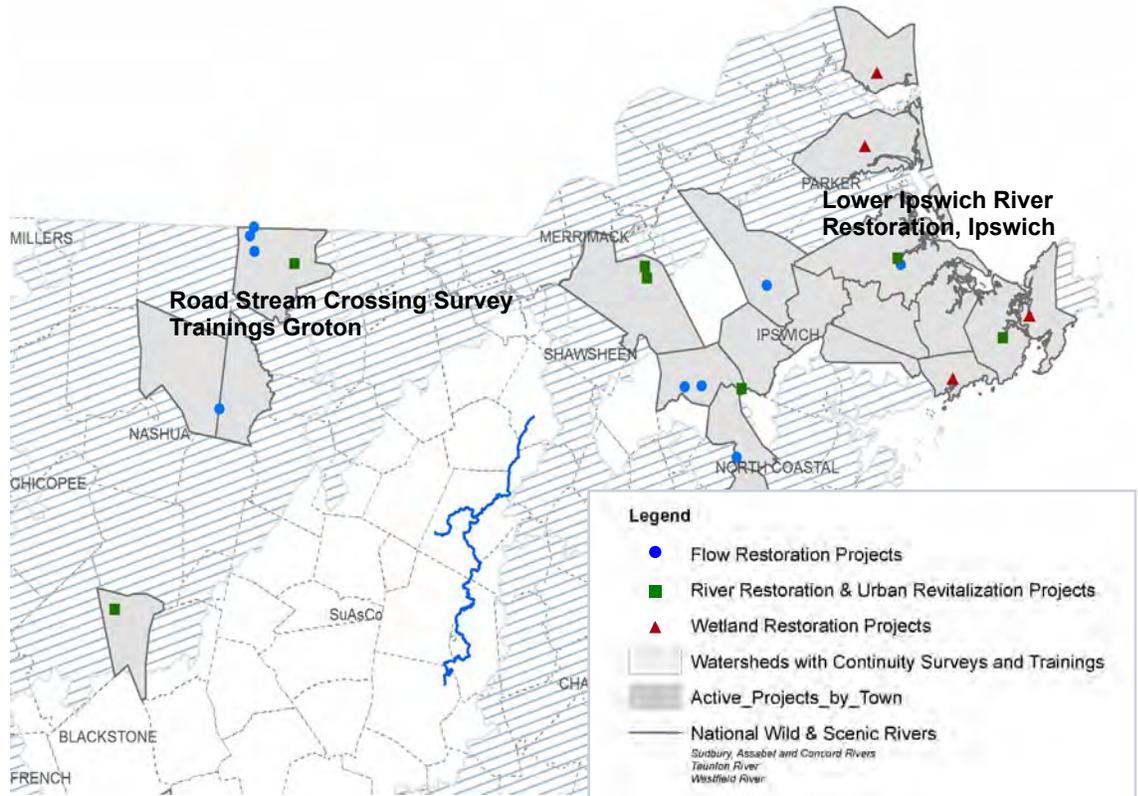
**Housatonic Watershed Streamflow Restoration
Pittsfield**

DER's Streamflow Restoration program continues to work with multiple partners in **Pittsfield** to improve streamflow below recreational dams. This past winter DER installed a telemetry station at the Onota Lake dam that measures water level and assists with lake management and downstream releases to Pecks Brook. This fall DER also funded a survey of macroinvertebrates in Pecks Brook, along with several other streams in the area, to better quantify changes in the aquatic community after modifications were made to upstream dam management.



Across the state more than 500 road-stream crossings were surveyed in 2016. Around 55% of crossings surveyed to date have been found to create moderate to severe barriers.

Up North



**Lower Ipswich River Restoration
Ipswich**

DER is working with the **Town of Ipswich**, the Ipswich River Watershed Association and many other partners to assess the feasibility of removing the Ipswich Mills Dam. The feasibility study is partially funded by the US Department of Interior/National Fish and Wildlife Foundation's Hurricane Sandy Coastal Resiliency grant program.



**Road-Stream Crossings Survey Trainings
Groton**

DER offered a Road-Stream Crossing Survey training in **Groton** to the Nashua River Watershed Association (NRWA). This training prepared the NRWA for their recent MET grant to survey culverts in the Squannacook River subwatershed and assess whether they are a barrier to natural stream continuity. DER offered 4 River Continuity Trainings with 34 trainees in 2016.

