Massachusetts Department of Fish and Game
Division of Ecological Restoration
Invested in Nature and Community

Ebb & Flow

George N. Peterson Jr., Commissioner
Tim Purinton, Director

November 2016
http://www.mass.gov/der

Welcome

Greetings, restoration friends and colleagues:

Our aquatic ecosystems are under an incredible amount of stress from the ongoing and persistent drought. This long period of drought will be remembered, like the blizzard of 1978 or the hurricanes of the late 1950s.

Despite the dire news, it gives me solace to know that there are people like you who work tirelessly to improve environmental conditions and restore our rivers and streams. So when the rains come and the waters rise, (and we know they will) our watersheds will recover and become more resilient.

Restoration is not a panacea for abnormal or unique conditions of stress, either from human impacts or natural disasters, but restoration has the ability to help our aquatic ecosystems recover more quickly or stave off the detrimental impacts of floods and droughts.

See you on the water.

Tim Purinton, Director

In this Issue

Streamflow and Drought
Michelle Craddock

Mattapoisett River Mattapoisett Sept 1 2016

Periods of low streamflow and drought are a natural occurrence and many aquatic organisms have evolved traits that enable them to survive. However, this summer's drought has highlighted how human activity and a changing environment have greatly impacted the ability of many aquatic organisms to survive under drought conditions.

DER's Streamflow Restoration program documents flow stress conditions around the state, due to water withdrawals near headwater streams and impervious surfaces that reduce the potential for rain to recharge aquifers. These data are used to inform and support policy and actions that restore and maintain healthy streamflows.

This summer and fall we observed many streams that were completely dry for months at a time and others that were just a series of disconnected pools. In these impacted streams, the baseflow (groundwater that feeds streams during periods when there is no precipitation) had disappeared as groundwater levels dropped below the streambed due to the impacts of water withdrawals, lack of precipitation and impervious surfaces. In other streams water levels behind dams dropped below spillways, resulting in no flow below the dam. The lack of water and flow in these streams directly impacts habitat quantity and quality which may have lasting impacts on aquatic organisms.

While many streams that we monitor were severely impacted by drought conditions, the reference streams that we monitor as part of a regional climate change monitoring network fared much better. These streams are located in relatively undeveloped and forested watersheds with healthy riparian corridors and proved more resilient to drought conditions. These streams were able to maintain baseflow and cool temperatures throughout the drought, illustrating how important these forests and riparian vegetation are to maintaining healthy streamflow. This natural infrastructure allowed the precipitation to slowly infiltrate and recharge groundwater aquifers, providing lasting benefits for instream habitat and water temperature. These streams flowed throughout the summer and fall while many other streams were dry.

Impacts of the drought are not limited to streams, as drinking water suppliers, fishing and recreational enthusiast as well as the agricultural industry all faced serious drought related impacts. One bright spot of the drought is the increased emphasis and interest in the importance of water conservation, especially during the summer. Many communities were able to greatly reduce water use through conservation practices, including increased education, watering restrictions and bans. These conservation efforts not only benefit water supplies but also streamflow.

For water conservation tips see: Mass.gov/eea/drought

How are the kids? Initial Monitoring Results for Eel River Headwaters Atlantic White Cedars

Alex Hackman

Eel River November 2015

Training Volunteers at Eel River November 2015

Around 2005, The Town of Plymouth had a vision: restore a globally rare Atlantic white cedar (AWC) swamp within a retired cranberry farm. Soil chemistry, groundwater levels, and the site history suggested it was possible. Years later, and with the assistance of DER and many others (U.S. Fish and Wildlife Service, The Nature Conservancy, USDA Natural Resource Conservation Service, and more), the vision was put into action. Approximately 20,000 young (2-3 year old) trees were planted as part of the Eel River Headwaters Restoration Project. The effort was the first of its kind in Massachusetts, and earned the Town of Plymouth and partners the Coastal America Partnership Award from the U.S. Department of Interior in 2011.

To determine the effectiveness of this ambitious AWC tree planting effort, DER and the Town organized a volunteer-based monitoring program. At three separate monitoring events (years 1, 2, and 5 following planting) dozens of volunteers collected data on tree size and condition. About 600 individual trees were measured at each sampling wave. Information was collected on overall vegetation coverage and moisture levels within 157 sampling plots for each year. The results were compiled, analyzed (thank you Dr. Keri-Nicole Dillman), and presented at the Atlantic white cedar symposium in Plymouth in March 2016.

