# City of Delray Beach Sea Grape Trimming Plan

**Prepared by:**

**Aptim Environmental & Infrastructure, LLC**

**and**

**Coastal Protection Engineering LLC**

**February 2020**

# City of Delray Beach Sea Grape Trimming Plan

## TABLE OF CONTENTS



### Photographs



### Figures



### Tables



### Appendices

# City of Delray Beach Sea Grape Trimming Plan

## 1.0 Background

A sandy beach and dune provide natural protection against storm surge and waves. The beach and surf zone dissipate the waves, whereas the dune, especially a vegetated dune, provides a reserve of sand that can be released during storm activity and recharged during calmer weather (McLachlan and Brown, 2006). Most of the natural dune habitat that once existed in south Florida has been lost due to coastal development, but the City of Delray Beach has worked to restore the beach and dune on the municipal beach since the initial beach nourishment project in 1973. Soon after the beach construction in 1973, the City planted dune vegetation along the back beach to capture wind-blown sand (Photograph 1). Since then, the dune habitat has accreted and measures between 100 to 220 feet wide providing habitat for numerous plant and animal species. The City actively manages the dune in order to balance wildlife, recreational, aesthetic, and storm protection needs (Photograph 2).

**Photograph 1. Dune vegetation planting after the initial beach nourishment in 1973.**

**Photograph 2. The Delray Beach dune today (November 2019).**

The landward edge of the dune in Delray is dominated by sea grapes (*Coccoloba uvifera*), which measure between 21 and 128 feet wide (west to east) with numerous smaller (< 10-foot-wide) patches, making up a substantial portion of the dune width. The sea grapes play a major role in stabilizing the beach and dune system and facilitate accretion by storing sand in the dunes. Along the municipal beach (R-176+800 to R-182+500), which measures approximately 6,450 feet in length, the majority of the sea grapes are trimmed to maintain a height of about 2 to 4 feet above grade (Photograph 3). There are five areas along the beach that include untrimmed sea grapes

that measure approximately 20 feet in height and provide iconic "sea grape tunnels" between the sidewalk and beach (Photograph 4). These five areas make up approximately 520 feet along the municipal beach coastline.

**Photograph 3. Trimmed sea grapes along beach access.**

**Photograph 4. Untrimmed sea grape tunnel along beach access.**

Florida Statute 161.053(2)(a) protects dune vegetation by stating that once a coastal construction control line (CCCL) has been established by the Florida Department of Environmental Protection (FDEP), which has been established in Delray, then, "no person, firm, corporation, or governmental agency shall…damage or cause to be damaged such sand dune or the vegetation growing thereon seaward thereof, except as hereinafter provided." This statute protects salt-tolerant vegetation so that any proposal to alter the native vegetation seaward of the CCCL must be authorized by permit if it is expected to damage the plants. Damage is defined as trampling, crushing, breaking, digging up, or excessive cutting of roots, stems or branches. Excessive cutting means the removal of branches, stems and leaves in excess of FDEP's sea grape trimming guidelines (Appendix A) or the standards found in ANSI A300 Part 1: Tree, Shrub and other Woody Plant Maintenance – Standard Practices (Pruning) (ANSI, 2017). FDEP does include exemption criteria for maintenance of sea grapes seaward of the CCCL when following the guidelines listed below (see Appendix A for additional detail):

Shrub(s): Less than 72" in height

- No more than one third of the leaf mass of each plant may be removed in a single pruning event or in a single year

Tree(s): 6' in height, or more

- No more than one third reduction in the height of each tree annually
- Provided there is no more than one third of the leaf mass removed, annually
- Pruning shall not result in plant being reduced to less than six feet in height

The City seeks to continuously improve the health of the dune system while protecting nesting and hatchling sea turtles from light pollution. This trimming plan reviews the current conditions of the Delray dune, the elements that promote a healthy dune, the most recent field investigation to inventory the sea grapes, recent lighting surveys, and provides recommendations for maintenance of Delray's sea grape areas.

## 2.0 A Healthy Dune

The zones of a natural beach and dune system in south Florida include the submerged, intertidal and upper beach, foredune, coastal strand/scrub zone, and maritime hammock (Figure 1). The foredune is usually built by sea oats and may also include bitter panicgrass and saltmeadow cordgrass (FNAI, 2010). Coastal strand is usually the first woody plant community inland from the coast, behind the grassy sea oats. The species composition of natural coastal strand in south Florida includes species such as saw palmetto and/or sea grapes with a mix of low, native shrub and herbaceous species (FNAI, 2010). A dense strand/scrub community can resist extreme environmental conditions such as fire, freezes and hurricanes and thus provide upland protection due to their stabilizing qualities. A maritime hammock is a predominantly evergreen hardwood forest growing on stabilized coastal dunes lying at varying distances from the shore with tropical species prevalent south of Cape Canaveral. Tree species characteristic of a tropical maritime hammock include gumbo limbo, seagrape, and white or Spanish stopper (FNAI, 2010).

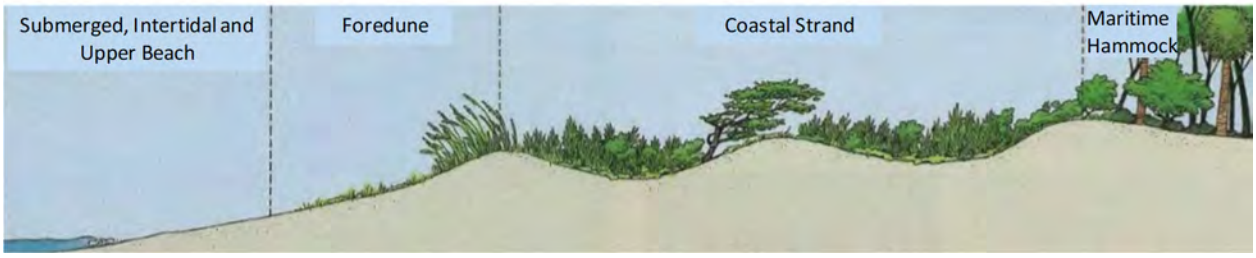



**Figure 1. The zones of a natural dune system in Florida (adapted from Williams, 2007).**

In Delray, the dune habitat along the municipal beach includes a foredune and a coastal strand/scrub zone but does not include a maritime hammock. The foredune includes a predominantly herbaceous community occupying the transition zone between the sandy beach and the coastal strand. It is dominated by sea oats but also includes bitter panic grass, cordgrass and several other species (Photograph 5). The coastal strand community immediately west of the foredune is a wide area dominated by sea grapes (Photograph 6). Between the sea grapes and the sidewalk, saw palmetto, cocoplum, buttonwood, and sable palms are also found (Photograph 7).

Coastal development has resulted in removal of the natural dunescape in much of south Florida; however, Delray is one of the few areas in south Florida with a relatively wide vegetated dune. The City realized early on the importance of a healthy and stable dune system and has proactively managed the dune since the initial beach nourishment project in 1973. Although not in the study area, Atlantic Dunes Park to the south in Delray is one of the few remaining coastal ecosystems in South Florida with a natural dune profile that includes beach/dune, coastal strand/scrub and maritime hammock communities.

A coastal dune management plan addresses several main elements, including the removal of invasive exotic pest plant species, remedial and maintenance pruning of native strand/scrub zone species, and supplemental planting of the strand zone with a diversity of native species (Barron, 2015). In an effort to further enhance the stability and health of the dune, the City has implemented several initiatives that include these elements. These efforts have strengthened the sea grapes, enhanced the diversity of the habitat and facilitated recruitment of an additional 73 native and ruderal plant species (Barron, 2015).

