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moffatt & nichol

DUNE RESTORATION AND CREATION PLAN

Master Plan



Document Verification

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1. Introduction

1.1. Statement of Purpose

Dunes are part of Florida's coastal ecosystems providing economic, environmental, and recreational benefit to the local community. The Town has retained M&N to prepare a Dune Restoration and Creation Plan (Plan) that addresses future dune construction as well as the restoration and maintenance of existing dunes. The Plan outlines dune management recommendations, prioritizes locations for new dunes, and provides a typical design profile for new dunes with native salt-tolerant vegetation palette. The entirety of the Town's beach was evaluated, and the dunes categorized by physical/geographic characteristics and existing condition. The management approach was developed utilizing information obtained through onsite reconnaissance, input from Town officials and staff, and initial regulatory agency outreach.

1.2. Objectives

The Plan's focus is to foster projects that can have both immediate and long-term benefits, while also developing a feasible program in terms of design, permitting, and maintenance. In general, the Plan concentrates on the initial goals outlined below:

- Develop a plan to improve existing dunes through exotic vegetation removal.
- Optimize the dune topographic profile to lower the height of specific peaks to comply with elevations specified within Appendix B .
- Remove breaches in the existing dune system by creating new vegetated dunes where there currently are none.
- Create a maintenance standard and schedule for existing and new dunes.
- Prioritize new dune locations for storm protection, enhanced diversity, and aesthetics.
- Establish native salt-tolerant vegetation Planting Palette.
- Provide recommendations for further action items, studies, and/or assessments.
- Discuss FDEP permitting instruments for Plan implementation.



2. Dune Functional Values

2.1. Ecology

Dunes are an important part of Florida’s coastal ecosystems. Vegetated dunes provide habitat to a distinctive subset of regional biota that is particularly well adapted to survive beach conditions (salt spray, periodic saltwater inundation, periodic drought, soil erosion, dune migration, and harsh winds), including butterflies and migratory birds.

The Town’s beaches are also essential habitat for nesting sea turtles. Sea turtles travel hundreds of miles across the ocean to lay their eggs on Florida's beaches, one of the few places in the world that are suitable for marine turtle nesting. The Pompano segment (FDEP R-25 to R-50), which includes the Town, saw 458 loggerhead, 3 leatherback, and 1 green turtle nest in 2020 (NOVA Southeastern University, 2021). Additionally, the vegetated dune provides a visual barrier for potential artificial light spillage onto the nesting beach, which could result in marine turtle and hatchling disorientations.