Where We Work

Down South



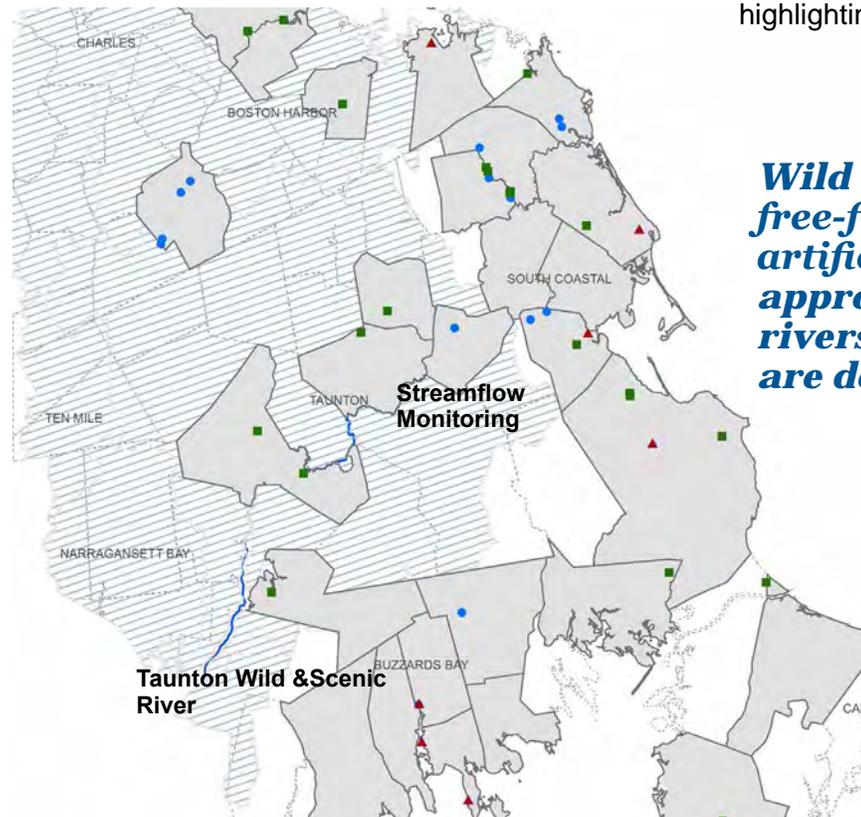
Streamflow Monitoring Multiple

DER's Streamflow Restoration Program works with partners to collect high quality streamflow data, to better understand the causes of unnatural streamflows, and to inform and support policy and actions that restore and maintain healthy flows. The program currently monitors 35 sites, including many in the southern part of the state such as First Herring Brook, Third Herring Brook, and the Jones River.



Wild & Scenic Rivers Taunton

The Taunton River was officially designated "Wild and Scenic" in 2009 and since that time the grassroots Taunton River Wild and Scenic Stewardship Council has supported multiple dam removals, trail development, water quality monitoring, historic preservation and public access projects. DER serves as the primary state contact for the committee. In 2016 the Council released the Taunton River Pathways guide to help people experience the river by highlighting walking, biking and paddling trips.



Wild & Scenic Rivers are free-flowing rivers without artificial obstructions. Of the approximately 8,229 miles of rivers in Massachusetts, 147 miles are designated Wild & Scenic.



Recent studies show that culverts that meet the MA Stream Crossing Standards are often less expensive than traditional culvert replacements when costs are accounted for over the life of the replacement.

On the Cape & Islands



**Coonamessett River Restoration
Falmouth**

DER is supporting the **Town of Falmouth** as it restores the Lower Coonamessett River. Working together, the two organizations secured \$1.3 million for the removal of two dams, restoration of the river channel and adjacent wetlands, and replacement of an undersized road crossing with a bridge. Construction begins in summer 2017.



**Culvert Assistance
West Tisbury**

DER provided guidance on the replacement of a failing culvert that caused a sink hole in the Black Brook Crossing Road. Commenting on DER's assistance, the **Town of West Tisbury** stated: "We couldn't have done it without your guidance and review of the project plans! In large part we owe the success of this project to you being available to the town." DER is building municipal capacity to replace undersized culverts with better designed structures that provide both ecological and public safety benefits.

Reducing Impacts of Drought & Improving Streamflow

For most of 2016 and continuing into 2017, drought conditions have covered much of Massachusetts. While precipitation has increased since last fall, the majority of the state is still in drought warning.



Above left and middle: Low, but within normal, flows observed at Fish Brook, a tributary to the Ipswich River that has minimal upstream water withdrawals on August 31. On the same day, record low and no flow conditions observed in Martins Brook, Ipswich River's largest tributary.