So what did we learn? First, we wanted to understand overall tree survival and growth. At year 5, approximately 65% of trees within the sampling plots had survived. That's pretty good! We found substantial differences in survival within different areas of the project site. The southern and northern sections fared better than the central region. This could be related to soil moisture – and will be further assessed. In terms of growth, by year 5, the average tree height was 5 feet and the tallest tree observed was 12 feet. Most trees (73%) were bearing cones by year 2, and evidence of re-generation (seedlings!) was clearly observed in year 5.

The volunteer collected data also helped us answer broader questions including about the pace of site re-vegetation. During construction the site was turned to bare mud but one year after construction, 42% of plots had full ground coverage. By year 5, that increased to 92%. Activation of the native seed bank and natural plant regeneration thus seems successful, an important finding for future cranberry farm to wetland restoration projects.

The punchline: So far so good. The site is on a positive trajectory toward a healthy AWC swamp, perhaps 100 years from now. In terms of regional wetland restoration practice, these findings are helping to shape our planting approach at other wetland restoration sites in the region.

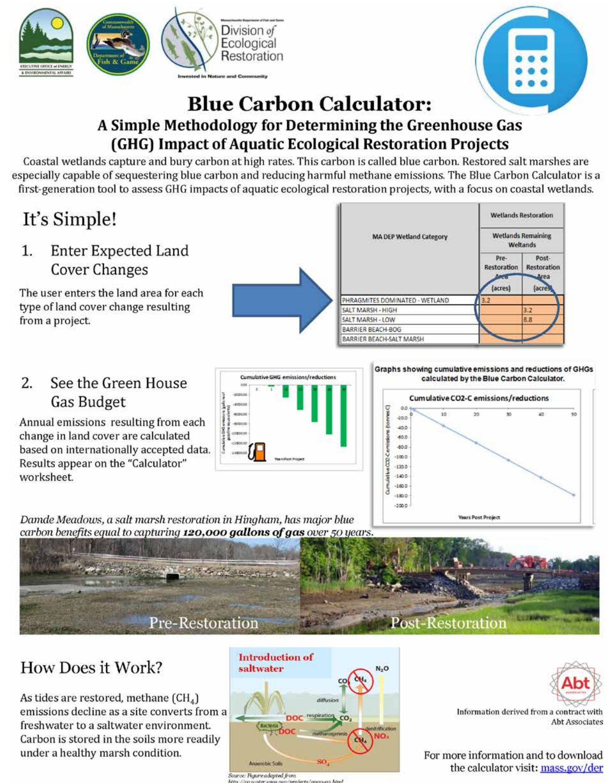
You may wonder about the title to this short article. For those of us who've spent a decade working on this project, these trees really do feel like our babies. Thanks to our partners and local volunteers who have helped us learn how "the kids" are doing.

The site is now public conservation land with a beautiful trail system maintained by the Town of Plymouth. All are invited to see this site (park here). Enjoy!

Interested in learning more? Additional information on the overall project can be found here and here.

Blue Carbon Calculator, a simple tool for estimating greenhouse gas emissions for aquatic ecosystem restoration projects

Tim Purinton and Nick Wildman



Coastal wetlands are loaded with "blue carbon". Blue carbon is the term for the carbon stored in the dense, organic soils of salt marshes and other coastal wetlands such as eel grass beds and mangrove forests. What we can see at the surface is only a fraction of this rich material, at a restoration site in the Great Marsh (Newbury,) the organic peat deposits are up to 5 feet thick.

In addition to storing tons of carbon, salt marshes (and all wetland types) naturally emit varying amounts of greenhouse gases (GHG): carbon dioxide, methane, and nitrous oxide. Because those gases each have a different longevity in the atmosphere and effect in our environment, the emission of greenhouse gases is often quantified and expressed in greenhouse gas equivalents.

With financial support from our parent agency, The Executive Office of Energy and Environmental Affairs (EEA), and in tandem with Abt Associates, we have developed a simple spreadsheet tool that can help us incorporate GHG considerations into the process of selecting and prioritizing aquatic ecosystem restoration projects. We call this new tool the Blue Carbon Calculator. Users simply plug in the anticipated changes in wetland cover types from a coastal, wetland, or riverine project and the Calculator estimates the associated change in GHG emissions.

Healthy wetlands are a critical part of our planet's ability to regulate carbon. The Blue Carbon Calculator can help us better understand this important ecosystem service of wetlands. Outputs from the calculator underscore the potentially huge reductions in methane emissions when we convert a freshwater wetland site back to a salt marsh with the reintroduction of salt water. On the flip side, creation of new freshwater wetlands, if converted from uplands, can result in an increase in methane production. The restoration of all types of wetlands is important for many reasons, not just GHG accounting. Some of the co-benefits include water filtration, flood storage, and habitat enhancement.

