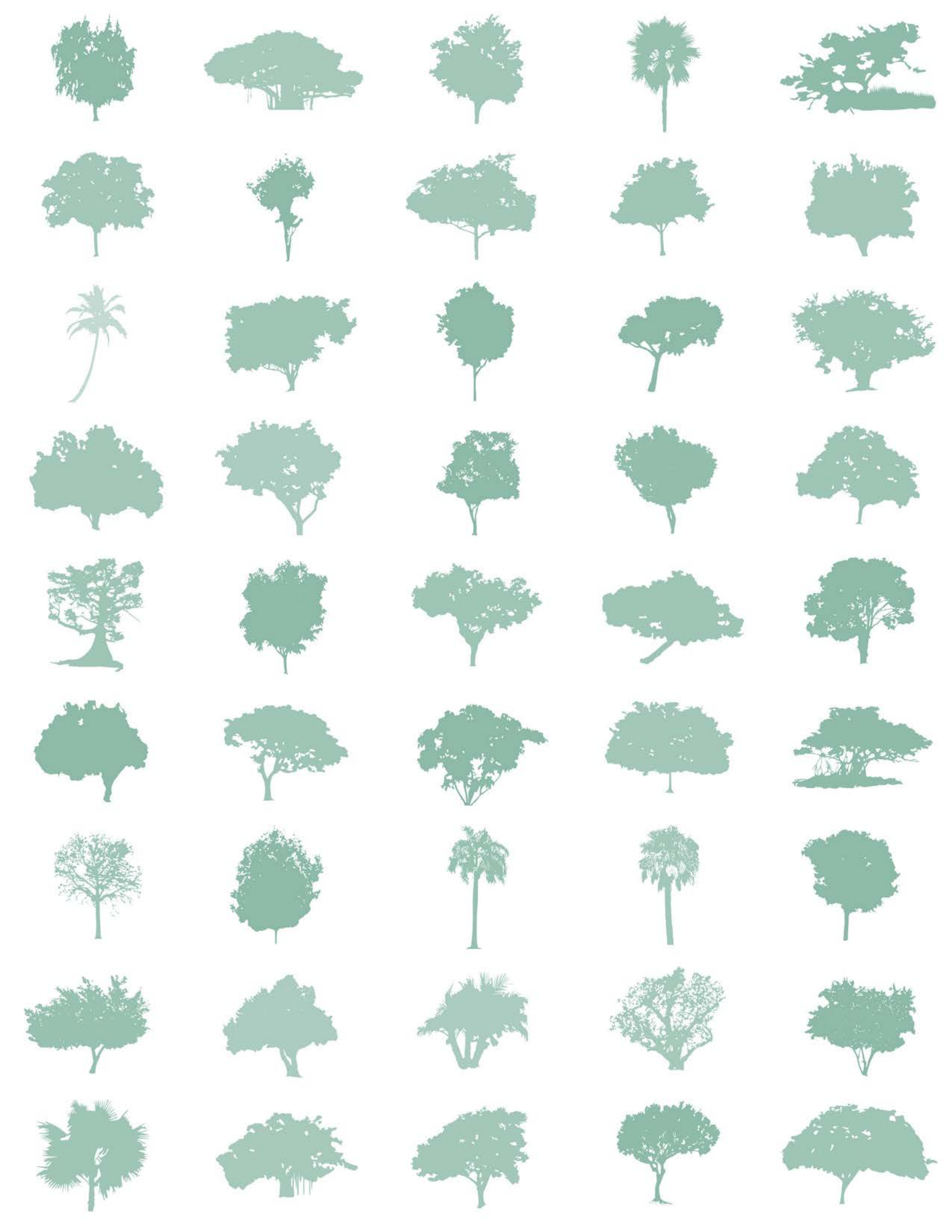
CRANDON PARK

Site Analysis

CRANDON PARK TODAY - PART I

VOL. 2



The Crandon Park: A Call for Change report is comprised of an *Executive Summary* and the following *Research Volumes*:

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Crandon Park: A Call for Change

Research & Analysis Report

Volume 2 - Part I

~

Prepared for
Citizens for Park Improvement (CPI)

Elaborated by
West 8 urban design and landscape architecture

CRANDON PARK

VOLUME 2 - PART I | SITE ANALYSIS

2 Site Analysis

Crandon Park Today - Part I

2 Site Analysis

Current Conditions, Findings & Recommendations

Crandon Park is defined by its physical, ecological, social and cultural assets. This chapter examines the Park's existing conditions, while analyzing and extracting findings that culminate in specific recommendations. A close analysis of the Park's current condition reveals that many of the programmatic, functional and maintenance restrictions of the current Master Plan have resulted in a park that is deteriorated and underperforming.

On-the-ground observation and assessment

Overview of Site Challanges

In this section we provide a high level summary of our conclusions regarding the current condition of Crandon Park. In short - the land has enormous potential both in terms of its natural environment, its location to an important urban area and the Park bones created by the famed designer, William L. Phillips in the 1940's. Somehow, despite those enormous advantages the Park is failing in terms of public use and enjoyment, and even ecological performance and resilience.

- **Crandon Park's current identity is largely defined by a wide road, asphalt parking lots, and degraded amenities.**

  The few visitors to the Park or the many whizzing by in motor vehicles on Crandon Boulevard are left with a clear and lasting impression: asphalt, acres of hot, miserable areas with few cars occupying the thousands of spaces needlessly provided.

  Important Park facilities can only be accessed by travelling on and off the four lane highway that bisects the Park. For example, a visitor to the north parking lot cannot access the south parking lot without going on and off the boulevard.

  Those accessing the Park east of the boulevard can see a trail of broken down or otherwise abandoned facilities; roads and sidewalks that begin and end in no rational order; and parking that makes public use of the Park daunting.

- **Crandon Boulevard fragments the Park.**

  The site organization separates two of the most popular park activities west of the boulevard, golf and tennis, from the Park itself. And in the process wastes acres by providing unnecessary roads for access and egress and wastes other acres for duplicative parking. In its present configuration, this highway essentially denies the Park an identity, internal communication or the rational use of limited uplands.

- **Natural ecological areas are degraded.**

  Those knowledgeable of such things see overwhelming evidence of a losing battle against invasive fauna and flora near and in the hundreds of acres of environmentally sensitive areas.

Furthermore, landscaping in the public areas are confronted with trees here and there like lost soldiers, indicating neither a natural outcome of their existence or that of a landscaping plan.

- **The Park is unprepared for the effects of climate change, sea level rise, and hurricane events.**
  The current site, and Master Plan document, ignores the looming problem of sea level rise and its consequence for all of the Park.

The Park is neglected in its maintenance.
The overall maintenance of the Park is poor with some important areas in critical, even dangerous, status.

- **There is no observable community engagement or care for the Park.**
  Besides the Marjory Stoneman Douglas Nature Center, the park exhibits a lack of community interest, dedication, involvement or philanthropy. From our research, the Park is supported primarily by taxpayer dollars ... from taxpayers who chose to visit other more hospitable public places.

The absence of routine maintenance and delayed capital improvements are indicative of insufficient financial support for Park activities. This is likely the consequence of little or no community involvement in the Park, no opportunity for the public to affect improvement in Park facilities or operations and no effort to obtain philanthropic support. These shortcomings led to a deteriorated park, which attracted fewer visitors. With fewer visitors, there were lesser revenues, and the cycle has continued downward.

It is, however, not all bad. Despite its decades of neglect, if properly planned in a public process, this land could provide to the people of Miami-Dade County one of the most spectacular public parks in the United States.

In the following we discuss these issues, and also opportunities, in detail.

Crandon Park Specific Areas


2
2
Crandon Park Marina
4
Crandon Park Golf Course
3
Ibis Preserve
8
Bear Cut Preserve
1
Crandon Boulevard
11
Parking & Beach Drive
9
Marjory Stoneman Douglas Nature Center
17
Archaeological Site
10
1000ft

Anatomy of The Park

Composite of Framework Components

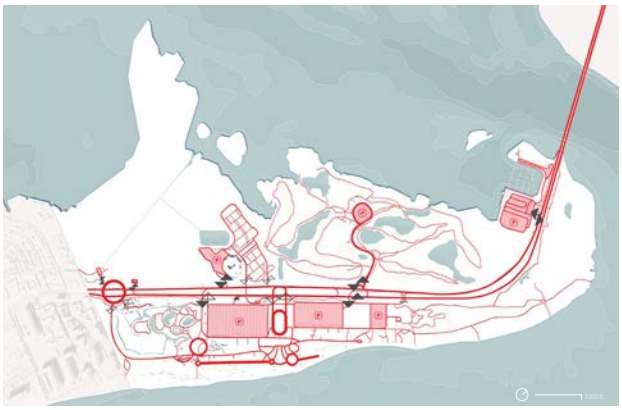
Five Key Components

constitute the current Framework of Crandon Park. While each one forms an important layer, they must all serve in harmony with one another for the Park to perform optimally.

The following section provides in-depth analysis and critical assessment of each Key Component's physical condition and operational performance.

