The Sheridan Beach and The Esplanade

Public Access, Land Management, and Implementation Plan

Final Report approved by the Michigan City Park Board on May 7, 2014

Prepared for Michigan City Parks and Recreation Department
Michigan City, Indiana

ACKNOWLEDGEMENTS

We would like to acknowledge the following people for their involvement with this plan

Michigan City Parks and Recreation Board:

Bryant Dabney, President
Phil Latchford, Vice President
Philip Freese, Secretary
Chris Chatfield

Michigan City Parks and Recreation Department:

Jan Orlich, Superintendent
Shannon Eason, Administrative Director
Jeffrey Katz, Attorney

Dunes Restoration Committee:

Frank Seilheimer, Chairperson
Jan Orlich
Paul Reilly
Jeffrey Kirsch
Ed Hogan
Nicole Barker
Dale Engquist

TABLE OF CONTENTS

Michigan City Parks & Recreation

SMITHGROUP JJR

INTRODUCTION

In 2012, SmithGroupJJR (SGJJR) was retained by the Michigan City Parks and Recreation Department ("Parks Department") to complete an Ecological Assessment, Restoration and Access Plan for Sheridan Beach and The Esplanade in Michigan City, Indiana. The focus of the ecological assessment was to document base line ecological conditions, develop ecological restoration strategies, and to begin a preliminary conversation as to challenges and opportunities related to site access for a variety of users. SGJJR used ecological findings from the 2012 plan to inform the Public Access, Land Management, and Implementation and Management ("Plan"), which focuses on recommendations for improving public beach access and wayfinding, and facilitating adjacent property owner beach access through sensitive dune areas.

It is our intent that this Public Beach Access Plan be used as a tool by the Parks Department and the Parks and Recreation Board to objectively inform future land use and land management decisions within the project area. Ultimately, the Plan will be incorporated into the Parks and Recreation Five-Year Master Plan.

Background

The project area consists of Sheridan Beach and The Esplanade, a 1.1 mile long, 66-acre stretch of sand beach and dune system along the southern side of Lake Michigan, approximately bound by Lake Michigan to the north, the Dunescape development to the west, the Town of Long Beach to the east, and private residences to the south (see Figure 1). The Esplanade was quitclaimed by the owners and subdividers (heirs of the original owners) of the adjacent lands. They dedicated it for public use and enjoyment as a public esplanade, walk, park and bathing beach. Sheridan Beach was also dedicated by the original owners and subdividers of the adjacent lands for public use and enjoyment as a beach. Both The Esplanade and Sheridan Beach are owned, managed and maintained by the Parks Department.

The project area base map used for all exhibits within this report was generated using readily-available digital data from LaPorte County, Indiana Beacon web, and other municipal information.

Stakeholder Group

This Plan has been informed and guided by a stakeholder group consisting of adjacent property owners, Parks Department staff, the Michigan City Urban Forester, and Michigan City area residents. A set of guiding principles were developed and approved during the stakeholder process of the original ecological study (SGJJR 2012). SGJJR incorporated comments from the stakeholder group for this Plan during a kickoff meeting during May 2013, and subsequent draft plan reviews in August and October 2013. The Plan was presented to the public during a Parks and Recreation Board meeting in

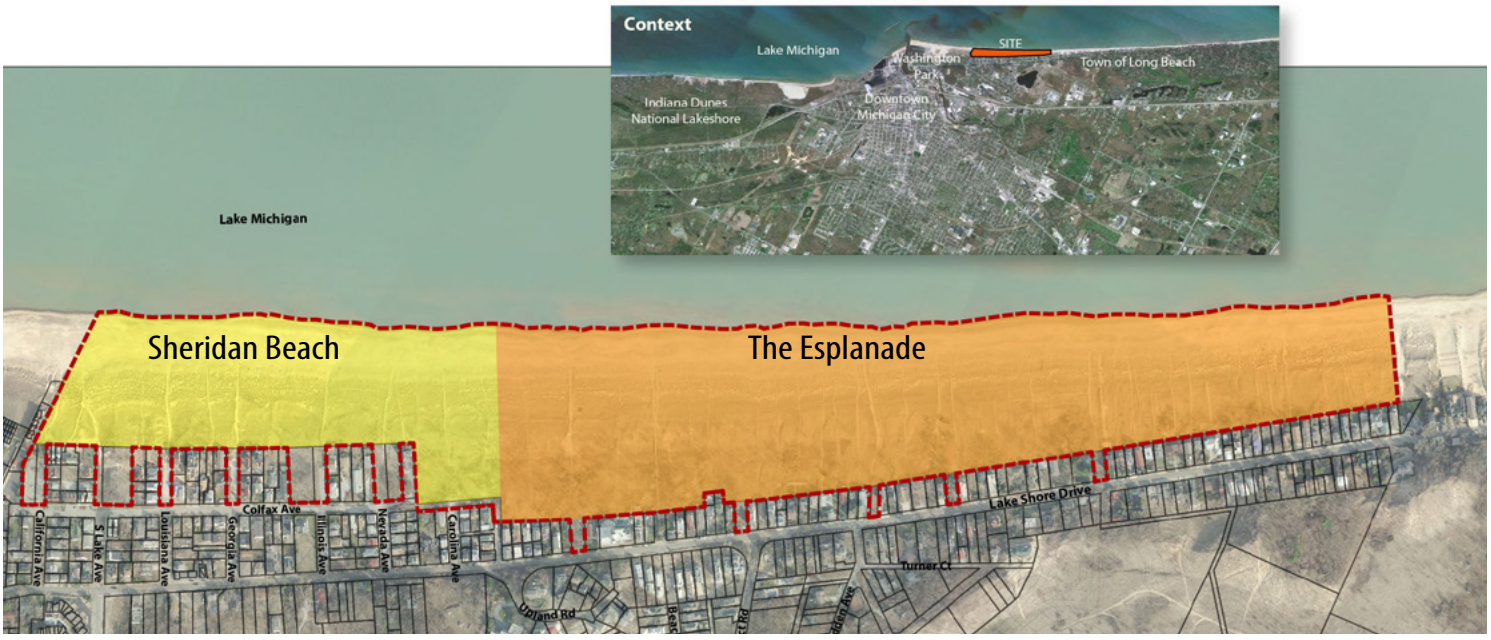
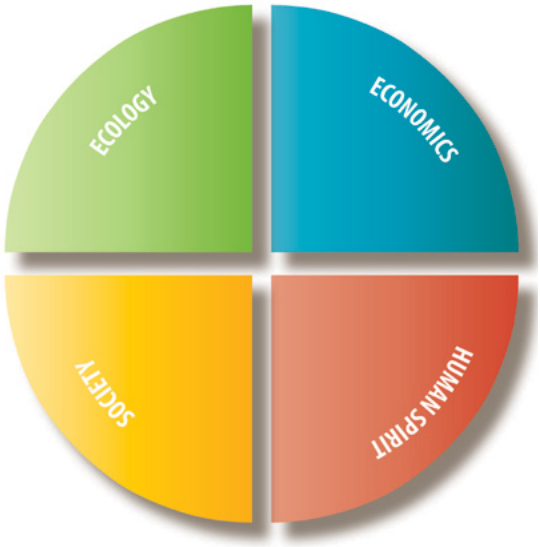


Figure 1: Location Map

Guiding Principles

During the development of the 2012 Ecological Assessment, Restoration, and Access Plan, prepared by SmithGroupJJR, the stakeholder group and the Parks Department developed a set of guiding principles. The same guidelines remain relevant for the Public Access, Land Management, and Implementation Plan.