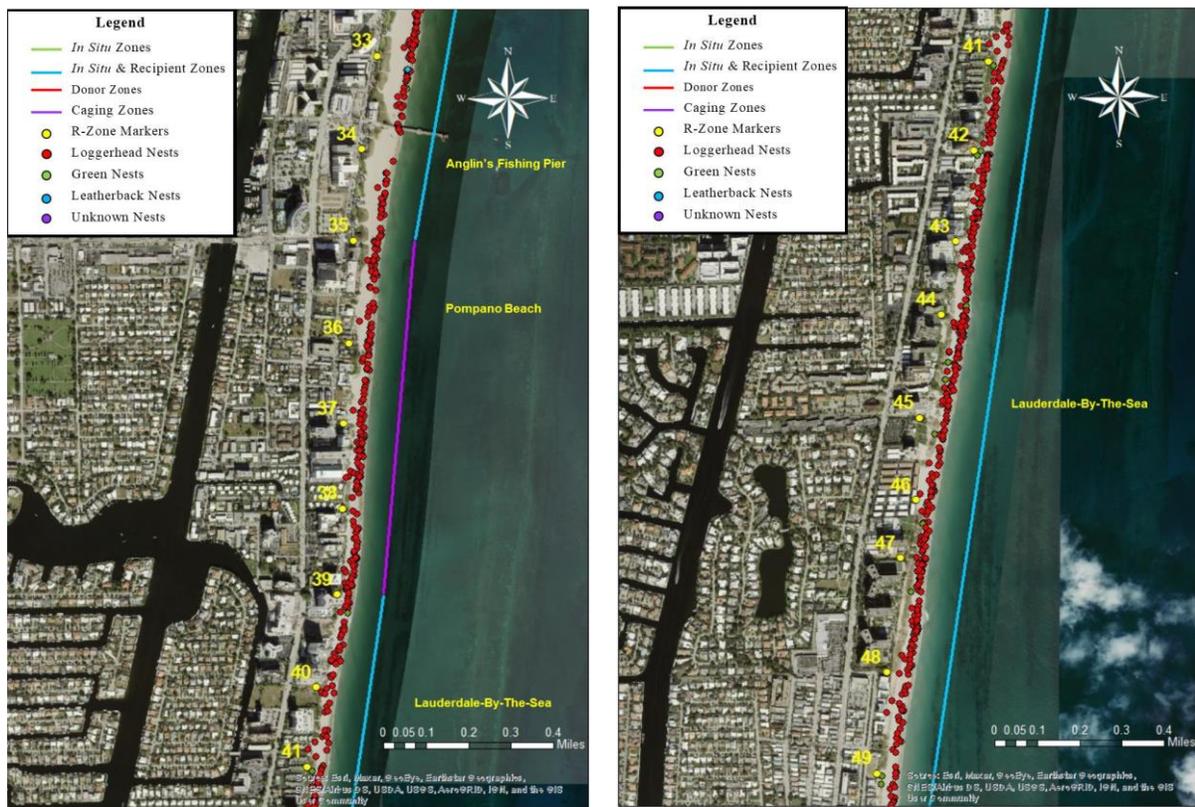


FIGURE 1 – LOCATIONS OF 2020 SEA TURTLE NESTS WITHIN THE TOWN (NOVA SOUTHEASTERN UNIVERSITY, 2021)

2.2. Storm Protection

Vegetated coastal dunes provide storm protection by maintaining and supplying sand to beaches. Coastal dunes provide a first line of defense, protecting riparian coastal areas from storm damage and flooding by coastal waves / elevated sea levels through the elevation and stored sand volume. To



protect this function, the coastal dune volume must be maintained while allowing the dune shape to conform to natural wind and water flow patterns.

Sea level rise increases the risk of coastal flooding; dunes are a viable option to minimize the effects of sea level rise. Beach dunes help prevent erosion caused by increased high tide and king tide events. Increased dune health also helps to prevent breaches and overtopping from wave action that can cause washout of upland property and damage to upland structures, which range in value from ~\$350,000 to \$10,900,000 (Source: Property Appraiser 2022 data).

2.3. Financial Value

Florida beaches are visited by millions of people every year, both residents and out-of-town tourists, to enjoy the warm weather and temperate waters. Properties adjacent to healthy beach and dune systems typically enjoy increased financial value. Additionally, tourism associated with a healthy beach increases revenues for restaurants, hotels, other local businesses, which in turn translates to increased sales tax benefits to the community.

It is important to note that, per U.S. Census Bureau 2017 data, accommodation and food service sales within the Town were >\$80MM (United States Census Bureau, 2017).



3. Dune Management Zones

The dune management zones are a reflection of the continuation of the Town’s Resolution 2018-08, which adopted a sea oat dune construction and maintenance policy where the Town committed to constructing and maintaining sea oat dunes within the Town. The resolution facilitated the creation of new vegetated dunes with the agreement of the riparian property owners, many times within their property limits. These agreements included an agreement that the Town will endeavour to regrade and reposition the excess accumulated sand in the area between the western edge of a dune and the first manmade structure (e.g., a fence, sea wall, or building) upon request of the property owner. Additionally, the agreement indicates that the Town will monitor and remove invasive species from the dunes and replant as necessary.

Through the above referenced program, a large portion of the beach now includes vegetated dunes with a low prevalence of invasive species (refer to Appendix A – Vegetation Assessment). The existing beach / dune conditions were evaluated utilizing information obtained from onsite reconnaissance and aerial photography review. The varying conditions of the existing dune and adjacent upland uses were considered to establish management zones. These management zones are based on the presence of dune vegetation and riparian property ownership in an effort to establish a program consistent with the Town’s overall beach management goal of establishing a dune management program for storm protection value, habitat health, and aesthetic value, while also being sensitive to riparian property owners’ needs. These zones and their associated conditions are the basis for their differing recommendations for long term management. The zones have been broken down as follows:

- New Dune
- Public Dunes, adjacent to public property
- Existing Dune, adjacent to private property

3.1. New Dune

3.1.1. Characterization

Several parcels (as listed in the table below) do not have vegetated dunes adjacent to their properties. In order to create a continuous dune for storm protective value, as well as the ecological benefits that it provides, the Town is encouraged to continue working with property owners to integrate new dunes. The following provide typical characteristics of these dunes:

- Riparian parcel is privately owned.
- There is no vegetated dune on the property.