Key Components:

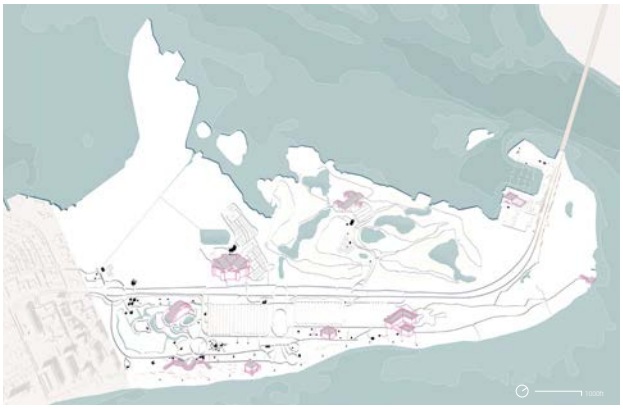
1. Circulation & Access
2. Vegetation & Ecology
3. Coastal Landform Topography
4. Park Structures & Site Furnishings
5. Program & Park Use



Circulation & Access

Vegetation & Ecology

Coastal Landform Topography



Park Structures & Site Furnishings

Program & Park Use

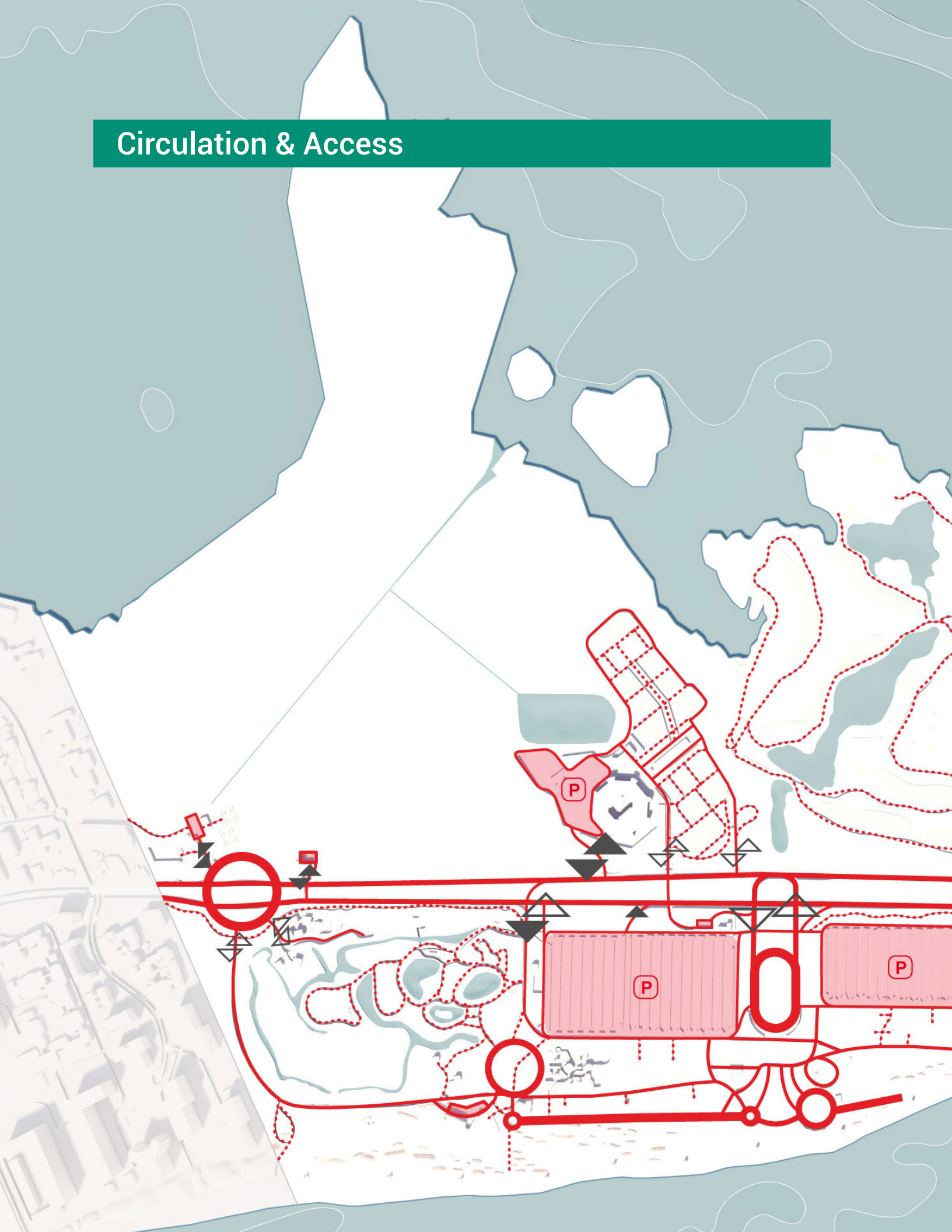
Analysis of the existing conditions of each Key Component is studied in further depth through site research and diagramming, on-the-ground observation, photo documentation, and studying historical imagery, records, and surveys. It also provides more detailed critiques of each Component's current physical state and performance. These serve as an initial assessment of the Park's performance today.

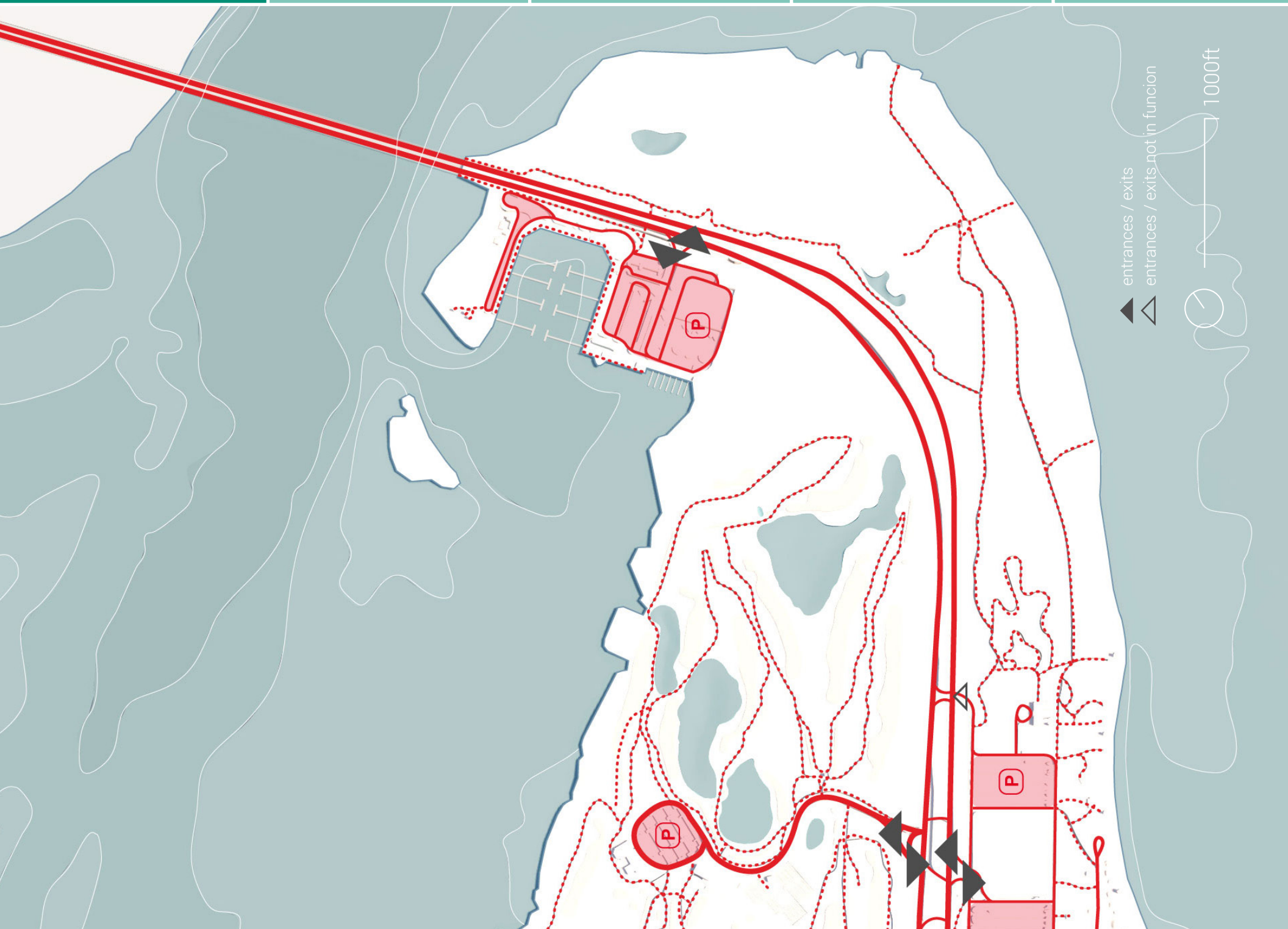
The Findings section provides a summation of key takeaways and observations of the current conditions based on contemporary public park standards[1] of safety, quality of the physical condition, aesthetic appearance, and experiential performance, where applicable. While some of these observations may be considered interpretive, they establish the fundamental criteria upon which each Component might be deeply examined and evaluated going forward.

Lastly, the Recommendations section offers overall approaches for Park improvements, offering both physical and operational objectives. These Recommendations are intended to serve as a basis for establishing priority Park improvements and high-level recommendations, which are summarized in this volume
2.3 Summary | A Synthesis of Findings & Recommendations.

1. Miami-Dade County defines a Model Park System as having the following qualities: "*Seamlessness, Beauty, Access, Equity, Sustainability, and Multiple Benefits.*" For the full description, see Miami-Dade County, Miami-Dade County Parks and Open Space System Master Plan (2007), p. 16.