The principles are organized by the four tenets of sustainability:



Social

- Enhance wayfinding and access for a diverse user group (i.e. ADA, children, elderly, etc.).
- Improve access from adjacent homes while limiting negative impacts on ecology.
- Identify additional parking opportunities.
- Be sensitive to the historic relationship between neighbors and beach users.

Metrics:

- Provide at least one additional ADA access with parking.
- Provide additional wayfinding signage to clearly designate every public access point.
- Develop and enforce trail access standards and specifications that support these principles.

Ecological

- Identify, protect, connect, and restore sensitive resources.
- Work toward a sustainable and maintainable natural landscape.
- Control invasive weeds.
- Honor natural processes (i.e. wind, wave, succession, and fire).
- In areas outside of the beach, maximize native plant cover and minimize bare sand cover.

Metrics:

- Reduce abundance of privet, oriental bittersweet, catalpa, and poison ivy by 90%.
- Maintain a palette of 100% indigenous plants to be used for restoration and landscaping.
- Encourage the use of consolidated beach access paths.

Economic

- Structure public access improvements so that they are fundable and easily phased.
- Minimize maintenance costs for infrastructure as well as natural areas.
- Maintain or increase property values of parcels along the lake.

Metrics:

- Implement the first phase of restoration within two years of the plan's adoption.
- Create a beach access brochure for marketing.

Human Spirit

- Identify, enhance, and protect viewsheds.
- Honor and enhance the native dune landscape (i.e. don't make it something it is not).
- Provide opportunities for quiet contemplation.
- Respect the privacy of neighbors and provide opportunities for the public to experience quiet, unbroken access to open space.

Metric:

- Provide two additional and intentional opportunities for quiet contemplation.

PUBLIC ACCESS PLAN

Background

There are currently 18 dedicated public rights-of-way off of Colfax Avenue and Lake Shore Drive that provide access to Sheridan Beach and The Esplanade (see Figure 2). Steep slopes and loose sand make all access points difficult to traverse and have made universal access impossible.

In addition to the public access points, residents and property owners have created volunteer pathways from their private properties through the dunes to the beach. There are approximately 70 volunteer pathways dissecting Sheridan Beach and The Esplanade. These pathways are clearly visible from an aerial photograph of the site. Collectively, these pathways damage soil-stabilizing dune plants, create large patches of bare sand that are difficult to traverse, and exacerbate blowing sand and dune formation in public use areas.

The Goal of the Public Access Plan

The primary goal of the Public Access Plan is to facilitate access to and from the beach for multiple user groups in a way that minimizes damage to sensitive dune habitat, respects the privacy of neighbors, and helps the community appreciate the dunes, beach and lake. The primary strategies involve improving wayfinding, consolidating paths, and providing hard surfaces to encourage users to stay off of sensitive dune plants.

Ultimately, consolidation of pathways, along with judicious contouring of dune access paths per restoration and beach access pathway license agreements by and between the Parks Department and an adjacent resident (see Appendix X), will result in improved public access to the waterfront and beach and reduced impact on ecological communities.

The Public Access Plan was developed with the following principles in mind:

- Volunteer paths are permitted to exist, but those in close proximity to each other are encouraged to be consolidated into improved pathways, resulting in less exposed sand.
- The location of heavily-used volunteer paths inform the location of consolidated, improved pathways.
- The paths are located so as to avoid sensitive ecological communities.
- Private paths through the dunes are constructed of a boardwalk, mat, or other hard surface to reduce erosion, prevent blowing sand, and facilitate walking.
- Bare sand adjacent to the cut path is immediately stabilized with native beach grass (Ammophila brevilugulata).

Process

The following describes the process that the design team used to determine the location of public access routes and pathways.

1. To determine the placement of the pathways, the planning team identified all existing paths nearest to existing public access points. Any path associated with a public access point was given priority and considered a proposed public entry and beach access path (those that run perpendicular to the waterfront).

2. The team identified existing elevated or at-grade boardwalks. This included the Parks Department's elevated boardwalk north of the Beachwalk Resort Community ("Beachwalk Boardwalk") as well as boardwalks that have been constructed by residents.

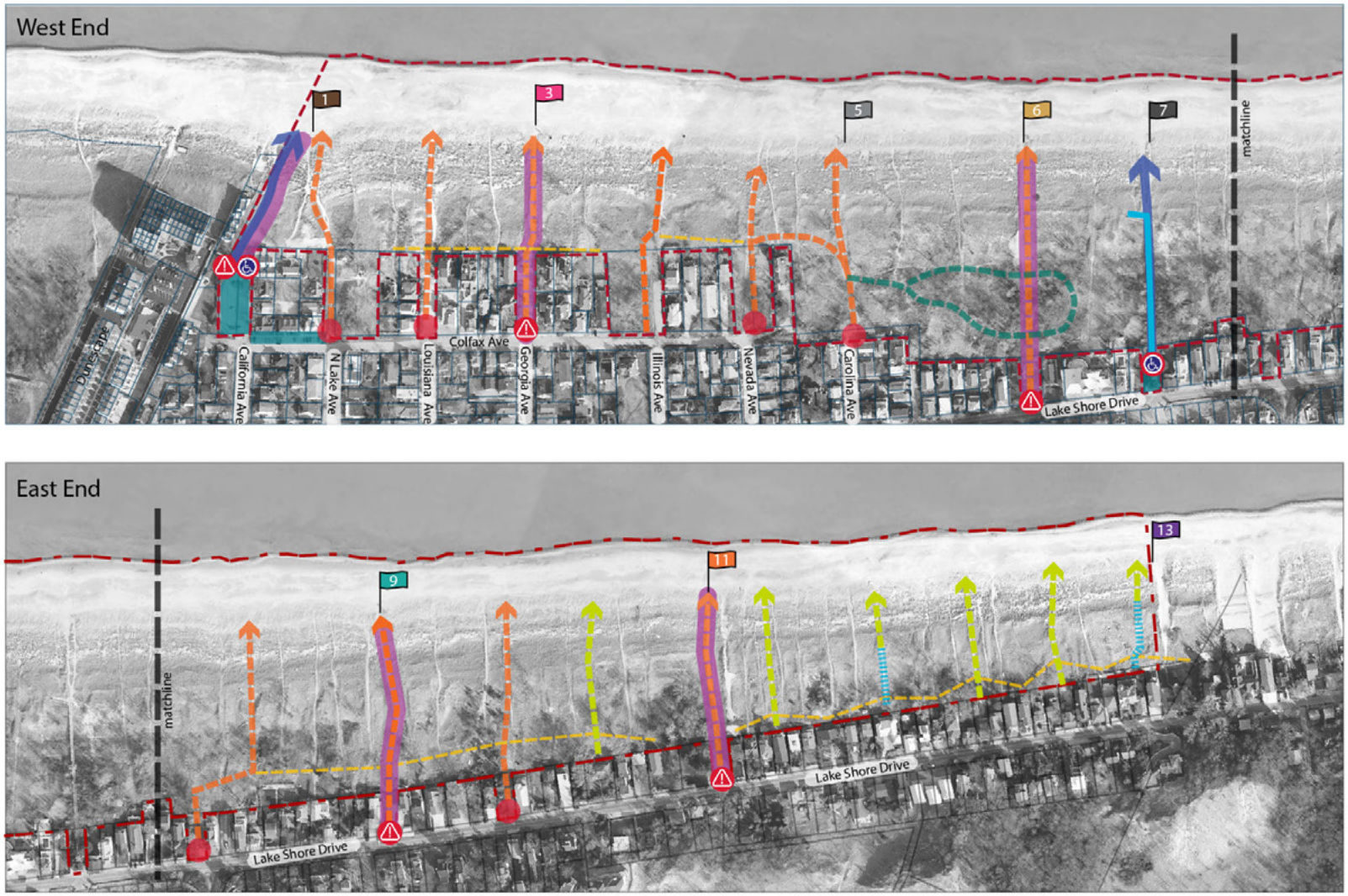
3. The team identified all other volunteer paths that have been created over time. Specific importance was placed on paths that already appear to be shared among adjacent neighbors, which are visible in the aerial photograph as small paths leading to one larger path.