**Photo 5. Sea oats in the foredune.**

**Photo 6. Sea grapes in the coastal strand.**

**Photo 7. Saw palmetto along the western boundary of the dune.**

## 3.0 Sea grape Field Investigation

An assessment of the sea grapes was conducted in the dune system of the entire municipal beach from Casuarina Road (R-182+500) to the northern limit (R-176+800) on November 7 and 15, 2019. Real-Time Kinematic (RTK) GPS was used to delineate and mark each sea grape patch. The entire extent

of the sea grapes was delineated by taking a series of fixes (position data) around each patch to capture the width (east to west) and length (north to south) of the sea grapes. For smaller patches (less than 10 ft wide/long), a single fix was taken in the center of the patch. The approximate height or height range was recorded for each patch. Other dominant vegetation within the dune system were also recorded. Representative photographs from the survey area are provided in Appendix B.

Figure 2 shows the extent of sea grapes in the dune system from R-182+500 to R-176+800. A total of 146 patches were observed ranging from less than 10 ft in width to approximately 128 ft (Patch 1). Heights ranged from 1 ft to approximately 20 ft throughout the area. The tallest (untrimmed) sea grapes were located at five (5) beach access pathways: (1) within Patch 1; (2) between Patches 1 and 2; (3) between Patches 14 and 18; (4) between Patches 29 and 30; and (5) between Patches 39 and 42. The untrimmed sea grapes are presented as the hatched areas in Figure 2. The wider sea grape patches typically began at the landward edge of the dune and extended seaward. From approximately R-180+500 north to R-177+500, smaller patches were observed along the seaward edge of the foredune and were intermixed with sea oats (*Uniola paniculata)*, bitter panic grass (*Panicum amarum*), and cordgrass (*Spartina patens*). These three species dominated the foredune area. Table 1 provides a list of the other dominant dune vegetation observed during the assessment. Appendix C provides detailed observations for each sea grape patch and other dominant vegetation located between the patches.

**Table 1. List of observed dominant dune vegetation.**

| Common Name | Scientific Name |
|---|---|
| Bay Cedar | *Suriana maritima* |
| Beach Naupaka | *Scaevola taccada* |
| Buttonwood | *Conocarpus erectus* |
| Cocoplum | *Chrysobalanus icaco* |
| Cordgrass | *Spartina patens* |
| Bitter Panicgrass | *Panicum amarum* |
| Dune Sunflower | *Helianthus debilis* |
| Nickerbean | *Caesalpinia bonduc* |
| Sable/Cabbage Palm | *Sabal palmetto* |
| Saw Palmetto | *Serenoa repens* |
| Sea Oats | *Uniola paniculata* |


Figure 2a. Location of sea grapes along Delray's municipal beach.

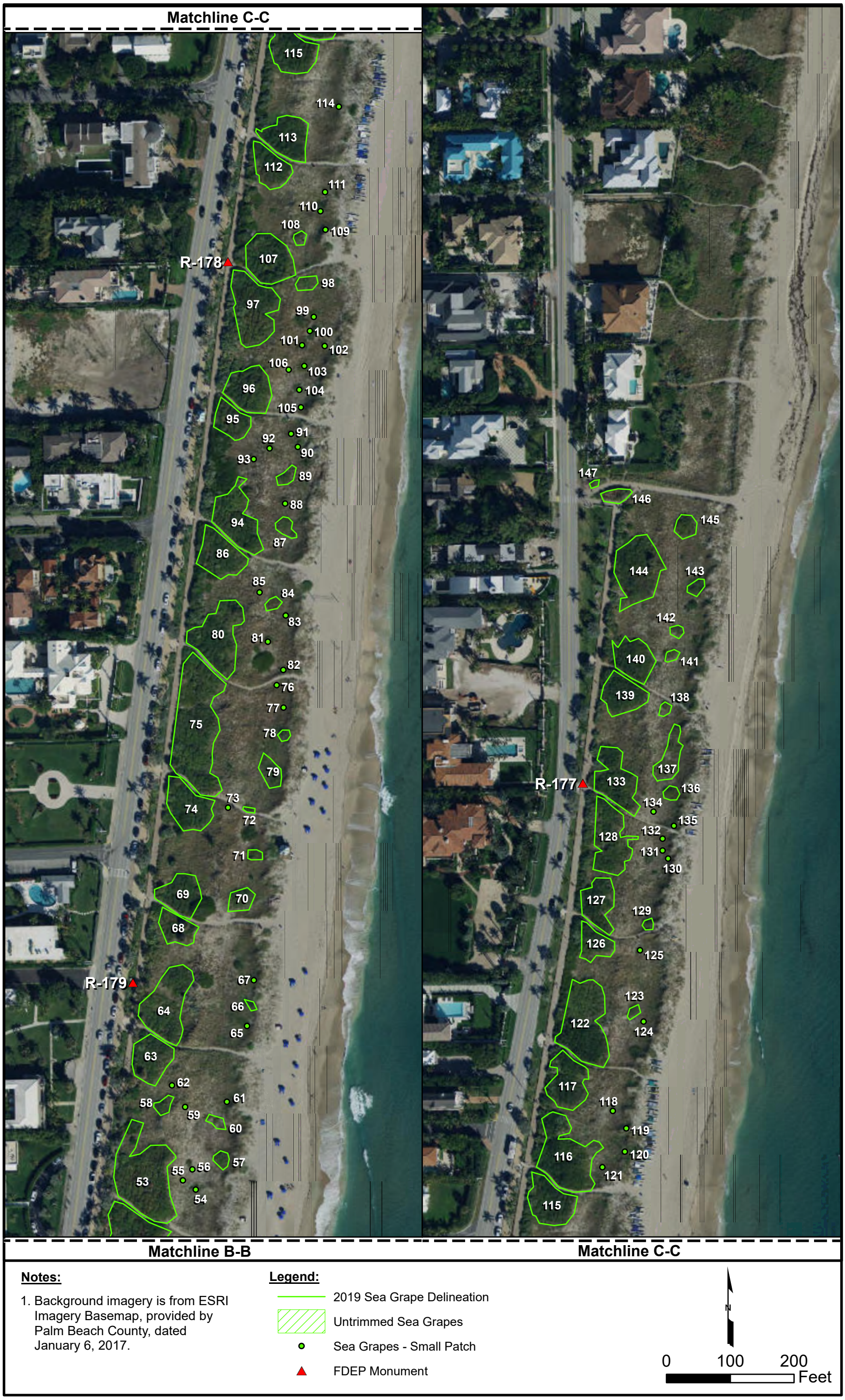



Figure 2b. Location of sea grapes along Delray's municipal beach.

## 4.0 Lighting

The municipal beach in Delray is adjacent to an urban area and the City has taken great strides to reduce light pollution that reaches the beaches, especially during sea turtle nesting season. During the 2019 sea turtle nesting season, the City voluntarily conducted four lighting surveys to identify and address light pollution visible from the beach. The City's enforcement section contacted homeowners and businesses and provided recommendations tailored to each violation. Of the 134 combined lighting violations observed during the surveys, 89 had been addressed by the final lighting evaluation. Additionally, the City Commission opted to "go dark" during the 2019 nesting season where the streetlights along A1A were off between March 1st and October 31st in an effort reduce potential turtle disorientations.