Water use in Massachusetts typically peaks in the summer when streamflow is at its lowest. High water use combined with low summertime streamflow places stress on our rivers and streams and the organisms that depend on them. Reducing water use through conservation, especially in the summer, is a key step to keeping water in our rivers and maintaining water supplies. This past spring and summer the Streamflow Restoration Program started to explore innovative and non-regulatory ways to reduce outdoor summer water use in an effort to improve streamflow.

Using a technique called Community Based Social Marketing (CBSM), DER worked with the Ipswich River Watershed Association (IRWA), the Towns of **Topsfield** and **Wenham**, and Action Research (a CBSM consulting firm) to better understand barriers to reducing residential water use during the summer. CBSM integrates marketing concepts with other approaches to better understand the audience and the barriers preventing behavior change. Once barriers are understood, targeted messages and solutions are

developed that can lead to real change.

DER began utilizing this approach to understand water use behaviors in the Ipswich River Watershed, an area that suffers from chronic flow stress. The first step of this project determined high-priority water conservation behaviors by exploring residents' current water use and the potential for adopting conservation actions. Four potential target behaviors were identified: stop watering lawns, fix leaks in irrigation, install weather based controllers on automatic irrigation, and fix pool leaks. DER and partners then evaluated the benefits and barriers to residential water users for each of these four behaviors. Benefits and barriers were determined through a mail survey of residents in **Topsfield** and **Wenham**.

The third step will be piloting and testing outreach recommendations that address priority barriers and benefits identified in step two. DER and partners are currently planning this approach with the goal of piloting some of the recommendations in the spring



Above: Ipswich River Watershed Association holds a breakfast in the Ipswich River in September (Photo by Ipswich River Watershed Association).

and summer of 2017. The conservation strategies will be focused on reducing and/or eliminating lawn watering and will address identified barriers, including the perception that grass will die if not watered and that reduced lawn watering would not save much water. Each of the strategies will be evaluated for effectiveness.

The current drought has highlighted the need for innovative and effective water conservation strategies. Aquatic organisms have been under tremendous stress due to low and no flow in many rivers across the state. Our hope is that this project will demonstrate new, effective tools that can help reduce summer water use and improve resiliency of water supplies and the health of our rivers.

Reducing water use through conservation, especially in the summer, is a key step to keeping water in our rivers and for maintaining water supplies.

Improving the Health & Resiliency of Rivers & Streams

Across the Commonwealth committed volunteers work with watershed groups to assess the health and quality of our local rivers. For many of the groups and their volunteers, water quality monitoring is a decades-long mission to identify issues and assets, and to inform the public about the status of their rivers while augmenting environmental agencies' work state-wide.

DER assists many of these groups with training, quality control, planning and data interpretation. In 2016 we focused on assisting the monitoring community with the long-standing challenge of making their data accessible and meaningful to the general public. When people understand and feel connected to their rivers, they are much more likely to work together to improve river health and enjoyment.

While many people are interested in the health of their local rivers, the data collected by watershed groups does not attract a huge audience. Over the years these groups have prepared numerous education and outreach reports filled with compelling findings and rock-solid data, but most have resulted in only modest consequence. This situation is not unique to water quality monitoring. Studies consistently show that facts alone are not enough to influence the general public.

Effective outreach and education should intentionally engage target audiences in ways that make people care enough to take meaningful actions that advance specific objectives. To promote fresh thinking and new outreach techniques, DER offered a workshop to introduce our partners to the proven outreach approach of Social Marketing. This approach mixes techniques from traditional commercial marketing and sociology to greatly increase the effectiveness of outreach campaigns.

DER convened thirty monitoring veterans for two days of immersion into the world of Social Marketing that works to establish an 'emotional connection', in contrast to the traditional fact-driven outreach approach. For a group dominated by scientists, being told data and analysis must take a backseat required a huge shift in perspective.

The two day workshop offered a bare bones introduction to this fascinating field and provided enough of a catalyst to encourage several attendees to return to their groups and start making some simple changes in web and print materials. DER hopes to be able to expand Social Marketing as a tool for river advocates in the coming year.



Top and bottom: Volunteers sampling macroinvertebrates.

Benefits Intersect at Road-Stream Crossings



Wherever roads cross streams, undersized culverts can disrupt natural stream processes and pose flooding and washout hazards for municipalities. Despite the recent addition of stream crossing standards to wetland regulations, many culvert replacements still do not fully meet improved design criteria. To better understand why, in 2015, DER conducted a needs assessment with Massachusetts municipal highway and public works directors to identify challenges to constructing better culverts.