TABLE 1 – LIST OF PROPERTIES WITH NO DUNE

1398 S. Ocean Blvd – Malulani	1 Commercial Blvd – Aruba Beach Cafe
1530 S. Ocean Blvd – Ocean East	4300 El Mar Drive – Winter Colony
5450 N. Ocean Blvd – Atlantic Beach Villa	4220 El Mar Drive – Costa Del Sol
5400 N. Ocean Blvd – Sea Ranch Villas	4200 El Mar Drive – Sea Villa
4636 El Mar Drive - The Residence	



3.1.2. Management Recommendations

- Recommend that the proposed dune be ≥ 20 feet wide.
- Seaward edge planting should be largely aligned with existing stable vegetation.
- Vegetation installed should be a mix of a minimum of 5 species from the Planting Palette provided within this document, with sea oats making up greater than 50% of the contribution.
- It is recommended that new dune events be conducted between November 1st and March 1st (outside of marine turtle nesting season). It is preferred that the activities be conducted within February, close to the beginning of Florida’s wet season.
- Post-and-rope fence is recommended to be installed along the boundary of the vegetation to discourage / prevent foot traffic.
- Beach accesses through the dune should be kept to the minimum required, should be at an angle, and should be no greater than FDEP recommended 6’ width (except for areas that are required to provide emergency vehicle access).
- Newly planted vegetation shall be watered until established.
- Fill is not proposed as part of the new dunes. As with other dune plantings within the area, the vegetation is anticipated to trap sand and allow the dune build naturally.

3.1.3. Maintenance Recommendations

- Once established, the maintenance of the dune will fall within the Existing Dune category (refer to Section 3.3.3).

3.2. Public Dunes

3.2.1. Characterization

The Town manages several parcels adjacent to the beach (see Table 2 below). The greater part of these public properties are at street ends and all appear to be vegetated. The priorities of these public access points include the following:

1. Ensure that beach access is maintained for residents and visitors.
2. Ensure that emergency vehicle access is maintained at those beach access points where it is required (Pine Avenue and the Access Immediately South of Commercial Blvd).
3. Ensure that dune vegetation provides protection to limit windblown sand and flood washout during storm events into the street ends.

TABLE 2 – LIST OF PUBLIC PROPERTIES ADJACENT TO THE BEACH

Beach Access Path adjacent to Cristelle	4600 El Mar Drive	Datura Avenue
Pine Avenue	El Prado	Hibiscus Avenue
Washingtonia Avenue	Commercial Blvd	Palm Avenue

3.2.2. Management Recommendations

To meet the goals noted within Section 3.2.1, the following management guidelines are proposed for the dunes adjacent to public property:

- Ensure that post-and-rope barriers are installed to limit pedestrian impacts to dune vegetation at the street access points.
- Verify that emergency access points meet the vehicular drive lane width requirements (as decided by the Town’s emergency services departments) and adjust as necessary.



- Adjust the access points at the street ends so that they are diagonal to the shoreline vs. perpendicular to the shoreline.
- Non-emergency access points should be limited to the FDEP recommended 6' width.
- Trim excessively overgrown vegetation at access points as necessary to maintain 6' clearance (heavily encroaching on the access path / creating a security concern). Trimming activities should be coordinated with a dune vegetation specialist to prevent permanent damage to the existing plants.
- Limit the number access points at the street ends.
- Plant vegetation to close excess openings.
- When closing gaps at the street end, vegetation installed should be a mix of a minimum of 3 species from the Planting Palette provide within this document. It is preferable that the proposed species complement, not necessarily match, the species present in the adjacent dune in order to increase diversity.
- New plantings should be watered until established.

3.2.3. Maintenance Recommendations

The following maintenance guidelines are recommended for the dunes adjacent to public property:

- Town staff to conduct semi-annual inspection events to identify invasive species for removal.
- Areas of invasive species will be identified and removed.
- If large barren areas are present after removal of invasive species or due to illegal footpath creation, or if required by the FDEP, they should be replanted with plants selected from the Planting Palette to prevent erosion or recolonization by non-native plant species.
- Access points should be assessed to confirm that required clearance is being maintained. Trim as necessary to meet minimum requirements.
- Post-and-rope fences should be inspected, and repairs made where breaks are located.
- Dune height maintenance / reduction activities are not recommended for public parcels.

3.3. Existing Dune, adjacent to privately owned property

3.3.1. Characterization

The lion's share of parcels within the Town are privately owned properties with a vegetated dune on the adjacent beach. This includes all oceanfront parcels not included within Tables 1 and 2 above. These parcels include property owners that participated with the Town's Resolution 2018-08, adopting a sea oat dune with the understanding the Town will endeavour to regrade and reposition the excess accumulated sand in the area between the western edge of a dune and the first manmade structure (e.g., a fence, sea wall, or building) upon request of the property owner. The following provide typical characteristics of these dunes.