4. The team developed a network of collector paths that run laterally between the public beach access paths.

5. Universal access paths were determined based on existing compliant boardwalks such as the Beachwalk Boardwalk.

6. An interpretative ecological path was designated within a dune habitat area which has high ecological restoration potential.

7. Emergency Access Routes were located off of California and Illinois roads and the road access point connected to Flag 11.



Legend

- Proposed Public Entry and Beach Access Path
- Proposed Universal Beach Access Path
- Emergency Access Route
- Proposed Lateral Collector Path
- Proposed Interperative Ecological Path
- The Beachwalk *(Elevated boardwalk, City-owned)*
- Existing Boardwalk *(At-grade boardwalk, by residents)*
- Suggested Shared Access Paths
- Project Site Area
- Parking
- Beach Flags

Notes:

1. Beach Pathway License Agreement is described in full in SectionXX of the Report.

2. Parcel data and aerial photography based on existing data sources from local and state agencies and has not been field verified for accuracy.

0 75 150 300 450 600 Feet

Sheridan Beach and The Esplanade Public Beach Access Plan

Michigan City, Indiana

Figure 2

Design Recommendations

This section includes general recommendations on the location, design and materials for the following:

- Public Entry and Beach Access Paths
- Lateral Collector Paths and Shared Access Paths
- Universal Beach Access Paths
- Interpretative Ecological Path
- Parking Improvements
- Signage and Wayfinding
- Emergency Access Routes

Public Entry and Beach Access Paths

Public beach access paths (those that run perpendicular to the beach) should be 5-foot wide boardwalks at grade and should be sited in order to balance the shortest path to the beach while taking advantage of breaks in the dune topography. Each section of the boardwalk should not exceed eight feet long to allow for easy installation and maintenance. These sections should be light enough to temporarily remove to allow for re-grading of sand as needed.

Materials

The structural wood for the boardwalk system (e.g. joist, post, etc.) shall be select, pressure-treated lumber. All connections should be stainless steel or galvanized.

The decking for the boardwalks can be a synthetic wood polymer product or wood decking.

Synthetic Decking: A wood polymer product such as "Timber Tech" or equivalent synthetic material would provide a durable and long-lasting product. Recommended colors shall be grey or tan to blend in with the natural environment.

Wood Decking: The City may also consider a pressure treated, Grade 1 decking as a cost-saving alternative. Select, pressure-treated decking will require additional maintenance to alleviate splintering and warping of the boards.

A typical section of this type of boardwalk is shown below in Figure 3. A typical detail of how the boardwalk meets the road entry is shown in Figure 3a (inset).

Matting: Roll-out polyester permeable mats (e.g. Fiber Bond Beach Mat, Deschamps' Mobimat, Boddingtons' PathMat) may be installed on the surface and will not sink into the sand or may be covered with a few inches of sand. These mats may be installed in the spring and removed in the fall. Rubber mat panels are a polyethylene material, typically sized at 2' long x 4' wide x 2" thick, with molded in-traction pattern that promotes easy walking/rolling. The panels also have drainage holes that help alleviate damage to the existing environment as well as provide drainage. The panels can be permanently connected or, when portability or seasonality are issues, temporarily connected utilizing a quick-connect system that permits assembly/disassembly without the use of tools, electricity, or specialized knowledge. Little or no ground preparation is required.

Figure 3 - Typical section of a Public Access Pathway.

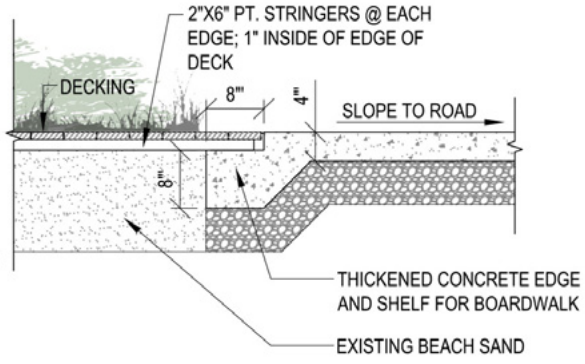


Figure 3a: Typical section of Public Access Way connection to the road

Lateral Collector Paths and Shared Access Paths

In addition to the public access paths, the Plan provides recommendations for collector paths and shared access paths.

Shared access paths run perpendicular to the beach, as shown in Figure 2. The proposed locations of these shared access paths are based on observations of existing volunteer paths and were selected as a means to provide a relatively even distribution of beach access for residential users. The majority of these paths are located at the east end of the project site where public access points are fewer. Each suggested shared access path provides access to the beach for 5-7 residences.

Residents will be encouraged to use shared access paths to reduce the number of volunteer paths that disrupt dune habitat and cause dune instability. The installation of shared access paths does not preclude the use of existing volunteer paths, which may be improved pursuant to a Restoration and Beach Access Pathway License Agreement between the Parks Department and an adjacent resident (See Appendix A).

Lateral collector paths run laterally between the public access points and the suggested shared access paths. They are sited to provide better access through vegetated dune areas (see Figure 2 for proposed locations).

Both shared access paths and collector paths should be 5-feet wide (maximum) and constructed at grade to follow existing topography.

Each section of the boardwalk should not exceed eight feet long to allow for easy installation and maintenance, and each should be light enough to temporarily remove to allow for re-grading of sand as needed.

Please refer to the "Restoration and Beach Access pathway License Agreement" for more specifics on the construction and Terms and Conditions for Access Paths per Appendix A.

Materials:
The decking for the boardwalks can be a synthetic wood polymer product or wood decking.

Synthetic Decking: A wood polymer product such as "Timber Tech" or equivalent synthetic material would be durable and long-lasting . Recommended colors shall be grey or tan to blend in with the natural environment.

Wood Decking: The City may also consider a pressure-treated, Grade 1 decking as a cost-saving alternative. Select, pressure-treated decking will require additional maintenance to alleviate any splintering and warping of the boards. A typical section of this type of boardwalk is shown in Figure 3.

Matting: Roll-out polyester permeable mats (e.g. Deschamps' Mobimat and Boddingtons' PathMat) will not sink into the sand and may be installed in the spring and removed in the fall. Rubber mat panels are a polyethylene material, typically sized at 2' long x 4' wide x 2" thick, with a molded in-traction pattern that promotes easy walking/rolling. The panels also have drainage holes that help alleviate damage to the existing environment as well as provide drainage. The panels can be permanently connected or, when portability or seasonality are issues, temporarily connected utilizing a quick-connect system which permits assembly/disassembly without use of tools, electricity, or specialized knowledge. Little or no ground preparation is required.

Universal Beach Access Paths and Improvements

The goal of improving universal access to Sheridan Beach and The Esplanade is consistent with the overarching goal of the Public Access Plan, which is to provide better accessibility for all residents and community members, including those with disabilities. To that end, recommendations in this Plan take into account guidelines for universal beach accessibility per the United States Access Board, Recreation Facilities, ADA, and ABA Standards (Final Guidelines for Outdoor Developed Areas, September 26, 2013).

The team used the federal guidelines as a tool to determine the location, size, and number of universal beach access points within the project area. The recommendations for universal access in this report are suggested guidelines based on federal standards but are not mandated at the municipal level in Michigan City.

