Mystic River Watershed Initiative Science Forum
Thursday April 9, 2015 | 8:30 – 1:00 pm
5 Post Office Square | Boston, MA 02109 | Court Room 6
Meeting Summary
Prepared by the Consensus Building Institute

Please refer to MyRWA's website for details of the presentations. All meeting documents and presentations for the Mystic River Watershed Initiative Science Forum will be located here:

http://mysticriver.org/epa-steering-committee/

WELCOME AND INTRODUCTION

Curt Spalding, EPA Region 1 Administrator, opened the Mystic River Initiative Science Forum. He emphasized his excitement for visioning the future potential to continue restoring the quality of the Mystic River Watershed. Noting the diverse group present at the forum, he commented that their willingness to collaborate will strengthen restoration efforts. He highlighted the need to implement a multi-year systematic approach to address several issues, including stormwater, bacteria, and nutrients, and the impacts of climate change on existing conditions. In conclusion, he commented that EPA's efforts in the region have accomplished objectives once thought impossible in such a human-dominated watershed and pointed to the potential of advanced nutrient modeling and dynamic learning feedback loops to further strengthen EPA's efforts to improve the quality of life.

Representative Denise Provost, Somerville, noted her long history working to improve the quality of the Mystic River Watershed. She filed bill H.785, which passed as bill H.4302 in Fall 2014, establishing the Mystic River Water Quality Commission. The Commission is composed of a range of key stakeholders who are charged with developing priority recommendations for the legislature to improve water quality to enable safe boating and swimming and address other environmental issues, such as invasive species, flooding, and eutrophication.

Tom Faber, EPA Region 1 Laboratory; Dr. Patrick Herron, Mystic River Watershed Association (MyRWA) Deputy Director; and Carri Hulet, facilitator with the Consensus Building Institute, introduced themselves. Ms. Hulet led the group in introductions and reviewed the day's agenda, explaining that the forum would begin with presentations followed by a whole group discussion about next steps for the watershed, particularly in regards to opportunities for improved monitoring and collaboration.

Conditions in Alewife Brook, Mystic River Mouth, and Update on Basin Overenrichment

Kelly Coughlin and David Taylor, Massachusetts Water Resource Authority, presented on combined sewer overflow events (CSOs) and basin enrichment in the Alewife Brook and Mystic River mouth. Ms. Coughlin explained that the long-term CSO control plan, facilitated by separating stormwater from the sewer system, will be completed by December 2015, leading to an 85% CSO reduction and decreased annual CSO activation. She also reviewed bacterial monitoring programs. The bacterial monitoring program began in 1989, expanding to 45 monitoring locations. The Alewife Brook has the poorest water quality in terms of bacterial indictors, although the conditions are improving significantly and the impacts are fairly localized. She emphasized the importance of tracking multiple bacterial indicators and mentioned the release of the final CSO annual report in 2015.

Mr. Taylor provided a background on basin overenrichment. Phosphorous is a major cause of overenrichment with dams trapping phosphorous upstream and reducing system flushing. Phosphorous entering the system through runoff, stormwater, and pipe outfalls leads to algal growth, hypoxia, and organic enrichment of the watershed. Phosphorous conditions are improving in the summer, possibly due to the spread of macrophytes and increased system flushing. It may be infeasible for the watershed to reach the nutrient level reference conditions of non-urbanized watersheds. Dissolved oxygen levels above the dams remain static.

In response to audience questions, Ms. Coughlin and Mr. Taylor explained that bacterial concentrations are higher in the Alewife Brook than the main stream because high bacterial concentrations are localized. Phosphorous and nitrogen levels are higher in the Mystic system than other systems in the region largely due to the human density around the watershed, rainstorm runoff from lawns and pipes, and limited flushing of the river. They also noted the challenge of attracting ecologists to study urban systems. In addition, the MWRA is beginning an assessment period in the watershed, and the evaluations will include discussions with stakeholders about how to appropriately address issues, including formaldehyde concerns. Audience members also noted the presence of residual nitrogen in the system from nitric acid production during the First World War.

Modeling Storm Event Phosphorus in Alewife Brook with Respect to Climate Change.

