Plum Island Point Beach Access and Trail Plan

Prepared by the City of Newburyport, National Wildlife Federation, University of New Hampshire, and the Massachusetts Department of Conservation and Recreation. Primary contributing authors: Taj Schottland, Gregg Moore, Julia Godtfredsen, and Darryl Forgione.

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Introduction

The Plum Island Point dune system is located along the mouth of the Merrimack River and the Atlantic Ocean, running between the Coast Guard Station and 53rd Street on Plum Island (see Figure 1). Spanning just under a mile of coastline, the beach and dunes serve as an important first line of defense against the open ocean, protecting over a dozen roadways, hundreds of homes, and public infrastructure from coastal flooding. The area is popular for recreational activities such as fishing, bird watching, sun bathing, and swimming. It is also prime nesting habitat for federally listed piping plovers and a number of state-designated Species of Special Concern, like the least tern.

Figure 1 Project Area. See appendix A for a larger map of the project area.

Despite its great ecological and economic importance, the dunes at Plum Island Point are facing increased threats from frequent beach erosion events and increasingly chronic storm surge and overwash. While of less immediate concern, the dunes also face threats to the resilience of native dune vegetation associated with several pressures including foot traffic, drought, and die-off. Foot traffic, particularly along the dune crest at the seaward edge of the dune is leading to further erosion at the critical edge, where frequent storm surge carves measurable sections of dune and beach with each

storm. Yet due to dune loss, and regular high water at the site, the dune crest is often the only easily passable thoroughfare for beach users to make their way down the beach for recreation, fishing, or other activities. Stakeholders have indicated that in some cases, walking off paths along the dune crest is the only [safe] way to access these areas during high tides. An updated trail network, with improved signage and education materials is clearly needed to increase sustainable, environmentally sensitive access while also maintaining safety for all users of the resource.

It's estimated that the Plum Island Point dune crest north of the South Jetty has receded over 300ft landward since the U.S. Army Corps of Engineers (USACE) repairs to the Jetty in 2012 (estimate based on aerial photography and dune profiles). Roughly 40% of this dune and beach loss has occurred in the last year[1], suggesting that the threat to roads, infrastructure, and livelihoods may soon be impacted. Even moderate storms often result in measurable loss of the dune's seaward edge. Residents who monitor erosion estimated another 4-8 feet of dune loss from the relatively minor 2017 April Fools' Day storm.[2] Subsequent survey of the critical reservation terrace area using RTK-GPS reveal even greater loss in the most sensitive areas (see Figure 2 and Appendix G).

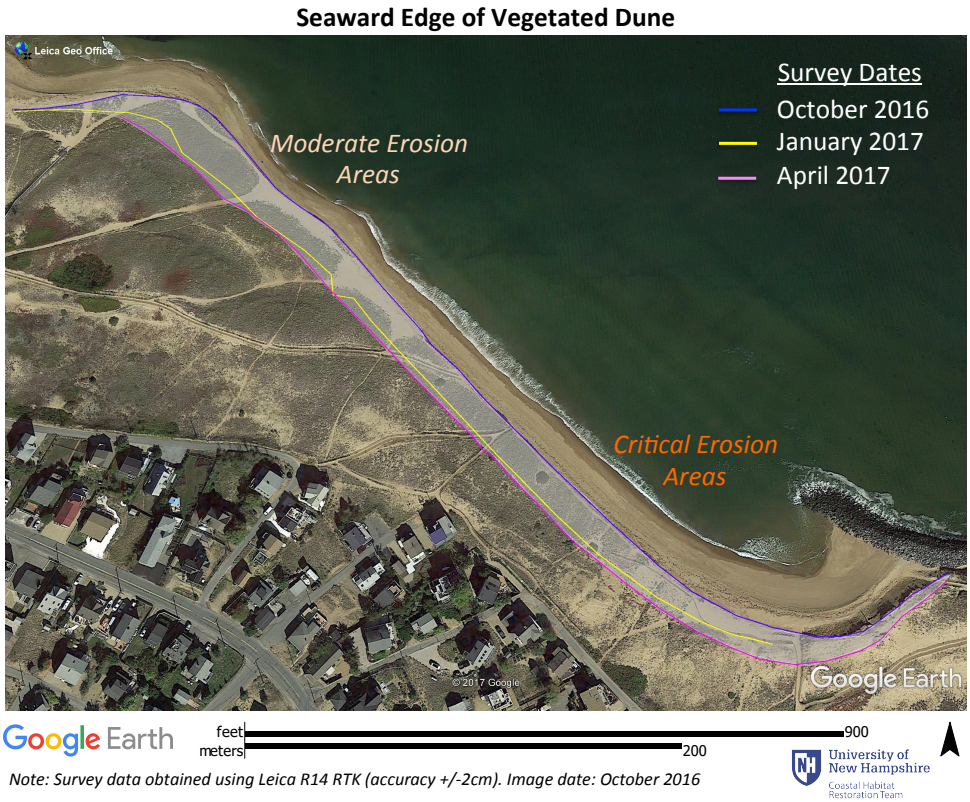


Figure 2. Survey of the seaward edge of vegetated dune over a six month period show dramatic loss of dune and beach, some of which is dangerously close to homes along Reservation Terrace (Critical Erosion Areas from 69th to 75th Streets).

[1] Gregg Moore, personal observation
[2] Personal communication with V. Ellis on 4/2/17.

The potential for significant coastal flooding is also a major concern. During storms, large waves approach the crest of the dune. When this happens, the depressed foot paths leading to and from the beach can serve as channels for storm surge to penetrate the dune and potentially impact the neighborhood. This threat puts houses and roads at increased risk of flooding and increases erosion landward of the dune. As dune area is lost to erosion, the historic network of paths and access ways no longer provide efficient (or in some cases, safe) access to the resource. Furthermore, as new trails develop without proper planning and foresight, the entire resource (e.g., dunes and beach, waterfront) become increasingly threatened while hindering public access.

There are numerous stakeholders and resource users who have a vested interest in protecting the dunes, preserving beach access, and reducing the threats to public safety. Major resource users include: Plum Island residents, Newburyport residents who live off island, local visitors, tourists, beach goers, bird watchers, and fishermen and women. The resource area (e.g., beach and dunes) is owned by the Massachusetts Department of Conservation and Recreation. As property owners they have final authority on management practices. However, DCR recognizes that the beach and dunes are a popular public resource, while serving as an important ecological feature that naturally buffers the impacts of coastal flooding.

To enhance the resilience of this important dune system, the City of Newburyport, the University of New Hampshire, the National Wildlife Federation, and the Massachusetts Department of Conservation and Recreation (DCR) (hereinafter "Project Team") and the broader Merrimack River Beach Alliance have partnered on a project to engage local stakeholders and to improve management of this public resource. Funded by the Massachusetts Office of Coastal Zone Management's (CMZ) Coastal Community Resilience Grant Program (FY17), this project had three main objectives:

1. Reduce dune erosion and prevent neighborhood flooding through targeted dune restoration;
2. Provide enhanced beach access for residents and visitors while simultaneously reducing human disturbance of the dunes; and
3. Engage residents and visitors on the importance of dunes and the effects of human disturbance.

