



Developing and Implementing a Restoration and Management Plan to Combat Threats and Challenges to Coastal Dune Resiliency in Urban Landscapes

City of Milford
November 2018



Sponsored by a grant from the Connecticut Institute for Resilience and Climate Adaptation (CIRCA). CIRCA is a partnership between the University of Connecticut and the State of Connecticut Department of Energy and Environmental Protection. More information can be found at: www.circa.uconn.edu

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Developing and implementing a restoration and management plan to combat threats and challenges to coastal dune resiliency in urban landscapes

PROJECT BACKGROUND AND CONTEXT:

The City of Milford has approximately 17 miles of shoreline – the longest of any town in Connecticut. Coastal properties sustained substantial damage from Storms Irene and Sandy. These storms and frequent less damaging flooding from routine super-high tides, coastal flooding and sea level rise are growing concerns in the city. Improving Milford's coastal resiliency has been a significant effort throughout the city's departments and commissions including the Flood Erosion Control Board, The Hazard Mitigation Committee, the Community Rating System's Committee, and the Conservation Commission. The goal of this project was to showcase a living shoreline approach to coastal resiliency through the restoration of a sand dune in a city shoreline park.

The sand dune is located in an 18.29 acre open space parcel that is adjacent to the westerly side of Silver Sands State Park. The area is today called Walnut Beach Park, but it was historically known as Myrtle Beach, when it was a coastal residential neighborhood with 138 businesses, 584 dwellings, a church, a community hall, hotels, and the amusement park. Between 1964 and 1968, the structures in the area were demolished through an urban redevelopment project and most of the area was rebuilt with condominiums and apartment buildings. In 2012, the development of a boardwalk that extends along the north side of the project's sand dune eastward into and through Silver Sands Park has made Walnut Beach Park a highly visible city park that receives thousands of visitors in the summer. The large number of visitors to this park made this site an ideal location for a living shoreline project.

PROJECT DESCRIPTION, INCLUDING GOALS AND METHODS:

This living shoreline vegetative restoration project was funded by a grant through the Connecticut Institute for Resilience and Climate Adaptation (CIRCA). Restoration took place on a 370 ft. long section of degraded sand dune in the City of Milford's signature coastal park – Walnut Beach Park. The highly trafficked boardwalk mentioned previously bounds the northern edge of the project sand dune area, and the western and eastern ends of the project area are bordered by the Albert Munroe Pier and a beach access walkway, respectively. The project area totaled approximately 14,274 square feet.

Pre-project, the dune had varying densities of established coastal and native vegetation, including American Beach Grass (*Ammophila breviligulata*), Salt Hay (*Spartina patens*), Seabeach Evening Primrose (*Oenothera humifusa*), Beach Pea (*Lathyrus japonicus*), Common Milkweed (*Asclepias syriaca*), Seaside Goldenrod (*Solidago sempervirens*), Eastern Red Cedar (*Juniperus virginiana*), and Pin Oak (*Quercus palustris*).

The dune was also severely overgrown with several non-native invasive plants that threatened the dune's resiliency and degraded its habitat and its aesthetic quality. Invasive plants of greatest concern that were targeted for removal and replacement through this project were Japanese Knotweed (*Polygonum cuspidatum*), Oriental Bittersweet (*Celastrus orbiculatus*),

Mugwort (*Artemisia vulgaris*) and Black Locust (*Robinia pseudoacacia*). The potentially invasive *Rosa rugosa* was also present in good supply, but it was not targeted for removal.

Project activities took place during the time period of January, 2016 to August, 2018.

Steps in the project included:

Assessment of invasive plant density. Plant counts were made across most of the sand



dune and photographs throughout the project also documented changes in site conditions. The photo above was taken on October 13, 2015 before management efforts began. Previous invasive plant control efforts at this site had met with little success. The site area containing the majority of the invasive plants extended from the Burt Monroe Fishing Pier 167 feet (51 meters) eastward towards Silver Sands State Park. Total invasive plant cover in this area was estimated at 90%. A detailed survey identified five predominant invasive plant species in the management area. Japanese Knotweed represented 78%, Oriental Bittersweet 15%, Mugwort 4%, Honeysuckle 2%, and MultiFlora Rose less than 1 % of invasive plant types being managed.