Beachwalk Improvements (Flag 7)

The Beachwalk Boardwalk is constructed of wood and currently provides universal access toward the beach but does not reach the beach edge. The Beachwalk Boardwalk is centrally located within the project site at Flag 7 (see Figure 2 and images on facing page). This access is heavily used by families toting strollers, coolers, and wagons.

The Beachwalk Boardwalk does not fully extend to the beach, but instead terminates within the dune area. At this terminus there is a landing parallel to the beach which provides space to park wheelchairs, strollers, and wagons.

The Beachwalk Boardwalk is generally in good condition but is in need of minor repairs, including the replacement of individual weathered boards and painting.

In order to provide more complete universal access, we recommend extending the Beachwalk Boardwalk to the beach and providing a landing at the new terminus for wheelchair parking, strollers, and wagons. The extension of the Beachwalk Boardwalk should match the existing structure in materials, width, and construction.

Residents shall be permitted to install turf grass 20' beyond their property line, toward the lake, to serve as a fire break and for passive uses. No other herbaceous, woody or hard landscaping will be permitted within this 20' buffer. It shall be the responsibility of the residents adjacent to the buffer to maintain the buffer and keep it free of invasive weeds.

Existing photos of the Beachwalk

Additional Universal Access (Flag 1)
In addition to the existing universal access located at the Beachwalk Boardwalk, the Parks Department should also consider a second universally accessible boardwalk option at the west end of Sheridan Beach at California Avenue. This location will allow universal access at a heavily populated and dense residential area of the beach. This location also allows for the addition of designated handicapped parking within the existing parking lot near the intersection of Colfax Avenue and California Avenue.

The new universal access path at California Avenue should provide beach access that is compliant with current federal guidelines.

The following is a summary of current guidelines for universal access on beach and dune areas. They are provided for reference only, with the understanding that given the sensitive nature of the dunes, cost, and unique needs of the Parks Department, they may not be practical. Our recommendations are sensitive to these guidelines but strive to directly meet the unique needs of the Parks Department.

- A universally accessible route should be located every 1/2 mile within the project site.
- The running slope of any segment of beach access route should not be steeper than 1:10 (10%). Where beach access routes are steeper than 1:20 (5%), a resting interval is required at the top and bottom of each segment.
- Cross slopes for beach access routes should not be steeper than 1:48, and where the surface is other than concrete, asphalt, or boards, the cross slopes should not be steeper than 1:20.
- Beach access routes should be a minimum of 60 inches wide to enable individuals who use wheeled mobility devices to pass beach visitors traveling in the opposite direction. An exception permits the clear width of beach access routes that are not removable to be reduced to 48 inches at dune crossings.
- Handrails should be provided where the slope of beach access routes at dune crossings are steeper than 1:20 (5%).

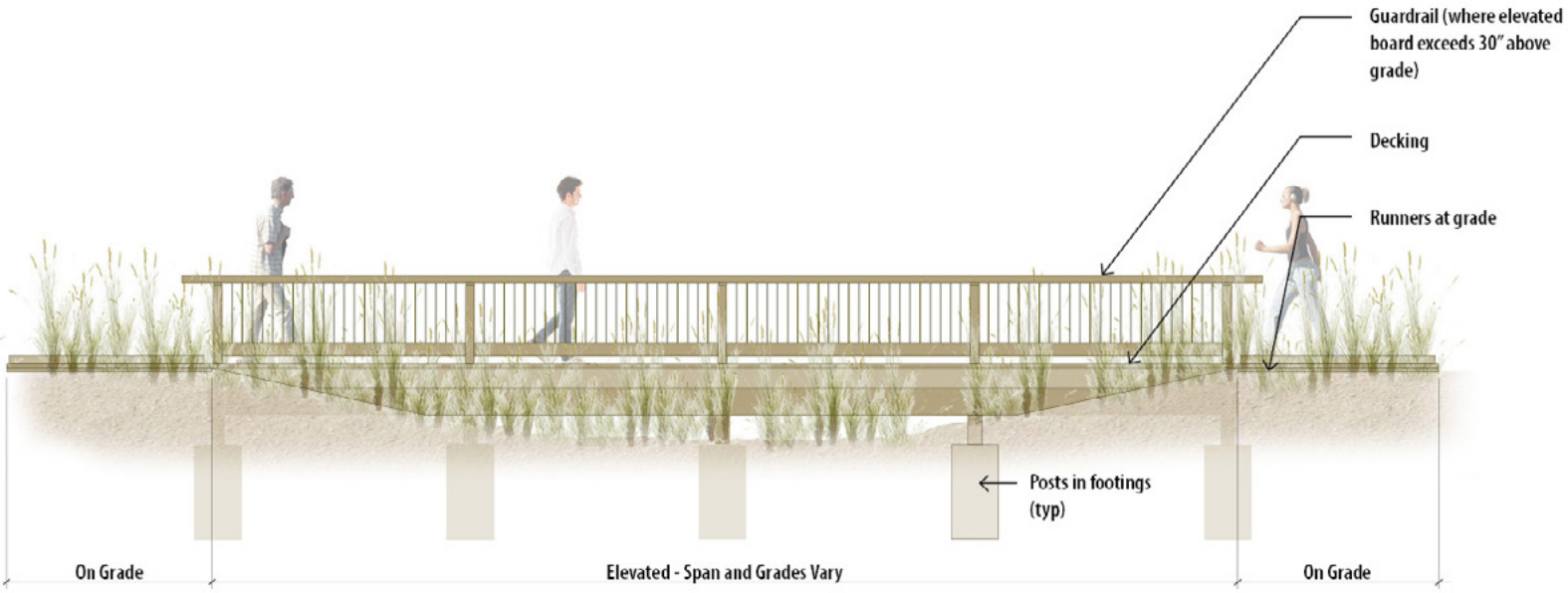


Figure 5 - Typical section of a Univesal Access Pathway over steep grades (greater than 10% slope)