With this understanding, the City of Newburyport has worked closely our collective Project Team to develop integrated management practices that facilitate continued public use of the beach while also protecting the vulnerable natural resource. A product of a collaborative effort that directly engaged and solicited public input, this plan highlights the work completed through this CZM grant, summarizes the rationale for why each activity was conducted, outlines the methods used to achieve successful outcomes, and provides recommendations for future work to support this important natural resource. Specifically, this plan articulates publically vetted alternatives and recommendations that the City of Newburyport, DCR, and other stakeholders can implement to meet the needs of all users and stakeholder groups.

Summary of Work Completed

Work completed includes 1) a reconfiguration of beach access trails that complies with DCR intentions to improve the overall beach management, 2) installation of improved signage, 3) creation of a beach access trail map and dune fact sheet, and 4) strategic dune restoration plantings to improve the resilience of the system. Future recommendations include preliminary consideration of an elevated boardwalk concept to facilitate an improved resource user experience and enhanced collaboration between the City of Newburyport, DCR, and the Merrimack River Beach Alliance. A detailed description of each of these activities follows.

1. Configured beach access to eliminate duplicative foot paths and reduce human stressors on the dune.

There are currently 25 distinct footpaths that are visible from aerial imagery crossing over the approximately 35 acres of dune. It is clear that some of these trails are wider and more defined than others, while some are historic or rarely used accesses. A recent study by UNH revealed that these may be grouped into each of three broad categories: 1) Main Paths, 2) Trails, and 3) Historic/Abandoned. These categories are defined by width, connectivity to roads and parking areas, and presence of encroaching vegetation (the latter a proxy for likely frequency of use). Because foot traffic can kill dune vegetation[3], and vegetation is what anchors a dune in place[4], reducing the number of paths is likely to increase the stability of the dunes along Plum Island Point. Figure 3b depicts the average width of each trail measured in the field (minimum of 3 width measurements) superimposed over the dune erosion surveys (Figure 2). The wider the path, the more bold the line. Note that abandoned paths or paths now absent due to beach and dune nourishment activities were assigned a width of 0.1m so that their original location would be shown on the map because they might not be visible otherwise.

Figure 3a-b. Beach access map with simplified path and trail numbering. This is the map used in community discussions so that we could easily communicate and differentiate between the dense network of access ways when engaging the public (left); Field-surveyed access ways and beach erosion areas. Access ways are shown as a function of measured path width (average of 3 or more width measurements along the path). Note that portions of the access ways seaward of the pink line no longer exist as they have been lost to rapid beach erosion (right).

[3] http://www.mass.gov/eea/agencies/czm/program-areas/communications/cz-tips/cz-tip-beaches.html
[4] http://www.mass.gov/eea/docs/czm/stormsmart/properties/ssp-factsheet-3-vegetation.pdf

The Project Team hosted a public meeting and a site visit to solicit public input, analyzed erosion data, and assessed path width (as a metric for estimating public use). Since not all stakeholders were able to attend the meeting, and to allow for further consideration and discussion, we fielded additional comments via email for the days following the meeting. Among those unable to attend the public meeting was the Plum Island Surfcasters, Inc. Georgette Y. E. Henrich, President of Plum Island Surfcasters, provided written comment pertinent to the issues being discussed just prior to the public meeting. Her comments refer to the main access ways (solid white arrows) in Figure 3a. An excerpt from that communication follows:

> *"My club, Plum Island Surfcasters, invited its membership-base to participate in an online survey concerning the beach access issue at the north end of the island and I would like to share with you a summary of the results. I understand there is a meeting tomorrow night to discuss the next steps to be taken so I would like the group to know where the people who responded to the survey stand. In summary, 17 people took the survey, with ~80% traveling > 10 miles to fish on Plum Island and that same number fishing > 6 times a year. 5 fishing areas were identified and the Refuge, Front beach up to the south jetty and the mouth of the Merrimack were the most widely fished area with Joppa Flats and up river being the other areas. Trails 1-4 were the most commonly accessed trails with trails 9-12 being used slightly more than 5-8. The question of trail closure was raised where if trails 4-8 and 10 and adjacent spur trails being closed, would you still fish that area and ~65% responded yes, 25% saying no and 10% unsure."*

The Project Team presented a series of scenarios or management alternatives for the stakeholders to consider using a power point presentation. Slides included 1) paths and trails under existing conditions, 2) DCR-approved/permitted trails only, 3) paths most used by a subset of members of the Plum Island Surfcasters who responded to the online survey referenced above, and 4) an amalgamation of the recommendations of stakeholders from our previous community meeting. In an attempt to find common ground between each, the Project Team then presented a fifth slide we developed as a draft recommendation for how to reconfigure beach access to maximize resource access while minimizing inherent threats to fragile resource area functions and value. Our recommendation integrated suggestions, comments and when possible, specific recommendations from the initial public outreach of meetings and additional email comments, coupled with the requirements of DCR's responsibilities and management plan as the land owner. (See Figure 4 and Appendix B). At that meeting, the public was given an opportunity to provide uninterrupted feedback on all five options as well as the overall project (see Appendix C for a list of comments received). The public was also invited to participate in an anonymous straw poll, voting for the trail configuration they supported. Public opinion was fairly evenly split between a "no action" alternative and the Project Team's recommended trail configuration (for complete results of the straw poll, see Appendix D). Based on this collection of data and stakeholder input, and with the stated goal of maintaining beach access for all resource users, the Project Team suggests the following beach access reconfiguration (Figure 4).