The five areas with tall sea grapes (see hatched area in Figure 2) provide some buffer from light sources reaching the beach. In total, the five stands of tall sea grapes extend for approximately 520 feet of the 6,450-foot long municipal beach. During the 2019 lighting surveys there were no lighting violations observed that penetrated the tall sea grapes. It should be noted however that there are also many areas with trimmed sea grapes that did not have lighting issues. This indicates that the tall sea grapes provide a shield from light pollution, but the ultimate solution is for the upland homes and buildings to comply with the City's lighting ordinance and install turtle-friendly lighting.

**Photo 8. Tall sea grapes east of the pavilion just south of Atlantic Avenue.**

The area with the most lighting issues along the beach is on the corner of Atlantic Avenue and A1A. There is a section of tall sea grapes that extend along the sidewalk for about 70 feet just east of the pavilion (Photograph 8). It appears that these sea grapes, along with the pavilion, provide an obstruction to lights visible from the beach.

When considering sea grape trimming, in addition to adhering to Florida Statue 161.053(2)(a), maintenance of sea grapes must be in compliance with Chapter 370.12(1), Florida Statutes, known as the Marine Turtle Protection Act. Trimming sea grapes may affect sea turtles by allowing artificial light to be visible from the nesting beach. This may deter adult females from emerging to nest on the beach and it may disorient hatchling turtles since they find their way to the ocean by heading toward the brightest horizon, which is naturally over the ocean. More

information and examples of appropriate sea grape trimming to minimize potential light trespass can be found in FWC's Sea Grape Trimming and Sea Turtles document (Appendix D).

## 5.0 Recommendations

The following recommendations are based on the historical management and maintenance of the dune habitat, the recent sea grape field investigation, the 2019 sea turtle nesting season lighting surveys, and the aesthetic value of the tall sea grapes.

***Exotic Vegetation Removal***

In order to enhance the dune habitat, it is critical to first remove all invasive, exotic vegetation. This may include, but is not limited to, beach naupaka (*Scaevola taccada*) and Brazilian pepper (*Schinus terebinthifolia*). The exotic species exist amongst native species in Delray's dunes; therefore, care must be taken to ensure impacts to native vegetation are avoided and/or minimized as much as possible. Removal of small clusters of exotics should be done by hand cutting and digging to remove roots. If it is possible to gain access from the upland side without impact to native vegetation, heavy equipment may be used but will not be permitted on the beach during sea turtle nesting season. Areas that are disturbed by removal of exotics should be replanted with native species. Selective herbicides may also be applied during exotic species removal using cut/stump, hack and squirt or direct hand spray treatment, as authorized in the FDEP CCCL permit.

***Continued Maintenance***

Trimming sea grapes may promote a more stable shrub by encouraging the plant to branch laterally, and pruning can allow space for other species to thrive within the habitat. This practice maintains the natural low stature of a coastal strand and may provide an overall more robust dune vegetation community. The City is already managing the majority of the sea grapes along the municipal beach by maintaining a trimming and pruning program. The previous CCCL permits authorized an initial trimming to 18-24 inches above grade with maintenance hedging of 36-48 inches. During the sea grape survey conducted in November 2019, it was found that, aside from the "tall sea grapes," the height of the sea grapes along the municipal beach mostly ranged between 2 and 8 ft tall. Those areas of sea grapes that have previously been trimmed to 18-24 inches above grade should be maintained to the authorized height of 36-48 inches. In areas that have not been trimmed to 18-24 inches above grade, authorization should be requested to do so with a maintenance height of 36-48 inches. Trimming should mimic the natural shape of the plants. See below for "tall sea grape" recommendations.

The City may also consider increasing pruning to mitigate continued expansion of the sea grapes seaward. Pruning to shrub heights above grade (36-48 inches) can replicate historic coastal strand growth form, improve storm resilience and control lateral spread. Additionally, there are patches

of sea grapes within the foredune, e.g., areas such as 7, 41, and 87 shown in Figure 2, that should be managed to minimize continued expansion or considered for removal entirely. If removed, these areas should be replanted with foredune species such as those found in Table 2 below.

***Dune Plantings***

The City has also planted native vegetation in the dune to promote diversity of the dune habitat, which has resulted in the natural recruitment of additional native species. It is recommended to continue to evaluate the diversity of the dune community and enhance it with native dune plantings. Dune plantings should be located in areas where exotic vegetation has been removed or in areas exposed by pruning.

The species recommended for plantings will depend on the location within the dune profile where the restoration efforts are taking place but may include common species already known to exist in the area, including those presented in Table 2. UF/IFAS (2018) recommends a diversity of plants but cautions that species should not be intermixed within the same row or zone but should instead be planted in homogenous blocks or rows. Sea oats are the most commonly encountered dune-former because they thrive under constant burial from sand blown off the beach. For this reason, they are often the most seaward species found in the foredune, provide protection of landward vegetation, and promote dune growth. Bitter panicgrass in the seawardmost position of the foredune also promotes dune growth and serves to protect and increase survival of species planted landward (UF/IFAS, 2018).

Within the coastal strand/scrub zone in Delray, sea grapes are the dominant species. In areas that currently exposed or will be exposed after exotic vegetation removal, native strand species should be planted. The species presented in Table 2 provide examples of species that are native to this area and would promote natural diversity of the strand community. In addition to common species found in the dune, natural diversity should be enhanced through plantings of rare and listed species found (or previously found) in the area.

**Table 2. Common dune vegetation species recommended for restoration efforts.**

| Foredune | Coastal Strand/Scrub |
|---|---|
| Sea oats (*Uniola paniculata)* | Saw palmetto (*Serenoa repens*) |
| Beach cordgrass (*Spartina patens*) | Cocoplum (*Chrysobalanos icaco*) |
| Bitter panicgrass (*Panicum amarum*) | FL Keys blackbead (*Pithecellobium keyense*) |
| Seashore dropseed (*Sporobolus virginicus*) | Marlberry (*Ardisia escallonioides*) |
| Dune sunflower (*Helianthus debilus*) | Caper Tree (*Capparis flexuosa*) |
| Beach verbena (*Verbena maritima*) | Sea myrtle (*Baccharis halimifolia*) |
| Inkberry (*Scaevola plumeria*) | Bay cedar (*Suriana maritima*) |
| Seashore paspalum (*Paspalum vaginaium*) | Sea lavender (*Argusia gnapalodes*) |
| | Beach creeper (*Ernodea litorallis*) |
| | Silver palm (Coccothrinax argentata) |
| | Florida agave (*Agave decipiens*) |

***Tall Sea Grapes***

The recent sea grape investigation documented five areas along the municipal beach with tall (up to 20 ft) sea grapes. A survey of these specific tall sea grape areas was conducted in December 2018 (APTIM, 2018) and again in November 2019. The tall sea grapes do not appear to have been negatively impacted by the effects of Hurricane Dorian, which generated winds between 40 and 60 mph in south Florida. Additionally, the dune habitat along the municipal beach lacks a maritime hammock, such as is found in Atlantic Dunes Park to the south. Maritime hammocks are important resting and feeding sites for migrating songbirds (FNAI, 2010). The taller sea grapes provide a canopy that may serve as hammock habitat to provide shelter and food resources for migratory birds.

The tall sea grapes also provide a buffer between lights from upland structures (homes and businesses) and the beach, which can reduce potential sea turtle disorientations. Additionally, the iconic sea grape tunnels leading from the sidewalk to the beach are part of Delray's beachscape and provide an aesthetically pleasing experience to beachgoers. They also keep the sand cooler on the walk to and from the beach.

It is recommended to leave the currently tall sea grapes untrimmed, especially in the areas closest to Atlantic Avenue. The City may consider trimming the tallest sea grapes in a manner that allows the sea grape tunnels to remain intact.