Based on invasive plant counts after the herbicide treatments by All-Habitat Services (described below), the control efforts achieved 86% suppression rate for the targeted invasive plants. We anticipate a minimal number of remaining plants that will need to be spot treated.



The following photo was taken August 24, 2018 during the last herbicide treatment under this grant program. The Japanese Knotweed that dominated the before picture of 2015 has been almost completely eliminated or seriously stunted.

Invasive vegetation treatment. All-Habitat Services, LLC was contracted based on their knowledge and experience of dealing with invasive management in sensitive areas such as our dune project. They recommended treating the Japanese Knotweed (*Polygonum cuspidatum*) and Oriental Bittersweet (*Celastrus orbiculatus*) by applying the aquatic labeled herbicide Polaris® (Imazapyr) using a thin invert emulsion application technique. Control treatment consisted of two applications of the aquatic herbicide Polaris® (Imazapyr) at strategically timed intervals. This herbicide translocates into the plant's rhizome system, immediately arresting the growth cycle and limiting the extent of their above ground biomass.



The first application was conducted in June 2017 once the target vegetation had expressed sufficient leaf surface for herbicide uptake. This treatment had moderate success. A second

application was made in late summer 2017 to control regrowth following the initial application. The third and final herbicide treatment took place in summer 2018 to spot treat any regrowth vegetation. These treatments significantly reduced stem density and effectively controlled the stands of Japanese knotweed and by the end of the treatment protocol, the Japanese Knotweed and Oriental Bittersweet were essentially eradicated from the dune.

Along with the Japanese Knotweed and Oriental Bittersweet, there was a smaller infestation of Mugwort (*Artemisia vulgaris*). This infestation was treated by applying the herbicide CleanSlate® (Clopyralid) at a rate of 8 ounces per acre. This herbicide was mixed in an aqueous formulation and selectively applied to avoid non-target injury. Application was conducted by broadcast and spot spray on foot. By the end of the project, Mugwort was very well controlled, but not eradicated and will require ongoing manual or spot treatment control. It will also be necessary to continue manual weed control for some additional new weeds, such as sow thistle and smartweed, that are entering cleared areas that have not had the chance to fill in with beach grass. Some *Rosa rugosa* plants were also killed as a result of the treatments, possibly because other target vegetation, especially the Oriental bittersweet, was so intertwined that it was not possible to avoid contact with the rose plants. We plan to replace the *Rosa rugosa* with native *Rosa virginiana* in 2019.



The photo above was taken on March 18, 2018 following a project work day by Janet McAllister and Steve Johnson to rake out the leaf litter to prepare the site for the second beach grass planting on April 1st, 2018. The site was well cleared of invasive vegetation at this time.

One additional surprising plant death – that of a mature Pin oak tree growing in the sand dune – occurred by the end of the project and the cause of this death is still unclear. All Habitat thought it was highly unlikely that there could have been enough transfer of the herbicide through roots to harm the mature tree. Chemical drift is also an unlikely cause because other nearby plants, including an Eastern Red Cedar tree, were not harmed. We hypothesize that salt water intrusion from several severe high tides in Fall 2017 may have weakened the tree (which is not

a species that would normally be found on a sand dune) and contributed to its overwinter death during the cold winter.

Native beach grass planting. American Beach Grass (*Ammophila breviligulata*) was planted on approximately 4,500 square feet of dune. Plantings occurred during two highly successful community work days, the first on April 1, 2017 and the second on March 24, 2018.

The first area planted in 2017 was approximately 2,000 square feet of fore dune that was not overgrown with invasive plants, but that had little to no existing beach grass cover. Thirty volunteers responded to the outreach announcements and, working in pairs, they planted



2,800 beach grass culms in two hours. The site planting area and our tools limited the number of volunteers that could safely work in planting teams to about 25-20 people. Other volunteers cleaned up trash or relayed supplies to the planters. We were fortunate to have just the right number of people to get the work done and have the volunteers feel a sense of accomplishment and a positive experience.

By the time of the second beach grass planting day on March 24, 2018, the invasive plants were well controlled, and several volunteers cleared the area of dead plant materials to make the sand areas designated for beach grass planting more visible and accessible. The City of Milford provided a roll off dumpster for collecting the dead plant remains.