As we better understand the GHG implications of our land management decisions, new funding opportunities emerge. For example, efforts are underway to quantify the GHG emission reductions of coastal restoration projects and determine if there is a market to sell those GHG reduction credits as offsets to generate revenue for wetland restoration. The Blue Carbon Calculator has shown us that aquatic ecosystem restoration is both a climate mitigation and climate adaptation strategy.

Special thanks to EEA, Abt Associates, Steve Crooks and Waquoit Bay National Estuarine Reserve for their help with the development of the calculator. You can download the Blue Carbon Calculator at http://www.mass.gov/eea/agencies/dfg/der/about-us/blue-carbon-calculator.html

Damde Meadows, a salt marsh restoration in Hingham, has major blue carbon benefits equal to capturing 120,000 gallons of gas over 50 years.

Division of Ecological Restoration Project Updates

Mill River Tidegate vs. King Tide

Tidegates are structures that regulate the flow of tidal water into and out of tidal areas. Their primary purpose is to control the amount of tidal water that flows into the area of land that lies upstream, with the focus on preventing the flooding of roads, houses, and other infrastructure. Poorly designed or managed tidegates can also have a detrimental effect on the natural areas upstream that rely on the very same flow of tides. In particular, our coastal tidal wetlands are susceptible to the detrimental effects of the control of the flow of salt water, namely when that control restricts and reduces the natural flow of tides, leading to long-term damage to the ecology, health and functioning of these valuable wetlands.

In August 2011, DER worked with the City of Gloucester and numerous project partners to install a new, specially-designed tidegate at the entrance to the Mill River Estuary. The new tidegate allows all but the highest tides to enter the estuary. This allows for almost full tidal restoration while simultaneously protecting upstream infrastructure (buildings, roads, etc.) from tidal flooding. DER staff, City of Gloucester officials, and partners had the opportunity to observe the performance of the tidegate during a recent King Tide courtesy of this photograph provided by our partner at the NOAA Restoration Center.

King Tides (a non- scientific term) are the naturally occurring, exceptionally high tides generated when the Earth, sun and moon align during new and full moons. These tides are excellent test cases for what we might expect with sea level rise. The project partners were excited, but not surprised, to see that the tidegate performed as expected during these higher tidal events. While this event illustrates the effective existing functioning of this tidegate, it also highlights the importance of proper tide gate management, particularly given that these extreme tides may be more common in the future.

Left: Mill River Gloucester, Tide Gate. Right: Mill River Gloucester Tide Gate at King Tide Photo courtesy of Eric Hutchins, NOAA Restoration Center, October 18th, 2016 ~1:45PM

King Tide

The “king tide” describes the highest seasonal tides that occur naturally each year. The Massachusetts king tides initiative documents the effect that extreme tide events have on the state’s beaches, coastal waterways, private property, and public infrastructure. You can see more photos from King Tide event that occurred in October here: https://mycoast.org/ma/king-tides/photos

Town Brook Restoration Showing Great Results

Former Site of Off Billington Street dam impoundment

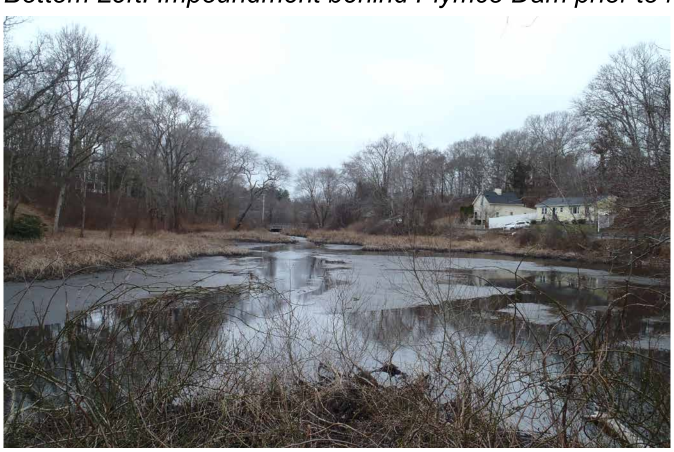
It has been nearly three years since the Off Billington Street Dam was removed from Town Brook in Plymouth. It was a long, cold winter reshaping the channel and removing tons of contaminated sediment. In spring of 2014, the former impoundment a dozen plant species sprang up. In the years since then, DER and partners have continued to monitor the evolution of the plant community and to hand-pull invasive purple loosestrife. Having just completed Year 3 of that monitoring, the change is striking. Gone are the annuals and common early successional weeds. The plant community is now dominated by native wetland species from the seed mix that was planted in 2014, as well as recruits from elsewhere in the stream corridor.

