FINAL REPORT

Spragues Cove Stormwater Remediation Project
Monitoring, Community Involvement, Education

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Submitted by
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Submitted to
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Background

Sprague Cove is located on the western side of Sippican Harbor along the shore of Buzzards Bay in the Town of Marion. The Cove is immediately adjacent to the town's only public bathing beach, Silvershell Beach. Productive shellfish beds in Sprague Cove are presently closed due to bacterial contamination. The primary source of this pollution are two stormdrain systems that discharge to the Cove, the largest of which drains a 64 acre area of roads and driveways in the densely developed lower portions of Marion village.

In 1991, the Town of Marion and the Buzzards Bay Project began exploring options for treating this stormwater runoff prior to discharge. The result has been the construction of a 3 acre manmade wetland system to treat the "first flush" of stormwater, the most contaminated portion of the runoff. Stormwater contaminants such as bacteria, sediments, and nutrients are removed through natural physical and biological processes within the staged wetland and open water system. Along with the water quality benefits, the Sprague Cove stormwater wetland provides enhanced wildlife and fish habitat and replaces a filled parking area that was formerly a saltmarsh.

The Sprague Cove Stormwater Remediation Project was constructed in 1995 with funding from an EPA/DEP 319 Nonpoint Source Pollution grant, the Town of Marion, US Fish and Wildlife Service, and Cove Charitable Trust. Once the construction was completed, a large citizen effort was mobilized to plant the system with a variety of wetland species such as cattail, bullrush, and lily in order to make the system function like a wetland to remove contaminants. The Sprague Cove Project has been and continues to be not only an extremely successful stormwater remediation project but an equally important community environmental education and wetlands restoration effort. But it is also a work in progress.

The system's first year was believed to be fundamental to its future success and longevity both from a functional and community acceptance perspective. Recognizing this, the Buzzards Bay Project applied for and was awarded funding from the Massachusetts Environmental Trust in the Spring of 1996 to continue the important post-construction aspects of the Sprague Cove project. The MET funded effort sought to achieve the greatest scientific, technical, and educational benefits out of the already significant community investment in the Sprague Cove Stormwater Remediation Project by doing three things:

- monitor and document the effectiveness of the Sprague Cove stormwater remediation system for pollutant removal for use as a model for other communities faced with urban runoff pollution, particularly in coastal areas;

- involve as wide an audience as possible in the maintenance of wetland plantings in and around the constructed wetland and enhance wildlife habitat within the project area;

- conduct further community outreach to inform the public of the effectiveness of the stormwater system and the consequent improvements to Sprague Cove and Silvershell Beach.

Describe the results of your project.
Discuss the highlights and any unanticipated problems:

Monitoring

Initial water quality monitoring of the Spragues Cove Stormwater Remediation system by the Massachusetts Division of Marine Fisheries has already shown significant improvements in the levels of fecal coliform bacteria being discharged from the system. The potential for the reopening of shellfish beds for harvest in adjacent Spragues Cove and the protection of the town swimming beach at Silvershell will serve as a valuable return on the community's investment of time and money.

During the summer of 1996, intensive water quality monitoring was conducted in the Spragues Cove Constructed Wetland System (seven locations) and at Silvershell Beach (two locations) for fecal coliform bacteria. Sampling results indicated an overall reduction in fecal coliform bacteria present in stormwater. However, some sampling indicated increased levels of fecal coliform towards the end of the system. Both the BBP and Massachusetts DMF had noted significant amounts of geese droppings on the interior dikes, which were presumed to be the most likely source of this unanticipated increase.

In addition to the regular fecal coliform sampling, two full sampling runs were completed on August 13 and September 4 for the following additional parameters: Clostridium, Total Suspended Solids, Total Organic Carbon, Volatile Organic Compounds, Total Nitrogen, Phosphorous, Heavy Metals.

During the second full sampling run the BBP received volunteer assistance from a group of visiting Italian wetland scientists, for whom a tour was given of the wetland three weeks earlier. Results from these samples - taken after a rain event - indicated low levels of all parameters exiting the system.

The original check valve located at the outlet pipe was replaced in July 1996 with a lighter-weight, PVC check valve. The old valve was made of iron, which made it vulnerable to corrosion and improper operation. As a result, bay water was flowing back into the wetland system and causing salinity levels to increase in parts of the deep pool and the second marsh thereby inhibiting the growth of desired wetland plant species. In addition, the heavy valve was not fully open during low tides, which seemed to reduce flow from the discharge pipe. The new PVC valve resolved all these deficiencies. It is highly resistant to corrosion and therefore more reliable. The valve also operates at its maximum potential, as the flap gate is much lighter and does not pose resistance to the water flowing out of the pipe.

