CRWA

Charles River Watershed Association

Building resiliency and protecting the Charles River

Annual Report | Fiscal Year 2016

Preparing for a changing climate

Responding to climate change requires a commitment to build resiliency to flooding and drought in our communities and to develop innovative strategies for water resource management.

From CRWA's Executive Director and Board President

People expect universities, government research organizations like the National Oceanic and Atmospheric Administration, or a combination of the two like the National Science Foundation to undertake the kind of work described in this Annual Report. Although CRWA does do, and will continue to do, the more grassroots kinds of things like educational outreach, or hosting New England's largest canoe and kayak races, or putting together one of the largest clean-up efforts in the nation each spring, what makes us unique is our research science and legal advocacy.

That work started back in 1994, initially to monitor the Charles and get a better understanding of the issues the river faced as a kind of polluted afterthought in a complex metropolitan environment.

Over the years and decades, as CRWA began to understand those issues, our research and legal work began to change. We started to model and test new approaches to the way we use water in all its forms in our cities and towns, and look for ways we could get human water use to better replicate the way water would have worked had we never built Boston.

This Annual Report does a good job introducing you to much of that work. From reimagined wastewater treatment that generates energy to urban landscapes that capture rainwater and reconnect it to the ground and groundwater, CRWA has created a vision of eastern Massachusetts that is vastly more resilient to climate change while reducing greenhouse gas emissions and creating neighborhoods that are at once more attractive to residents and more welcoming to nature. That our vision is also financially responsible and economically desirable is an added benefit.

Over time, as our vision is realized, one of the greatest benefits will be a fully restored Charles River. Swimming, fishing, the aesthetics of a living river system running through the heart of Boston, and the solace a closer relationship between nature and each of us will provide is within our grasp.

And CRWA is leading the way.

Robert L. Zimmerman, Jr.
Executive Director

Tom Sieniewicz
Board President

Responding to a changing climate

Climate change is happening and we are already experiencing its effects—warmer temperatures, intense precipitation, and more frequent summertime droughts. Globally, 2016 was the hottest year on record and in Boston, the hottest August ever measured. The summer of 2016 was also the driest ever recorded in the Boston area — just 3.92 inches of rain fell June-August. The Northeast has seen a 2˚F rise in temperature since 1895, and a sea level rise of about 1 foot. The changing climate threatens our communities, vital freshwater resources, and the Charles River's ecosystem. Droughts stress habitat, fisheries and wildlife, alter water quality, curtail recreation, and deplete our drinking water supplies. Floods damage property and infrastructure. Increased precipitation increases stormwater pollution, washing nutrients, debris, sand, oil and metals into the Charles River. Nutrient pollution, primarily phosphorus, acts as a super fertilizer feeding the growth of invasive plants and causing dangerous cyanobacteria, or blue-green algae, outbreaks. These outbreaks, which are increasing in extent and duration, impact the environment and pose public health risks.

Preparing our communities for climate change has never been more important. It requires new land use planning, restoring floodplains and adoption of green infrastructure approaches. It requires a change to how we think about and value our freshwater resources, and strategies to protect and restore them. CRWA is researching, designing, building and monitoring green infrastructure systems that replicate natural hydrology. Our projects soak up the rain to recharge aquifers, provide flow to rivers and streams, prevent water pollution, and reduce flooding.

As the climate changes, CRWA is helping the watershed, its aquatic ecosystem, and communities become more resilient.

Collecting data to diagnose the river's problems

With your help, CRWA scientists and our strong team of dedicated volunteers have collected one of the most robust water quality data sets on any river in the nation.

CRWA intern Alexandra Flowers collects water samples on the Charles

Understanding the big picture through monthly sampling

CRWA's comprehensive water quality measurements—a data set that extends more than 20 years—allows our scientists to assess the health of the Charles River over time and across regions.

The data we have collected indicates that water temperatures in the river are rising, particularly in the lower basin. In the past 4 years twice as many water samples were measured above 83° F than in the preceding 16 years. When the river rises above this temperature, it cannot hold the dissolved oxygen necessary for fish and other aquatic organisms to survive. Warmer water also encourages the growth of toxic cyanobacteria blooms.

Zooming in closer with biological monitoring

In 2016 as part of a project begun in 2014, CRWA scientists and 23 trained citizen scientists collected and identified benthic macroinvertebrate organisms—aquatic insects and other bottom-dwelling river organisms—at 17 sites along the river and its tributaries. Counting and ranking these organisms based on the amount of pollution they are able to tolerate helped CRWA further assess river health.