***Lighting***

The City voluntarily conducted four lighting surveys during the 2019 sea turtle nesting season, the follow up of which resulted in a substantial decrease in light pollution visible from the beach. Each violation was addressed by reaching out to the homeowner or business with mostly positive

results. It is recommended that the City continue with lighting surveys and compliance follow up throughout nesting season to reduce light pollution visible from the beach. Additionally, a CCCL permit will require pre- and post-trimming lighting survey to document the number, location, color and intensity of all light sources visible from the nesting beach. Any issues arising from the pre-trimming survey will need to be addressed before trimming occurs.

Once the trimming has occurred, all pre- and post-project survey data must be reported to FWC and FDEP to document that the project meets the exemption criteria for vegetation maintenance, complies with permit, or requires corrective action to eliminate illumination of the beach. If additional light sources are found to illuminate the beach, or if the permit conditions are not satisfied, FDEP may suspend or revoke the permit until corrective action is taken.

## 6.0 References

ANSI. 2017. ANSI A300 Part 1: Tree, Shrub and other Woody Plant Maintenance – Standard Practices (Pruning). Developed by the Tree Care Industry Association (TCIA) and written by the Accredited Standards Committee (ASC) A300. 33 pp.

Aptim Environmental & Infrastructure, LLC. 2018. City of Delray Beach, Memorandum regarding Sea Grape Tunnels.

Barron, R.H. 2015. Analysis and Recommendations for Management of the Coastal Dune at Delray Beach, Florida. Prepared by Coastal Management and Consulting with assistance from The Institute for Regional Conservation.

Florida Natural Areas Inventory (FNAI). 2010. Guide to the Natural Communities of Florida: 2010 edition.

Florida Statute 160.053(2)(a). Coastal construction and excavation; regulation on county basis. https://www.flsenate.gov/Laws/Statutes/2011/161.053

370.12 Marine Animals; regulation. Protection of Marine Turtles. Marine Turtle Protection Act. http://www.leg.state.fl.us/statutes/index.cfm?App_Mode=Display_Statute&Search_String=&URL=Ch0370/Sec12.htm&StatuteYear=2001

McLachlan A. and A.C. Brown. 2006. The Ecology of Sandy Shores. 2nd Edition.

University of Florida IFAS (UF/IFAS). 2018. Dune Restoration and Enhancement for the Florida Panhandle. Prepared in fulfillment of reporting requirements for the USFWS grant agreement No. F07AP00022 Habitat Restoration for Beach Mice: Landscape-Level Population Studies and Dune Restoration.

Williams, M.J. 2007. Native Plants for Coastal Restoration: What, When, and How for Florida. USDA, NRCS, Brooksville Plant Materials Center, Brooksville, FL. 51p. http://www.fl.nrcs.usda.gov/programs/pmc/flplantmaterials.html

# APPENDIX A

## FDEP's Sea Grape Trimming Guidelines

# Sea Grape Trimming Guidelines

There are a small number of plant species that can endure the extreme conditions encountered along our state's coastline. Dune species such as the Sea grapes thrive in this harsh environment. Sea grape trees and shrubs act as a continuous sand trap. The accumulation of sand by the leaves, limbs and stalks play a major role in the construction of the beach and dune system. Without the stabilizing and accreting effects of Sea grapes and other salt-tolerant plant species, the beach and dune system becomes more vulnerable to erosion. To put it simply, sand stored in the dunes provides protection to homes and other structures from the effects of coastal storms.

The Florida Legislature recognized the importance of coastal plant species. Therefore Florida law states that no person, firm, corporation, or governmental agency shall damage or cause to be damaged sand dunes or the vegetation growing on the dune system (subparagraph 161.053(2)(a), Florida Statutes). Consequently, it is the policy of the Department of Environmental Protection to protect native salt-tolerant vegetation and endangered plant communities. Property owners or their agents proposing to alter the native vegetation seaward of the Department's Coastal Construction Control Line must apply for a permit if the alteration can be expected to damage the plants.

Damage to vegetation refers to the trampling, crushing, breaking, digging up, or excessive cutting of roots, stems or branches of native salt tolerant plants naturally occurring on-site or planted for dune restoration. Excessive cutting means the removal of branches, stems and leaves in excess of the Department trimming guidelines for sea grape or the standards published in ANSI A300 Part 1: Tree, Shrub and other Woody Plant Maintenance - Standard Practices, Pruning. Damage to beach and dune vegetation will be avoided, minimized or mitigated through the permit process.

Vegetation maintenance that does not damage plants as defined above, including trimming, shearing, pruning, dead heading and other accepted horticultural practices is exempt from permit requirements. An exemption from the permitting requirements of the Department of Environmental Protection does not shield the property owner from enforcement action taken by local, state, or federal agencies. Furthermore, proper horticultural practices must be followed to ensure that the plants are not damaged or destroyed. For more information you may contact the Bureau of Beaches and Coastal Systems regulatory program at 850/488-7708.

Persons intending to maintain native vegetation seaward of the Coastal Construction Control Line must consider the impacts to sea turtles. Removal of beachfront vegetation increases the potential for disorientation and subsequent injury or mortality of hatchling sea turtles, which are attracted to light. Pruning or trimming removes vegetation that often prevents lights from shining on the beach and thus protects sea turtle nesting habitat. Vegetation maintenance that increases lighting of the beach must be in compliance with Chapter 370.12, Florida Statutes, "Marine Turtle Protection Act." The property owner must evaluate existing or potential site lighting and take appropriate measures to eliminate the potential for increased light cast on the nesting beach. For information on lighting issues see the attached information on "Sea Grape Trimming and Sea Turtles," or visit the Florida Fish and Wildlife Conservation Commission website. You may also contact the sea turtle conservation program at 850/922-4330.

Sea turtle mortality resulting from increased illumination is a violation of Chapter 370.12, Florida Statutes, and the Federal Endangered Species Act of 1973. Such a violation could subject the responsible party to prosecution by both the Department and the U.S. Fish and Wildlife Service with fines up to $10,000.

SEA GRAPE (COCCOLOBA UVIFERA):

Is a native, salt-tolerant plant, which is an important component of the beach and dune system throughout its range. Fruit of the sea grape is a berry, which grows in grape-like clusters. The fruit is a source of food for a number of native birds and mammals. The leathery, broad leaves of sea grape may grow to be 10 inches wide. Throughout its range, the sea grape is important to owners of oceanfront property. The large round leaves trap windblown sand and thereby help to build dunes that protect upland structures. Furthermore, thick stands of sea grape slow storm induced erosion of dunes.

**Exemption Criteria:** The Department will exempt maintenance of sea grapes seaward of the Coastal Construction Control Line from the permitting requirements of Chapter 161, Florida Statutes, when the maintenance will not damage or destroy the plant. The Department has determined that the maintenance will not destroy the plant when following the guidelines listed below:

**Shrub(s):**
**Less than 72" in height.**

- No more than one third of the leaf mass of each plant may be removed in a single pruning event or in a single year.

**Tree(s): 6' in height, or more.**

- No more than one third reduction in the height of each tree annually,
- Provided there is no more than one third of the leaf mass removed, annually.
- Pruning shall not result in plant being reduced to less than six feet in height.