- Due to agreements with the Town and Resolution 2018-08, Residents will request assistance from the Town when they have determined that an excess build-up of nuisance sand at, or immediately landward of, the dune.
- Dunes are typically healthy, with a low occurrence of invasive species.
- Dunes will grow in height due to sand trapping by the plant species.
- Presence of post-and-rope is inconsistent throughout the Town.
- High occurrence of beach bean, bitter panic grass, spurge, and croton.



- Based on the WHAFIS Engineering Study prepared by M&N (Appendix B), the ideal dune crest elevation is +11.5’ NAVD to avoid potentially increased impacts during a 1% FEMA storm event.
- Dune crest height varies within the Town as indicated within the Table 3 below.

TABLE 3 – PEAK DUNE ELEVATION (NAVD) AT FEMA DESIGNATED TRANSECTS

	FEMA Transect									
	#49	#50	#51	#52	#53	#54	#55	#56	#57	#58
Peak Dune Elevation (ft, NAVD88)	8.7	9.5	11.6	10.1	16.0	8.9	14.4	13.6	8.8	13.1

3.3.2. Management Recommendations

The following address management of the existing dunes adjacent to private properties.

- Refer to “Existing Dune, adjacent to privately owned property (Existing Dune)”
- The following management guidelines are proposed for the Existing Dune areas:
- Dune height / nuisance sand adjustment events are to occur as follows:
 - When dunes become too high or too close to a seawall. Height will be verified by surveyor, LiDAR, or other technical source.
 - Dune height adjustment may not permit the height of the dune crest below +11.5 NAVD.
 - Recommend maintaining a minimum 5’ wide dune crest and 20’ wide dune base.
 - Dune adjustments may only be conducted once every 5 years, per property (to allow vegetation to establish and mature).
 - Maintenance will not be conducted where there is no need. The height of the dune will be modified when excessive (lowered by ~1-2 feet).
 - Maintenance events to be conducted via FDEP field permit, along with County approval.
 - Sand must be regraded in immediate vicinity.
 - Disturbed vegetation must be replaced in kind. Refer to Planting Palette. Note that the County recommends replacement plantings consist of greater than 50% sea oats.
 - Plantings should be diverse (minimum 3 species for areas <150 sf, 4 species for areas <300 sf, and minimum of 5 species for areas greater than 300 sf.)
- Height complaints should be evaluated to determine if modifications to the vegetation could provide a similar result. It is an opportunity to increase diversity of the dune, while also thoughtfully choosing / locating species to avoid or minimize visual barriers.
- Install post-and-rope fence in areas where it is absent.
- Inspect existing post-and-rope fence and repair any existing damage.
- Non-native species present should be removed, including as much of the roots as possible so that it does not grow back.
- Large barren areas present after removal of invasive species should be replanted with species selected from the Planting Palette.
- New plantings should be watered until established.

3.3.3. Maintenance Recommendations

The following maintenance guidelines are recommended for dunes adjacent to private property:

- Town staff to conduct semi-annual inspection events to identify invasive species for removal.



- Areas of invasive species will be identified and removed.
- If large barren areas are present after removal of invasive species or due to illegal footpath creation, or if required by the FDEP, they should be replanted with plants selected from the Planting Palette to prevent erosion or recolonization by non-native plant species.
- Post-and-rope fences should be inspected, and repairs made where breaks are located.
- Dune height maintenance / reduction activities to be addressed on an as needed basis, at the request of the property owner. Refer back to 3.3.2.
- The Town will conduct LiDAR surveys of the dune to assess existing heights (frequency may be limited due to costs and budget restrictions). When possible, County beach surveys will be utilized in lieu of LiDAR surveys to reduce costs.



4. Dune Management Specifications

4.1. Beach Access

Public beach access points exist throughout the Town's beach and dune system. The main points used by the Town for vehicular / emergency access to the beach are Pine Avenue and the access immediately south of Commercial Blvd. The following guidelines address Beach Access management throughout the preceding segments of the Town beach:

- Unnecessary footpaths should be closed with vegetation plantings to minimize the potential for storm-related breaches of the protective dune feature.
- New access points should be installed at an angle (See Figure 2 below as an example) to prevent windblown sand and dune breaches / channelling of storm surge onto upland property.
- Beach access paths can, as appropriate, be augmented with an independent vegetation buffer (see Figure 3) at the seaward endpoint, provided that the target recreational beach width is maintained. This will also assist in the prevention of windblown sand / surge impacts to upland property during coastal storm events.
- Public access point widths should be maintained at 6 feet.
- Emergency vehicular access points, as designated by the Town, should be maintained at a minimum of 10 feet width.
- Access points narrowed by overgrowth should be cut back and trees limbed up when possible.