Volunteers also assessed the riverine habitats at each site. The impacts of the drought that began in 2015 and deepened in 2016 were evident with dry stream beds and extremely low streamflows. The observations and organisms collected during the drought will further our understanding of the impacts on aquatic organisms and water quality.

Empowering the public to make informed choices

CRWA's water quality notification program uses a sophisticated forecasting model based on real time weather and flow data to inform the public when the Charles River is less safe for boating. Our forecasts, accessible in real time on CRWA's website, provide information to help people make informed decisions about water-based recreation. Boaters also have access to hourly data, including water temperature and wind speed, collected at CRWA's Charles River weather station in the Lower Basin.

Climate change is bringing an increase in precipitation and heavy storms to the Northeast. Heavy storms wash polluted runoff to the Charles River. Coliform bacteria concentrations in the river generally spike following wet weather, as sewage enters the river via combined sewer overflows, municipal storm drains and overland flows.

Phosphorous, a nutrient discharged into the Charles River in stormwater runoff, is currently double the level that the river can safely assimilate. It contributes to toxic cyanobacteria outbreaks that are harmful to humans and wildlife. Exposure to these toxins may cause skin irritation, allergic responses, headaches or abdominal pain. CRWA works with state and federal agencies to monitor cyanobacteria outbreaks and to inform the public when they occur. This summer, CRWA continued working with the U.S. Environmental Protection Agency (EPA) to develop and test cyanobacteria monitoring protocols to provide comprehensive monitoring and reporting of cyanobacteria outbreaks.

CRWA's data-driven understanding of the Charles River allows us to develop strategies that approach challenges holistically. The results of this approach are seen in successful Blue Cities demonstration projects and effective advocacy.

Your support matters! Contributions from people like you give CRWA the independence to research, advocate and innovate to protect the Charles River and our communities. Give today at www.charlesriver.org/give

Imitating nature to protect our cities

CRWA's Blue Cities Initiative ® and Smart Sewering projects seek to mimic the natural water cycle in cities and towns, reducing pollution and increasing resiliency to climate change.

Helping communities go green

At the core of CRWA's Blue Cities® approach is reducing pollution through green infrastructure that uses soil and plants to capture, treat and infiltrate stormwater back into the ground to increase groundwater levels. About 70% of phosphorous pollution in the Lower Charles River comes from stormwater runoff. This pollution feeds plants and algae, harming the ecosystem and accelerating the eutrophication or "death" of the river. To slow this process, municipalities and private landowners need to reduce their phosphorus-laden runnoff to the river. This can be achieved with green infrastructure which has the added benefits of reducing heat island effects. CRWA provides training and technical support to municipalities seeking to incorporate green infrastructure low impact development approaches into their projects.

CRWA partnered with the Boston Planning & Development Agency (BPDA) to study how neighborhoods in North Allston can use green infrastructure to reduce nutrient pollution. CRWA studied existing conditions in these neighborhoods and developed green infrastructure strategies that could be used at specific sites. This work demonstrated that these strategies are feasible for treating runoff in a dense urban area. As a result of our work, Boston Water and Sewer Commission and the City of Boston are investigating implementing similar strategies.

In Watertown, CRWA is collaborating with the town on green infrastructure improvements to Edenfield Avenue to reduce stormwater runoff while beautifying the neighborhood and improving pedestrian and driving experiences. With input from residents, CRWA created designs to transform this residential street into a "green street" using multiple green infrastructure installations. The project will be built in spring 2017.

Recycling waste into energy

CRWA's research on the next generation of infrastructure demonstrates that we can manage wastewater locally in even the densest urban settings while conserving water, generating renewable energy and restoring nature. Relying on proven technology, CRWA's approach uses wastewater and food waste to fuel Community Water and Energy Resource Centers (CWERCs) to treat water while producing thermal and electric energy. Some of the treated water from the CWERC will be recycled to recreate wetlands and streams or to replenish local groundwater. This will help restore the natural environment.

This year, CRWA modeled the expansion of a distributed sewer system that would use CWERCs to treat wastewater in 43 communities. We demonstrated that a distributed network of CWERCs could replace existing centralized systems while remaining cost effective.