Figure 6 - Typical section of a Univesal Access Pathway at-grade

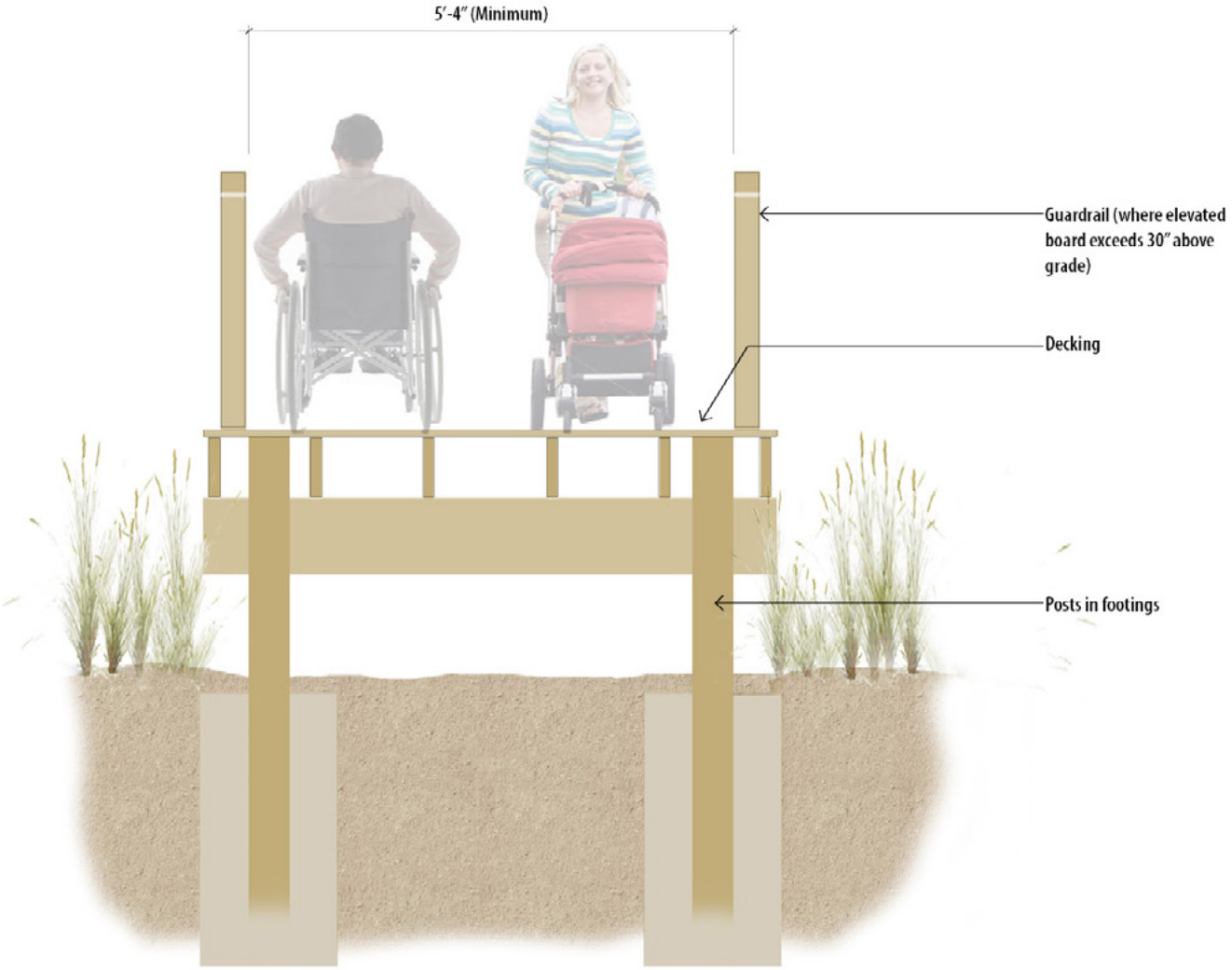


Figure 7 - Typical section of a Univesal Access Pathway at-grade

Ecological Interpretative Path

The ecological path provides an opportunity for nature lovers to quickly get into, navigate, and learn about the dune system. The path could be constructed to be similar to the public entry and beach access paths in order to provide for heavier use. It could also resemble the lateral collector paths that have a more gentle footprint but are less universally accessible. An informational kiosk should be located at the trail head to greet visitors and to provide a map and information about the trail.

Trail markers should be placed along the trail at no greater than 600 feet apart to reinforce trail identity and provide distances. Hazard signs may be placed within 100 feet of poison ivy or other potential hazards. Signage may be needed in sensitive areas to protect fragile habitats and soils.

Interpretive signage can be developed to educate visitors about wildlife, characteristic plants, history, restoration, the unique dune environment, and other site features and activities.

Specific recommendations for interpretative signage are discussed further in the Signage and Wayfinding section.

Parking

While the project team acknowledges that public parking near the project area is an issue, the Michigan City Parks and Recreation Department intends to address this issue at a later date.

Signage and Wayfinding

Existing wayfinding on the beach is well established with the City's flag color and number system. The flag numbers on the beach correlate with bus stop signs on Colfax and Lake Shore Avenues. However, there is no longer a bus running this route, and the bus stop signs are not well-aligned with the actual public access points. This inconsistency causes more confusion than wayfinding.

Wayfinding and signage provides important information to assist visitors in identifying where they are located on site, display riptide warnings and other site-relevant information, and direct them to area parks, public beach access points, interpretative and/or recreational areas, restrooms, and emergency access locations. Signage and wayfinding also provide a clear distinction between public and private property.

A signage and wayfinding system should be hierarchal and coherent and provide information at key locations. There should be clear wayfinding and signage directing users to Sheridan Beach and The Esplanade as well as within the project area at each public access point. Public access points from the road should be clearly linked to beach flag numbering on the beach.

We recommend establishing a signage and wayfinding system that addresses the following:

- Washington Park west of the project area is the gateway to the City's park system on the lake. We recommend a primary level sign at Washington Park that establishes the visual theme and provides a map of the City's public beach from the river to the east end of Sheridan Beach and The Esplanade.
- Directional signs should direct users from Washington Park, through Fedders Alley, and to our project area.
- The parking lot at California Avenue is the gateway to Sheridan Beach. A primary sign at this location should provide a more detailed map of the project area as well as access points, points of interest, and other relevant information. Each public access point should be signed and aligned with flags on the beach. The theme of the signs at the access points should carry the same theme as the City's flag color and number system.
- Since the public access points are fixed, the location of beach flags should be moved as necessary to align with public access points.

The following offers design guidance for wayfinding signage:

- Vehicular directional signs should be 4 feet to 6 feet from the ground.
- Preserve maps should be a maximum of 6 feet wide by 6 feet tall. A preserve map would be appropriate at the parking lot at California Avenue.
- Bike/pedestrian directional signs should be a maximum of 4 feet high. These signs should be located at all of the public access points.
- All fonts should be easy to read and ADA-compliant.
- Vehicular directional sign lettering should be a minimum of 4 inches high and all uppercase.
- Bike/pedestrian directional sign lettering should be a minimum of 1 inch in height.
- Beach maps should have a minimum of 12 point font.
- Sign material should be environmentally sustainable, locally manufactured, and low maintenance.

Figure 8: Existing Beach Flag Signage and Wayfinding

Emergency Access

Emergency access paths are shown on Figure 2. These sites were located to minimize conflicts with parked cars and residents, to minimize damage to higher quality ecological zones, and to take advantage of lower dune elevations.

Emergency Access Paths are 12' wide. This provides adequate width for a public boardwalk, for an emergency ATV to ride beside the boardwalk, or for the City's four-wheel drive emergency vehicle to straddle a boardwalk. Since the City's existing emergency vehicle is designed with balloon tires to traverse sand, no special roadbed treatment is necessary.