**Advisory Notes:**

**THIS DOES NOT PRECLUDE LEAF AND STEM TIP SHEARING.**
**REMOVAL OF DEAD, BROKEN AND DISEASED LIMBS IS NOT INCLUDED IN ESTIMATES.**
**CANOPY REDUCTION GRATER THAN 1/3 OF THE HEIGHT OF THE PLANT WILL REQUIRE A PERMIT.**

- Maintenance of sea grapes, in accordance with the conditions described above, and not in conflict with the standards published in ANSI A300 Part 1: Tree, Shrub and other Woody Plant Maintenance - Standard Practices, Pruning, are exempt from the permitting requirements of Chapter 161, Florida Statutes, for any number of consecutive years.
- Proposed trimming that will result in reducing the plant to a height of less than 42 inches for shrubs and less than six feet for trees, or completely destroy it, will not be exempt from the permitting process. The Department will consider the site-specific information, including the possible adverse impacts to the beach and dune system from the activity, as part of its determination of whether or not to permit the proposed activity.

In addition, maintenance of sea grapes must be in compliance with Chapter 370.12, Florida Statutes, "Marine Turtle Protection Act" and should not result in additional exposure of salt-sensitive coastal hammock vegetation to increased salt spray.

# APPENDIX B

## Photographs

Photograph 1. Facing north at first beach access north of Casuarina Road.

Photograph 2. Facing south towards Casuarina Road.

Photograph 3. Facing west towards at same access in Photograph 1.


Photograph 4. Beach access between Patches 1 and 2.

Photograph 5. Facing south at Patch 2.

Photograph 6. Facing south at Patch 3.

**Photograph 7. Patch 5 with sea oats in foreground.**

**Photograph 8. Sea oats between Patches 5 and 6.**

**Photograph 9. Cocoplum, bay cedar, and saw palmetto between Patches 6 and 8.**

**Photograph 10. Facing north at Patch 9.**

**Photograph 11. Beach naupaka along west edge of Patch 12.**

**Photograph 12. Facing north at Patch 14.**

**Photograph 13. Facing west at beach access along north edge of Patch 14.**

**Photograph 14. Facing north at Patch 14.**

**Photograph 15. Facing southwest at Patch 18.**

**Photograph 16. Typical small seagrape patch (Patch 23).**

**Photograph 17. Facing west at access between Patches 29 and 30.**

**Photograph 18. Sable palms west of Patch 30.**

Photograph 19. Facing north at Patch 37.

Photograph 20. Buttonwood at northwest edge of Patch 37.

Photograph 21. Facing north at Patch 39.

Photograph 22. Nickerbean at Patch 39.

Photograph 23. Typical medium seagrape patch (Patch 41).

Photograph 24. Patch 44 near seaward edge of dune.

Photograph 25. Cocoplum shown on left located seaward of Patch 69.

Photograph 26. Cocoplum seaward of Patch 69.

Photograph 27. Close-up of cocoplum.

Photograph 28. Saw palmetto along landward edge of Patch 74.

Photograph 29. Facing south at Patch 80.

Photograph 30. Cocoplum, nickerbean, bay cedar between Patches 80 and 86.

Photograph 31. Saw palmetto between Patches 94 and 95.

Photograph 32. Cocoplum and saw palmetto between Patches 94 and 95.

Photograph 33. Facing north at Patch 97.

Photograph 34. Saw palmetto between Patches 96 and 97.

Photograph 35. Facing south at Patch 113.

Photograph 36. Patch 125 near seaward edge of dune.

**Photograph 37. Facing north at Patch 128.**

**Photograph 38. Beach access between Patches 128 and 133.**

**Photograph 39. Facing west at Patch 144.**

**Photograph 40. Facing northwest at Patch 144.**

**Photograph 41. Patch 146.**

**Photograph 42. Patch 147.**

# APPENDIX C

## Sea Grape Assessment Data

**Delray Seagrape Assessment**
Municipal Beach from the northern limits to Casuarina Road (R-176+800 to R-182+500)
Conducted on November 7 & 15, 2019

| Patch # | Approx. Height (ft) | Dominant Vegetation Seaward of Seagrapes | Dominant Vegetation Between Sidewalk & Seagrapes | Dominant Vegetation Between Patches | | Notes |
|---|---|---|---|---|---|---|
| 1 | 3-20 | Sea Oats, Dune Panic Grass, Cordgrass | | NA | | |
| 2 | 5-10 | Sea Oats, Dune Panic Grass, Cordgrass | | | NA | |
| 3 | 4-6 | Sea Oats, Dune Panic Grass, Cordgrass | | Saw Palmetto, Sea Oats | | |
| 4 | 4-6 | Sea Oats, Dune Panic Grass, Cordgrass | | | Saw Palmetto/Bay Cedar | |
| 5 | 4-6 | Sea Oats, Dune Panic Grass, Cordgrass | | Sea Oats | | |
| 6 | 4-6 | Sea Oats, Dune Panic Grass, Cordgrass | | | NA | |
| 7 | 4 | NA | | (b/t 6 &8) | | Small patch near seaward edge of dune |
| 8 | 4-6 | Sea Oats, Dune Panic Grass, Cordgrass | | Cocoplum, Bay Cedar, Saw Palmetto | | |
| 9 | 4-6 | Sea Oats, Dune Panic Grass, Cordgrass, Bay Cedar, Fern-like shrub | | NA | NA | |
| 10 | 4-6 | Sea Oats, Dune Panic Grass, Cordgrass, Cocoplum | | | | |
| 11 | 1-5 | NA | | | NA | Small patch near seaward edge of dune |
| 12 | 4-7 | Sea Oats, Dune Panic Grass, Cordgrass, Dune Sunflower, Fern-like shrub | Beach Naupaka | NA | NA | |
| 13 | 4-8 | Sea Oats, Dune Panic Grass, Cordgrass | | NA | | |
| 14 | 4-20 | Sea Oats, Dune Panic Grass, Cordgrass | | | NA | |
| 15 | 3 | NA | | NA | | Small patch near seaward edge of dune |
| 16 | 3 | NA | | | NA | Small patch near seaward edge of dune |
| 17 | 3 | NA | | NA | | Small patch near seaward edge of dune |
| 18 | 4-20 | Sea Oats, Dune Panic Grass, Cordgrass | Cocoplum, Dune Sunflower, Buttonwood | | NA | |
| 19 | 2 | NA | | NA | | Small patch near seaward edge of dune |
| 20 | 3 | NA | | | NA | Small patch near seaward edge of dune |
| 21 | 2-3 | NA | | NA | | Small patch near seaward edge of dune |
| 22 | 2-3 | NA | | | NA | Small patch near seaward edge of dune |
| 23 | 2-3 | NA | | NA | | Small patch near seaward edge of dune |
| 24 | 2-3 | NA | | | NA | Small patch near seaward edge of dune |
| 25 | 4-7 | Sea Oats, Dune Panic Grass, Cordgrass | | (b/t 25 & 29) | | |
| 26 | 4-6 | NA | | Cocoplum | NA | |
| 27 | 4-6 | NA | | NA | | |
| 28 | 4-6 | NA | | | NA | |
| 29 | 4-20 | Sea Oats, Dune Panic Grass, Cordgrass | | NA | | |
| 30 | 4-20 | Sea Oats, Dune Panic Grass, Cordgrass | Sable Palms | | NA | |
| 31 | 1-3 | NA | | NA | | Small patch near seaward edge of dune |
| 32 | 1-3 | NA | | | NA | Small patch near seaward edge of dune |
| 33 | 4 | NA | | NA | | Small patch near seaward edge of dune |
| 34 | 4 | NA | | | NA | Small patch near seaward edge of dune |
| 35 | 8 | Sea Oats, Dune Panic Grass, Cordgrass | Sable Palms, Cocoplum, Buttonwood | Cocoplum | | Medium patch near landward edge of dune |
| 36 | 10 | Sea Oats, Dune Panic Grass, Cordgrass | Sable Palms, Cocoplum, Buttonwood | | Sea Oats, Dune Panic Grass, Cordgrass, Sable Palm | Medium patch near landward edge of dune |
| 37 | 8 | Sea Oats, Dune Panic Grass, Cordgrass | Sable Palms, Buttonwood | NA | | |
| 38 | Duplicate of Patch 34 - deleted | | | | NA | |
| 39 | 8-20 | Sea Oats, Dune Panic Grass, Cordgrass | Nickerbean | NA | | |
| 40 | 1 | NA | | | NA | Small patch near seaward edge of dune |
| 41 | 1 | NA | | NA | | Small patch near seaward edge of dune |
| 42 | 4-20 | Sea Oats, Dune Panic Grass, Cordgrass | Buttonwood, Sable Palm, Saw Palmetto | | NA | |
| 43 | 2 | NA | | NA | | Small patch near seaward edge of dune |
| 44 | 6-8 | NA | | | NA | Medium patch near seaward edge of dune |
| 45 | 2 | NA | | NA | | Small patch near seaward edge of dune |
| 46 | 2 | NA | | | NA | Small patch near seaward edge of dune |
| 47 | 5-8 | Sea Oats, Dune Panic Grass, Cordgrass | | NA | | |
| 48 | 1-2 | NA | | | NA | Small patch near seaward edge of dune |
| 49 | 1-2 | NA | | NA | | Small patch near seaward edge of dune |
| 50 | 1-2 | NA | | | NA | Small patch near seaward edge of dune |
| 51 | 1-2 | NA | | NA | | Small patch near seaward edge of dune |
| 52 | 1-2 | NA | | | NA | Small patch near seaward edge of dune |
| 53 | 1-8 | Sea Oats, Dune Panic Grass, Cordgrass | Buttonwood, Saw Palmetto | (b/t 53 & 63) | | |
| 54 | 1-2 | NA | | Sea Oats, Dune Panic Grass, Cordgrass, Saw Palmetto | NA | Small patch near seaward edge of dune |
| 55 | 1-2 | NA | | NA | | Small patch near seaward edge of dune |
| 56 | 1-2 | NA | | | NA | Small patch near seaward edge of dune |