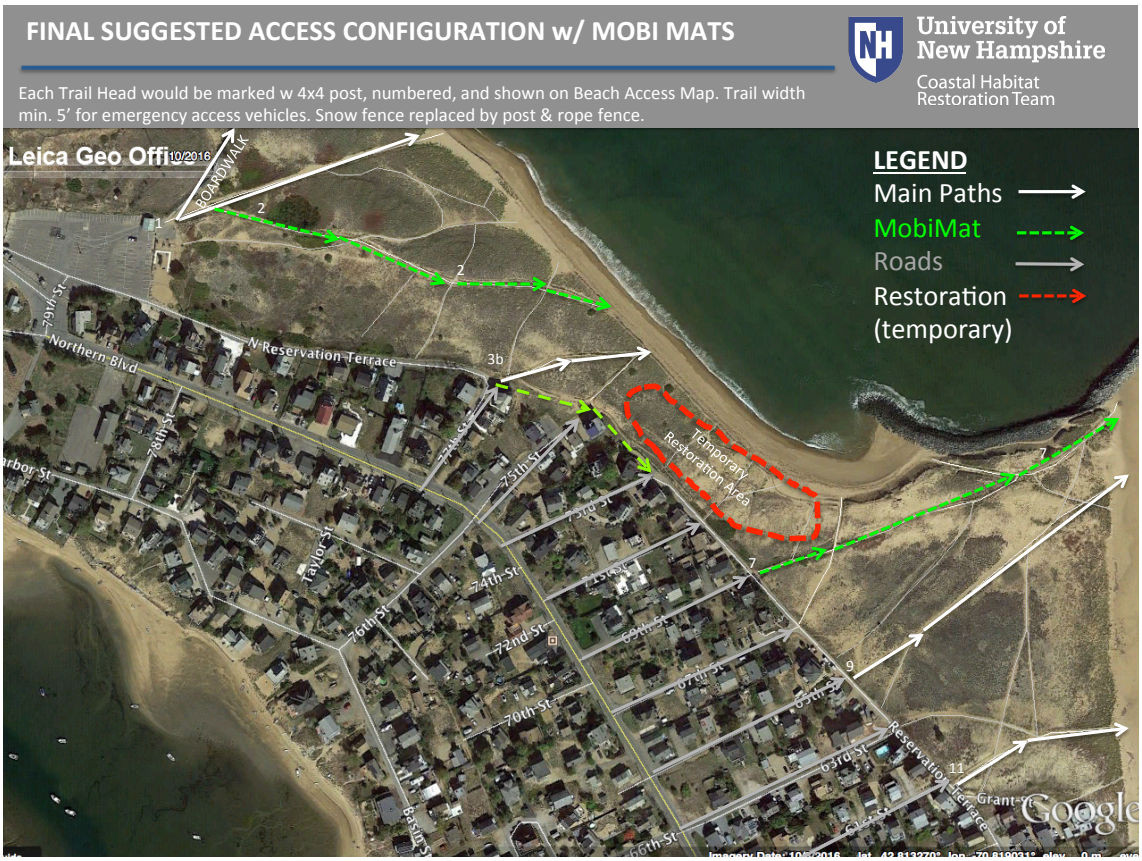


Figure 4. Suggested trails to be maintained with fence (white) and Mobi-Mats® (green) within the project area.

Given the critical threats to rapidly eroding areas at Reservation Terrace, the Project Team is recommending an immediate but temporary closure of all access points and trails between 75th Street and 69th Street. This action is motivated by the threat to existing roads, infrastructure and public safety that would be acerbated by increased foot traffic and will allow for unfettered opportunities for dune nourishment and restoration plantings. As the shoreline is stabilized, then the closure between 75th and 69th street should be re-evaluated and one or more trails should be opened as conditions allow. The Project Team urges the City of Newburyport and DCR to coordinate on an annual evaluation to assess site conditions and determine if additional trails may be opened.

2. Improved beach access using Mobi-Mats®.

Overseen by the City of Newburyport, the Project Team and our partners installed ~2,000 linear feet of Mobi-Mats in key 'high use' areas defined through stakeholder engagement activities. This effort now provides complete access to the beach on Paths 2 and 7 (see Figure 4) from paved surface to the beach recreation area. Installing Mobi-Mats® along designated beach access trails has made it easier for beach goers of all abilities to access the beach. These mats create a "nonslip semi-rigid and stable rollout

pathway" that is compliant with the Americans with Disabilities Act.[5] Mobi-Mats® also allow for vegetation to grow up and through these surfaces and minimize impacts to the resource. Mobi-Mat® width will facilitate beach access for all users, while also providing a stable surface for resource area maintenance and emergency vehicles when and if needed. While the Project Team is recommending closing some trails (per the reconfiguration highlighted above) 1), enhancing the trails that do stay open will help offset any inconvenience of having to walk further along the road or beach to get to an access/exit point. Purchase of 1,500 l.f. were made possible through funding provided by CZM. In addition, 300 l.f. of Mobi-Mats® were donated by Plum Island Taxpayers Association (PITA) in honor of Plum Island resident Karen Roman, while DCR provided 250 l.f. These matching funds were made available as a direct result of the CZM grant. The City of Newburyport, DCR, UNH and several undergraduate student interns provided critical installation assistance. During installation, we were met with an outpouring of support from beach goers who were extremely pleased with the quality and accessibility the mats provided.

Figure 5. Installation of Mobi-Mats® on Trail 2 (left) and Trail 7 (right) required considerable effort to follow the natural meanders of the existing beach access ways, but provides full access from road to beach for all beachgoers.

3. Prepared to replace sand fencing as it degrades with durable rope and post fencing.

The Project Team feels strongly that traditional sand fencing should primarily be used to capture sand and improve sand accretion rates rather than to discourage foot traffic. Sand fencing is an effective tool for building up the dune profile.[6] However in some areas along Plum Island Point, it is currently employed as a tool to guide beach access. Many vocal members of the public have made clear that they view sand fencing as unattractive and undesirable. Moreover, its use for trail delineation can negatively impact wildlife as well as sand movement (when not strategically placed). Accordingly, the Project Team recommends replacing sand fencing for trail demarcation with durable post and rope fencing (see figure 6 for example). This will be more aesthetically pleasing, will not restrict wildlife or natural sand migration, and

Figure 6. Recommended fencing style.

[5] http://www.mobi-mat-chair-beach-access-dms.com/range-us/mobi-mat-recpath-beach-access-mat/
[6] http://www.mass.gov/eea/agencies/czm/program-areas/stormsmart-coasts/stormsmart-properties/fs-6-fencing.html

will be less likely to be damaged by wind. All beach trails should eventually be lined on both sides with the post and rope fencing. As part of this project, the Project Team purchased 450 wooden posts (4x4x96 ft) and over 2,400 linear feet of 5/8" white poly line to create a symbolic fence line to help direct the public to designated paths and trails (see figure 6 as an example of the finished product). These materials will allow for rope fencing both sides of each of the ~1,000 l.f. Mobi-Mat® pathway enhancements we completed in this project. The City of Newburyport and DCR staff have committed to installing these materials as the sand fencing degrades over the next year or so (work to occur outside of this grant period). At the request of DCR, the project team is not removing existing sand fencing that is in good condition.

4. Continued dune restoration and nourishment.

During the project period, five dune restoration-planting events have been completed in the area of concern. Coordinated by UNH and partners at UNH's Cooperative Extension, students from grade 3 through 12 engaged in planting activities, with nearly 10,000 shoots planted through their volunteer efforts (figure 7). Plantings have included restoration plantings focused on establishing native species across broad dune areas in need of enhancements, and trail closure plantings that were placed in areas of trail and path closure. Since the process of finalizing this Beach Access Plan is an ongoing process, the majority of effort to date has focused on restoration planting in the broad areas. After this funded project is complete, additional trail closure plantings will be conducted by the Project Team through December 30, 2017.

Figure 7. Team members Gregg Moore and Alyson Eberhardt working with grade school students a nearby school to plant one of the most critical areas adjacent to 71st Street, Newburyport.