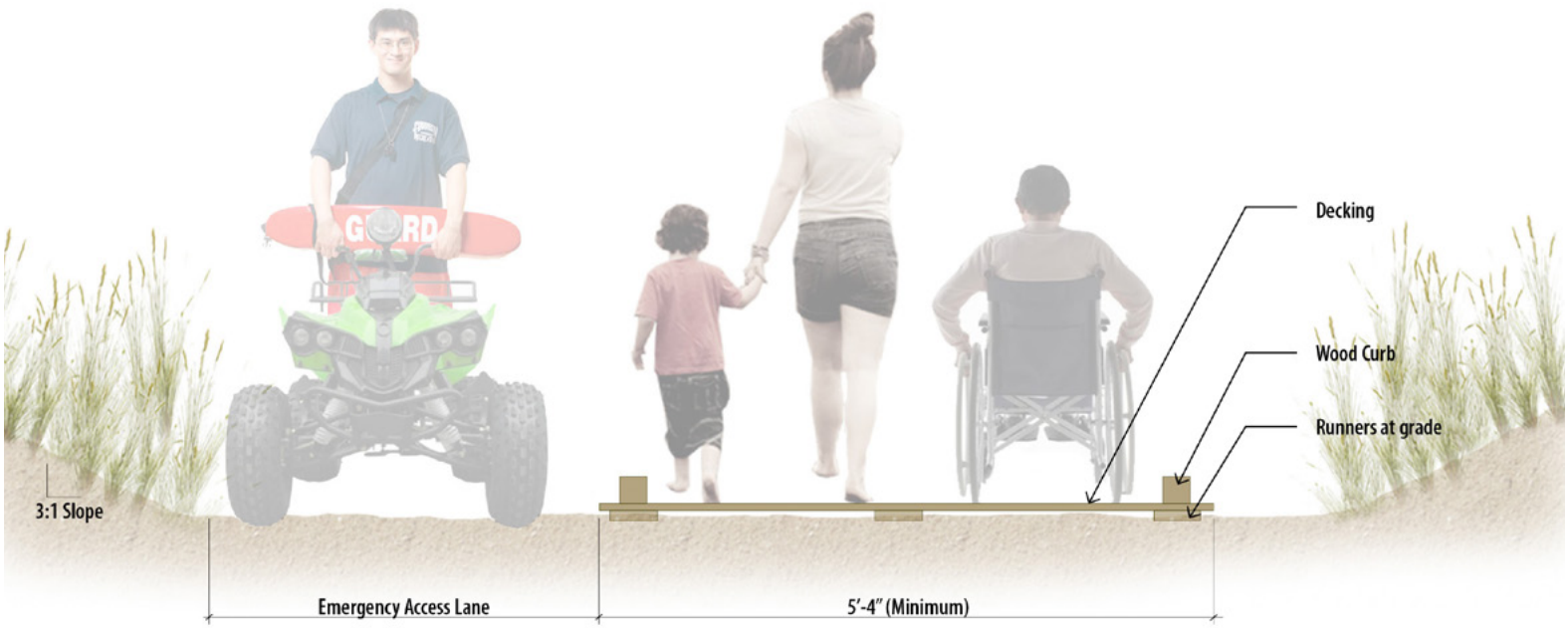


Figure 11: Typical Section of an Emergency Access Route

ECOLOGICAL RESTORATION PLAN

Background

The Sheridan Beach and The Esplanade Ecological Assessment report (October 12, 2012) describes existing ecological conditions, management zones and strategies, a proposed management schedule, and a budget for implementation. The primary findings of the 2012 report are summarized below.

Open space within the project area consisted of a degraded remnant dune system that nonetheless maintained characteristic and even sensitive native species of fore dune, secondary dune and transitional ecological communities. We measured a Native Mean C value of 3.5 and an FQI of 32.6 which qualifies it per Wilhelm and Masters (2006) as at least of marginal natural area quality. These statistics likely would have been slightly higher had we completed additional floristic surveys during the late summer when many species in the Asteracea family bloom. Primary ecological stressors we observed were encroachment by invasive weeds; the absence of fire; and large areas of bare sand caused by pedestrian and ATV traffic that contributed to dune instability and subsequent blowing sand.

The diversity and abundance of non-native and invasive species was remarkable. More than half (86) of the 164 species observed were not indigenous. We classified nearly one-third (44) of the plants observed as invasive species.

In general, dune health, as measured by the abundance of invasive plants, decreases moving landward. The fore dune is healthiest in that weeds are practically non-existent. This is because few species other than beach grass and scouring rush can survive the wind, blowing sand, and hot, droughty conditions that occur at the face of a dune. The most degraded areas occurred closest to homes and beach access areas, where soil disturbance and the diversity and abundance of invasive weeds were most evident.

In general, the potential to restore diverse and stable ecological communities is high. The matrix of characteristic species persists, and plant diversity would increase dramatically with the management of shade-suppressing woody invasive species. Following the completion of remedial restoration activities – in which the most pernicious invasive species are brought under control through selective woody brush removal, the use of herbicide, and supplemental seeding and planting – prescribed fire will provide the most effective and economical tool to maintain and enhance the health of native ecological communities.

Pages 8-13 in the 2012 Ecological Assessment Report provide detailed recommendations for phasing and restoring open space within the project area (see Appendix B). All of the recommendations in the 2012 report remain valid. The recommendations in this Plan take a more holistic look at potential phasing strategies which directly link restoration activities to proposed access activities.

1. ***Restoration, Public Access, and Sand Management.*** The implementation of public access improvements and sand management activities will temporarily damage vegetation and expose sand. The restoration of these bare sand areas using appropriate native plant material should be completed immediately and in conjunction with these other improvements.

2. ***Fire Management.*** The most cost-effective way to control invasive woody and herbaceous vegetation is using prescribed fire. We recommend burning a unit of the project area every year so that each area is burned on a three to five-year cycle. See Appendix C, which illustrates that the project site can be divided into five Fire Areas using public access points as fire breaks. Please note that any existing boardwalks or public access pathways should be protected using foam or a wet line during prescribed burns, or, if possible, removed during the burn. The Fire Management Plan should be prepared by a burn professional

3. ***Protect the Best.*** The fore dune and most of the secondary dune communities are the healthiest from an ecological perspective. These relatively healthy areas are outside of the management zones described in the Ecological Assessment report. It is much less effort to maintain and geographically expand a healthy community than it is to conduct remedial restoration work. Therefore, we recommend maintaining and enhancing healthy communities as a first priority, keeping weedy areas from spreading as a second priority, and restoring weedy areas as a third priority.

4. ***Management Zones 6 and 9.*** The Ecological Assessment Report noted these two zones as having higher restoration potential. This is also where the proposed ecological trail is located. These would be good zones to begin remedial restoration work from an ecological and educational point of view. These zones are

described in the Ecological Assessment Report (see page xx in Appendix B).

5. ***Entryways and Gateways.*** New access points will give users an opportunity to look around and wonder what other new things are happening on the ground. Opportunities for remedial restoration in the vicinity of new access points will help garner support and enthusiasm from the community.

SAND MANAGEMENT PLAN

Background

Sand dunes form when there is an abundant source of exposed sand, relatively constant wind, water level fluctuations, and vegetation to capture blowing sand. In general, the formation of dunes tends to accelerate when water levels in Lake Michigan are high. High water levels exacerbate bluff erosion, which mobilizes sand that is available for dune formation. Local factors have a profound influence as well. Jetties and breakwaters can interrupt the littoral transport of sand, causing localized beach degradation or excessive aggradation proximate to the structure. Low water levels can lead to localized dune formation by leaving broad expanses of sand exposed to wind.

The mechanism for the formation of wind-borne dunes is the same throughout the world. Fine to medium-grained sand is rolled and blown within a meter of the ground until turbulence created around a structure, such as a clump of dune grass, causes the wind to lose energy and the sand particles to fall out on the lee side of the structure. Dunes form and shift as long as there is an availability of fine and medium grained sand, wind, and structures to create turbulence.

Dunes along large water bodies tend to grow parallel to the shore and toward the source of sand. In the Great Lakes region, most dune formation occurs during fall through early spring. The formation of an ice foot along the shore can reduce the amount of winter wave erosion and sand movement.

In the early 1900s sand mining created significant depressions in the dune topography of Sheridan Beach and The Esplanade. These sand mining depressions interfere with public access, collect water and encourage the proliferation of invasive species. The Parks Department may use the excess sand that it collects from Washington Park and elsewhere to fill in the sand mining depressions in the topography, provided that there are no plants on the State of Indiana Threatened, Endangered or Watch List (e.g., American Sea Rocket (Cakile edentula var. lacustris and Dune Goldenrod (Solidago simplex var. gillmanii)) in such sand mining depressions in the topography and Marram Grass (Ammophila breviligulata) is promptly planted on the bare sand.

Effect of Land Use Practices on Dunes

While the formation of sand dunes is an entirely natural process, the use of the dune landscape affects whether dunes are an asset or a nuisance.

There are three primary factors at Sheridan Beach and The Esplanade that exacerbate aggregation of nuisance sand:

- Multiple volunteer trails between public access points and private homes through the dunes kill soil stabilizing dune vegetation, which results in exposed sand that blows and forms nuisance dunes.
- Beach grooming activities create a wider expanse of exposed sand than would naturally occur if the dunes were allowed to grow toward the lake and source of sand. This contributes to dunes growing vertically rather than horizontally.
- Lack of weed and woody brush management on the dunes results in a proliferation of nuisance weeds and woody material that do not hold soils in place, as well as native dune, prairie, and savanna plant communities.