Volunteer response was again good with 25 volunteers planting an additional 5,200 beach grass culm across approximately 2,500 square foot of sand dune that had been cleared of invasive plants. During each beach grass planting day, the sand dune was also cleared of trash.





Educational outreach. Public outreach about the project and CIRCA funding occurred in several ways. A presentation about the project was made to the City Board of Alderman at their televised meeting at the time of funding. Press coverage of the project also appeared in The Milford Mirror (See the attached press copy” Dune Restoration Planned at Walnut Beach 1-5-2016). Seventy one (71) citizen volunteers donated over 234 hours with this project on eight different project days. This does not include the additional annual litter cleanup of the greater dune area with MacKenzie’s annual project that attracts over 125 people each year.



All volunteers who participated in the beach grass planting days received education about CIRCA and its support of coastal resiliency projects in CT; living shorelines as a tool for improved coastal resiliency and the reasons for this particular project; the resiliency and habitat values of native vs. invasive plants; and the importance of monitoring and maintenance of healthy coastal habitats. Signs describing the CIRCA-funded coastal resiliency project were also placed in the project area. Our volunteer efforts were supported by Milford’s 2017 Coastal Certificate Class, Surfrider Connecticut, MacKenzie’s Annual Beach Cleanup, The Milford Conservation Commission, The Milford Land Conservation Trust, and the Walnut Beach Association groups. We are grateful for all of the volunteer efforts to promote this project.

Volunteers develop a sense of stewardship and help continue to be champions for this project that extends to educating people about the progress.

EXPLANATION OF HOW PROJECT ADVANCED CIRCA MISSION AND PRIORITY AREAS



Strengthening the resilience of Milford's coastal areas has gained heightened support since Superstorm Sandy. Our built environment in coastal areas continues to be vulnerable to erosion, flooding, and the impact of wave action. An example of this occurred again on Saturday, October 27, 2018 during a coastal storm that eroded several un-vegetated sandy beach areas in the Bayview neighborhood of Milford. LIS flooded low lying streets, homes and vehicles. The Walnut Beach dune restoration and resiliency project demonstrates the great benefit that a living shoreline provides. This CIRCA grant project offers an alternate solution to the growing impacts of climate change on the natural, built, and human environment.

Including living shorelines practices requires continued educational outreach to residents and municipal staff to understand the benefits and capabilities to mitigate flooding.

DESCRIPTION OF HOW APPLICABLE CIRCA RESEARCH PRODUCT(S) WERE UTILIZED

Throughout this project, the conversation around the growing impacts of climate change on the natural, built, and human environment has informed people of the realities we are facing. This has had ripple effects in multiple City of Milford coastal resiliency projects. The 20" by 2050 sea level rise projection from the article by James O'Donnell (cited below) has been incorporated into several Community Development Block Grants, Disaster Recovery (CDBG-DR) projects underway in Milford.

The CIRCA article [\[MJ1\]](https://circa.uconn.edu/wp-content/uploads/sites/1618/2017/09/ExecSummarySeaLevelRise_J_ODonnell_Sept-2017-1.pdf), O'Donnell, James (Sept. 2017) Sea Level Rise and Coastal Flood Risk in Connecticut: An Overview Available at: https://circa.uconn.edu/wp-content/uploads/sites/1618/2017/09/ExecSummarySeaLevelRise_J_ODonnell_Sept-2017-1.pdf (Accessed: 3 November 2018).

PROJECT OUTCOMES

The project outcome of renovating a section of sand dune at Walnut Beach Park in Milford to demonstrate the living shorelines approach to coastal resiliency was mostly achieved. The success of this approach was recently demonstrated during an extremely high tide and coastal flooding that resulted from the Nor'easter that hit CT the weekend of October 27-28. The sand all along the water side of the boardwalk in Silver Sands State Park, which is not vegetated or is only sparsely vegetated, was washed inland over the boardwalk and into the marsh in vast large quantities. The sand in vegetated areas at Walnut Beach fared much better with little to no sand washing.