Circulation & Access

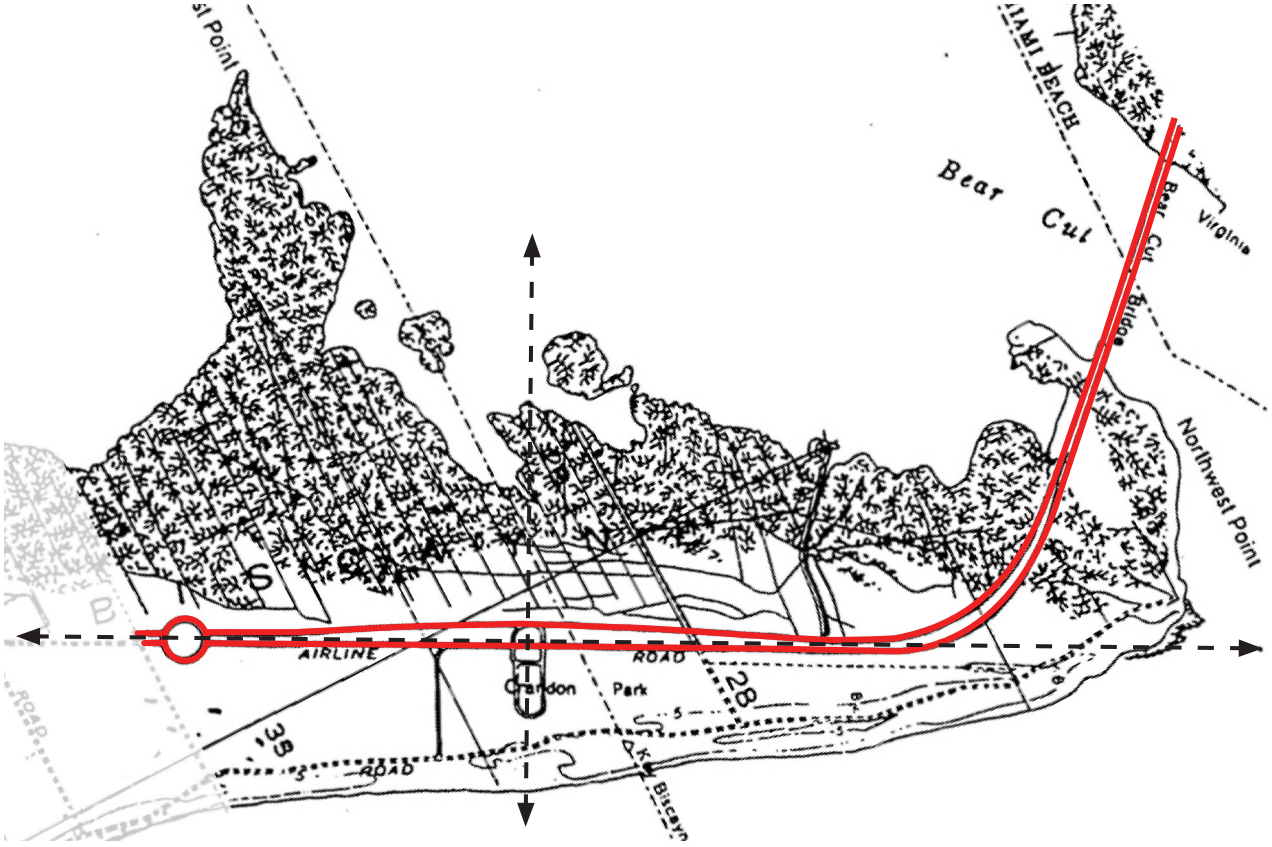



entrances / exits
entrances / exits not in funcion
1000ft

Circulation & Access

Analysis of Existing Situation

Circulation and access are Crandon's Park connective tissue. They bind together all of the program areas — the natural preserves, cultural attractions and active and passive recreational zones — and play a critical role in ensuring visitors' sense of safety and a pleasant, experiential quality of the Park. Running the entire length of the Park, Crandon Boulevard is the backbone of the site and its primary means of circulation and access.

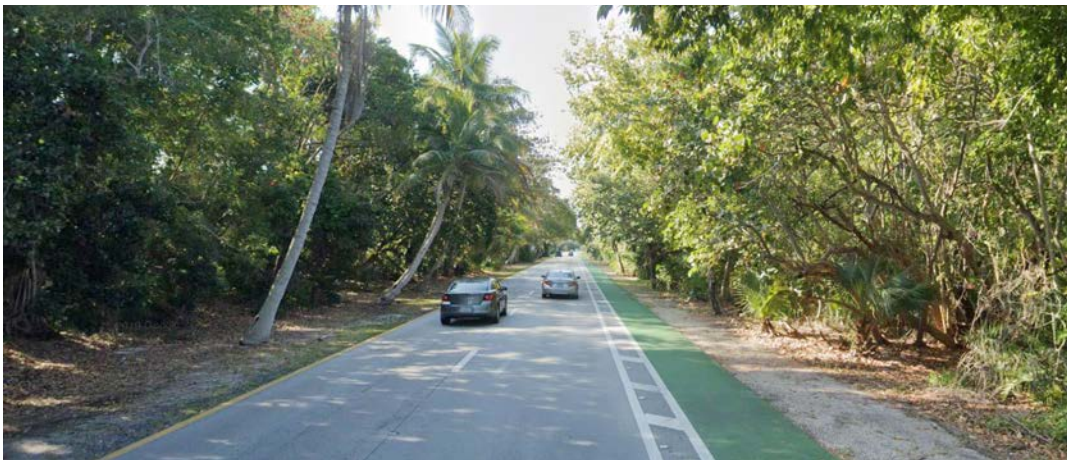


Site-oriented around strong North-South circulation spine and East-West axis; 1947 Site Plan of William L. Phillip's Design

Visual & Spatial Relationships

The structural bones of Crandon Park are defined by its visual and spatial relationships. Crandon Park was originally designed around two axes — one running north to south, and the other east to west. The north-south axis follows Crandon Boulevard, which runs the entire length of the Park and is the backbone of the site. The strength of this axis is almost overpowering, dividing the Park into two sides. The east-west axis, which intersects at the Central Allée and Lagoon, was originally by Phillips to visually and spatially connect its two halves by providing stunning view corridors to the Atlantic Ocean (east) and Biscayne Bay (west). However, only the east side is perceivable today, as vegetation blocks views to the west. As a result, Crandon Park remains highly divided to this day both visually and spatially. At best, these conditions create a sense of two parks — one on the east, consisting of a beach, and nature center, and one on the west, consisting of a marina, golf course, and tennis facilities. At worst, this tunnel effect provides no sense of a unified park at all.

Driving down Crandon Boulevard, one may only catch a few glimpses of the Park. Views of Biscayne Bay are only available as one exits the Rickenbacker Causeway into Key Biscayne. After that, dense vegetation soon creates a green tunnel that engulfs the four-lane road. This tunnel effects is almost continuous except at the Central Allée and right before entering the Village of Key Biscayne, quite suddenly via the Rickenbacker Circle.



Crandon Boulevard has become an overgrown tunnel separating the east and west side of the park both visually and spatially

The West Side

The West side of Crandon Park is a collection of isolated amenities — the Marina, the Golf Course, the Tennis Center and Calusa Park. These areas do not have pathways connecting them; therefore, pedestrians are unable to walk from the Tennis Center to the Golf Course, for example. Only a bike lane, which runs along Crandon Boulevard, allows continuous access along the west side of the Park for non-drivers.

The nature preserve areas that divide these destinations are even more isolated, as they do not provide entry points, or any kind of access into their perimeters. This leaves about 50% of the west side of the park inaccessible for public enjoyment. This is a missed opportunity for nature enthusiasts, bird watchers, and others to learn and engage with Crandon Park's unique natural environment.

The West side of Crandon Park

The East Side

Unlike the West side of the Park, which has three revenue-generating facilities, the east side of the Park has only a few vendors generating funds. For this reason, among others, this east side exhibits a lower level of care and maintenance. Not only does this create issues of equity within the park, but it further adds to the sense of division.

Two large parking lots define the layout of the east side, which present an asphalt barrier and hostile environment to pedestrians. The east side is anchored by a nature preserve to the north (Bear Cut), and renovated zoo grounds to the south (Crandon Gardens) and beach and picnic grounds to the east. Despite the natural beauty of the Park, the eastern amenities are largely underutilized and, in some instances, poorly maintained. In conclusion, problems of limited access, confusing circulation and minimal maintenance plague the site.

The East side of Crandon Park

Vehicular Circulation

Crandon Park's circulation system is predominantly car-oriented. The Park is primarily accessed by car via the Rickenbacker Causeway and Bear Cut Bridge, which connects Key Biscayne to its neighboring barrier island, Virginia Key. As the main circulatory spine of the island, Crandon Boulevard bisects the Park along a strong north-south axis.

Its current footprint approximately follows that of the historic Airline Road, which was built as a service road when the land was used for plantations. Its route winds south through the Village of Key Biscayne continuing to the tip of Bill Baggs Cape Florida State Park. Though never realized, an extension of Crandon Boulevard was proposed as part of a grander vision to build a *Thoroughfare System* (1967) that would connect a constellation of barrier islands off of Florida's coast.

Vehicular Circulation and Access Points

Parking Lots

The most obvious deficiency in the Park's presentation is the huge and unnecessary volume of poorly located asphalt parking lots and access roads. Indeed, the most visible and lasting image of the Park is not Phillips' design of the Allee or the beaches, but of the many acres of uninviting asphalt parking lots that in summer months elevate temperatures to dangerous levels and retard the development of adjacent foliage.

Shooting off east and west from the Boulevard are a number of large parking lots near the Marina (645 spaces), Golf Course (215 spaces), Tennis Center (105 spaces), Crandon Beach (3,450 spaces) and Calusa Park (32 spaces). Most noticeable are the sprawling North and South parking lots that service Crandon Beach. These were originally designed by Phillips to hold approximately 3,450 cars of expected visitors, as early aerial footage illustrates.