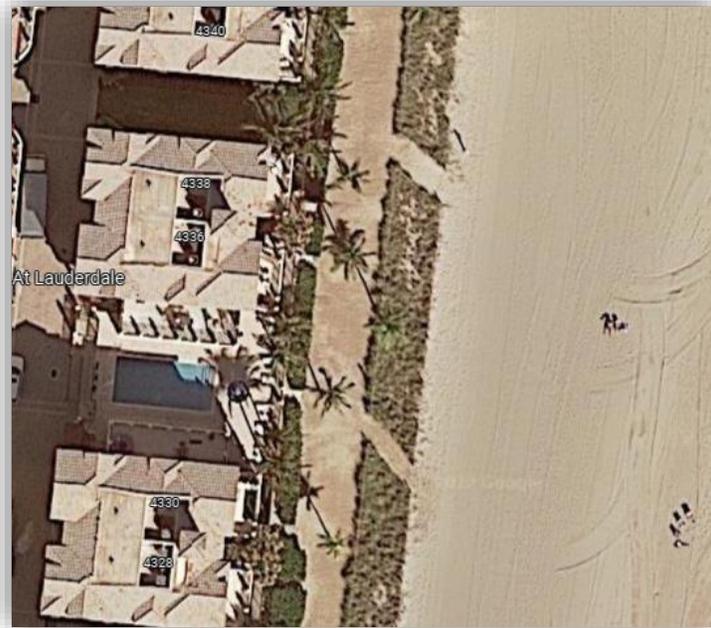


FIGURE 2 – ANGLED BEACH ACCESS PATHS (SOURCE: GOOGLE MAPS)

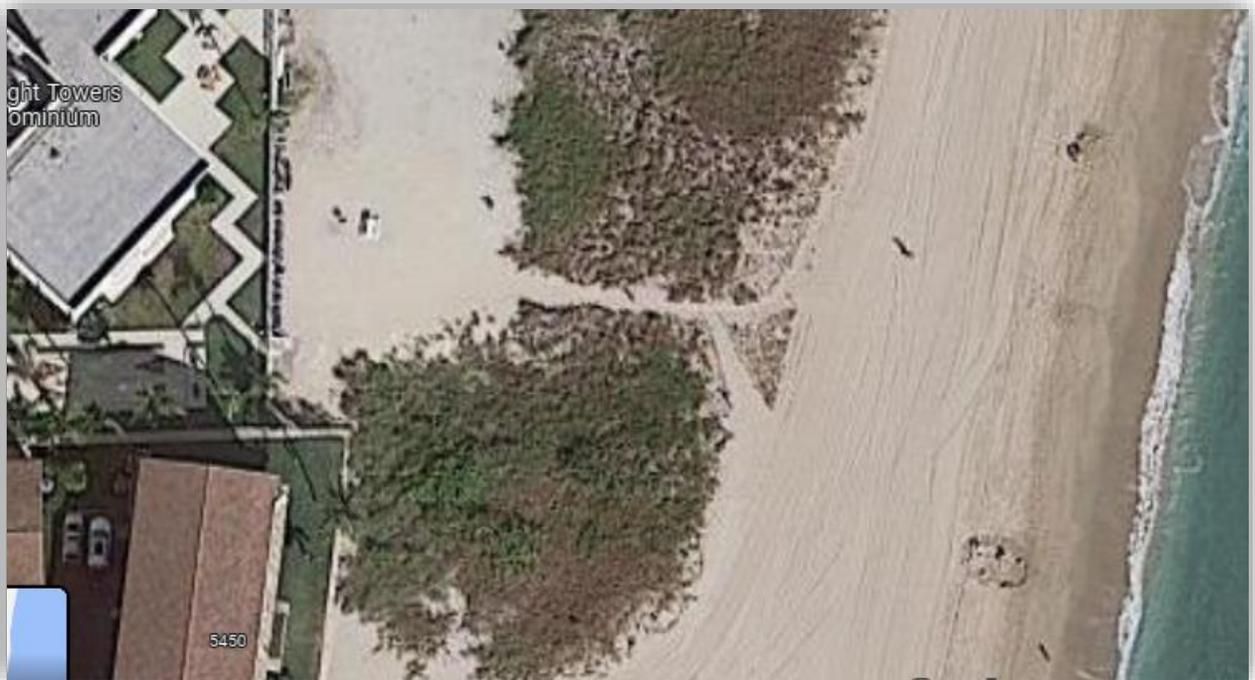


FIGURE 3 – VEGETATION BUFFER AT ACCESS PATHS (SOURCE: GOOGLE MAPS)

4.2. FEMA, Climate Change, and Resiliency

FEMA's NFIP issues FIRMs that define flood zones with types and degrees of flood risk. The NFIP recognizes the importance of dunes in reducing coastal flood hazards. The NFIP defines a primary frontal dune as a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward of and adjacent to the beach. Primary frontal dunes are subject to erosion and may be vulnerable to overtopping or breaching from high water levels and waves during coastal storms.