Although lack of construction funding was the most commonly reported problem, towns also cited their need for help to better understand how to design improved culverts, navigate regulatory requirements, and complete projects successfully with limited staff capacity.

Responding to these findings in 2016, DER's Stream Continuity Program launched a training program to help municipal road managers learn how to complete culvert replacement projects that meet current design standards more efficiently and for less cost. Over 30 municipal Public Works and Highway Directors gathered for the first of these trainings focused on road-stream crossing assessment. Attendees learned how site-specific culvert and river information forms a critical foundation for successful culvert design and construction.

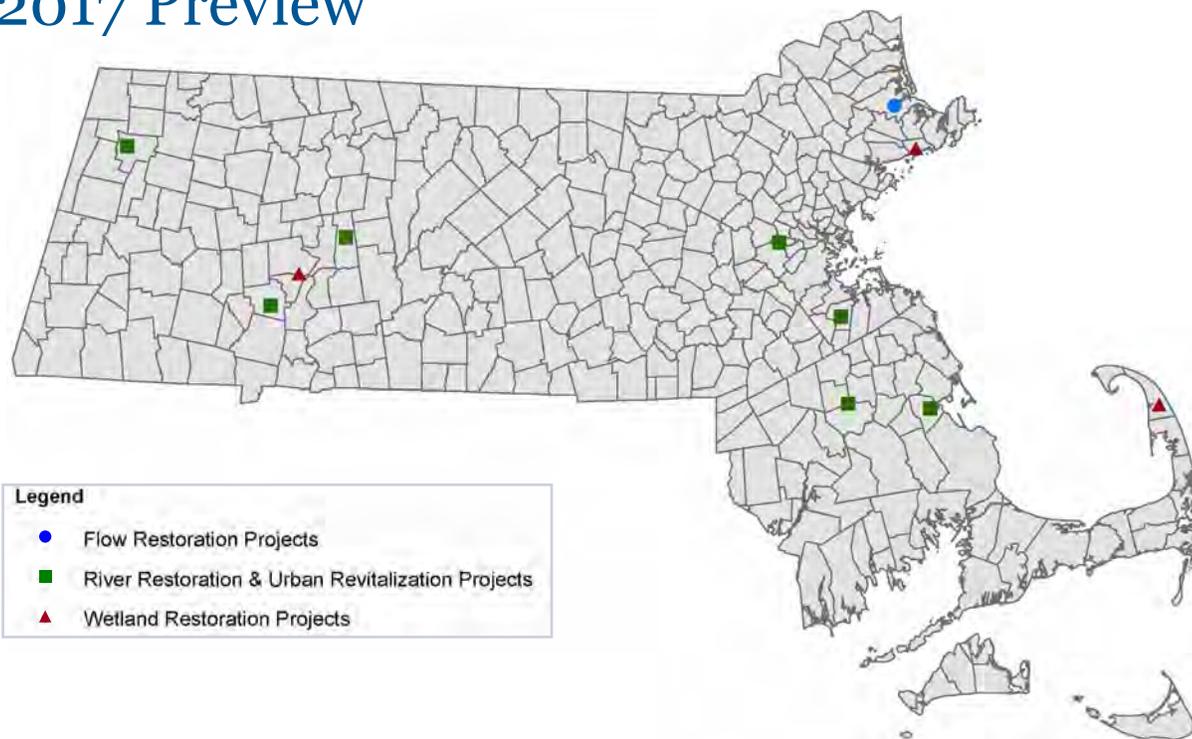


Subsequent DER trainings provided detailed guidance for municipal staff on how to build better culverts for their communities. Guidance included how to set up efficient contracts with engineering firms, how to select an appropriate replacement structure, and how to reduce construction costs. DER is building a toolkit of resources on our website so that all Massachusetts municipalities will have access to this information.

DER provides training and technical assistance to communities and organizations conducting Road-Stream crossings assessments. This year we found that given the prolonged drought conditions, many streams were dry and in some cases flow was blocked from the downstream channel due to poorly designed crossings. While trout would have been able to migrate downstream to find refuge near coldwater seeps until drought conditions improve, the journey back upstream will be more complicated. In times of stress poorly designed crossings can lead to protracted consequences for aquatic populations long after flow is restored.

Top: DER's Tim Chorey and Kristen Ferry offer technical advice on a culvert replacement. Bottom: DER's Carrie Banks trains volunteers to do road-stream crossing assessments.