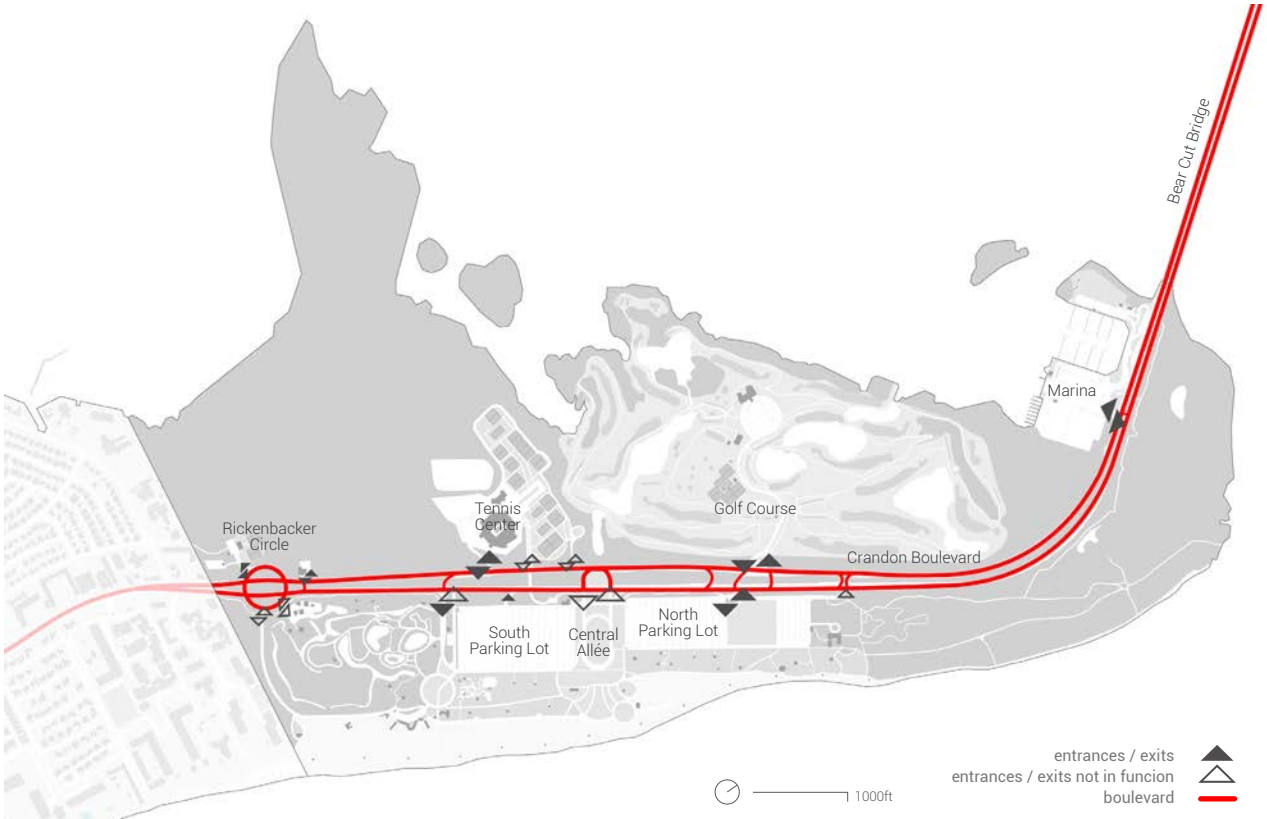
Crandon Beach Parking around 1950's

Vast expanses of asphalt and impervious surfaces

Crandon Boulevard

Other than its elevation relative to sea level and the dangers posed by bike lanes adjacent to traffic moving at high speeds, Crandon Boulevard is an asphalt road in good condition that appears to be afforded regular maintenance. Daily traffic along Crandon Boulevard is not heavy and is free flowing except on holidays and weekends when the volume of cars from the State Park is considerable. During special events and local festivals, the Boulevard can become heavily congested (increasing at times by 44%)[2]. Activities on Virginia Key often create traffic bottlenecks at the Bear Cut Bridge. The relatively free traffic flows causes actual highway speeds to be substantially in excess of the posted speed limits that vary between 40 and 45 mph. There is poor visibility around turns due to vegetative overgrowth, and dense vegetation throughout long stretches together pose a safety threat to drivers, bicyclists or pedestrians attempting to cross or travel along the Boulevard. In heavy rain events, portions of the boulevard are flooded.

2. Corradino Group. *Village of Key Biscayne Transit Mobility Study* (Miami, FL: Dec 2015) p. 8 - 9, 43.



Crandon Boulevard and Access Points, 40% of the entry/exit drives are blocked or not in use

The Bear Cut Bridge will require replacement as its current configuration and condition would not likely survive a Category 2 hurricane according to the County's engineer.[3] When replaced, thought should be given to creating a grade separation at the Marina to better facilitate access/egress and queuing of trailered boats.

3. Hardesty & Hanover, Foundation Evaluation of the Existing Bear Cut Bridge Pier (August 16, 2013)

Crandon Boulevard North bound

Crandon Boulevard South bound

Access/egress to Park facilities

Compounding the excess of asphalt parking lots, is a site plan that provides access to each of the Park's facilities independently through the four lane boulevard bisecting the Park and leading to the Village of Key Biscayne and Cape Florida State Park. Furthermore, it was not necessary to establish a long drive to a golf course clubhouse and other drives to a tennis facility. Having done so, the current site plan isolates each of these activities from the Park itself.

Blocked entry drive to Tennis Center

Main entrance into Tennis Center is closed to vehicles and pedestrians by improvised barricade of plant pots

Closed exit to the North Parking Lot

Principle access points occur along the Boulevard at entrances to the Marina, Golf Course, Central Allée, Tennis Center, and east parking lots. Though these main entrances have undergone few major infrastructural changes since first constructed, a number are currently closed or refrasebarricaded. Accompanying signage is often obscured by vegetation or not readily visible to drivers. For example, two of the three entrances into the Tennis Center — including the Main Entry — are barricaded with either green fencing or potted plants. The current access point to the Tennis Center is also not well demarcated, except for a small sign almost engulfed by roadside vegetation. In addition, the Beach Parking circulation is highly confusing. Except for access points at the Central Allée and South Parking Lot, all other entrances/exits onto Crandon Boulevard are barricaded and contain seemingly random signage. Designed at a time that gave preference to the automobile over other modes of transport, overly complicated parking lot circulation patterns have become archaic, and do not support more sustainable modes of transport, such as biking or rideshare systems.

Crandon Boulevard still retains some truly splendid moments. Phillips's design for the Park intended the Boulevard to be an homage to the Park's history as a coconut plantation. Vintage postcards and photographs from the 1960s and 70s show how the separated north and south lanes were screened from one another to create a "sense of serenity — with walls of green edges contributing to a park-like ambience and withdrawal from the tensions of traffic."[4]

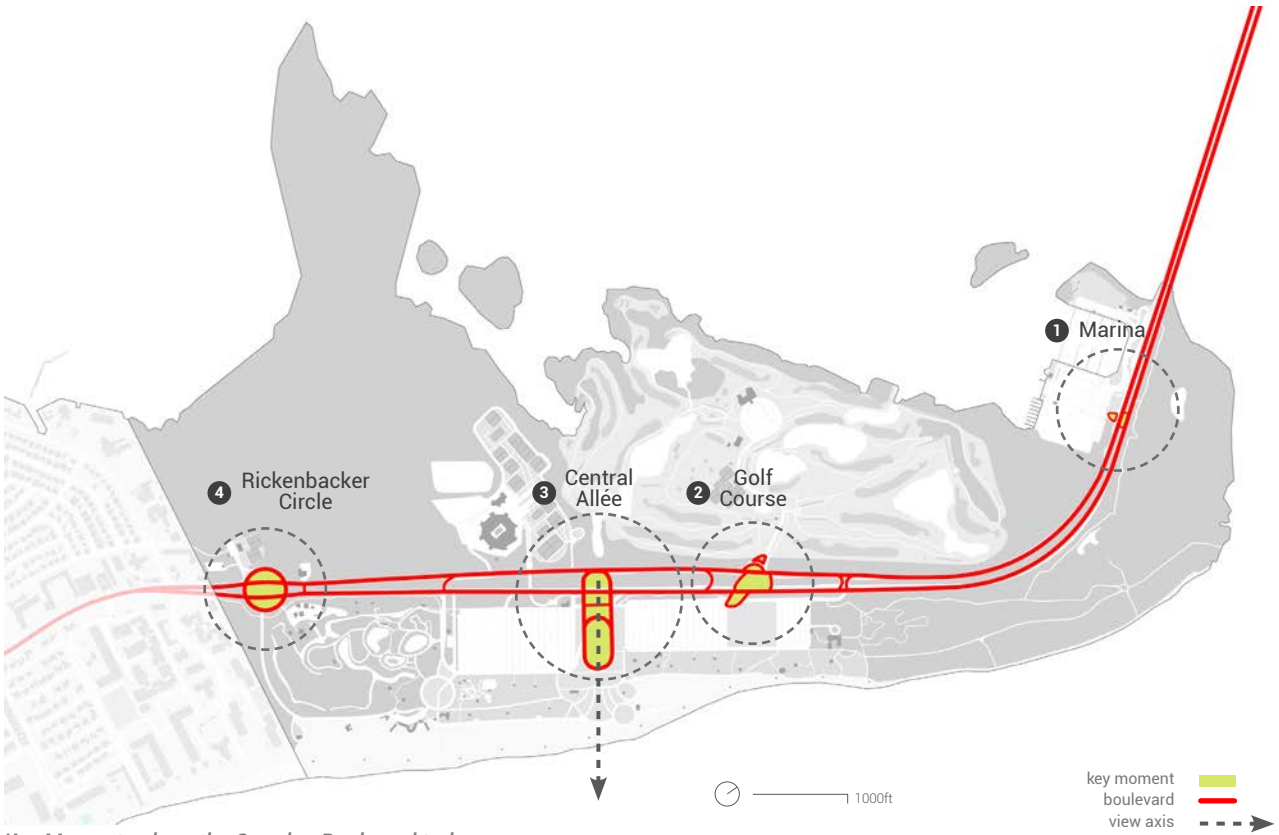
4. Richardson, *Crandon Park Master Plan (1995), p. 24.*

Four lane Crandon Boulevard with around turns and poor visibility due to dense vegetation

Current view corridor of Central Allée to Atlantic Ocean; the West side of Phillips's east-west side axis