Kate Munson, Tufts University graduate student, overviewed modeling to project the effect of climate change on phosphorous levels in the Alewife Brook. She provided a background on the causes and adverse effects of phosphorous in the watershed, noting that phosphorous is mobilized during dynamic events, such as storms. She sampled total unfiltered phosphorous concentrations during storm events at a location 600 meters downstream of the Broadway Bridge by Dilboy Stadium and then adjusted the collected data for projected future climate conditions. She found that several factors, including dry days before a storm, season, storm flow rates, CSO flows, temperature, and pre-storm phosphorous conditions, predict phosphorous concentrations during storms. Based off of phosphorous sensitivity to these causal variables and future climate conditions, the

model predicts a 10% increase in phosphorous concentrations in the watershed during future storm events.

In response to audience questions, Ms. Munson elaborated that phosphorous could become more easily re-suspended in the watershed from sediment during future storms as the river becomes shallower, further increasing phosphorous levels. Higher temperatures also increase phosphorous mobilization rates. In addition, restoring the Alewife Brook to a more natural, less channelized condition could potentially decrease phosphorous levels by allowing the water to flood over a larger area, promoting biological phosphorous digestion. The model draws from both baseline data collected by volunteers as well as stormwater sampling data collected by Ms. Munson. The model produces an equation to project phosphorous loads at a particular sampling point; model equations for other sites within the watershed would require a site-by-site sampling effort.

State of the Mystic in 2014: Current conditions, Trends and New Insights

Andy Hrycyna, MyRWA, watershed scientist, and Dr. Herron presented on the current state of the Mystic watershed. Mr. Hrycyna emphasized the importance of dissolved oxygen (DO) levels, as an indicator of system health and influence on plant and animal wellbeing. DO enters the system through atmospheric interactions and photosynthesis and is consumed during respiration and decomposition. DO levels in the Mystic Watershed have remained constant over the past ten years and are normally above the 5 parts per liter state standard. But levels vary greatly across sites due to the quantity of organic materials in the sediments, CSO events, low turbulence, and shading that reduces photosynthesis levels. The lowest levels are found at sites near wetland outflows and in the Alewife Brook.

Attendees added that, while rain water could increase DO levels during storms, storms could also lead to displacement of low DO water from nearby wetlands into the river, consequently lowering in-stream DO. Organic loads from CSOs during storms could also contribute to low DO areas. Mr. Hrycyna also noted that there is likely no backflow into the Alewife Brook during storm events.

Dr. Herron described multiple trends in the watershed that paint a broad view of the watershed's health. He emphasized that, as an urbanized system, it will take time to observe system response, but positive change is already occurring. He explained that bacterial concentrations are decreasing and, despite public misconceptions, it is safe to boat in the watershed over 90% of the time. He displayed a map of phosphorous concentrations, the limiting nutrient in freshwater aquatic systems. None of the systems in the watershed have achieved the EPA's phosphorous standards. In addition, from 2001 to 2014, invasive water chestnut has spread from 1 to 35-40 acres within the watershed. MyRWA began a harvesting program in 2010 and is partnering with other stakeholders, including DCR, to promote mechanical harvesting. While water chestnut can absorb phosphorous, it simply moves the phosphorous to the sediment if the plants are not

removed from the system. MyRWA composts the harvested water chestnut at a farm, and DCR composts it near the Franklin Zoo. River herring populations are also increasing with an estimated 239,000 herring entering the Mystic Watershed in 2013. Finally, the Mystic Watershed is one of six water bodies in the state with impaired chloride levels.

In response to a question, Dr. Herron noted that there are no serious plans to remove the Amelia Earhart Dam to improve the quality of the river system since upstream infrastructure and recreational activities rely on the conditions created by the dam.