2017 Preview



DER is excited to begin working on 11 new priority projects selected in late 2016, adding to our total roster of 62 projects:

Arcadia Sanctuary Floodplain Restoration, Easthampton

The site is located along the Mill River, a tributary to the Connecticut River. This project will restore biodiversity and floodplain wetland functions to a portion of the Arcadia Wildlife Sanctuary and will serve as a model for other floodplain restoration opportunities in the Connecticut River valley.

Ipswich River Flow Restoration, Ipswich Watershed Communities

The Ipswich River frequently experiences below normal flow conditions in the summer. This project will provide assistance to the Ipswich River Watershed Association by piloting innovative, non-regulatory water conservation strategies with the goal of reducing non-essential outdoor water use and improving streamflow.

Jones River Restoration, Kingston

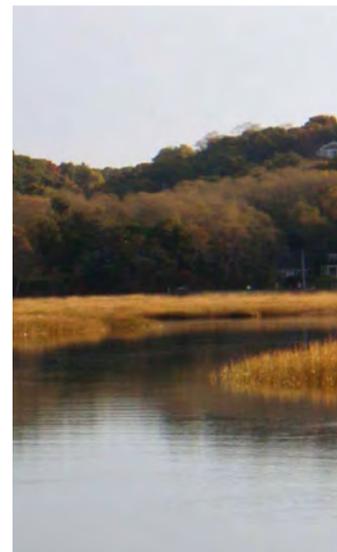
DER will support the Town of Kingston and the Jones River Watershed Association with removal of the Elm Street Dam, a Significant Hazard Dam located at the head of tide. Removal of the dam will restore connectivity to over 24 miles of river habitat.

Manhan River Restoration, Southampton

This project seeks to remove the Lyman Mill Dam to restore connectivity to 27 miles of river habitat on the Manhan River, a coldwater tributary to the Connecticut River. Much of the upstream watershed has been designated Core Habitat or Critical Natural Landscape by MassWildlife's Natural Heritage and Endangered Species Program.

Pamet River Restoration, Truro

The Pamet River watershed spans from Cape Cod Bay to the Atlantic Ocean. This project will build upon an ongoing study of tidal restrictions around the Route 6 - Pamet River crossing and other crossings and explore opportunities to restore tidal habitat connectivity along the river.



Charles River Restoration, Watertown*

Removal of the Watertown Dam would eliminate a Significant Hazard dam in a populous area and restore fish passage to miles of the Charles River. DER will assist the dam owner and other interested partners with evaluating the technical and social feasibility of removing the dam.

Fearing Brook Revitalization, Amherst*

Fearing Brook has been impacted for generations by realignment, straightening, stormwater inputs, and riparian encroachment. The brook has potential for improved habitat in some sections, including daylighting and stormwater improvements.

Fore River Restoration, Braintree*

This project will remove the Hollingsworth and Ames Pond dams and make associated channel improvements to restore fish passage in the Fore River system.

Kitchen Brook Restoration, Cheshire*

The Kitchen Brook Dam is listed as a Significant Hazard and is an impassable obstruction on the brook, which drains part of Mount Greylock's eastern slope. Removal of the dam will benefit wild brook trout and other coldwater species.

Sawmill Brook Restoration, Manchester-by-the-Sea*

DER will assist the Town of Manchester with studies to evaluate a number of infrastructure problems on Sawmill Brook to reduce flooding and improve habitat. This project will benefit resident and migratory fish species.

Town River Restoration, Bridgewater*

The High Street Dam is the first dam from the ocean on the Town River. Its removal would reconnect over 10 miles of riverine habitat upstream of the dam, and coupled with other ongoing efforts, could restore aquatic organism passage from Narragansett Bay to Lake Nippenicket in Bridgewater and Raynham.

**Provisional Status*



Left: Pamet River Restoration. Right: Jones River Restoration - Elm Street Dam Removal.



Commonwealth of Massachusetts

Division of Ecological Restoration

Invested in Nature and Community

Website: www.mass.gov/der

Twitter: [@MassEcoRestore](https://twitter.com/MassEcoRestore)

Flickr: http://www.flickr.com/photos/der_riverways/



Left: Before Rattlesnake Dam Removal in Fall River, MA. Right: After Removal

The Division of Ecological Restoration restores and protects the Commonwealth's rivers, wetlands, and watersheds for the benefit of people and the environment. DER works with many partners across a variety of aquatic systems – from freshwater to saltwater – to restore the ecological integrity of degraded habitats for the benefit of people and the environment.



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