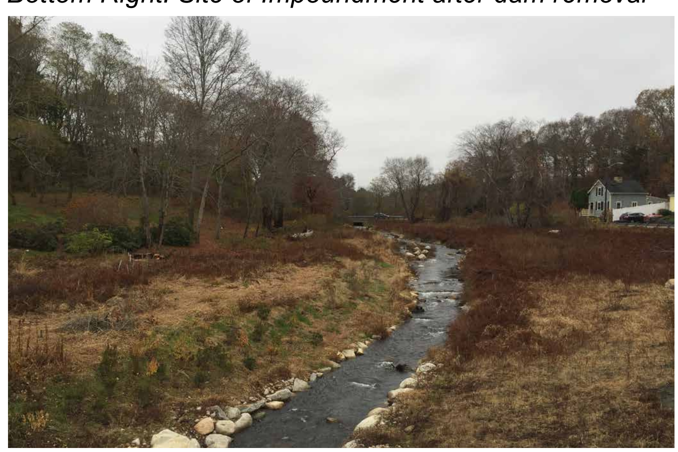
This pattern is also playing out just upstream, at the site of the former Plymco Dam. This dam was removed in winter of 2014-2015. As record snow blanketed much of Massachusetts, crews pushed forward restoring the channel and constructing a brand new bridge similar to the one that replaced the Off Billington Street Dam. Now, after the second growing season following dam removal, the project site is really coming into its own as a natural habitat. DER and partners will continue to monitor both sites for another two years to document the establishment and succession of the plant community.

The Town of Plymouth and DER are also working with NOAA Fisheries and US Fish and Wildlife Service to remove the Holmes Dam from Town Brook. With any luck, that should occur in 2017 or 2018. The Holmes Dam project will address the final fish passage barrier on Town Brook and remove a high hazard dam that is a liability to the Town.

Many know that the Billington Street Dam removal on Town Brook was one of the first in the Commonwealth in 2001. A new fish ladder at Jenney Grist Mill Dam and channel improvements at the mouth of the brook have helped restore this centerpiece of downtown Plymouth. The tradition continues as the Town and partners band together to achieve a number of common goals. As you can see, in this very historic town, Town Brook offers lessons from the past and inspiration for the future.

Top Left Plymco Dam prior to removal. Top Right After the Plymco Dam removal.
Bottom Left: Impoundment behind Plymco Dam prior to removal. Bottom Right: Site of Impoundment after dam removal





Assessment of Abbey Brook Complete (Springfield)

Top left: Abbey Brook 'headwaters' at the top of the ravine.

Abbey Brook is a small headwater stream on the western edge of Springfield that flows into the Chicopee River. The brook's source is buried, with the first glimpse of the brook visible when it flows from a pipe at the top of a steep ravine. The narrowness and steepness of the brook's valley precluded development resulting in 30 acres of open space and conservation land in the midst of a densely developed urban landscape. The Abbey Brook Conservation Area is now the focus of a vibrant partnership of local, city, academic, state and federal entities known as Sustainable Springfield.

Sustainable Springfield has several goals including education, community engagement and habitat restoration. DER's contribution to the restoration piece was recently completed when a report on the existing conditions and recommendations for a range of restoration measures was finalized and shared with the Sustainable Springfield partners.

The quick take away of the report is that stormwater can be a dominating influence in an urban waterway. The most arresting indicator of this at the Abbey Brook Conservation Area is the ubiquitous signs of instability and changing topography as embodied in the several 'newish' shopping carts so embedded in the river bank only a few inches of plastic handle is visible. The surrounding uplands shunts stormwater into the Abbey Brook ravine with the large stormwater outfalls, several feet in diameter, testament to the significant quantities of runoff flowing into the brook. Many of the outfalls were found to be in poor and even collapsed condition.

As anticipated in a landscape with a long history of change and manipulation, the assessment report identified the prevalence of invasive species throughout the site. Off road vehicle use was also documented with many images highlighting the negative impact just a few vehicles can cause. Rutted trails and mucky stream crossings caused degraded habitat and increased erosion.

Abbey Brook Conservation Area is not without some unique attributes. Despite the density of the urban area, there is an extensive network of trails and some thriving wetland resource areas. The surrounding residents can easily access the site and a community school has used the conservation area as an outdoor classroom. The students have already collected several seasons of water quality data.