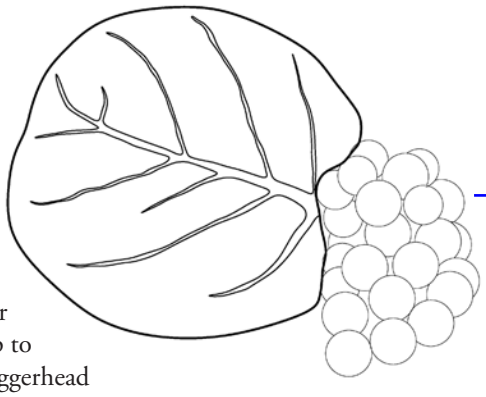
| | | | | | | |
|---|---|---|---|---|---|---|
| 57 | 3 | NA | | NA | NA | Small patch near seaward edge of dune |
| 58 | 2-4 | NA | | | NA | Medium patch near landward edge of dune |
| 59 | 1 | NA | | NA | | Small patch near landward edge of dune |
| 60 | 2 | NA | | | NA | Medium patch near seaward edge of dune |
| 61 | 1 | NA | | NA | | Small patch near seaward edge of dune |
| 62 | 1 | NA | | | | Small patch near landward edge of dune |
| 63 | 3-8 | Sea Oats, Dune Panic Grass, Cordgrass | | | | |
| 64 | 4-7 | Sea Oats, Dune Panic Grass, Cordgrass | Saw Palmetto, Sable Palm | | (b/t 64 & 68) | |
| 65 | 4 | NA | | NA | Sea Oats, Dune Panic Grass, Cordgrass, Saw Palmetto, Sable Palm | Small patch near seaward edge of dune |
| 66 | 4 | NA | | | NA | Medium patch near seaward edge of dune |
| 67 | 5 | NA | | NA | | Small patch near seaward edge of dune |
| 68 | 5 | | Saw Palmetto, Sable Palm | | NA | |
| 69 | 4-6 | Sea Oats, Dune Panic Grass, Cordgrass, Cocoplum | Saw Palmetto, Sable Palm | (b/t 69 & 74) | | |
| 70 | 1-4 | NA | | Sea Oats, Dune Panic Grass, Cordgrass | NA | Medium patch near seaward edge of dune |
| 71 | 4 | NA | | NA | | Medium patch near seaward edge of dune |
| 72 | 4 | NA | | | NA | Medium patch near seaward edge of dune |
| 73 | 1 | NA | | NA | | Small patch near landward edge of dune |
| 74 | 4-6 | Sea Oats, Dune Panic Grass, Cordgrass | Saw Palmetto | | NA | |
| 75 | 4-8 | Sea Oats, Dune Panic Grass, Cordgrass | | NA | | |
| 76 | 2-4 | NA | | | NA | Small patch near seaward edge of dune |
| 77 | 2-4 | NA | | NA | | Small patch near seaward edge of dune |
| 78 | 5 | NA | | | NA | Medium patch near seaward edge of dune |
| 79 | 4 | NA | | NA | | Medium patch near seaward edge of dune |
| 80 | 3-8 | Sea Oats, Dune Panic Grass, Cordgrass | | | (b/t 80 & 86) | |
| 81 | 2 | NA | | NA | Cocoplum, Nickerbean, Bay Cedar | Small patch near seaward edge of dune |
| 82 | 1-2 | NA | | | NA | Small patch near seaward edge of dune |
| 83 | 1-2 | NA | | NA | | Small patch near seaward edge of dune |
| 84 | 2 | NA | | | NA | Medium patch near seaward edge of dune |
| 85 | 1 | NA | | NA | | Small patch near seaward edge of dune |
| 86 | 2-8 | Sea Oats, Dune Panic Grass, Cordgrass | Ficus | | NA | |
| 87 | 1-3 | NA | | NA | | Medium patch near seaward edge of dune |
| 88 | 3 | NA | | | NA | Small patch near seaward edge of dune |
| 89 | 4 | NA | | NA | | Medium patch near seaward edge of dune |
| 90 | 2-3 | NA | | | NA | Small patch near seaward edge of dune |
| 91 | 2-3 | NA | | NA | | Small patch near seaward edge of dune |
| 92 | 2-3 | NA | | | NA | Small patch near seaward edge of dune |
| 93 | 2-3 | NA | | NA | | Small patch near seaward edge of dune |
| 94 | 3-8 | Sea Oats, Dune Panic Grass, Cordgrass | Cocoplum, Saw Palmetto | | Cocoplum/Saw Palmetto | |
| 95 | 4-10 | Sea Oats, Dune Panic Grass, Cordgrass | Cocoplum, Saw Palmetto | NA | | |
| 96 | 4-8 | Sea Oats, Dune Panic Grass, Cordgrass | | | Saw Palmetto | |
| 97 | 4-8 | Sea Oats, Dune Panic Grass, Cordgrass | | NA | | |
| 98 | 3 | NA | | | NA | Medium patch near seaward edge of dune |
| 99 | 1-3 | NA | | NA | | Small patch near seaward edge of dune |
| 100 | 1-3 | NA | | | NA | Small patch near seaward edge of dune |
| 101 | 1-3 | NA | | NA | | Small patch near seaward edge of dune |
| 102 | 1-3 | NA | | | NA | Small patch near seaward edge of dune |
| 103 | 1-3 | NA | | NA | | Small patch near seaward edge of dune |
| 104 | 1-3 | NA | | | NA | Small patch near seaward edge of dune |
| 105 | 1-3 | NA | | NA | | Small patch near seaward edge of dune |
| 106 | 1-3 | NA | | | NA | Small patch near seaward edge of dune |
| 107 | 4-8 | Sea Oats, Dune Panic Grass, Cordgrass | | (b/t 107 & 112) | | |
| 108 | 4 | NA | | Saw Palmetto/Ficus | NA | Medium patch near seaward edge of dune |
| 109 | 4 | NA | | NA | | Small patch near seaward edge of dune |
| 110 | 4 | NA | | | NA | Small patch near seaward edge of dune |
| 111 | 1 | NA | | NA | | Small patch near seaward edge of dune |
| 112 | 4-8 | Sea Oats, Dune Panic Grass, Cordgrass | | | | |
| 113 | 1-10 | Sea Oats, Dune Panic Grass, Cordgrass | Saw Palmetto, Bay Cedar | (b/t 113 & 115) | | |
| 114 | 4 | NA | | Saw Palmetto | NA | Small patch near seaward edge of dune |
| 115 | 2-10 | Sea Oats, Dune Panic Grass, Cordgrass | | NA | | |
| 116 | 4-8 | Sea Oats, Dune Panic Grass, Cordgrass | Saw Palmetto | | Saw Palmetto | |
| 117 | 4-10 | Sea Oats, Dune Panic Grass, Cordgrass | | NA | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 118 | 2-4 | NA | | NA | NA | Small patch near seaward edge of dune |
| 119 | 2-4 | NA | | NA | | Small patch near seaward edge of dune |
| 120 | 2-4 | NA | | | NA | Small patch near seaward edge of dune |
| 121 | 2-4 | NA | | NA | | Small patch near seaward edge of dune |
| 122 | 2-10 | Sea Oats, Dune Panic Grass, Cordgrass | | | (b/t 122 & 126) | |
| 123 | 2 | NA | | NA | Saw Palmetto, Bay Cedar | Medium patch near seaward edge of dune |
| 124 | 2 | NA | | | NA | Small patch near seaward edge of dune |
| 125 | 2 | NA | | NA | | Small patch near seaward edge of dune |
| 126 | 2-10 | Sea Oats, Dune Panic Grass, Cordgrass | | | NA | |
| 127 | 2-10 | Sea Oats, Dune Panic Grass, Cordgrass | | Saw Palmetto | | |
| 128 | 2-4 | Sea Oats, Dune Panic Grass, Cordgrass | Saw Palmetto | | NA | |
| 129 | 4 | NA | | NA | | Medium patch near seaward edge of dune |
| 130 | 1-2 | NA | | | NA | Small patch near seaward edge of dune |
| 131 | 1-2 | NA | | NA | | Small patch near seaward edge of dune |
| 132 | 1-2 | NA | | | NA | Small patch near seaward edge of dune |
| 133 | 2-8 | Sea Oats, Dune Panic Grass, Cordgrass | Saw Palmetto | (b/t 133 & 139) | | |
| 134 | 1-3 | NA | | Saw Palmetto, Sea Oats, Dune Panic Grass, Cordgrass | NA | Small patch near seaward edge of dune |
| 135 | 1-3 | NA | | NA | | Small patch near seaward edge of dune |
| 136 | 4 | NA | | | NA | Medium patch near seaward edge of dune |
| 137 | 1-2 | NA | | NA | | Large patch near seward edge of dune |
| 138 | 1-3 | NA | | | NA | |
| 139 | 4-8 | Sea Oats, Dune Panic Grass, Cordgrass | | NA | | |
| 140 | 4-8 | Sea Oats, Dune Panic Grass, Cordgrass | Saw Palmetto | | (b/t 140 & 144) | |
| 141 | 2 | NA | | NA | Saw Palmetto, Sea Oats, Dune Panic Grass, Cordgrass | Medium patch near seaward edge of dune |
| 142 | 2 | NA | | | NA | Medium patch near seaward edge of dune |
| 143 | 3 | NA | | NA | | Medium patch near seaward edge of dune |
| 144 | 2-10 | Sea Oats, Dune Panic Grass, Cordgrass | Saw Palmetto | | NA | |
| 145 | 4 | NA | | NA | | Medium patch near seaward edge of dune |
| 146 | 7 | NA | | | NA | Medium patch near landward edge of dune |
| 147 | 5 | NA | | | | Small patch near landward edge of dune |