We were fortunate to have the benefit of recent dune nourishment areas installed by MADCR to help secure the dune and protect the adjacent homes. As referenced in the attached letter (Appendix G) MADCR's nourishment, which should be considered matching effort on this project, was absolutely critical to preserving the dune in the most critical area of Plum Island. Without their work, many of our restoration actions *and* trail work would not be possible.

5. Designed and installed signage that directs resource uses to designated paths.

Addressing a clear community and resource user concern, the Project Team to install signage to streamline resource access and exit (e.g., beach side and road side installation). Signage is critical for guiding resource users to designated beach access points. Through consultation with the public, the Project Team recommends two sets of signs to be installed:

- Small signage that is ocean facing, posted along the east side of the dunes (thereby viewable by people walking up and down the beach). The signs should be placed approximately every 100-200 feet and the color scheme should be consistent with the City-designed signs currently posted at the North Point parking lot. Proposed content for the sign includes text reading "These dunes aren't made for walking, please use marked paths" along with an arrow to beach access trails and the name of the trails/street number.
- Large signage that is road facing and is placed along the West side of the dunes at every beach access point (thereby viewable by people walking along the road or at the parking lot). The signs should be consistent with the City-designed signs currently posted at the North Point parking lot. They should include easily recognizable icons denoting beach rules and should include a large, easily interpreted trail map noting all beach access points and trails.

Through this grant, the team has designed and printed three of the large signs and are installing two at the Plum Island Point parking lot and one at 69th street access point. See Appendix E for a copy of the sign template. The Project Team recommends the smaller signs be designed and installed, however that work will have to occur outside of this grant. The Conservation Commission and the Plum Island Taxpayers Association may be able to fund this work and should be consulted moving forward.

6. Designed, printed and distributed trail maps and dune fact sheets.

A combined beach-access trail map and dune fact sheet will help resource users quickly identify the locations of all access point/trails. Because beach trail maps will be broadly distributed to residents and visitors alike, it is an opportunity to also include facts about dune resiliency and the importance of protecting the vulnerable natural resource. The Project Team designed and printed a beach access map and dune fact sheet (See appendix F). The Project Team printed and distributed 1,000 copies of the finalized map and fact sheet, posted an online version on the City of Newburyport website, and is in talks with DCR to create similar factsheets and maps for other DCR coastal properties across the state.

Future recommendations

1. Install an elevated boardwalk

While it may not be economically feasible to construct, many stakeholders have commented that they would like to see an elevated boardwalk over the fragile dunes to provide access to the beach. Indeed, the westernmost beach access is such a structure, spearheaded by Ron Barret (Newbury resident) and

President of the Plum Island Taxpayers Association (PITA) – a process that took almost 10 years to initiate. The boardwalk is clearly one of the most used beach access ways, particularly for visitors parking in the Plum Island Point parking area. Boardwalks are extremely costly and given the high rates of erosion on the beach under present conditions, this approach may not be practical if current rates of erosion continue. If such a boardwalk were to be constructed, it would seem best configured parallel to the shore and situated along the landward part of the dune closest to Reservation Terrace and allow for tie-ins from remaining footpath networks that would run diagonal or perpendicular to the boardwalk. Given that our Team just completed installation of Mobi-Mats® along the two longest and arguably among the most commonly used paths to access the beach (Paths 2 and 7, Figure 4), the community and visiting beach goers may now reconsider the need for an elevated walk way given the ease and efficiency of Mobi-Mats® to provide the same ease of access for a fraction of the cost, permitting, and time needed to complete such an ambitious project.

2. Work with Merrimack River Beach Alliance (MRBA) to continue improving the resilience of the existing dune system.

The MRBA is uniquely poised to continue resiliency efforts on Plum Island Point long after this project concludes. The City of Newburyport, DCR, and other stakeholders should continue coordinating with the MRBA, providing them with updated erosion data and management options. Furthermore, if active management is to occur, it is critical that the MRBA engage the general public in a facilitated dialogue to ensure that the needs of residents, visitors, and all resource users are taken into consideration.