Removal of invasive plants was successful, but reestablishment of beach grass and coastal shrubs is not complete. The area will need additional plantings and routine maintenance weeding for the next few years. Committed volunteers are in place to accomplish this and the City will sponsor additional community work days such as those conducted for the two beach grass plantings.

Some of the areas planted to American beach grass during the second planting did not survive. The reason is unclear, but these areas will be replanted in the Spring of 2019. Planting of salt tolerant native shrubs was also not completed and the City will purchase shrubs to complete this aspect of the project in 2019.

Project educational objectives to highlight the living shorelines approach to coastal resilience were met primarily at the community beach grass planting days where volunteers received information about the CIRCA grant funding the project, coastal resiliency benefits of living shorelines, beneficial attributes of native coastal vegetation and challenges regarding invasive plants.

The CIRCA Living Shorelines Project and the positive response to this project in the city created an opportunity to secure a \$10,000 donation from UI to continue the restoration effort in the sand dune to the west of the Albert Munroe fishing pier. This funding will allow the same approaches used in the CIRCA project to be extended beyond the 370' (113 meters) project dune to an additional 1,750' (533 meters) of sand dune.

A local environmental group, Environmental Concerns Coalition (ECC) is sponsoring a presentation by Dr. Juliana Barrett on Saturday, November 10, 2018

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CLIMATE CHANGE IMPACTS AND MILFORD

Event Date: Saturday, November 10, 2018 - 2:00pm to 3:00pm

This panel will explore current and predicted climate change impacts for Connecticut and Long Island Sound over the next 100 years, information and tools that are available and adaptation strategies to improve our resilience. This program is hosted by the Environmental Concerns Coalition and Milford Public Library, and presented by Dr. Juliana Barrett with Moderator Emmeline Harrigan.

LESSONS LEARNED DURING THIS PROJECT:

Conducting this project yielded many lessons learned about the time and effort required to control invasive plants, the vigilance and maintenance that will be required to retain control of renovated landscape, and how to organize and conduct successful community volunteer efforts. The project also demonstrated that citizens share a deep concern for protecting the coastal environment and, when provided with an opportunity, they enthusiastically respond to calls to be environmental stewards. These lessons are a valuable learning outcome for future City of Milford projects and for others who may pursue similar projects.

Invasive management & coordination: Skilled, professional service is necessary for invasive plant control in an environmentally sensitive environment. All-Habitat Services was an invaluable partner in helping to manage the established invasive vegetation while being as protective as possible of existing desirable native plants present.

Build in time to adjust plans due to weather. Weather was often difficult to schedule around with the planned invasive plant treatments. This caused the control phase of the project to take longer

than anticipated, and 100% control was not achieved during the project period. Long-term monitoring and continued treatment will be needed to sustain the success we have achieved. Additional funding and the continued support of the City will also be needed, and is promised.

Messaging about invasive plant management: It is important to have a clear understanding of why the invasive plant management is needed and why the control measures selected are necessary and appropriate. We had many conversations with the public about the problems created by invasive plants in the sand dune and about the need for careful and professionally

Invasive Management - Living Shorelines Dune Restoration Project

Excuse our Appearance

Invasive non-native plants have overtaken this portion of our coastal dune. These plants reduce the resiliency of the dune against coastal storms, reduce the bio-diversity of the coastal habitat, and detract from the coastal beauty along this section of the boardwalk.

A CIRCA grant for the dune restoration project includes the selective spot treatment of invasive plant species by All-Habitat Services, Inc. This selective treatment targets the overwhelming infestation of invasive plants and is a key step toward restoring the dune to the natural and native mosaic it once was.

Native beach grass, shrubs and other coastal plants will be planted in 2018 to help restore the natural beauty, habitat, and improve resiliency against erosion for this section of the coastal dune.

Project Manager – Steve Johnson, Milford Open Space and Natural Resource Agent.
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applied herbicide treatments. Working with All-Habitat Services we posted the following flyer during treatments. This helped people understand the project activities and gain their support.

Messaging about Project Goals: It was important to have clear signage to support the goals of this living shorelines dune restoration project. This laminated 8 ½” double sided color flyer was posted at the project area to help inform people during and after project events.