# APPENDIX D

# FWC's Sea Grape Trimming and Sea Turtles

# Sea Grape Trimming and Sea Turtles



## What are sea grapes and how do I know if I have them?

**Sea Grape,** *Coccoloba uvifera* is a remarkable native, salt-tolerant species of plant found along many of Florida's beaches. Plants may appear as low spreading bushes or tall continuous hedges along the sand dunes. This plant can be identified by its thick circular leaves 8" to 10" in diameter and its grape-like clusters of fruit. This fruit is consumed by a number of native birds and mammals, while the protective canopy provides habitat for animals including songbirds, lizards, gopher tortoise and beach mice.

In addition to providing habitat, sea grape helps to stabilize sand dunes and to protect upland structures from storm-induced erosion. In fact, this plant has been deemed important enough to protect under Florida Statute.

## Does Florida really have sea turtles?

Yes. In fact, with its miles of warm sandy beaches, Florida is the single most important state for sea turtle nesting. Nesting season occurs from May 1st to October 31st throughout most of the state. From Brevard County to Broward County along the Atlantic coast, the nesting season extends from March 1st through October 31st.

**Sea turtles** are large air-breathing reptiles with paddle-shaped foreflippers and a number of adaptations that make them perfectly suited for a life at sea. These amazing animals once roamed the world's oceans in the millions with a suprising diversity of species. Today, only seven species remain worldwide. Five of these, the leatherback, green, loggerhead, Kemp's ridley and hawksbill, can be found in Florida's coastal waters. The first three regularly nest on Florida beaches. Sadly, all five species are listed as threatened or endangered.

It has only been in the last few centuries that demand for sea turtle meat, eggs, shell, leather and oil drastically reduced their numbers. Additional declines have continued from drowning in shrimp trawls, captures on long-lines, pollution and non-degradable debris in the ocean. One of the most devastating impacts to marine turtles has come from artificial light pollution onto nesting beaches.

Although they may live their entire life at sea, marine turtles must leave the relative safety of the ocean to nest. Usually, under cover of darkness, females will drag her body from the ocean across the beach where she will dig a nest and deposit roughly 100 leathery eggs in the warm sand. After about 60 days of incubation, the eggs will hatch and the hatchlings will make their way as a group to the sea. For loggerhead turtles, it may be 15 to 20 years before one of these hatchlings returns to her natal beach to nest for the first time.

## How can trimming my sea grapes affect sea turtles?

In a word, light. Artificial lighting trespassing onto sea turtle nesting beaches affects sea turtles in two ways. First, artificial lighting deters adult females from emerging from the surf to nest. Two studies conducted in Florida clearly demonstrated dramatic reductions in nesting attempts by loggerhead turtles where artificial lighting was introduced. This included effects by lighted piers and roadways close to beaches.

Secondly, hatchling turtles find their way to the ocean by orienting toward the brightest horizon. On a natural beach, this is the horizon over the ocean. The dark dune silhouette behind them keeps them from heading in the wrong direction. Hatchling turtles are highly sensitive to even minute quantities of short-wavelength or white light and will orient toward the brightest direction.