In Depth: Green Schools

Project: Green Infrastructure at five Boston Public Schools
Project Team: Boston Water and Sewer Commission (BWSC), Boston Public Schools (BPS), Horsley Witten Group, Offshoots, Kristin Metz
Locations: Five Boston Public Schools in Allston, Mission Hill, Roslindale and Roxbury (2)

New bioswale treats stormwater at the Irving

This project is using green infrastructure (GI) to capture and filter stormwater runoff at five Boston Public Schools. CRWA participated in design workshops at each school to gather student and teacher input on the designs. In July 2016, construction began at the Washington Irving Middle School (Irving) in the Roslindale neighborhood of Boston. GI features at the Irving include bioswales, porous playing fields and an outdoor "stormwater" classroom. Construction at the other schools is slated for summer of 2017. These projects will reduce water pollution entering the Charles River and will serve as models for stormwater retrofits at other Boston Public Schools.

The GI for the schools is designed to be highly visible and will help students explore how water flows through the school grounds. CRWA is also collaborating with Kristin Metz and BWSC on a stormwater curriculum for grades 5 and 7 that uses GI as a teaching tool. We plan to begin piloting the curriculum in fall of 2017 to help students learn about the importance and advantages of GI in preventing pollution and adapting to climate change.

Together we advocate for a resilient future

CRWA roots its advocacy in scientific understanding of the challenges to the river, the environment and our communities in a changing climate.

The Charles River at the Natick Dam was noticeably low this summer

Responding to extreme drought

This year much of Massachusetts suffered from extreme drought. The river and its tributaries experienced record low flows this summer and some water supplies and reservoirs were at risk. CRWA teamed with the Massachusetts Rivers Alliance to advocate for coordinated drought response actions by the state, and for effective water conservation messaging and public education. CRWA succeeded in raising both the state and the public's drought awareness and the importance of water conservation measures, particularly curtailing nonessential outdoor water use, by generating media coverage, calling on public officials to take a leadership role, participating in Drought Management Task Force meetings, and distributing conservation tips.

As the drought deepened, outdoor watering restrictions varied widely from town to town: some imposed total bans while others had no restrictions, or only "voluntary" restrictions. It quickly became clear that the state's 2013 Drought Management Plan failed to prevent water shortages and protect our streams and wildlife. The drought hit farmers particularly hard. The state now recognizes the inadequacies in the current drought plan and is working to improve it. This is essential because more frequent summertime droughts are predicted with climate change. CRWA continues to push for a more effective revised drought plan and for legislation to fill gaps in its successful implementation.

Advocating for sustainable use of water resources

In late 2014, MassDEP's Water Management Act (WMA) regulations, which govern large water withdrawals, were revised to require permit conditions that reduce use, minimize existing withdrawal impacts and offset impacts of increased withdrawals. However, MassDEP issued only 11 permits in 2016 under the new regulations. Over 110 water permits have been "administratively continued" by MassDEP, delaying implementation of the new regulations. CRWA reviews all draft WMA permits to ensure that the new regulations be fully and fairly implemented to safeguard Massachusetts' freshwater resources. We provided legal and advocacy support to other watershed groups grappling with new WMA permits and raised with MassDEP certain permit conditions that did not comport with the new regulatory requirements.

Concerned about the environmental impacts of the proposed 200-megawatt Exelon power plant in Medway, CRWA intervened in hearings before the MA Energy Facilities Siting Board. CRWA's General Counsel examined Exelon's witnesses about the impacts of the plant's water withdrawals on the river and its tributaries and opportunities for mitigating these impacts. CRWA also presented expert testimony to support both the plant's impacts and the necessary mitigation. Although Exelon does not have an agreement with Millis to sell water to the plant, the Siting Board approved the plant in November with some—but not enough—environmental protections.

Protecting the Charles River in court

When advocacy tools are not enough to protect the Charles, CRWA turns to the courts. In 2016, Conservation Law Foundation (CLF) and CRWA filed suit against U.S. EPA challenging the agency's failure to require improved stormwater management by owners of industrial, commercial, institutional and high density residential properties with large impervious surfaces in the Charles River Watershed. These currently unregulated land uses contribute bacteria, other pathogens, and almost 50% of the phosphorus pollution discharged to the river through stormwater runoff. The owners of these properties should contribute their fair share to cleaning up the river.

CRWA also joined CLF as plaintiffs in a petition to the First Circuit Court of Appeals for review of the municipal stormwater general permit for Massachusetts issued by EPA in 2016 on the grounds that it is not protective enough. Both cases are ongoing.