Objectives

Sand management requires that land owners recognize and respect the natural mechanisms of a dune landscape while leveraging those mechanisms to benefit people and wildlife. The goal of this sand management plan is to fulfill the following objectives:

- Minimize the amount of exposed sand that can blow and aggregate in locations where it becomes a nuisance.
- Facilitate the horizontal movement of dunes toward the lake.
- Use vegetation and mechanical structures such as sand fences to control blowing sand and facilitate dune formation in appropriate places.
- Provide better access to the beach for people and emergency vehicles in a way that maximizes the preservation of dune-stabilizing vegetation. (This objective is addressed in the Public Access Plan).

Sand Management Techniques

Sand Fences

Sand fences are porous barriers that reduce wind speed along the coast such that wind-blown sand accumulates on the downwind (lee) side of the fence. Sand fences can be used to direct the deposition of wind-blown sand to facilitate dune creation, protect infrastructure from blowing sand, and keep people off of sensitive vegetation and on paths.

The following general guidance can be used for laying out sand fences:

- Sand fences are usually about 4 feet high and are constructed of vertical slats with an ideal 50:50 ratio of slat to open space.
- The fence should be laid out parallel to the shore.
- While fencing may be installed during any season, most sand movement occurs during the non-growing season when there is less vegetation available to stabilize sand and block the wind. Sand fencing may be removed before the sand reaches about two-thirds up the fence, or left in place.
- Localized fence should be laid out perpendicular to the prevailing winds. At Sheridan Beach and the Esplanade, the prevailing winds are southwest in the summer and northwest in the winter.
- Use existing dunes to help guide fence placement by locating the fence parallel to dune formation.
- It could take six to 24 months for a new dune to bury a sand fence. If the objective is to raise the dune height, install a new fence on top of a newly formed dune so that the new fence is installed parallel to and four times the height of the fence toward the wind (see Figure 9).
- If the objective is to move the dune horizontally, install a second row of fencing parallel to the first about four times the height of the first fence.
- Single fences are as effective as a zigzag alignment, and spurs have not proven to effectively capture sand.

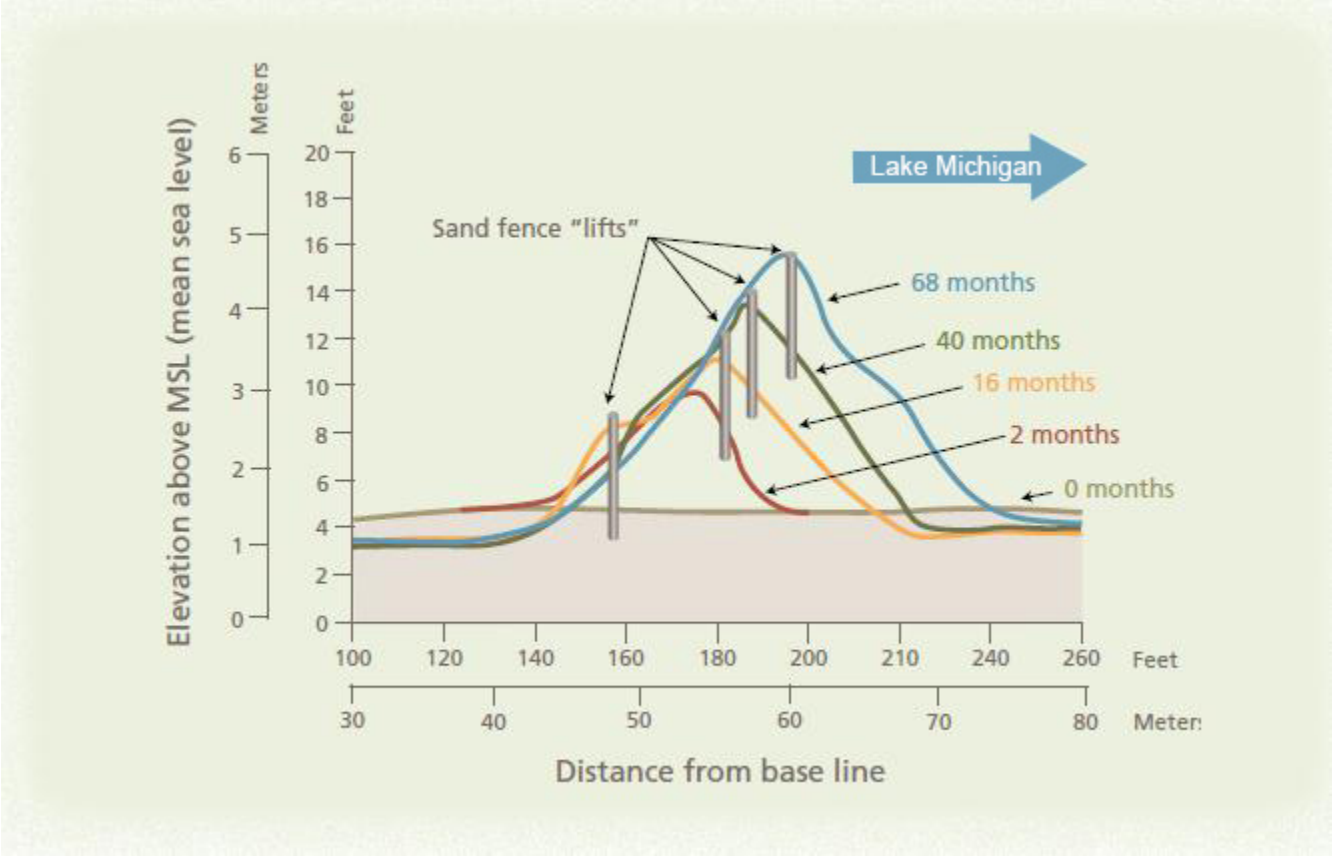


Figure 9: Diagram for growing dunes using sand fencing

- Fencing should provide enough gaps to facilitate the movement of people and wildlife.
- Dunes created by sand fencing should be stabilized with planted vegetation as soon as possible.

Restoration of Dune Grass

Dune grass provides the best long-term strategy for stabilizing sand dunes. The following guidance can be used for planting dune grass:

- Dune grass should be planted during late fall or early spring.
- Dune grass can be planted on 12", 18", 24", or 36" centers. In general, the denser the planting, the better and more quickly the dune grass will capture sand.
- Graduated plantings in which plants spaced more widely toward the water and more densely landward will help increase dune width per Figure 10.