The landward toe of a primary frontal dune is located at the point where there is a distinct change from a relatively steep slope to a relatively mild slope. The V, V1-30, or VE Zone is extended inland to the landward primary frontal dune toe, which establishes the minimum landward limit of the Coastal High Hazard Area. V, V1-30, or VE Zone limits are also defined by the area subject to wave heights between 1.5 and 3 feet during the base flood condition.

A continuous, well-established vegetated dune can influence the location of the V, V1-30, or VE Zone, which could have a direct impact on upland property owner's flood insurance cost and new/improved building design options. AE flood zones can potentially allow for new or substantially renovated buildings to have a closer context with existing historical structures, as structures in the V, V1-30, or VE Zone often must be elevated above the ground on pilings. Additionally, flood insurance rates for structures in AE flood zones are typically lower than in V, V1-30, or VE Zones.

The WHAFIS study conducted by M&N indicated that a minimum dune crest elevation of +11.5 feet NAVD was required to maintain the flood zone designations using the current FEMA methodology. Lowering the dune elevation below this recommended elevation may increase the risk of flooding associated with the 1% FEMA storm.

4.3. Dune Vegetation

4.3.1. Native Species

Dune vegetation should be selected based on appropriateness for the proposed location, both within the State of Florida and within the footprint of the dune. The recommended Planting Palette (Table 4) includes species native to the region, salt tolerant, drought tolerant, and tolerant of low soil nutrient conditions. Please note that recommended species do not preclude other native salt tolerant species from being proposed within the dune. A planting plan should be submitted for review / approval by Town staff and the FDEP under the Coastal CCCL permitting program. Commonly-occurring, native species observed within the Town's dunes include:

- Beach-elder *Iva imbricata*
- Bitter Panicgrass *Panicum amarum*
- Buttonwood *Conocarpus erectus*
- Cow Pea *Vigna luteola*
- Gulf Croton *Croton punctatus*
- Railroad Vine *Ipomoea pes-caprae*
- Sea Lavender *Argusia gnaphalodes*
- Sea Oats *Uniola paniculata*
- Seagrape *Coccoloba uvifera*
- Seaside Spurge *Euphorbia mesembryanthemifolia*



TABLE 4 – LAUDERDALE-BY-THE-SEA PLANTING PALETTE



C. Beach morning glory (*Ipomoea imperati*)
Height: Typically, 1-6’;
 stems short, less than 5 feet,
 rooting at the nodes.
Growth Rate: Fast.
Features: Pioneer species, an
 ephemeral groundcover.



D. Beach-peanut (*Okenia hypogaea*)
Height: About 2-6’.
Growth Rate: Fast.
Features: FL Endangered
 Species. Recommended for
 habitat restorations.



E. Beachstar (*Remirea maritima*)
Height: Typically, 2-3’.
 Spreading from rhizomes;
 emerging from bare sand.
Growth Rate: Mod. to slow.
Features: Found in the
 pioneer zone in bare sand.
 FL Endangered Species.



F. Camphorweed (*Heterotheca subaxillaris*)
Height: Typically, 2-4’.
Growth Rate: Fast.
Features: Recommended for
 habitat restorations.



A. Beach-bean (*Canavalia rosea*)
Height: Typically, 6-12’,
 creeping along the ground;
 stems to 50 feet or more in
 length.
Growth Rate: Fast.
Features: Important pioneer
 species. Attracts pollinators.



B. Beach-elder (*Iva imbricata*)
Height: Typically, 2-3’.
 Becoming broader than tall.
Growth Rate: Fast.
Features: A principal sand
 binder in the pioneer zone.



G. Coastal ragweed (*Ambrosia hispida*)
Height: Typically, 1-3’; may
 climb into other vegetation.
Growth Rate: Mod. to fast.
Features: Excellent
 groundcover in coastal areas
 with high light.



*Dune vegetation should be selected based on appropriateness for the proposed location, both within the State of Florida and within the footprint of the dune.



H. Cocoplum (*Chrysobalanus icavo*)
Height: Typically, 10-15'; .
Growth Rate: Moderate.
Features: Significant food source and cover for wildlife.