Four Key Moments along Crandon Boulevard

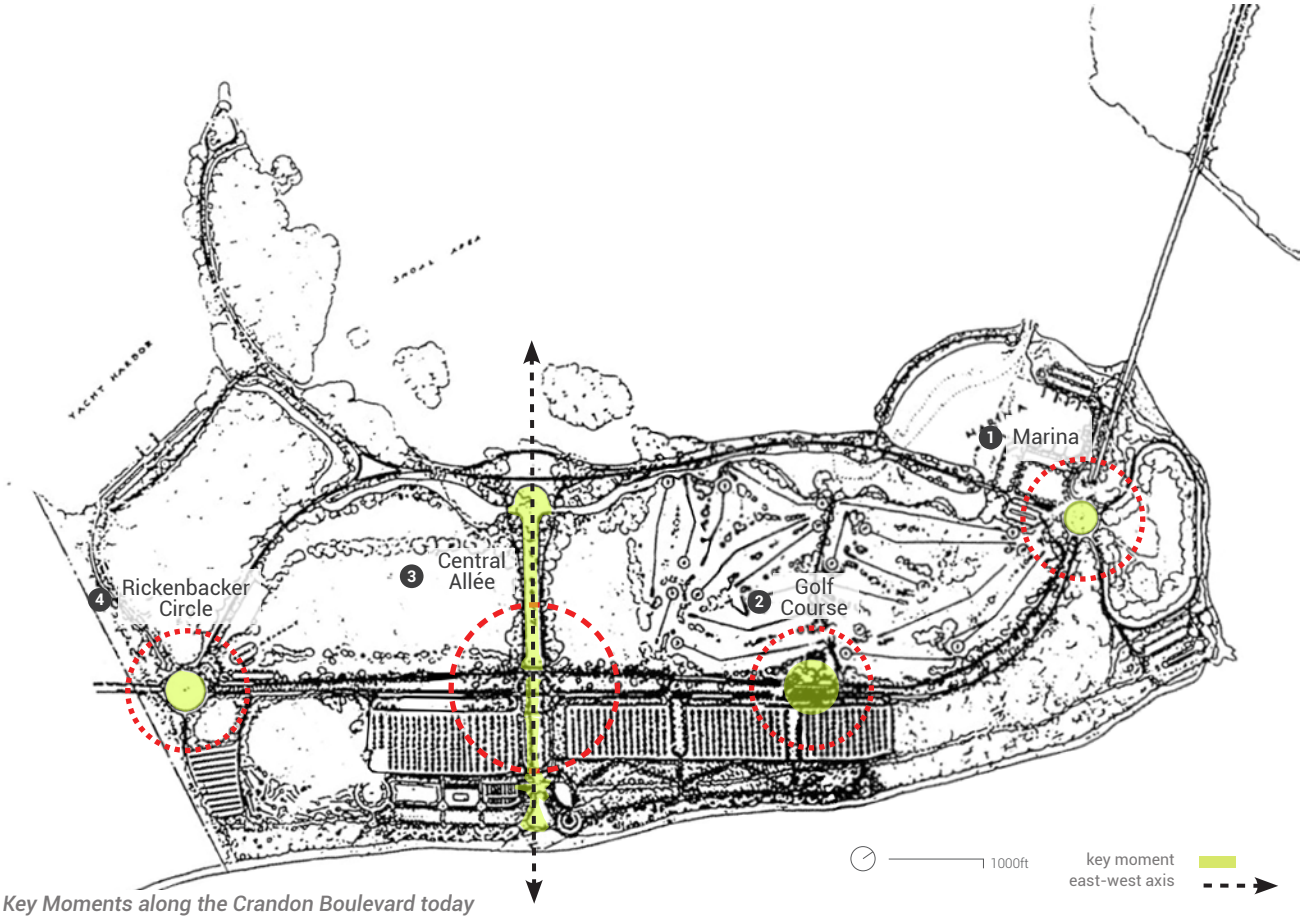
The landscape character of the Boulevard is well captured in four key sections that illustrate the visitors' experience when traveling by car.



Key Moments along the Crandon Boulevard today

View has been overgrown by vegetation, eliminating the West side of Phillips's key east-west connection

Current aerial view of Central Allée and remaining lagoon. Projected east-west axis and blocked view corridor proposed by Phillips



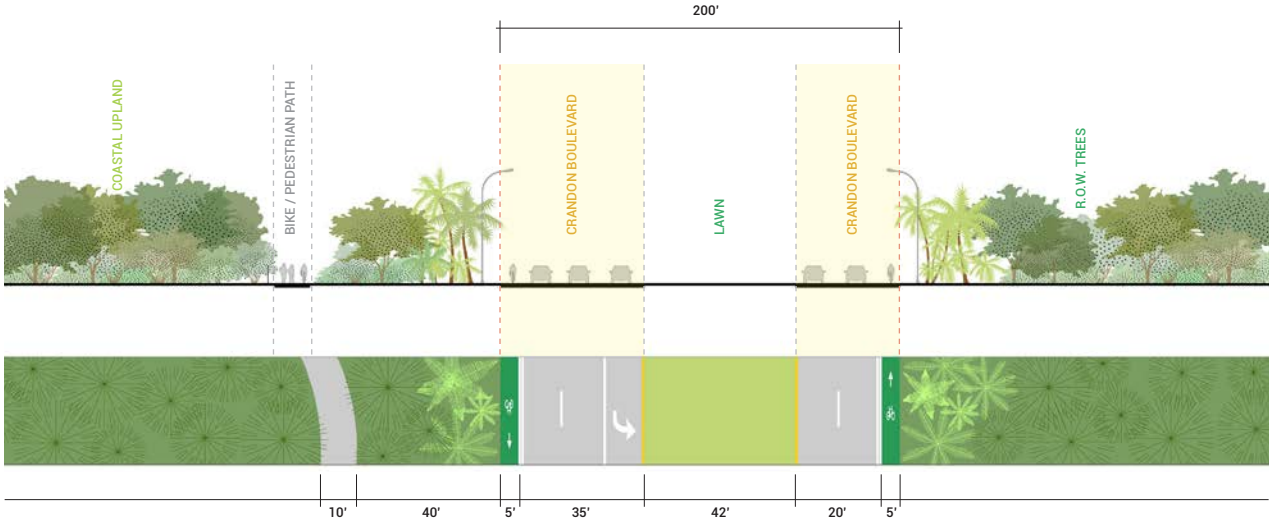
Key Moments along the Crandon Boulevard today

Moment 1 - Marina Entry

Marina Entry aerial view

Marina Entry - lacks welcome grand arrival experience and clear entrance mark. Also signage is too small for drivers to recognize an entrance on time

Arrival & Gateway



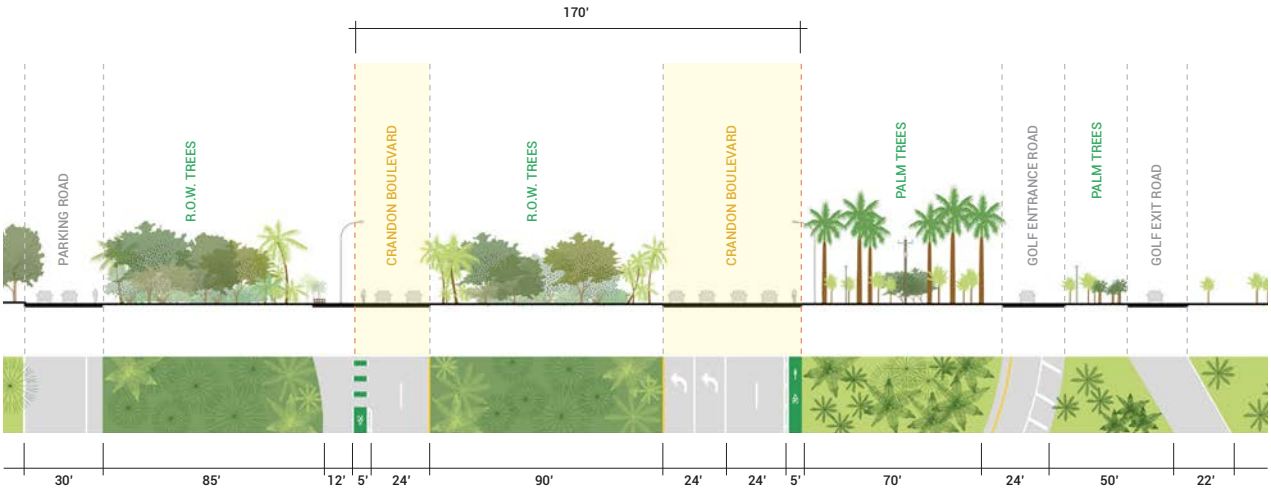
Moment 1. Upon entering the Park, the Marina is the first destination visitors encounter. Not far from the Marina entrance, the 110 foot-wide road is split by an open grass median. This point is the moment of arrival into Crandon Park. This clearing does not, however, exhibit a gateway arrival experience that signals that one has arrived at the Park.

Moment 2 - Golf Course Entry

Golf Course Entry aerial view

Golf Course Entry with open green lawn and Royal palms mark the arrival

Open Lawn with Royal Palm Tree Drive



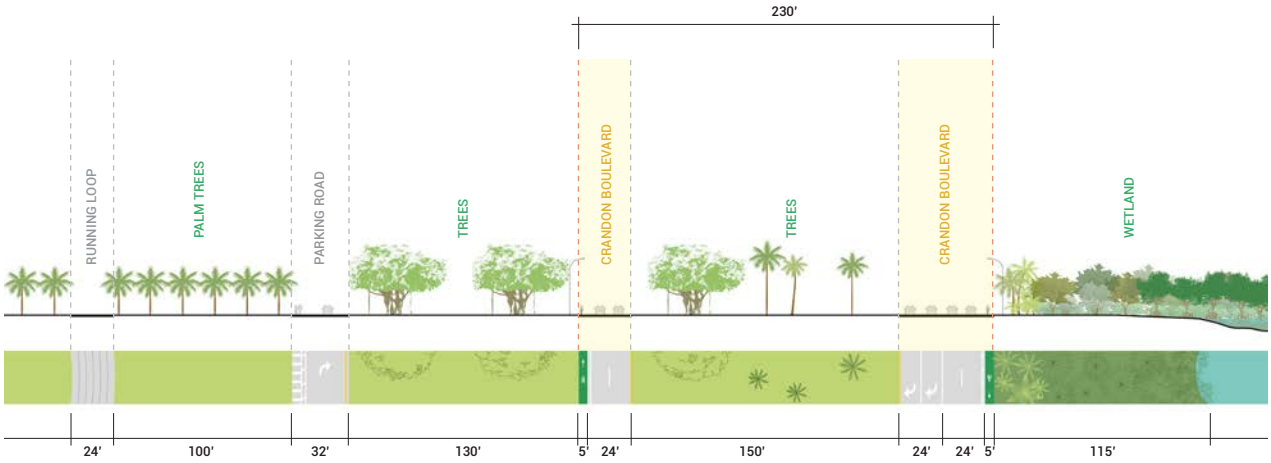
Moment 2. Turning south, the next critical nexus occurs at the entry point to the Golf Center. Drivers are immersed between two visually impenetrable green tunnels of lush parkway plantings framed by coconut palms at the Golf Entry and denser native and tropical plantings along the median and Bear Cut Preserve. This densely vegetated condition may be appropriate for screening out certain stretches of the Boulevard; however, continuous application throughout the entire length inhibits visitors from easily identifying key gateway moments, such as the exit to the Biscayne Nature Center. This condition continues south, creating a sense of compression before revealing the grand, celebratory expanse of the Central Allée. Unfortunately, the allee is hardly noticeable to drivers traveling at 45mph, which is also due to the road's low elevation.