Expanding our reach to multiply our impact

CRWA shares what we have learned from our work on the Charles to encourage the use of good water management techniques in projects throughout the watershed and beyond.

Changing how water works in cities

To further CRWA's mission to restore and protect the Charles River and its watershed lands, we educate residents, businesses, students, municipalities and environmental regulators by providing the information and tools necessary to protect the river. CRWA's workshops, internships and school programs are educating current and future planners, developers and engineers. Our programs help people adopt new perspectives and approaches to water issues and encourage the use of green infrastructure and mitigation measures to protect the natural water environment.

Our internship program exposes college and graduate students studying environmental science, urban planning and related fields to CRWA's science-based approach to water resources management. Interns gain experience designing demonstration projects, collecting and analyzing data and working with volunteers. Their work and ideas enrich our work and expand our outreach. A big thank you to this year's interns: Vladimir Balan, Grant Balkema, Maxime Dulieu, Allie Flowers, Miriam Jost, Stephen Lea, Paige McNamara, Bethany Perkins, Jaya Rawla, Allie Rowe, Apratim Sahay, Jake Sahl, Melanie Snow, Richie Treanor, and Grace Tucker.

A healthy river supports healthy communities, healthy families and a healthy economy—and a sustainable environment for the future! – Laurie Burt, member

Instilling ecological curiosity in kids and adults

CRWA reaches younger students through classroom visits and interactive activities that teach students how their actions affect the Charles River and what they can do to protect it.

Recently, CRWA collaborated with the Museum of Science on its new Yawkey Gallery on the Charles River, which opened in 2016. Hands-on activities connecting science, engineering, and the health of the river allow visitors to explore many of the issues that CRWA works on every day, including flood control, water quality and wildlife habitat. The permanent exhibit features a live-stream of Charles River water quality data collected by EPA's buoy in the Lower Basin. CRWA shared our knowledge about river ecosystems, water quality monitoring and green infrastructure with the museum.

The people we reach through our outreach programs, from young children to residents to seasoned professionals will help our water focused approach to creating resilient communities become mainstream.

In Depth: Stopping Pollution

Project: Soak it up Franklin
Partners: Franklin Department of Public Works, US EPA
Location: Franklin, MA

In 2016 we trained residents on how to build rain gardens at their homes to soak up the rain near where it falls while filtering out pollutants. CRWA and the Town of Franklin also hosted a tour of town rain gardens to build support for using this type of green infrastructure to reduce pollution while beautifying neighborhoods, schools and roads.

Franklin residents build a rain garden

Project: Municipal green infrastructure workshops
Partners: Foundation for MetroWest, Mass Audubon
Locations: Charles River Watershed

To help cities and towns reduce stormwater pollution and comply with EPA's new municipal stormwater permit, CRWA held workshops in Natick and Millis for municipal employees. Attended by representatives from nearly every watershed town, the training symposiums provided information on the new permit that is unique to Charles River communities, showcased green infrastructure practices that decrease polluted runoff, and discussed different funding and implementation strategies.

Your support matters

Thank you! For all you do for CRWA as a member, donor, volunteer, citizen scientist or activist.

Run of the Charles participants race to the finish line

Relying on terrific volunteers

Over 3,500 volunteers, including paddling enthusiasts, corporate volunteers and young people participated in CRWA's programs last year. Volunteers greeted paddlers at Run of the Charles, pulled invasive water chestnuts in Waltham and Newton and picked up trash along the river. Nearly 100 dedicated volunteers deepened their engagement with the Charles River as citizen scientist volunteers for CRWA's field science programs collecting water samples and benthic macroinvertebrates.

Our volunteers are essential to achieving our mission and help us expand the reach of our staff. A huge thank you to all our 2016 volunteers, listed at www.charlesriver.org/volunteerlist

Grateful for your support

CRWA is honored by the generosity of the people, businesses and foundations that support our work. Every dollar matters and your support allows us to continue the important work of building resilient cities, adapting to climate change and restoring the Charles River. Thank you! A list of our generous donors is available by request.