I. Dune sunflower (*Helianthus debilis subsp. debilis*)
Height: Typically, 1-2'.
Growth Rate: Fast.
Features: Sand binder on dunes. Attracts insect pollinators.



J. Evening-primrose (*Oenothera humifusa*)
Height: About 3-6".
Growth Rate: Moderate.
Features: Recommended for habitat restorations.



K. Florida venter conchigo (*Croton glandulosus var. floridanus*)
Height: Typically, 12-18".
Growth Rate: Fast.
Features: Nectar plant for butterflies.



L. Gulf croton (*Croton punctatus*)
Height: Typically, 1-3'.
Growth Rate: Mod. to slow.
Features: Recommended for habitat restorations.



M. Inkberry (*Scaevola plumieri*)
Height: ~2-5', usually broader than tall.
Growth Rate: Slow.
Features: Provides significant food and cover for wildlife. FL Threatened Species.



N. Perfumed spiderlily (*Hymenocallis latifolia*)
Height: Typically, 2-3'; more when in flower.
Growth Rate: Moderate.
Features: Food source for Luber grasshoppers.



O. Pricklypear (*Opuntia humifusa*)
Height: Typically, 2-4' (can be significantly taller).
Growth Rate: Moderate.
Features: Nectar plant for dotted skipper (*Hesperia attalus*) butterflies. Attracts insect pollinators.



P. Railroad vine (*Ipomoea pes-caprae subsp. brasiliensis*)
Height: Typically, 3-9"; stems to 100' long.
Growth Rate: Fast.
Features: Important pioneer species. Nectar plant for butterflies.



Q. Saltmeadow cordgrass (*Spartina patens*)
Height: Typically, 2-3'; 4' when in flower.
Growth Rate: Moderate.
Features: Accent groundcover in coastal areas.





R. Sea-lavender (*Tournefortia gnaphalodes*)
Height: Typically, 3-6'.
Growth Rate: Slow when older, fast when young.
Features: Nectar plant for Miami blue (*Cyclargus thomasi bethunebakeri*) and other butterflies. FL Endangered Species.



S. Sea-oats (*Uniola paniculata*)
Height: About 3-4'; to 6' or more when in flower.
Growth Rate: Moderate.
Features: Significant stabilizer of sand on beach dunes.



T. Sea-purslane, (*Sesuvium portulacastrum*)
Height: About 3-8".
Growth Rate: Mod. to fast.
Features: Nectar plant for Miami blue butterflies.



U. Searocket (*Cakile lanceolata*)
Height: Typically, 1-3'.
Growth Rate: Fast.
Features: Larval host plant and nectar plant for butterflies.



V. Seashore dropseed (*Sporobolus virginicus*)
Height: ~6-12"; 18" when in flower.
Growth Rate: Moderate.
Features: Larval host plant for obscure skipper (*Panoquina panoquinoides*) butterflies



W. Seashore paspalum (*Paspalum vaginatum*)
Height: Typically, 6-12"; to 2' in flower.
Growth Rate: Moderate.
Features: It can be mowed and is being used as a lawn grass in coastal areas.



X. Seaside joyweed (*Alternanthera maritima*)
Height: Typically, 3-12", climbing over the ground or other vegetation.
Growth Rate: Moderate.
Features: Recommended for habitat restorations.



Y. Seaside spurge (*Euphorbia mesembryanthemifolia*)
Height: Typically, 1-3'.
Growth Rate: Fast.
Features: Recommended habitat restorations.



Z. Yellow joyweed (*Alternanthera flavescens*)
Height: Typically, 3-12", climbing over the ground or other vegetation.
Growth Rate: Moderate.
Features: Host plant for several butterfly species.

Notes:

- All heights noted are typical for species.
- Photos and plant information sourced from the Institute for Regional Conservation, 2022
- Subject to availability.
- Dune planting plans subject to appropriate plant siting within dune (fore-, mid-, and back-dune).



4.3.2. Irrigation

Irrigation should be included only for those areas where new vegetation is proposed. Established dunes should not be irrigated. It is recommended that existing irrigation systems, if present, be removed to prevent accelerated growth. Irrigation should be provided until new vegetation is established, typically less than 6 months. Irrigation frequency is recommended daily for first 2 weeks, every other day for the following 2 months or as needed until established. Irrigation may be provided using the following two methods:

Temporary Irrigation System: An on-grade temporary irrigation system may be proposed for large areas of dune planting. As noted, a temporary irrigation system is located on grade, typically a low-cost PVC pipe system, which can be removed once vegetation growth is established.