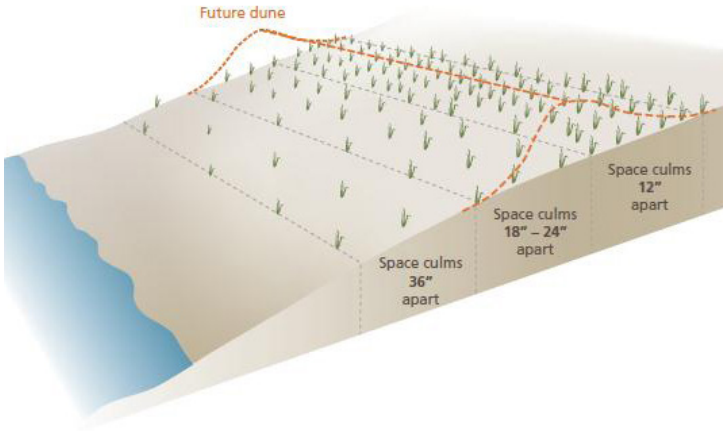


Figure 10: Dune grass planting phasing diagram

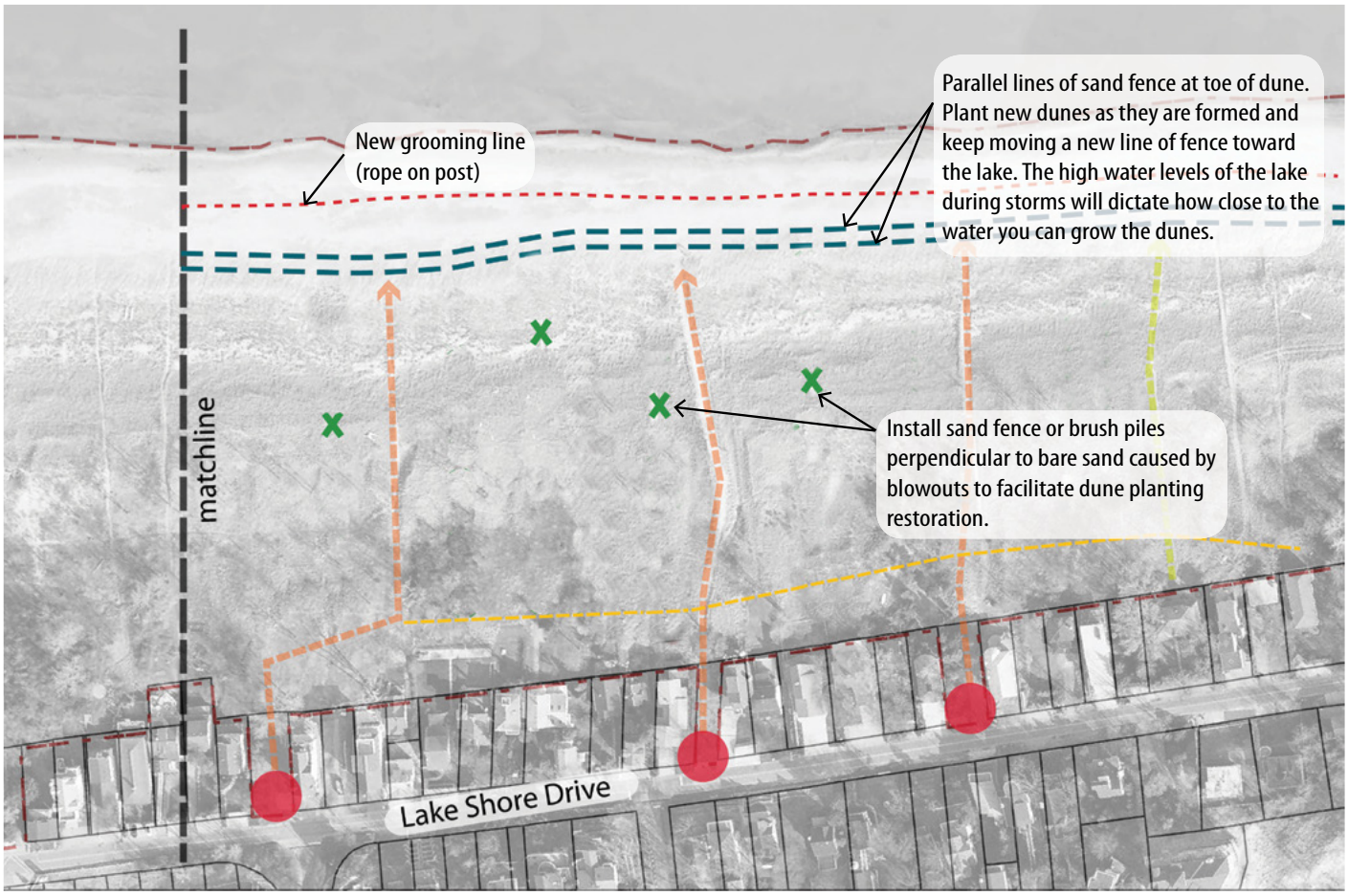


Figure 11: Typical detail describing sand fence and dune grass planting restoration

PHASING AND IMPLEMENTATION PLAN

Access Plan

We recommend the following phasing strategy for implementation of the Access Plan:

1. Wayfinding
We recommend establishing signage and wayfinding as the first priority in implementing this plan. This includes:

- A primary level sign at Washington Park that establishes the visual theme and provides a map of the City's public beach from the river to the end of Sheridan Beach and the Esplanade.
- Directional signs that direct users from Washington Park to Fedder's Alley and our project area.
- A primary sign at the parking lot at California Avenue that provides a map of the project area.
- Secondary signs at each of the access points.
- Shifting the location of beach flags (but preserving the numbers and colors) as necessary to align with public access points.

2. Emergency Access
This is a priority for obvious reasons.

3. Universal Beach Access Path at California Avenue
This access path is a high priority for the following reasons:

- It is the most heavily used;
- It will be the second universal access point;
- The universal access path will also provide greatly improved access for non-disabled users.

4. Improve Universal Beach Access at Boardwalk

5. Other Public Access Paths
We recommend that the City consider prioritizing other Public Access Paths based on projected parking and use.

6. Lateral Collector Paths
We recommend installing lateral collector paths when there are constructed Public Entry and Beach Access paths to which the lateral collector paths can connect.

7. Interpretive Ecological Path
It is likely that this work will be completed with a grant or by a philanthropist. Funding will drive the priority of constructing this path.

8. Private Shared Access Paths
These paths will be constructed by private individuals who will have their own privatization system.

9. Conservation Easement
The City should consider the creation of a Conservation Easement for Sheridan Beach and The Esplanade to provide a significant public benefit and the incorporation of an Internal Revenue Code 501(c)(3) Foundation to act as a qualified organization to administer the Land Management Plan and the Conservation Easement. To the extent permitted under applicable law and Internal Revenue Code Rules and Regulations, the donation from the City and adjacent homeowners of a Conservation Easement to a qualified organization for conservation purposes may qualify as a charitable donation of a partial interest in real estate.

Sand and Land Management

We recommend the following phasing strategy for implementation of the Sand and Land Management Plan:

1. Beach Grooming
Use a rope and posts to establish new limits for beach grooming per the Sand Management Plan.

2. Sand Fence
Figure 11 in the Sand Management Plan section indicates the location of sand fencing parallel to the fore dune. This fencing is intended to extend the dunes out toward the lake rather than provide bare sand that can only grow a dune vertically. As one fence grows a dune to capacity, an additional fence should be installed parallel to and lake-ward of the last, and the dune behind it should then be planted. It is difficult to predict how long it will take to build a dune along each fence. For budgetary purposes, the City should consider installing one to two fences per year for the next five years and planting each new dune each year.

3. Sand Blowout Repair
Brush piles or sand fences may be installed perpendicular to bare sand caused by blowouts. Once the blowouts are filled with sand, they should be planted with dune grass. These repairs can be completed concurrent with the construction of Beach Access Paths or with brush removal activities.

Natural Area Management

1. Prescribed Fire

We recommend the City begin annual burns immediately, as it is the most cost effective way for managing weeds and brush.

2. Phasing for Natural Areas

This is described in the Natural Area section of this report as well as in the original 2012 study.

APPENDICES

Appendix A - Beach Access Pathway Licesure Agreement

Appendix B - The Sheridan Beach and The Esplanade Ecological Assessment Report (2012)

Appendix C - Fire Management Plan

Appendix A

Beach Access Pathway Licensure Agreement

Appendix B

The Sheridan Beach and The Esplanade Ecological Assessment Report (2012)

Appendix C

Fire Management Plan