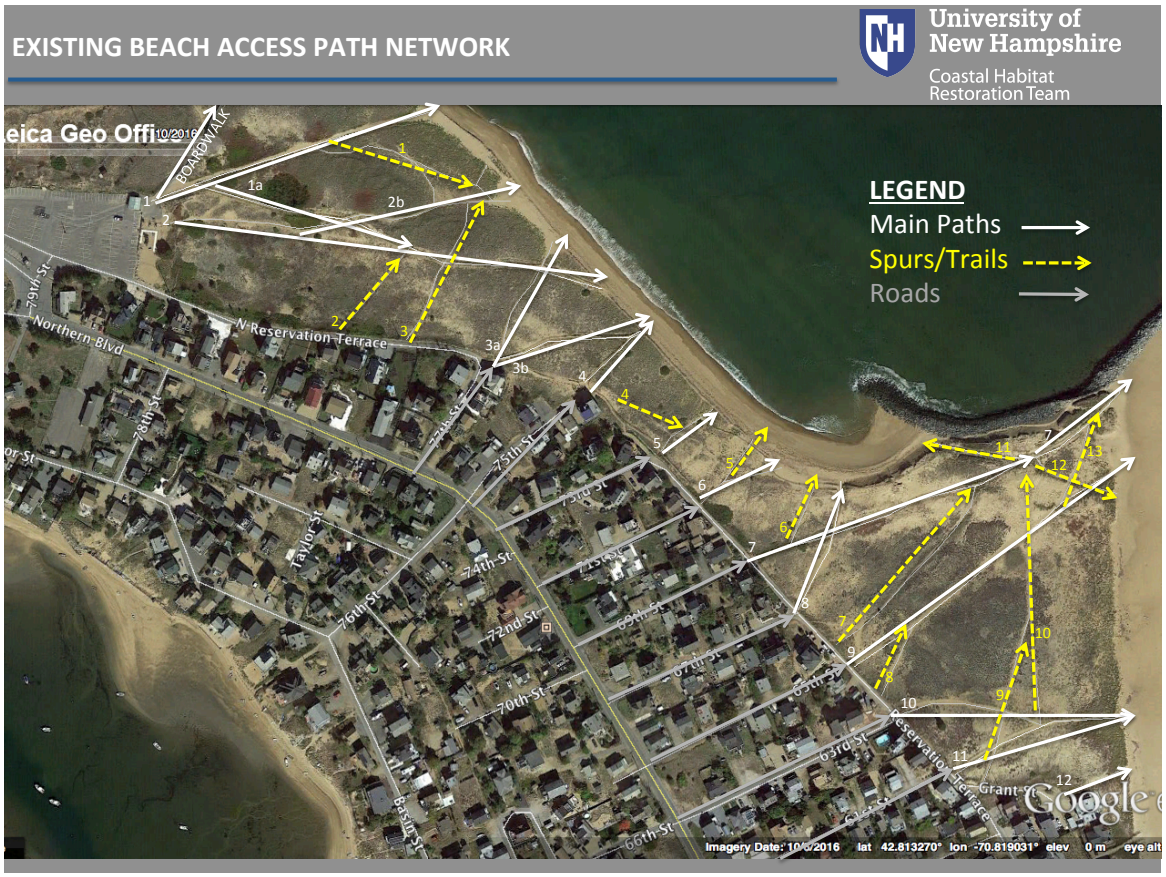
Conclusion

This project served as an exemplary demonstration for how to protect and restore important coastal habitats for the benefit of people and wildlife. The Project Team's big-tent approach helped solidify common ground among the many stakeholders and user groups who have a vested interest in this area and natural resource. Funding from CZM, along with significant in-kind match and cash contributions from DCR, UNH, NWF, and the City helped demonstrate to the residents and other stakeholders the state's commitment to addressing erosion issues that plague the north end of Plum Island. While more work will need to occur over the coming years to protect the dune system, this project had measurable impacts in: 8 acres of dune restored, over 80 community members attended the public meetings or site visits, over 200 K-12 students engaged in volunteer planting and restoration activities, and 1,000 brochures and 3 large signs that will help resource users both appreciate the natural resource and understand the importance of a resilient dune system for its ability to provide risk-reduction value to the community.

Appendix A: Maps

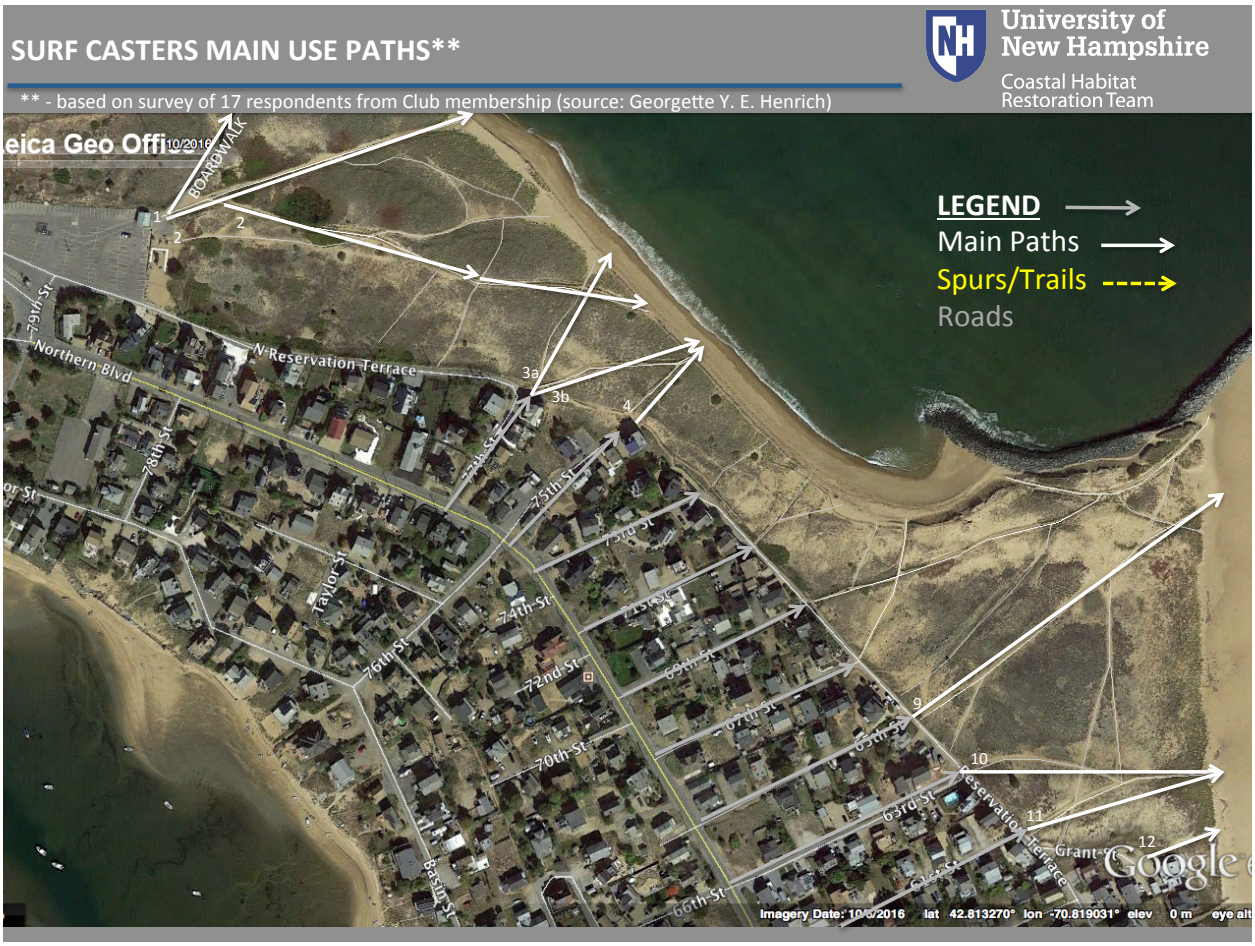
Project Area

Public Presentation Maps (1 of 5)