Moment 3 - Central Allée

Central Allée aerial view

Driving South, to the left the Central Allée opens view to Atlantic Ocean

Cathedral of Trees



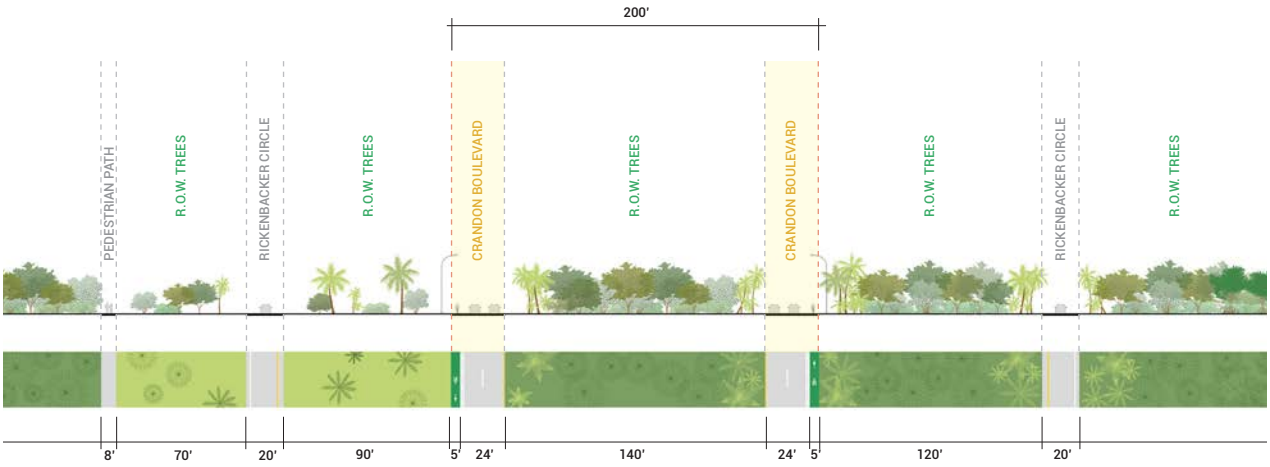
Moment 3. As the circulatory heart of the Park, the Central Allée forms the eastern side of an east-west axis perpendicular to the Boulevard. Its stunningly grand vista extends to the Atlantic Ocean and is framed by a cathedral of banyan trees and coconut palms. Despite the fact that this grand mall still preserves the same celebratory moment designed in Phillips's 1942 vision, much of Central Allée's open lawn remains inactivated by pedestrians. On the west side of Crandon Boulevard from the lawn, a lozenge-shaped lagoon is currently completely hidden by vegetation. This blocked western axis is a significant deviation from Phillips's vision, and a missed opportunity to create views towards Biscayne Bay and Miami Skyline.

Moment 4 - Rickenbacker Circle

Rickenbacker Circle aerial view

Overgrown Rickenbacker Circle screens the gateway to Village Key Biscayne

Roundabout



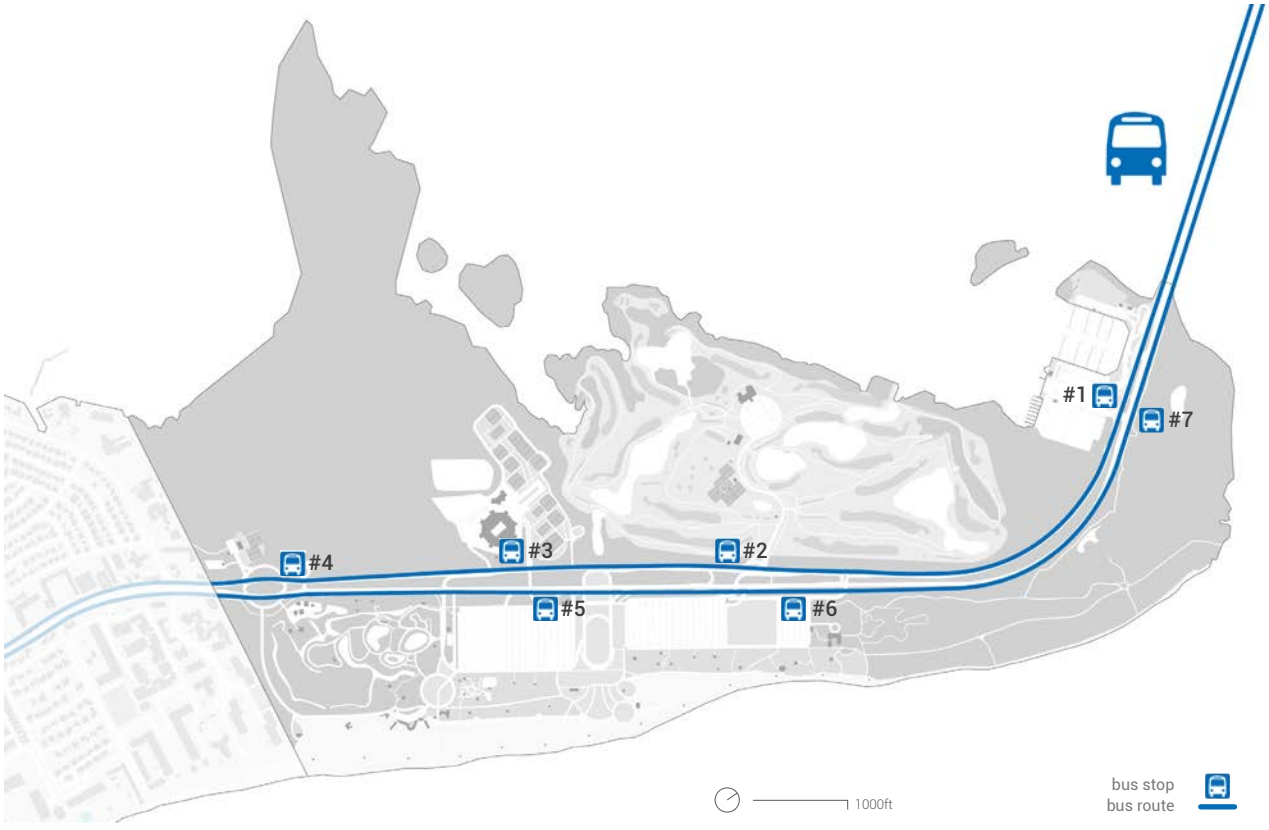
Moment 4. Finally, as visitors depart Crandon Park, they encounter Rickenbacker Circle, a four-lane, heavily vegetated roundabout that limits views in and out at this important entry point into Key Biscayne Village. While the split rotary makes it easier to access the adjacent amenity areas of Calusa Park and Park Service Area, excessive plant massing diminishes the current visitor experience.

Public Transit

While the majority of visitors to the Park travel by car, it is possible to access it via public transportation. There are seven bus stops (B102 Route) along Crandon Boulevard. Route B services Key Biscayne, connecting from the Brickell Metro Station to Cape Florida State Park. During peak seasons (January - May), ridership ranges from 45,000-61,000 riders each month.[5]

Four of the seven bus stops are in good condition, each having a furnished shelter accessible via a concrete walkway. There are no benches (except at Bus Stop #1 near the Marina), only a trash bin and bus stop sign. The other three are unfurnished, with the exception of signage. Bus Stops #2 and #6 do not have any connecting walkways. This makes it extremely difficult and dangerous for passengers to reach other parts of the Park, as they are at risk from oncoming cyclists and speeding cars, and must walk in the grass.

5. Corradino Group. Village of Key Biscayne Transit Mobility Study (Miami, FL: Dec 2015) p. 45-46.

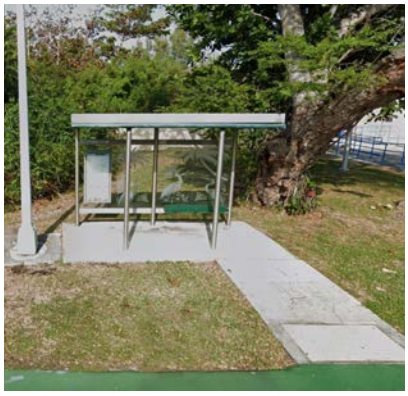


Bus Stop map

Bus Stop #1 at Marina - Bench and sign only

Bus Stop #2 - Sign only, no connection to a sidewalk

Bus Stop #3 - Shade and bench, no connection to a sidewalk



Bus Stop #4 - Shade and bench, no connection to a sidewalk

Bus Stop #5 - Shade, no connection to a sidewalk

Bus Stop #6 - Sign only

Bus Stop #7 - Shade and bench

Bike Lane along Crandon Boulevard has minimal separation from cars traveling at high speeds

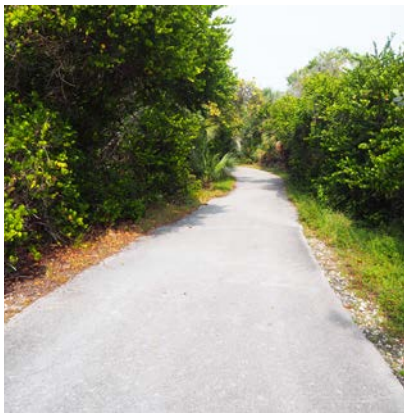
Bike Circulation

Crandon Park is also accessible via a five-foot wide bike lane (6.1 mi long), completed in 2016. The bike lane is part of the 8.5-mile Rickenbacker Bike Trail, which runs from Downtown Miami to Bill Baggs Cape Florida State Park. Currently, it runs down Crandon Boulevard directly adjacent to multiple lanes of cars traveling at 40 mph. The bike lane is aesthetically in good condition and well maintained. Although some stretches have a painted median between the bike and car lanes, the lack of modal separation raises safety concerns for cyclists. There are no designated bike crossings between the east and west sides of Crandon Boulevard, making it challenging for bikers to cross over to amenities on either side, including the beach. There is concern about cyclists' safety from oncoming vehicular traffic.