The assessment report concluded with a comprehensive list of possible restoration activities, the anticipated ecological gain of each project if implemented, the challenges to implementation and the relative cost of completing the activity. This concise listing will provide Sustainable Springfield with solid decision and management tools as they move forward with their restoration, education and recreational objectives and prioritization for their Abbey Brook initiative.

Left: Example of the significant erosion and instability visible along the banks of Abbey Brook.
Right: Rutting and erosion caused by off road vehicles are visible throughout the area.

Removal of Rattlesnake Brook Dam (Freetown)

The removal of the obsolete Rattlesnake Brook Dam (a.k.a. Crystal Springs Dam) located in Freetown begin in late October.

Removal of this barrier will naturalize stream processes and open the brook to migration to trout from Assonet Bay for miles upstream to the coldwater habitat in the upper watershed.

Design and constructing funding has been received from the National Fish and Wildlife Foundation Hurricane Sandy Coastal Resiliency Competitive Grant Program, The Nature Conservancy, DER, and Massachusetts Dam and Seawall Repair and Removal Fund.

Above: Rattlesnake Brook Dam
Below: The removal of the Rattlesnake Dam in process.

Cotley River Restoration Finds a Path Forward (Taunton)

Barstowe's Pond Dam left spillway

It's not unusual that the smallest dams sometimes prove to be the biggest challenges for removal. As in the case of the Barstowe's Pond Dam in Taunton, the challenge comes from a railroad bridge about a quarter mile upstream of the dam. After engineering analysis of the dam removal hydraulics indicated a change at the bridge, DER and partners began the long process working with the railroad owner to find a solution that would protect the bridge and allow the dam removal to go forward. Finally, this summer, DER began working closely with engineers from the MA Department of Transportation to design a solution that will achieve both goals with an aim to remove the dam in late summer 2017.

Restoration Resources

Events

Cold Water, Cold Beer II – Trout in the Time of Drought

November 15th - 7:30 - 9:00 PM

Many rivers in Massachusetts are drying up due to drought conditions coupled with water withdrawal. Most fish - if they are not gone completely - are extremely stressed. This event will talk about what can be done to save critical water resources. Speakers include: MassWildlife's cold water biologist Adam Kautza as well as Wayne Castonguay, Executive Director of the Ipswich River Watershed Association and Julia Blatt, Executive Director of Mass Rivers Alliance. Location: Patagonia Boston, 346 Newbury Street in Boston.

Articles

Dam Removal: Case Studies on the Fiscal, Economic, Social, and Environmental Benefits of Dam Removal, Headwaters Economics

Recently released by Headwaters Economics this report looks at the economics of dam removal. The report summarizes dam removal economics research and includes case studies of two DER project - the Whittenton Dam Removal in Taunton and the Bartlett Dam in Lancaster.

Aging Dams and Clogged Rivers: An Infrastructure Plan for America's Waterways, Center for American Progress

This report covers the safety, environmental and economic problems of America's aging, abandoned, hazardous, and deficient dams.

Grants

Small Bridge Program, MassDot

The Small Bridge Program was signed into law on August 10, 2016 by Governor Charlie Baker. This 5 year, $50,000,000 program will provide reimbursable assistance to cities and towns of up to $500,000 per year to aid in the replacement and preservation of municipally owned bridges with spans between 10' and 20'. This is a need and merit based program that will seek to fund those applications that demonstrate a critical need (i.e. emergency closure, detrimental detour routes for first responders) or will substantially extend the life of an existing bridge. Applications will accepted three (3) times per year - Oct. 31st, Feb. 28th, and June 30th. For more information.

Landscape Partnership Grant Program, EEA

The Landscape Partnership Grant Program seeks to preserve large, unfragmented, high-value conservation landscapes including working forests and farms. The program offers competitive grants to municipalities, non-profit organizations, and EEA agencies acting cooperatively to permanently protect a minimum of 500 acres of land. Deadline: December 6, 2016, 3:00pm. To learn more and to apply, click here.

Drinking Water Supply Protection Grant Program, EEA

The Drinking Water Supply Protection Grant program provides financial assistance to public water systems and municipal water departments for the purchase of land or interests in land for the following purposes: 1) protection of existing DEP approved public drinking water supplies; and 2) protection of planned future public drinking water supplies. It is a reimbursement program. Deadline: December 6, 2016, 3:00pm. To learn more and to apply, click here.

Environmental License Plates

The Massachusetts Environmental Trust (MET) provides funding to many river, wetland and other water resources protection and restoration projects throughout the Commonwealth. A major source of MET's funding comes from the sale of environmental license plates. Getting an environmental plate is easy and can be done on-line by clicking here, or in person at your local Registry of Motor Vehicles office.

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