The Mystic River Watershed: CEHS and MIT Engineering Field Lab Experiences for Students Past and Present

Dr. Harry Hemond, MIT Professor of Civil and Environmental Engineering, reviewed contamination-related studies on the Mystic River Watershed. Dr. Hemond explained his initial involvement in the watershed as a chemical reconnaissance effort in response to the Woburn leukemia cluster. He reviewed areas of toxic metal contamination in the Aberjona River and arsenic accumulation in the Mystic Lakes. He and his students identified a source of the contamination: decomposing hide piles in the Halls Brook Holding Area, dubbed the arsenic springs. Sediment cores revealed a relationship between manufacturing peaks in the region and the accumulation rates of arsenic and other toxins, with a similar trend found between lead accumulation and the peak use of leaded gasoline. Dr. Hemond then reviewed possible pathways of toxic metals to people, including wells and flooding, and noted other causal factors of arsenic release such as seasonality and nitrate depletion. He then provided brief summaries of other studies conducted by his students related to watershed chemistry, highlighting results showing the variability of methane release in the Upper Mystic Lakes. Finally, he listed his ongoing and future projects, many of which will focus on the Malden subwatershed and examine water quality issues stemming from bacteria, nickel, and other contaminants as well as examine whether sediment re-suspends contaminants into the water column.

In response to audience questions, Dr. Hemond explained that, though he would advise against drinking the water, arsenic levels should not pose safety hazards to people using Shannon Beach and swimming in the Mystic Lakes. In addition, the hide piles in Halls Brook Holding Area were remediated to oxygenate the conditions, and the piles should also become naturally nonreactive over time.

Alewife Constructed Wetland: Stormwater Attenuation, Water Quality Improvements, Ecological Enhancements, and Recreational Opportunities.

Catherine Woodbury, City of Cambridge Department of Public Works, presented an overview of the Alewife constructed wetlands, which were built to create a discharge zone for attenuated stormwater as part of MWRA's court ordered CSO control and sewer separation operation. The Department of Conservation and Recreation, DEP, and EPA are also partners in the project. The City will complete the project by December 2015, at

which point it will help reduce CSO discharge from 50 million to 7.5 million gallons annually and from 63 to 7 annual activation events. The constructed wetland has numerous benefits over a traditional stormwater retention basin, including habitat creation, recreational opportunities, and pollutant removal. Ms. Woodbury explained that two automatic sampling stations measuring inflowing and outflowing water would help track the success of the wetland once it is fully connected to the stormwater system later in the year.

In response to audience questions, Ms. Woodbury noted that the consultants for the project include Montgomery Watson Harza, Kleinfelder, and BioEngineering (now Chester Engineers). The MWRA and city jointly funded the sewer separation program, which included Cambridge capital funds and loans from DEP's Clean Water State Revolving Fund. While there are few other similar projects, there is a stormwater wetland in Fort Devens. An audience member added that Philadelphia is constructing similar green infrastructure projects, which are proving more economical than grey infrastructure for pollutant control. Ms. Woodbury noted that the stormwater wetland was a less expensive and disruptive option, and provided more societal benefits, than underground storage tanks. An attendee noted the importance of water quality testing at the site and mentioned that local eighth graders are conducting testing experiments at the site.

OPPORTUNITIES FOR COORDINATION AND COLLABORATION IN 2015

The group session began with an opportunity for organizations to share updates on their water quality sampling and monitoring efforts. Participants shared the following updates:

- Mr. Faber (EPA Laboratory): A new buoy operating in Blessing of the Bay will share data on a public website every fifteen minutes. The program should be operational by June 2015.
- Todd Borci (EPA Compliance/Enforcement): The long-term control plan construction will soon conclude. The system will be optimized over a four-year evaluation period to reach target numbers. Additionally, in an effort to control illicit discharges, EPA is tracking pharmaceutical indicators to identify stormwater outfalls discharging sewage. Since the implementation of tracking in 2005/2006, EPA has removed over 31,000 gallons per day of sewage from stormwater outfalls in the Mystic River Watershed, which is improving water quality.
- Dr. Herron (MyRWA): MyRWA is managing several programs including baseline monitoring of water quality, outfall hotspot monitoring, DO surveys, fish toxin surveys in saltwater sections of the watershed, and creation of a bacteria prediction model to highlight boating safety. MyRWA is also partnering with MIT to complete a public health risk assessment of the Malden River and with EPA and DEP to develop a phosphorous TMDL flow monitoring model.
- Jeff Barbaro(USGS): USGS will set up three new monitoring stations in September 2015, two on the main stem of the river (one by Route 16 and another slightly upriver), and one on the Malden River. The stations will deliver data to a website in real time.