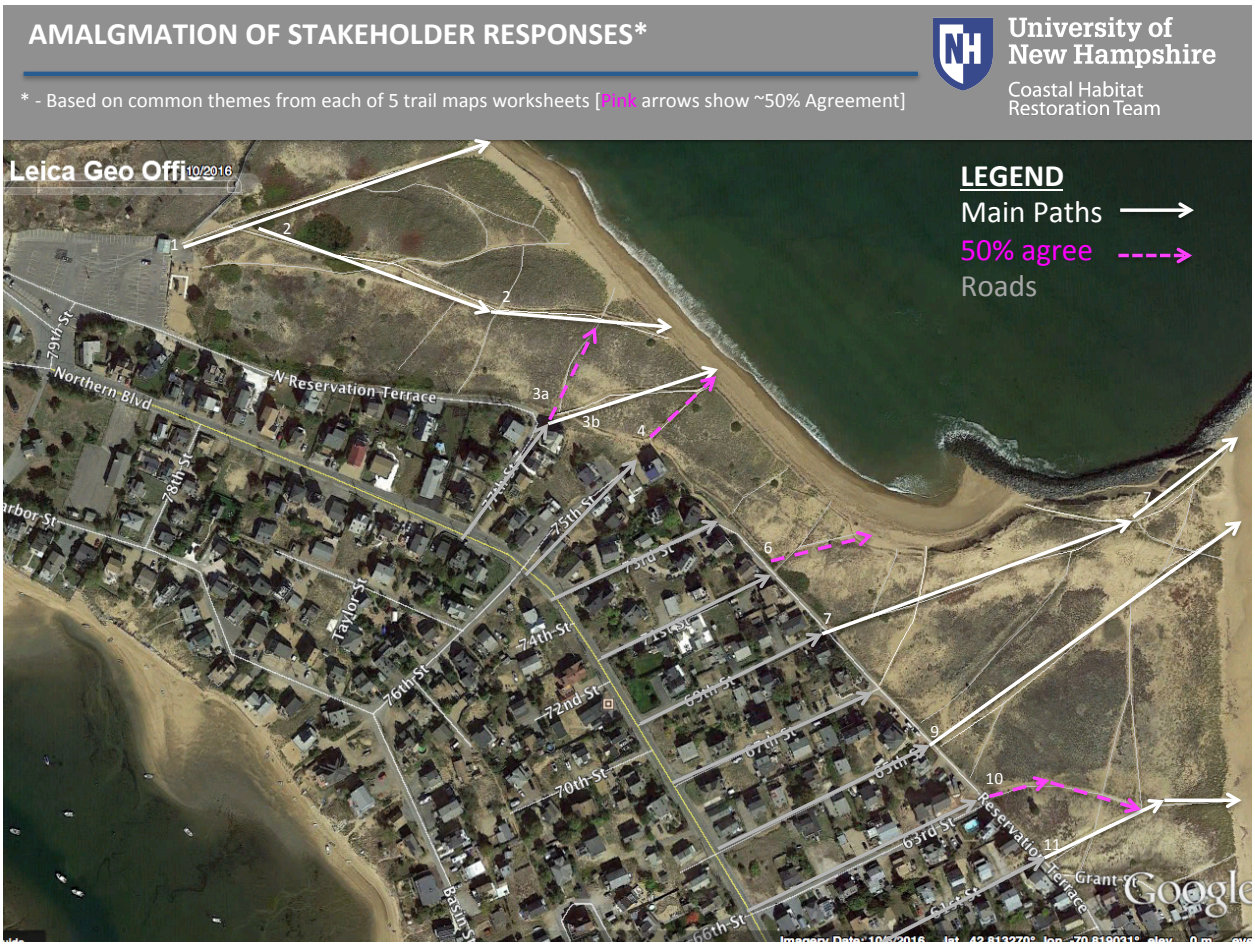


Public Presentation Maps (2 of 5)

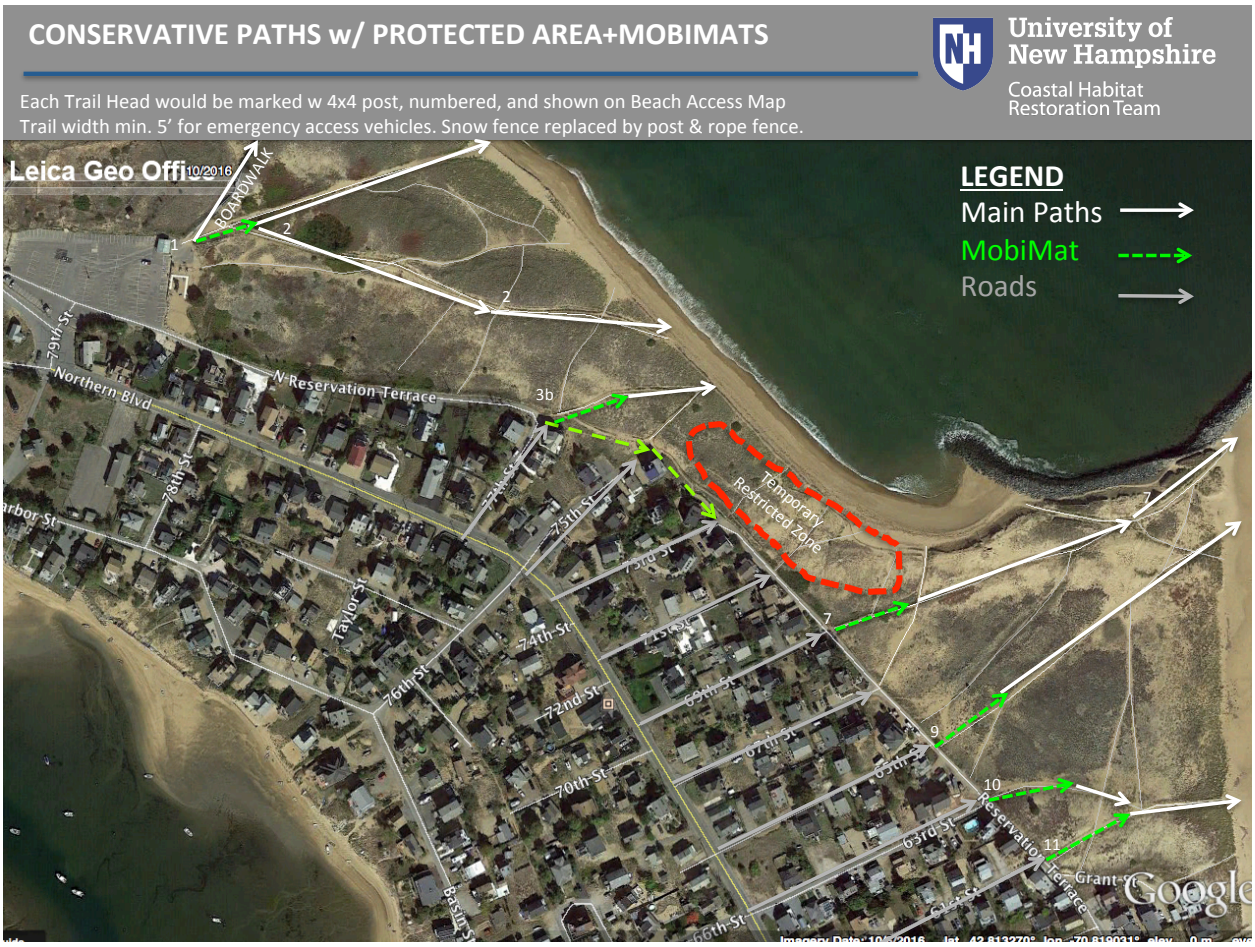
Public Presentation Maps (3 of 5)



Public Presentation Maps (4 of 5)