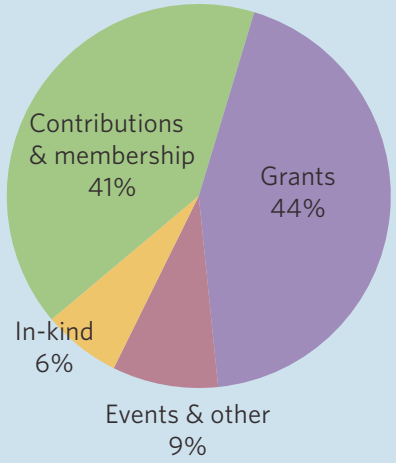
"My favorite thing at the Charles River is the playground... I like to look at the water and my favorite thing is in the spring when the trees and flowers are so beautiful!" -
Jasmine, Charles River Cleanup youth volunteer

Thank you, Landmark School

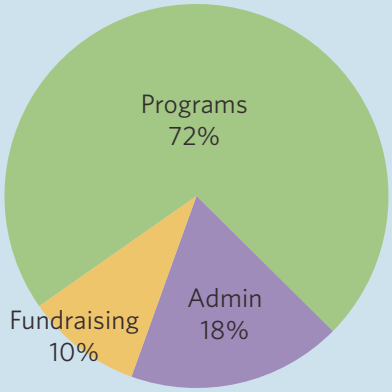
An eighth grader at Landmark School in Manchester, MA last year raised $388.05 from fellow classmates for CRWA. Students donated $2 each to participate in a "dress down day" the student hosted. Thank you Landmark students for supporting our work for a cleaner Charles River!

FY16 Financial Summary

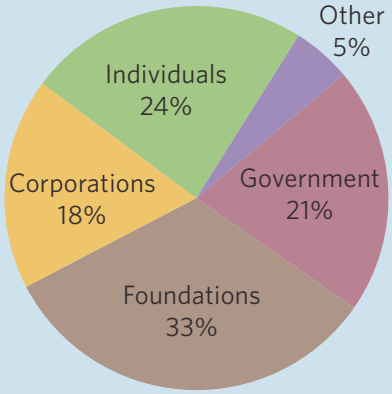
REVENUE AND SUPPORT



EXPENSES



FUNDING SOURCES



CRWA's 2016 audited financials will be made available at www.charlesriver.org/annual-report

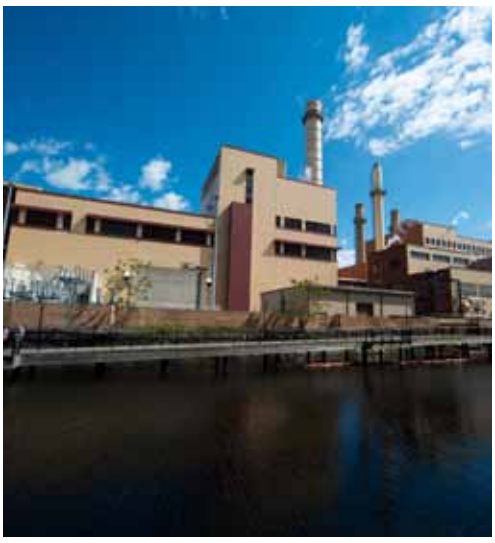
2016 Charles River Highlights

River recreation improved
Prompted in part by CRWA's advocacy and research, DCR removed the dangerous sandbar that had formed in the river in Brighton. With help from 524 volunteers and DCR mechanical harvesting, 24 acres of invasive water chestnuts were cleared from the river in Newton and Waltham.

70 river sites monitored
Staff, interns and volunteers monitored Charles River and tributary water quality year-round collecting samples at 70 sites. Volunteers collected over 4,909 macroinvertebrate organisms to further assess river conditions.

25 tons of trash removed
During the Annual Earth Day Charles River Cleanup, 3,100 volunteers removed 25 tons of trash from sites throughout the watershed, achieving recognition from American Rivers for the "most volunteers mobilized" at a river cleanup.

Fenway area protected from flood
The Muddy River Restoration Project, which CRWA has been deeply involved in for many years, improves flood control and habitat while adding green space to the neighborhood. Sampling by CRWA demonstrates the need for dredging of sediments in the upper Muddy River.



Blue Cities expanded
CRWA facilitated the development of green infrastructure designs for 5 neighborhoods, 5 schools and 2 green streets. To help guide these projects, CRWA and project partners organized 6 presentations and workshops to gather input from the community for each project.

Heat pollution reduced
The Kendall Power Plant in Cambridge now recycles its waste heat into "green steam" eliminating the discharge of this thermal pollution to the Charles River. This win-win follows years of negotiations and a challenge by CRWA and CLF to the plant's discharge permit.

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