Notably, an early plan by Phillips of the mainland approach of the Rickenbacker Causeway shows how he envisioned a separated bike/pedestrian lane to be called the *Paseo de las Américas.*

Bike map with bike parking stations

This lane was designed for slower pedestrian traffic and would have run parallel to the Causeway on the western side. Flanked on either side were "Trees of the Nations" and "Flags of the Nations." This indicates how the Causeway was envisioned as a grand gateway into a microcosm of the Americas encapsulated by Virginia Key and Key Biscayne. In his Crandon Park Master Plan (1993), Richardson similarly proposed a separated bikeway on the western side of Crandon Boulevard protected by a green buffer and tree plantings that would connect from Bear Cut Bridge to the Village of Key Biscayne. This path roughly would have followed the path of the current utility easement. Neither of these design objectives have been implemented at Crandon Park today.



Fossil Reef Bike Trail at Bear Cut Preserve

A winding, ten-foot wide asphalt bike trail, known as the Fossil Reef Bike Trail, peels off from Crandon Boulevard and cuts through the Bear Cut Preserve. Overall, the bike path is in good condition; however it is not ideal for cyclists desiring a straight direct path through the Park. The surrounding vegetation also appears to be trimmed regularly to maintain visibility.

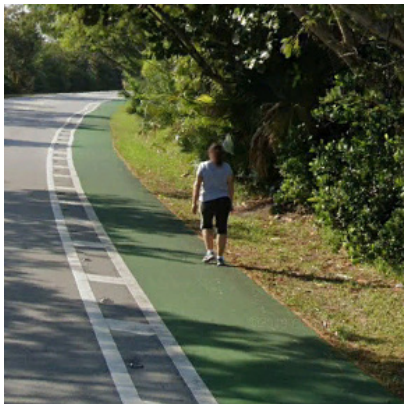
Bike Station #1 at Beach Promenade

Only four bike stations service the entire Park. Two are located in the Marina, one is located near the entrance to the Nature Center, and the other is near the Beach Promenade. All are located at irrelevant locations that are disconnected from the main bike routes. They are in poor to fair condition. Since many visitors to the Park are cyclists, it is a common sight to see bikes along the beach messily stacked against the coconut palms or variously scattered around the site. This diminishes the park's visual quality, making it seem unorganized and uncared for by not giving proper provisions for this basic amenity

Bike Station #2 in Marina parking area

Bike Station #3 at Nature Center

Bike Station #4 at Beach Promenade



There is no pedestrian path on the west side of Crandon Boulevard, forcing people to walk along the street in the bike lane

Pedestrian Circulation

Concrete and asphalt sidewalks and dirt nature trails provide pedestrian accessibility throughout the Park. However, the system of pathways between amenities is highly disconnected and limited. Connections to the Village of Key Biscayne via a shared pedestrian and bike path occur at Calusa Park and along the Crandon Gardens. In addition, the Beach Drive, which runs along the main stretch of Crandon Beach, provides a promenade for pedestrians and beach maintenance vehicles, as well as a solitary ADA path and ramps. Near the fossilized reef in the Bear Cut Preserve, a small wooden boardwalk allows visitors to move freely through the mangroves and experience an amazing overlook.

Pedestrian route map with crosswalks

Beach promenade with concrete wall seperating picning grounds and beach

Shared path connecting Key Biscayne village and Crandon Park is in poor condition

Yet, unlike most great parks of similar scale, which have a clear circulation hierarchy, Crandon Park's pedestrian network does not have a cohesive organizational framework. Most often, the pedestrian routes were either adopted in a piecemeal fashion to serve highly specific program needs as different developments were built over time (e.g., the Golf Course and Tennis Center), or were retrofitted later based upon outdated designs (e.g., Crandon Gardens). For these reasons, many interior paths are not contiguous with the larger vision proposed by Phillips.

Pedestrian circulation around the Central Allée in the heart of the Park is good, but access to it is not. Efforts to limit access to the Allee from the north and south parking lots and landscaping screens have isolated the Allee from public view or interest. A pedestrian who finds the Allee at the heart of the Park, will find this open, green mall, which creates a fluid pedestrian sequence, moving from the generous linear Allée to more narrow passages that gently curve in a fanning motion as they approach the Beach. Appreciation for the talent reflected in this design is difficult at grade level. From an elevated elevation west of the Allee to the beach, the presentation is simply spectacular. If anyone could enjoy such a vantage point.

Path to picnic shelter; does not provide a direct route to the beach

The pathways within the Picnic Grounds are disconnected, do not provide a direct route to the beach. For example, access points to the Beach area are often difficult to navigate with high walls, L-shaped passages and the existing stairs that are neither inviting nor generous. A roughly three foot high wall runs along almost the entire length of the Beach Promenade. This wall blocks views, interrupts air passage and severely limits pedestrian and ADA access. The situation leaves many visitors resorting to climbing over the wall to get to the beach prominade. In addition, this sand retention wall represents a more urban, defensive approach and attitude towards the ocean that is inconsistent with more contemporary natural resilience methods.

Concrete walls between beach and picnic grounds create a barrier for beach-goers

Directly adjacent to the three foot high wall, holding the edge between the beach sands and grassy Picnic Grounds is a 25-foot wide paved promenade for people, cyclists, roller bladers and beach maintenance vehicles. While this promenade is a great asset to the beach experience, moments of direct adjacency to the beach are lacking. There is typically either a steep drop with only a few intermittent stair connections, or there is a high concrete sand retention wall blocking access. A short wall disconnects the promenade from the Picnic area, creating limited points of access between the two amenities.

The only ADA path to the Beach in poor condition

Tequesta nature trail in Bear Cut Preserve is overgrown in areas and rarely used

Osprey nature trail in Bear Cut Preserve is rarely used

Shared path in Bear Cut Preserve in fair condition and receives some use

Boardwalk to Fossilized Reef Overlook in fair condition

Dirt path to nature trails are poorly advertised

Sidewalk along South Parking Lots in poor condition

Damaged path in Crandon Gardens

Damaged path in Crandon Park

Damaged Path in Crandon Gardens

Damaged path at Crandon Beach

Damaged beach promenade steps

Abandoned track at Central Allée

Entrance path to Nature Center is in good condition with an enhanced tropical experience

Sidewalk along Marina water in good condition

Damaged sidewalk by the Marina office

Damaged path in Calusa Park

Improvised path at Watersport Shop

Ad hoc dirt path in picnic grounds

Path at Paradise Cove Shelter in good condition

Sidewalk to Golf Clubhouse in fair condition

Golf Course paths in fair condition

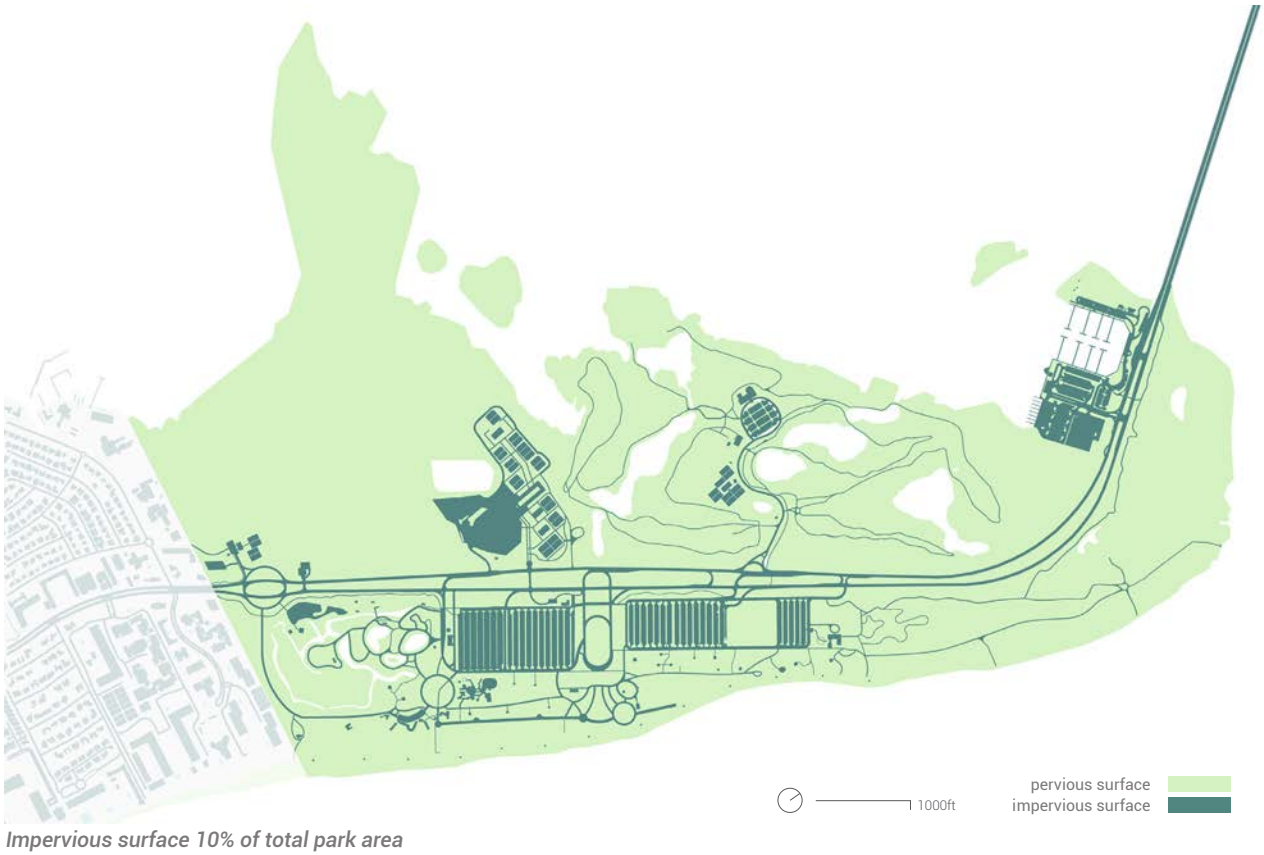
Golf Course paths in fair condition

Overgrown paving at Tennis Center, this area is rarely in use

Tennis Center path network, area no longer in use

Beach Concession shelter paving, this area is rarely in use

For pedestrians, there are generally very few demarkaded road crossings for a park of this size. For instance, along Crandon Boulevard there are only three points where it is possible to bisect east to west. The first crossing occurs immediately before the marina entrance. It connects the bike lane, bike trail, two bus stations, and the pedestrian pathway that peels off from the Rickenbacker Causeway. The second occurs at the Golf Course entrance connecting to a course pathway and interior path that leads to North Parking Lot. This last path leg, however, terminates abruptly into the parking circulation lane and does not connect to any sidewalk that could lead to the Nature Center or crosswalk to the open, multi-purpose field opposite. The last crossing is located at the Main entrance to the Tennis Center, offering a wide crosswalk across both lanes that connects to an interior path that leads to South Parking Lot. However, this interior path similarly terminates abruptly into the parking lot car lane. It does not connect to any peripheral sidewalk or crosswalk.