Manual Irrigation: For discrete areas of planting, manual irrigation utilizing a water truck or direct line from an upland property is recommended. For larger areas, portable sprinkler systems may be used. Sprinkled area will be controlled to planting area only and will avoid overspray onto the dry sandy beach.

4.3.3. Invasive Plant Species

Invasive/exotic plant species have an adverse effect on native plant communities, including loss of native plants due to non-native plant infestations and alteration of endangered species habitat. Invasive plant species can destabilize a dune community, resulting in reduced storm resilience, and should be completely removed from the dune when observed. Invasive species observed during recent Town-wide dune inspections include Beach Naupaka (*Scaevola taccada*) and Governor's Plum (*Flacourtia indica*).

4.3.4. Maintenance

In addition to the maintenance activities noted within sections 3.1.3, 3.2.3, and 3.3.3, M&N recommends the Town implement a post storm assessment and recovery plan. The plan should include a team to assess damage to the dune vegetation due to a significant storm event, including loss of vegetation, escarpment creation, and possible broken / damaged tree limbs.

The team should identify hazards to be rectified (i.e. escarpments to be knocked down, broken tree limbs to be removed, possible buried debris that has been exposed, etc.).

The team should also identify items for repair (broken post-and-rope fence, replanting areas of lost vegetation, etc.).

The team should reach out to the regional FDEP Field Agent to confirm the permissibility of remedial activities before they are undertaken.

4.3.5. Timing

It is recommended that large scale projects be conducted between November 1st and February 28th, outside of marine turtle nesting season. It is recommended that the projects be implemented close to the end of February to take advantage of Florida's wet season, to help establish the plants and reduce watering needs. Semi-annual dune inspection events should be conducted thereafter with maintenance activities provided on an as-needed basis. It is recommended that the results of the initial (3-4) inspection events be tracked closely, and inspection frequency re-evaluated based on those results.

4.3.6. Regulatory

Based on initial consultation with FDEP staff, the Town may continue to apply for field permits for future activities (planting and sand redistribution), in the same manner as previous done. Field permits do not require a permit application fee and are issued for a maximum timeframe of 12 months. Additionally, field permits are typically less time consuming to secure.



5. Next Steps

- Prepare a short list of the riparian property owners requesting dune height modifications. Verify the current dune crest elevation for those properties to confirm eligibility under the criteria within 3.3.2.
- Obtain quotes for annual or bi-annual beach topographic survey costs.
- Conduct further discussions with the FDEP to review Dune Restoration and Creation Plan and obtain their input.
- Conduct further discussions with Broward County to review Dune Restoration and Creation Plan and obtain their input.
- Evaluate development of a Beach Management Agreement with the State of Florida for holistic beach and dune management.
- Explore development of a “dune adoption” program that would allow upland properties owners the option to manage their adjacent dune to Town standards.

End Note: The Dune Restoration and Creation Plan is a living document to be adjusted as needed to address changing conditions, including sea level rise policies that may be adopted in the future.



References

Florida Department of State. “5B-40.0055 : Regulated Plant Index – Florida Administrative Rules, Law, Code, Register – FAC, FAR, eRulemaking.”, *MyFLRules*.

<https://www.flrules.org/gateway/ruleno.asp?ID=5B-40.0055>. Accessed 8 Jan. 2020.

Institute for Regional Conservation. (2022). *IRC - Natives for Your Neighborhood*.

<https://Regionalconservation.Org/>. Retrieved March 14, 2022, from

<https://regionalconservation.org/beta/nfyn/habitatDetail.asp?hab=BDN&ZipCode=33308>

Nova Southeastern University - Halmos College of Arts and Sciences. (2021). *2020 Technical Report*.

BROWARD COUNTY SEA TURTLE CONSERVATION PROGRAM.

https://hcas.nova.edu/seaturtles/documents/tech-reports/techreport_2020.pdf

United States Census Bureau. (2017). *Explore Census Data*. <https://Data.Census.Gov/>. Retrieved

March 17, 2022, from

[https://data.census.gov/cedsci/table?q=EC1772BASIC&g=E600000US1201139475&tid=](https://data.census.gov/cedsci/table?q=EC1772BASIC&g=E600000US1201139475&tid=ECNBASIC2017.EC1772BASIC)

[ECNBASIC2017.EC1772BASIC](https://data.census.gov/cedsci/table?q=EC1772BASIC&g=E600000US1201139475&tid=ECNBASIC2017.EC1772BASIC)



Appendix A

Vegetation Assessment



Appendix B

WHAFIS Engineering Study prepared by M&N