An existing concrete pipe at the sedimentation/settling basin was filled with concrete in July 1997. This pipe had connected the basin to the overflow ditch that discharged into Spragues Cove. During certain high tides, water from the cove was flowing back into the ditch. We suspected that this tidal water was reaching the old pipe and allowing saline water to enter the settling basin. Hydrometer readings before the block indicated moderate salinity levels. Shortly after the block, salinity levels continued to drop, until reaching zero one week later.

A large coastal storm and maximum annual high tides in December caused damage to the southern upper dike. After discussing the problem with the Town of Marion's DPW superintendent a new overflow control structure was installed. The wetlands are normally expected to flood following heavy rain events, but for the purposes of reseeding, this flooding is not desirable. By installing the structure, the excess water can be removed without compromising the retention time of the water to be treated, and give newly planted vegetation time to establish themselves. The structure was installed in March 1997 before volunteers resumed reseeding of the dikes. Water level control will be particularly helpful over the next few years as new vegetation becomes established on the slopes to minimize erosion and to deter geese.

Finally, a cut placed in the dike at the sedimentation basin was not capturing all the flow from Front Street. This problem was reported to the Town of Marion, and was rectified in late January of 1997 by installing a berm to redirect the street flow towards the cut. The stormwater now flows along the wetland-side of Front Street into the sedimentation basin. All of the water quality, structural, and hydrologic monitoring of the Sprague Cove system and its resulting improvements documented above were made possible due to the hiring of an intern detailed to the system and funded by the Massachusetts Environmental Trust award.

Involving the Public in the Maintenance of the Constructed Wetland

The development of a long-term sense of community stewardship of the site is expected to be enhanced and sustained by further direction and coordination.

The interior dikes exhibited slower than anticipated growth during 1996. During the first, third, and fourth quarters of the project period, additional soil (which was mixed with horse manure and compost) was placed on three of the four interior dikes with the help of volunteers, Buzzards Bay Project staff, and the Town of Marion. Several hundred plugs of narrow-leaf cattail (Typha angustifolia) were planted in the stone-lined channel which conducts treated storm water from the second marsh to the discharge pipe to Sprague Cove. This was to provide additional biological treatment of the water, deter geese from landing on the dikes or in the water, and to help increase soil stabilization (reducing the potential for erosion into the water).

The unusually heavy rain during and after the first week of September had severely hampered reseeding efforts by the BBP and volunteers. Approximately 18 community members and an additional dozen interested people from surrounding towns responded to a request for volunteers (via mail response cards, newspaper advertisements, TV). Unfortunately they were informed more than once that the event was postponed until the water receded to normal levels. Subsequent rain events were also heavy, causing further, frustrating delays in reseeding.

Following the December storm, reseeding of the interior dikes and the south dike was completed by twenty to twenty five volunteers in early April 1997. The event also included planting of 100 flowering plants and 300 narrow leaf cattails. Wildflower/wetland plant seed mix was sown on three interior dikes, as well as the south dike repaired by the town.

Twenty five low-growing bushes were planted along the interior dikes in May of 1997, and more

will be planted with the aid of volunteers next month. These bushes help to stabilize the soil, deter geese, and provide wildlife habitat for smaller birds and amphibians.

Community Outreach and Environmental Education

A two-page informational/educational brochure was developed and mailed to all postal patrons in the Town of Marion (copy of brochure enclosed). The brochure briefly described the project background, how the system functions, and results, as well as a list of actions citizens may take to help improve the water quality of the bay.

A community night town meeting was held on the project on October 24, 1996. Dr. Joe Costa, Mark Rasmussen and Michael Berkal of the BBP spoke to several community members regarding the project's history, and ongoing and future tasks. Dr. Costa also provided a report on effectiveness of the project to date (included). Two certificates of appreciation were also given to two residents for their outstanding contribution to the ongoing maintenance of the wetland.

On-site educational tours were provided to several visiting wetland scientists from Italy. The tours were requested by Battelle Research Labs in Massachusetts. Several of the scientists returned later to assist in a scheduled second water sampling event of the system.