We don't often think of light as pollution. Yet when artificial light is introduced into this critical nesting habitat, the effects can be disastrous. Between 20,000 to 30,000 hatchlings disorient to artificial lights each year. Hatchlings that orient towards a streetlight, condominium light or residential porchlight usually die from exhaustion, dehydration, predation or more direct causes such as being run over by cars. Any steps to minimize this light trespass and direct the light only where it is needed will help to protect sea turtles and restore nesting beaches.

Throughout the state, stands of sea grape act as a natural vegetative barrier blocking artificial light from nesting beaches and minimizing upland glow. Trimming or removal of this vegetative barrier can increase illumination levels on the beach and deter nesting or disorient hatchlings. This is considered interference with the normal nesting behavior of threatened and endangered species and can expose the property owner to potential fines or imprisonment under the Endangered Species Act (1973) and Florida Statutes 161 and 379.2431(1) The following pages illustates the best ways to minimize potential light trespass.

# Sea Grape Trimming Guidelines

## BEFORE Sea Grape Trimming

This diagram depicts a beach house with several styles of exterior lighting. These lights are shielded from the beach by a large stand of sea grape, *Coccoloba uvifera*. The homeowner would like to trim this stand of sea grape to improve the view from the balcony but is concerned about light trespass onto a sea turtle nesting beach and potential liability should these lights cause the disorientation and deaths of protected sea turtles.

## BAD Sea Grape Trimming

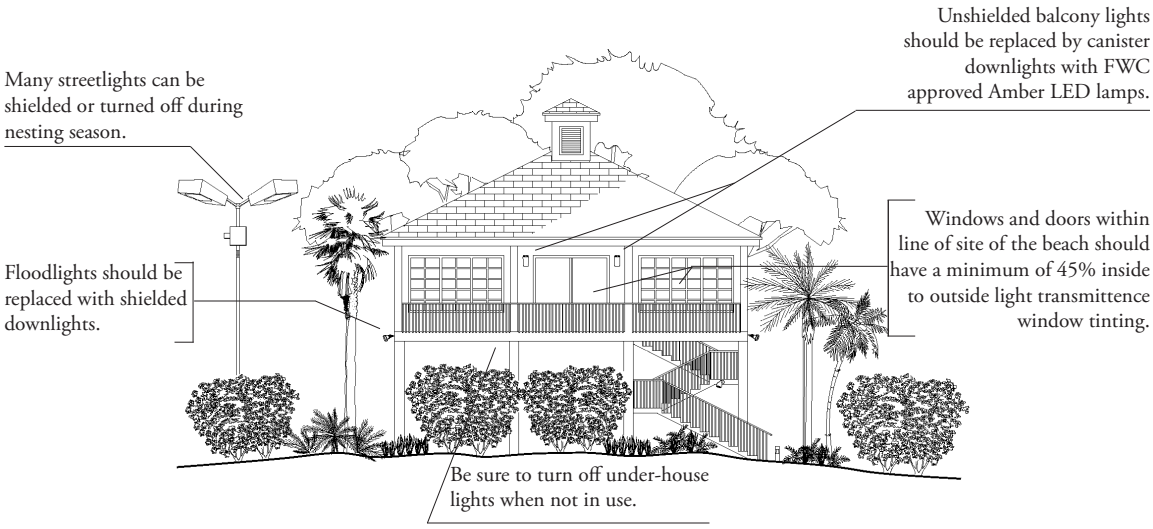
Here, the homeowner has over trimmed the sea grape stand. Although the homeowner now has a better view of the ocean, light pollution now shines onto the nesting beach disrupting normal sea turtle nesting behavior. Of particular concern are the poor light fixtures, car headlights and now the streetlight are also visible from the beach. This unpermitted trimming damages the sea grape stand, disrupts sea turtle nesting and exposes the homeowner to potential legal action including substantial fines.

## APPROPRIATE Sea Grape Trimming

The trimmed seagrape stand now allows a view of the ocean from the balcony. Realizing this would make the balcony light visible from the beach, the homeowner has replaced the jelly-jar light with well shielded canister downlight equiped with a FWC approved 3watt to 12watt Amber LED lamp. The homeowner has also replaced the floodlight on the beachside of the house with another canister downlight and bollard fixture with downcast horizontal louvers to illuminate the stairs for safety. Even after trimming, the homeowner has actually reduced illumination visible to the nesting beach.

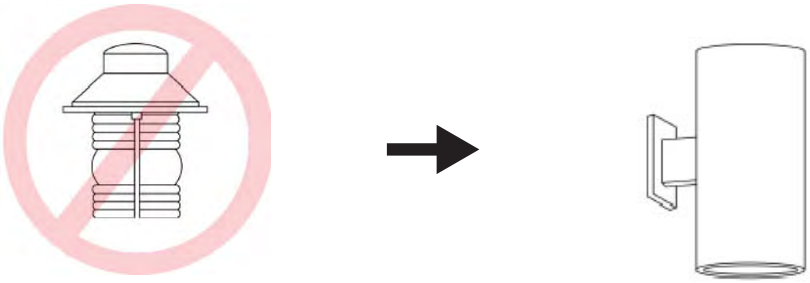
# Replacing Bad Light Fixtures

## A Typical Beach House As Seen From the Ocean




This diagram depicts a typical beach house with several styles of exterior light fixtures. These fixtures are inappropriate for use near sea turtle nesting beaches and should be replaced with shielded, downward directed lights. When correcting problem light fixtures, don't forget about your interior lights. Windows within line of site of the beach should be tinted with 15% to 45% inside to outside light transmittence film. Try to make it a habit to keep your window blinds closed at night during sea turtle nesting season from May 1st through October 31st through most of the state and from March 1st through October 31st from Brevard through Broward County on the Atlantic coast.

## Replace Poorly Shielded Lights Prior to Trimming Vegetation



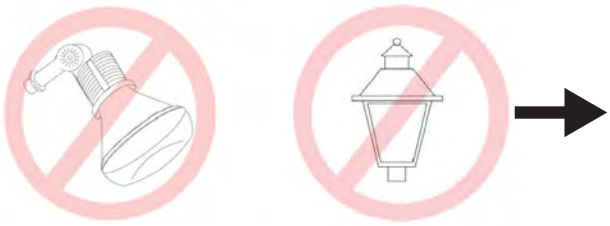
### "Jelly-Jar" Balcony Lights

Inexpensive unshielded balcony lights like the one shown above are visible up and down nesting beaches and cause problems for sea turtles every summer. It is not uncommon to see these poorly designed $3 and $4 fixtures on homes costing between $250,000 and $500,000.

### Canister Downlights

The best light fixture for beachfront property is the canister downlight using a 3watt to 12watt FWC approved Amber LED lamp. Excellent for human safety minimum glare, these lights allow almost no light trespass to occur.

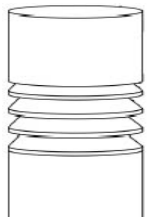
## Replace Floodlights and Unshielded Fixtures with Walkway and Path Lighting



### Floodlights

### Carriage Lamps

These unshielded exterior lights are poorly suited for use near sea turtle nesting beaches. These light fixtures contribute to light trespass onto neighbor's property as well as the beach.



### Bollard Fixture

This bollard fixture is equipped with horizontal downcast louvers. This is an excellent fixture for illuminating pathways and landscaping. Specified with long wavelength FWC approved Amber lamps, these lights reduce glare and actually improve night vision. Shields can also be added to the seaward side of many fixtures such as this bollard to block visibility from the beach.