Ms. Hulet asked the attendees to speak with their neighbors about:

- The sampling/monitoring information to be collected
- Opportunities for synergies and collaboration

The group shared the following ideas, comments and questions about sampling/monitoring:

- Collect sediment cores from Little Pond in Belmont.
- Gather data on thermal pollution in the watershed that could affect sensitive species, such as river herring.
- Measure the depth of different water bodies in the system.
- Create an urban biodiversity index for the Mystic River to better understand the connection between animal and plants and water quality. Animal and plant sampling could be done in conjunction with nutrient and bacterial testing.
- Collect data on sediment dynamics and remobilization, especially for the coastal area below the Amelia Earhart Dam due to the different water dynamics.
- Establish TMDLs for all traditional parameters.
- Explore particular contaminates of concern in Chelsea Creek such as petroleum products.
- Test water chestnuts during removal to quantify the amount of nutrients removed, particularly phosphorous.
- Develop a measure of human connectedness to the watershed and examine what could increase it. This could be evaluated through public surveys. This sense of connection could be increased through volunteer opportunities, activities along the rivers, bike tours, school activities that expose children to the Mystic River, and by day-lighting hidden streams and culverts.
- Study the potential for increased CSOs due to increased precipitation events resulting from climate change.

The group then shared the following ideas, comments, and questions about opportunities for synergies and collaboration:

- Engage small-scale developers who are constructing units by the river and encourage them to install mitigation measures, such as rain gardens and permeable pavement. These measures can also add value to new properties.
- Use Medford Vocational Technical High School as a resource or environmental science collaboration.
- The Acera Elementary and Middle School in Winchester is interested in partnering with scientists and would be interested in the upcoming STEM forum.
- Agencies that are conducting sampling and monitoring and sharing their results online could create a common website to pool their data or a page that aggregates the links to all the data sources.
- Ask radio station WEBC to run a daily water quality report on the watershed to highlight the safety of boating.

- DCR, MWRA, and other agencies could partner on the management of the Amelia Earhart Dam to attempt to increase the flushing of pollutants.
- Recreational groups, including sport fishers and kayakers, could provide support for restorations processes.

Participants then discussed ideas for and suggested changes to future science forums on the Mystic River Watershed, including:

- Increasing the length of the forum and divide it into two sections with one half focusing on general information and the other half on the Malden River, given the high number of research focused on it.
- Share more information on student research, which can be lost if not tracked.
- At the forum, participants should use nametags and state their name before making a comment.

Ms. Hulet then asked the group whether the science forum was adequately advertised. Dr. Herron noted that MyRWA solicited attendees through a list of prior attendance, an email list, its website, and its Facebook, while EPA invited sitting steering committee members. MyRWA also uses Twitter to increase awareness and live-tweeted about the current science forum. Audience members suggested that the EPA also use Twitter to attract additional attention and to share daily information about river conditions. Participants noted that they were uncertain whether the science forum was intended to be a smaller event or open to the public, and this should be made clear for future sessions. A participant noted that the science forums should be open to the public to provide information about the watershed to a wider audience and that the media should also be invited to disseminate news stories. Another attendee added that the information presented during the forum, particularly on the safety of boating, should be shared with Mystic River communities, especially low income and other marginalized groups.

CLOSING COMMENTS

Mr. Faber informed that group that EPA would consider whether to invite more people or continue with smaller groups of specialized stakeholders for future Mystic River Science Forums. EPA will also post the presentations and notes from the meeting onto the website.

EkOngKar Singh Khalsa, MyRWA Executive Director, thanked all the participants for attending and contributing to the forum. He emphasized that MyRWA's advocacy and programs are informed by accurate science and data and noted that the Mystic River Watershed will face new challenges as the area becomes increasingly urban, with Somerville revising its zoning laws and the construction of new developments in former green spaces. He also underscored the importance of the collaboration among different stakeholder groups and agencies in protecting the watershed and highlighted the need for environmental groups to continue to advocate for sustainable approaches to developers and other decision makers.