As a beach community, planting vegetation in the sand is not always understood or appreciated. For some people, the space used for plants is seen as reducing the recreational benefits of the shoreline. Having a consistent message on our signage, engaging in personal conversations with beachgoers, and other public outreach helped gain support for this project. Importantly, it also helped to avoid any vandalism of our plantings.

Preparation is needed before planting: Site conditions required a number of project work days to prepare the areas for planting. This required extra, often more strenuous work by a select few



project volunteers to cut, rake and remove dead plant material from the site. This preparation step was critical work that made the beach grass planting days a fun and productive experience for volunteers. Good site preparation was also vital for the beach grass plantings to get established.

**Milford’s Dune Restoration
Living Shorelines Grant**



Funding provided by:
Connecticut Institute for Resilience & Climate Adaptation

Personal hand tools such as the GroundWork Weed cutter from Tractor Supply along loppers proved to be effective in cutting the dead above ground stalks of Japanese Knotweed.

Public Works Support for Pre-Planting Preparation: The City of Milford’s Public Works Department was very helpful with providing roll off containers to dispose of invasive material.

Supplies for Beach Grass Planting: Planting in the un-vegetated fore dune was aided by use of pre-measured 8’ boards and PVC pipe spacers that allowed volunteers to stagger the bare root culms appropriately. These items were not budgeted and were bought with personal funds.



Volunteers: We are fortunate to have a small core of interested volunteers to assist with this project going forward. Our public outreach has been successful in attracting interested people of all ages to assist with projects like the beach grass plantings. Sustaining regular volunteer efforts is a challenge across the City. Highlighting the success of this living shorelines project during future news stories, presentations and conversations will help to sustain this project.

Time Management: The City of Milford’s project manager, Steve Johnson, accepted an additional role of Acting Assistant Public Works Director position in 2017. The added responsibilities and demands limited his available time on this project. Adapting to changing demands is important. Our future goals for continued plantings and treatment will require planning and resource coordination to ensure these activities take place as planned.

FINAL PROJECT SCHEDULE & BUDGET

The following are the project timeline and budget items: Some items like the sand fencing were not needed. Other items like additional beach grass, shrubs and permanent signage are planned for 2019 and will use funds from the city.

Date	Description	Volunteer time	Budget Cost
January 2, 2016	Dune preparation, cutting above ground dead vegetation to prepare for the invasive treatments. Invasive seeds were bagged up and removed for disposal. Dead material 20 tarp loads of dead material were removed to a wooded section across the parking lot for a compost and habitat pile	3 people, 12 hours	
January 9, 2016	Litter clean-up	2 people, 2 hrs	
June 1, 2016	Dune vegetation cutting to prepare for the invasive treatments. 25 tarp loads removed.	3 people, 14 hours	
March 29, 2017	Tools and materials purchased – Home Depot. 1. 12 HDX D-Handle Utility shovels - \$9.97 ea 2. 40 steel T-Posts \$4.48 ea 3. 8 Yellow rope cord, \$2.97 each.		\$322.60

Date	Description	Volunteer time	Budget Cost
March 31, 2017	Install metal fence posts	3 people, 6 hours	
March 2017	2,800 Bare Root culms of Cape American Beach Grass from Cape Coastal Nursery, S. Dennis, MA (Ordered Jan. 2017) Cape Coastal Invoice April 19, 2017 - 36 bundles @ 200 per bundle plus \$42 shipping.		\$546.00
April 1, 2017	Plant 2,800 beach grass culms	30 people, 90 hours	
July 13, 2017	All-Habitat Services – Herbicide Treatment		\$800.00
September 22, 2017	All-Habitat Services – Herbicide Treatment		\$800.00
March 10, 2018	Dune clean-up,	4 people, 15 hours	
March 2018	5,200 Bare Root culms of Cape American Beach Grass from Cape Coastal Nursery, S. Dennis, MA (Ordered Feb. 2018) Cape Coastal Invoice 26 bundles @ 200 per bundle plus \$130 shipping.		\$1,131.00
March 24, 2018	2 nd Dune Grass planting	25 people, 90 hours	
August 24, 2018	All-Habitat Services – Herbicide Treatment		\$800.00
September 2018	Shrubs, Beach Grass, Signage, and Maintenance - Balance		3,430.73
Total			\$7,830.33