A 3' by 5' outdoor educational display sign illustrating the components and functions of this project was installed along the wetland fence line at Silvershell Beach in April 1997. (see enclosed copy) Many residents and visitors have taken notice of the sign and the wetland, which indicates a continued interest by the public in this project and the ongoing effort to improve water quality in Buzzards Bay.

> "The Sprague's Cove drainage remediation project presented the designers and engineers with the Buzzards Bay Project with some unique challenges…These challenges were met head on with careful study and planning, which has produced a very effective drainage remediation project. The results are better than anyone expected. In addition to being an efficient treatment of urban runoff, the Town is left with an extremely pleasing site filled with wetland plants and flowers, the return of native wildlife, and a please citizenry. The introduction of fish in the deep lagoon and improved habitat has reduced the summer mosquito population and has not resulted in a single neighborhood complaint. This is a unique cooperative project in that it combined the resources of the NRCS, Massachusetts DEP, MCZM, US Fish and Wildlife Service, and the Town of Marion."
>
> Ray Pickles, Executive Secretary, Town of Marion

Tours of the wetland were given in early April for three 6th grade classes at the Sippican School in Marion. This was a prelude to their volunteer efforts that following week to help reseed selected areas within the wetland. Additionally, a tour for eight children associated with the Town of Marion Museum of Natural History, and an oceanography class at Tabor Academy were also given in early to middle April.

How has your project contributed to understanding of water quality issues and/or the coastal environment, and encouraged direct citizen involvement?

Through educational brochures, personal lectures, guided tours, and a permanent outdoor educational display sign at the Spragues Cove Constructed Stormwater Wetland, we anticipate a heightened public awareness and understanding of this project, and of the importance this and other

stormwater remediation projects have on improving water and habitat quality throughout the Buzzards Bay watershed.

Estimated number of people served by your project:

Residents of both the town's of Marion and Rochester (approximate combined population of 5,300) utilize Silvershell Beach for swimming and outdoor recreation and Spragues Cove for shellfishing.

Describe the geographic areas (cities and towns) and audience (age, ethnic composition, etc.) served by your project.

This project directly serves a 64-acre sub-watershed of Sippican Harbor in the Town of Marion, Massachusetts. The demographics of the community are very wide in terms of age, and narrow in ethnic composition (predominantly Caucasian); economic social structure is considered middle to upper-middle class, with the majority of the population having an education of a bachelor's degree or higher.

Describe how this project will be incorporated into your future programming. Indicate any other funding you have secured.

The success of this project has established surface stormwater detention in moderate to large scale watersheds as an effective and viable treatment option for urban non-point source pollutants. Similar designs will be considered for other sites in the Buzzards Bay watershed whenever site characteristics make constructed feasible. Unanticipated events experienced at the Spragues Cove site will hopefully be avoided or greatly minimized in their potential to reduce the overall effectiveness of the remediating utility of a constructed wetland receiving stormwater runoff. Furthermore, similar pre-construction concerns of community residents regarding safety, aesthetic values, and effectiveness of a similar project could be more effectively addressed and allayed by drawing from the experiences with the Spragues Cove stormwater wetlands project.

How has this project helped your organization?

One of the primary focuses of the Buzzards Bay Project in its efforts to implement the Buzzards Bay Comprehensive Conservation and Management Plan will continue to be the remediation of stormwater discharges impacting shellfish beds. The BBP had significant successes in the early 1990s with the use of infiltrating technologies for stormwater in the eastern portions of the Bay watershed where sandy soils prevail, but had been considerably limited in addressing stormwater problems in the western bay due to soil and groundwater limitations. The Spragues Cove project has provided a viable alternative for area's with similar site constraints. The lessons learned here with close post-construction monitoring will be used for years to come as the Buzzards Bay Project searches for innovative solutions to stormwater problems.

The Spragues Cove project has also provides a fantastic example to use in addressing resident concerns about constructed wetland projects. Citizen concerns regarding the system early along in the project have been dissolved. As the project continues to evolve, improved changes in water quality and the system's visual appearance will also serve to increase public support. Proper design, monitoring and maintenance of this project, as well as responsive, and considerate relations with the community served reflect well on the professionalism and effectiveness of the Buzzards Bay Project.

Attachments

Spragues Cove Educational Sign erected at Silvershell Beach
A Progress Report Highlighting the First Year of Monitoring

Educational Brochure
Newspaper Articles