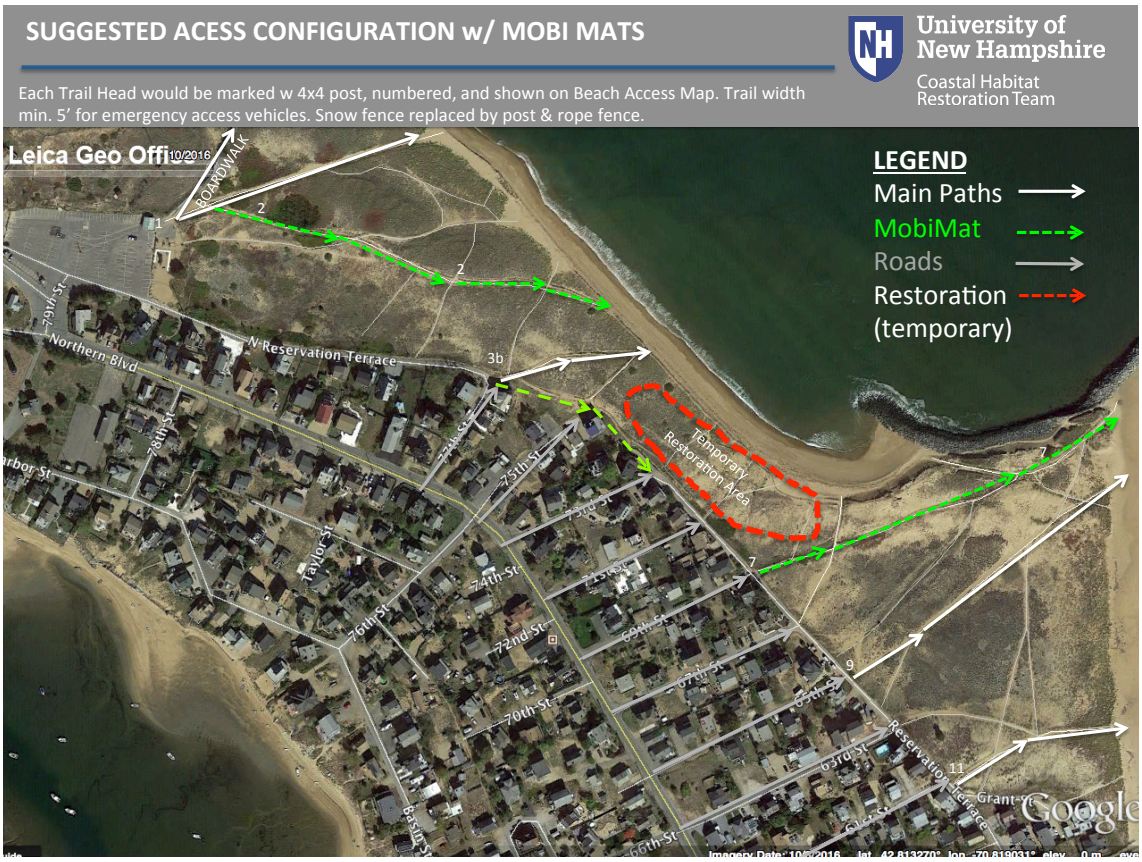


Public Presentation Maps (5 of 5)



Appendix B: Maps showing Beach Reconfiguration Recommendation

(* Revised from Slide 5 of 5, Appendix A, key difference being full Mobi-Mat® on Path 2 and 7)



Appendix C: Public Comments – Meeting 2

Public Comment notes recorded during the May 4th public meeting on the Newburyport Dune Restoration & Beach Access Improvement Project

Notes edited slightly for clarity the following morning on 5/5. Names removed for privacy.

- Comment 1: Are we putting fencing along the entire length of reservation terrace to guide access from the road? (Possible recommendation?)
- Comment 2: (Newburyport) Mobi-Mats® are good! Putting them at the beginning of the path is great but would be a problem for folks with a wheelchair. Add Mobi-Mats® to one trail to be fully ADA accessible.
- Comment 3: 67th street: community members could help raise funds to run out 69th street trail. Maybe up to 6k? Would be a great way to create a "dedicated path." Residents can help raise funds.
- Comment 4a: How can we stop people from walking along the scarp at high tide? Have life guards write on signs at the front of the trail, noting when there is high tide and what times the trail should be used.
- Comment 4b: 70th street; approved paths are pretty sparse. Can we adaptively manage path access (changing it as conditions change)?
- Comment 5: Got involved because we don't want private citizens to find their own solution; people taking action on their own isn't good. Mobi-Mats® are good. The project is making progress. Solution: look at the base of the jetty; lip that goes out (old breakwater). this erosion has happened before. Build a rock wall out. There's a jetty on 67th street that could be used. At high tide folks are going to walk out at high-tide and be unable to get back. People become trapped at the jetty during high tide.
- Comment 6: end of 69th was the access to the old coast guard station; road is still there buried underneath the sand. Plow the sand away from the old road and use it as an access point (ending with Mobi-Mats®).
- Comment 7a: the real problem around 75th and south (it has lost a lot of land in the past two years). Line of rocks causing a swirl and increasing ocean energy; Rocks brought in during the building of the jetty; might be causing the increased erosion. Right around 69th and 70th;
- Comment 7b: Be clear that the project encompasses both north reservation and regular reservation; Not a lot of people seem to use the paths. Small numbers of fishermen who use the paths;
- Comment 7c: Are there permitted paths?
- Comment 8a: What's best for the people; we're not talking about what's best for the beach. Current conditions on the weekend at mid-high tide. Folks are on the very north point where it's growing. Folks are getting funneled into that area. It's grown about 100'. Fishermen use the south area. Beachgoers up by the boardwalk. Path from the boardwalk is the best access point;
- Comment 8b: Look out to the parking lot: beautiful grass. Look to the south, too many signs, fences and paths; not scenic anymore. Not a lot of people use these trails; We have the right to use that beach; this project is denying beach access; lives on 77th street; has used it forever; people shouldn't say: don't walk out this path; How are people going to access the beach?

- Comment 8C: Prefer to have individual paths closed to save infrastructure. It's worth it.
- Comment 9: (repeat person); it's not been proven that people walking the path are the problem. If it's proven that's the issue, then let's close it. But not before. People stick to paths. The most direct paths are good. Have some studies to see if people walking the path leads to erosion. Real problem is the ocean/jetty.
- Comment 10: Post meeting comment: add beach wheelchairs that can be reserved.
- Comment 11: Post-meeting comment left in a note: use flags to note when there is no dry beach [due to high tide].

Appendix D: Straw Poll Tally

Straw Poll conducted at second public meeting. Comments transcribed to the best of the transcribers ability; some handwriting was unintelligible: "…" indicates some text was unreadable and thus not copied to this table.

Voter ID	Option #					Comments
	1	2	3	4	5	
1	X					USACE should repair jetty, replace sand, AND dredge + put sand back on beach
2					X	Hopefully when the beach becomes stable, the paths that have been historically at the end of every street will be reusable/reopened again.
3						Options 2-5 are insufficient by themselves. I've merged some of 1, 3, and 4 on the attached map. (map interpretation: Mobi-Mat® priority on trail 1 (directly to the right of the boardwalk). Has marked trail at the end of 67th (but not clear why). See map for more details.
4	X					No fences! Option 1 except take down existing fences; Option 5 is the worst option because we do not want a "temporary restricted zone"; Do not restrict access. This discussion is a distraction from the real issue of the erosion caused by the jetty
5					X	
6					X	To me - I suggest raising $$ to provide Mobi-Mats® to our beach on paths at 69th st. and from the park lot (trail 1). Whether it be $10,000 or $15,000… allows 2… total access to the ocean. Let us know. *(Name redacted)*
7					X	Agree with longer Mobi-Mats®if funds obtained. 69th street is of utmost importance to me. Had a solutions for high tide for safety reasons and dune protection. Need to figure out solution for man-made jetty issue.
8					X	But add Mobi-Mats®north of boardwalk end. Get rid of 2. Get rid of 3B.
9	X					People walking on the dunes is not the primary issue (in my opinion); the reconstruction of the jetty is!
10	X					Without river access, people will traverse the jetty - which is very dangerous. They will take the shorter but dangerous option almost every time. Path # 11 is crucial to maintain.
11	X					I would be open to option 5 if there was some way to provide access from the ocean side to the river side. Very important!
12				X		When are we going to have a meeting about the jetty that caused the erosion!
13			X			Use of Mobi-Mats®to direct and encourage at entrances is a great idea and should a lot to direct traffic

14	X					Keep spur #3 open. Thank you for all your hard work. Please remember that people bought homes to enjoy the land and ocean and access to it.
15	X					Please keep # 2 or 3 open
16	X					Please keep open #3
17	X					Please keep open #3
18					X	How about a time lapse camera or cameras. Recording foot traffic on the beach/dunes one summer weekend? It would show where people are actually going and end some of the unknown. I volunteer my house (end of 75th) as a camera location. *(name and contact info redacted)*
19	X					I struggling to comprehend how restricting beach access, when its unknown the degree of erosion is due to human impact, will restore the beach. A 24" path will not restrict dune growth or beach grass propagation. Keep all access points as is! No Mobi-Mat®! Will need additional public parking unless done from parking lot.
20	X					Cheap!
21				X		
22					X	I want to thank you for all the work and though you all have put into this
23					X	Must pay attention to high tide issues. Keep people off scarp.
24					X	Concentrate Mobi-Mats®on most important one or two trails
25		X				
26		X				Option 2 but don't need # 3 and 4. Remove #4. But add fencing and Mobi-Mats® - make at least one path matted all the way to the end for full ADA compliance. #11 would be best because people in wheelchairs will want to be on... Beach, not the river.
27					X	
28				X		
29				X		
30					X	Option 5 but would not use 3b; would use 4. Would use 3a. Probably need more access from North reservation terrace
31		X				Don't need trail 4 (extended from 75th). 77th is so close (I live closer to 75th). I like Mobi-Mats® and we could add #10 Mobi-Mats® to #11 and possibly give full coverage to beach?
32						Comment submitted by email shortly after the meeting: It was a pleasure to meet you and attend Thursday's meeting. I speak for myself and several other North Reservation homeowners who could not attend the meeting in asking that path #2 or 3 remain in use, so that residents have a path between 77th Street and the boardwalk. Thank you, Frank Ippolito 91 North Reservation Terrace.
TOTALS	**11**	**3**	**1**	**4**	**11**	

Appendix E: Large Sign Template

Appendix F: Beach access trail map and dune fact sheet

File is too large to embed in this document. View it online at the City's web site:: https://www.cityofnewburyport.com/sites/newburyportma/files/uploads/final_nwf_plum_island_point_beach_access_map_dune_fact_sheet.pdf

Appendix F: Photos

***Top Left*:** Attendees of the first public meeting listen to an opening presentation. ***Top Right*:** Staff from NWF, UNH, DCR, and the City of Newburyport led a site visit to Plum Island Point to see the accelerating erosion firsthand and hear from concerned stakeholders. ***Bottom Left*:** Restoration plantings conducted by UNH with volunteer collaboration with local area schools. ***Bottom Right*:** View of planted restoration areas between fencing and rope fence areas.

Appendix G: Documentation of Rate of Beach Erosion to MRBA

University of New Hampshire
Coastal Habitat Restoration Team

February 2, 2017

Senator Bruce E. Tarr
Senate Minority Leader
State House, Room 308
24 Beacon Street
Boston, MA 02133

Dear Senator Tarr and Members of MRBA,

As many of you know, the UNH Coastal Habitat Restoration Team has been actively monitoring dune resilience in Newburyport, with particular emphasis on the increasingly threatened dunes of Reservation Terrace. We have seven permanent dune profile transects in the area as part of our regional monitoring program. Each transect is marked with a 15ft rebar rod driven into the dune ~10 ft landward of the dune crest. Since installing rebar three years ago, we have been forced to relocate rebar 3 or more times – a testament to how regular the loss of dune is at this site.

To put the rate of loss into perspective, we've prepared a figure that shows the leading edge of dune that we surveyed in March 2016 and again in late January 2017 just after an unnamed nor'easter. These are shown overlain upon an orthophoto from 2013. The loss of dune has been staggering. In less than one year, the dune edge and beach has eroded landward over 40 linear feet, along a roughly 1,600 ft stretch of beach, much of this occurring overnight. That equates to an estimated 1.5 acres of dune loss in less than a year! In addition, storm surge caused impacts to the vegetation landward of the eroded edge, flooding dune vegetation and depositing extensive piles of wrack.

Figure 1. Leading edge of vegetated dune from March 2016 (blue line) and January 2017 (red line). The red line represents the edge of dune today, a distance of over 200ft landward of 2013 in some areas.

Furthermore, the wrack line's landward limit was surveyed within 75 ft of homes along Reservation Terrace. Had it not been for the recent dune nourishment spearheaded by Darryl Forgione and his team at DCR, it is my professional opinion that homes on Reservation Terrace would have suffered direct water damage from the tidal surge. DCR's efforts should be commended for helping this community and the City of Newburyport avoid potentially serious and expensive coastal storm related damage. The season for additional storms remains upon this community. I want to take this opportunity to underscore the importance of the MRBA *and* its regular inclusion of community members who, together, pushed for this protective action by voicing their concerns to a capable and receptive group.

Figure 2. Overview photo showing loss of dune, fence, and the importance of DCR's sand additions that formed a protective barrier stopping tidal surge from the late January storm. Note the extent of wrack deep into the dune system, stopping at the foot of the dune nourishment. (Photo date: January 27, 2017.)

Over the next few weeks, our UNH Team will be preparing an interim report that details the results of our quarterly dune profile sampling, and information from the additional storm-specific field surveys we conducted in response to community concerns to detail the rate and magnitude of change at this site. As an important component of the report, we will calculate the volume of sand lost and provide estimates of plant loss and changes in vegetation density and species richness we have noted as well. We believe it is imperative to provide the group with an accurate depiction of the changes that have been occurring at this site so that management goals can align with the day-to-day reality of a rapidly eroding dune system. We look forward to an opportunity to share these results and discuss the consequences as we look for management solutions with all stakeholders at an upcoming meeting.

Sincerely,

Gregg E. Moore, Ph.D.
Associate Research Professor

cc: Darryl Forgione, DCR
Julia Godtfredsen, City of Newburyport