Impervious surface 10% of total park area

Though cars are limited to 15 mph in the parking lots, the broken sidewalk creates a disconnected pedestrian experience for those trying to reach prime destinations like Crandon Beach or the Picnic Grounds.

Overall, all of the Specific Areas suffer from some level of degradation or insufficiency in regard to pedestrian pathway conditions. These typically include potholes, cracking at corners and edges, broken curbs, chipped steps, and instances where tree roots are breaking through the underside of the hardscape. Some of the worst-affected areas are the pathways that run through the Crandon Gardens and in the Beach and Picnic areas.

Though some ADA access is provided along the beach through use of special accessibility mats, they are extremely limited.

The only ADA path to the Beach in poor condition

Crandon Boulevard Crosswalk #1 at Marina

Crandon Boulevard Crosswalk #2 at Golf Course

Crandon Boulevard Crosswalk #3 at Tennis Center

Crosswalk along Central Allée and drive way

Crosswalk along North Parking Lot and drive way

Crosswalk between Crandon Garden and South Parking Lot

Findings

- **Poor overall site plan for locating Park facilities:** In the following sections we discuss how facilities were placed as they are. As each reaches the end of useful life requiring redevelopment an aspirational site plan for the future location of facilities would ensure that mistakes in the past are not mindlessly replicated in the future. This is particularly true for golf and tennis facilities that could, in an aspirational site plan, utilize a combined clubhouse facility located in the center of the Park, west of the central Allee. Such a plan would reduce the need for long drives and duplicative parking facilities. If done in connection with the grade separation recommended by Olmsted's Artemas Richardson, Crandon Park could, for the first time be properly known as One Crandon Park with a common identity and common access and egress.

- **Excessive and poorly located asphalt parking:** The overall Park experience would be substantially improved by reducing the volume of unused parking.

- **Heavy priority on the vehicular realm:** In general, Crandon Park's circulation favors car mobility, evidenced by the strong organizing presence of the Boulevard and many sprawling parking lots.

- **Potentially dangerous intersections and blocked sight lines:** Overgrown plantings severely limit views for turn lanes -- particularly along the median of Crandon Boulevard. This hinders drivers from seeing oncoming traffic, bicyclists and pedestrians.

- **Closed entries and unused parking structures:** Many of the vehicular entrances/exits onto Crandon Boulevard are barricaded. The closure of these entrances compromises and limits planned arrival moments. It also creates confusion for visitors. In addition, many of these entries contain toll booths and information kiosks that are abandoned.

- **Underwhelming gateway moments:** A number of the gateway moments along Crandon Boulevard are overgrown with dense vegetation or lack significant signage indicating entry. In particular, the moment of the arrival off of the Bear Cut Bridge into Crandon Park lacks clear visual cues that mark this significant gateway momen.

- **Disconnected bike and pedestrian system:** The lack of an overall pedestrian and bike circulation hierarchy throughout the entire Park has created disparate and disconnected network clusters that do not take into account the original design intent of Phillips's circulation layout.

- **Limited bike and pedestrian crossings:** In contrast to the Phillips' vision, which created various separate bike/ pedestrian paths, the existing Park accommodates a primarily car-driven experience and function. There are only three pedestrian crossings along Crandon Boulevard. The locations at which these crossings occur are often disconnected from each other and other program areas.

- **Unclear signage and wayfinding:** The graphic design of signage creates a distinct park aesthetic; however, the size and placement of this signage is not optimized to promote wayfinding and safety. In some instances, signage is too small and almost enveloped in vegetation. The signs' small scale also makes it difficult for drivers to read. In addition, many of the entrances are scattered with temporary signage that does not follow the Park's graphic identity and can be highly confusing and distracting.

Recommendations

- **Unify the site through relocated Amenities and circulation systems:** Bring all elements of the Park together at a few common places for access/egress. This would allow separation of the Park from the boulevard and, with separated grade, east/west access as contemplated by Richardson's 1993 plan. This would create for better internal circulation and establish a common and attractive public identity.

- **Restore the historic East-West Axis:** Phillip's vision provides the Park's organizational backbone of maintaining what is now an iconic horizontal axis that runs east-west and connects the Atlantic Ocean to Biscayne Bay and the Miami skyline. Visually opening up the Central Allée and reconnecting it to the now-hidden lagoon will help restore Phillips's original design intent. This measure would express the mission of Crandon Park, and Key Biscayne itself as a microcosm of authentic Florida.

- **Open strategic view corridors, per Phillips's Vision Plan (1942):** Identify and recapture key, curated moments, and frame selected views of the surrounding landscape. This is critical for enrichment of the visitor experience as well as helping them to orient themselves within the Park. Opening and framing views will also better connect program areas with each other.

- **Consolidate access points, per Phillips's Plan.** Identify, reduce and simplify the number of well-defined access points within the Park -- particularly off Crandon Boulevard. This will help to clarify and streamline the vehicular circulation network so it becomes less labyrinthine. It is also critical that each of these moments in the circulation sequence be thoughtfully enhanced to clearly announce gateways into each of the Specific Areas.

- **Reexamine current parking circulation and consider alternative strategies to meet present-day and projected parking demands:** The sea of asphalt parking lots across the Park should be analyzed and upgraded to meet current sustainable standards and resilient materials (e.g., permeable pavement).

In addition, alternative parking strategies that meet current and projected capacities should be explored, as well as potential innovative programmatic pairings that might better take advantage of the lot's close proximity and frontage to the beach and picnic grounds.

- **Study existing site hydrology and propose green infrastructure and stormwater solutions:** Most of Crandon Boulevard lies at an extremely low three-foot elevation. About three quarters of the road, stretching from the marina to the Tennis Center entrance, is vulnerable to storm surges above that elevation. Further studies should be conducted to analyze the current infrastructure and possible solutions to better integrate green infrastructure measures, such as rain gardens, bioretention, swales, rainwater reuse, flood protection, resilient and permeable surface.

- **Separate and prioritize pedestrian and bike systems:** To satisfy contemporary values regarding best sustainability practices and standards for park safety, it is important to consider expanding the bicycle network, and separating high-speed bike traffic from leisure rides between Miami and the Village of Key Biscayne. Retrofitting existing paths while also proposing entirely new routes, which would create continuity for park users. One immediate option could be to enhance the existing bike lane by creating a greater buffer from vehicular traffic through use of bollards or a green median. Another option would be to create a designated bike/walkway parallel to Crandon Boulevard on the west side.
  Furthermore, an expanded, more leisurely continuous bike trail separate from on-road bike lane is worth exploring. Given the current popular usage of the Bear Cut Bike Trail, which is accessible from the Rickenbacker Causeway, it would better strengthen the Park's ties to the resident Key Biscayne community if locals could more easily connect to this route.

  In addition to reinforcing local and regional bike networks, it is also critical to create a stronger bike path system within the Park itself so visitors can be able to circulate among various program areas by more sustainable means than automobile. Last, it is important to reexamine the pedestrian networks and identify opportunities for physical improvements and increased connectivity as they relate to the overarching vision.

Landscape Typologies


1
6
4
Parking Lot -
Median Trees
1
4
1
Lowland Nature
Preserve
7
Golf Course - Open Lawn
2
3
Right of Way (R.O.W) - Mixed Vegetation
Highland Nature
Preserve
6
4
6
5
1000ft

Vegetation & Ecology

Analysis of Existing Situation

If circulation and access are the connective tissue of Crandon Park, then vegetation and ecology are its membrane, giving character to its exceptional environmental and experiential qualities. Long before it became renowned as an "Island Paradise" full of such exotic plantings as the postcard-picturesque coconut palms, the Park's barrier island ecology offered a rich ecotone or ecological spectrum. This spectrum set a baseline for its coastal and marine flora and fauna today, which ranges from highly curated open lawns, golf courses and tropical gardens to more natural wetlands, coastal hammock and open beach and dunescapes.[6]

Nine Landscape Typologies

Crandon Park has nine distinct landscapes. These are categorized by their experiential attributes in combination with their ecological value and programmatic functionality. They are defined as follows:

1. ***Lowland Nature Preserve*** - consists of low-lying areas (≤ 3ft above sea level) that contain protected plant groupings, including wetlands and mangrove areas. This typology is found in two large portions of the Park at the northeast and the southwest, and along the bayside water's edge. Only the northeast portion is accessible to the public via an elevated boardwalk.

2. ***Highland Nature Preserve*** - thrives on higher ground areas (≥ 3ft above sea level) that contain protected plant groupings, including upland hammock species. In contrast to the otherwise-flat parkland, a natural ridge extends from the beach dunes into this area. This naturalistic occurrence can only be found in the northeast portion of the site, which is accessed by a narrow pedestrian pathways and an asphalt bike path.

6. Miami-Dade County, et al. *Crandon Park Natural Areas Protection Plan* (1991), pp. 13-14

3. ***Right of Way (R.O.W) - Mixed Vegetation*** contains a variety of street-edge plantings including dense areas of understory that are interspersed with shade trees and palms. This typology occurs in primarily vehicular settings, such as the Crandon Boulevard median with its well-defined street edge and associated bike lane.

4. ***Parking Lot - Median Trees*** are a mixture of individual, broad-headed shade trees with linear tracts of grass below. This typology is harsh for pedestrians and trees alike.

5. ***Picnic Grounds - Medium Density Canopy Coverage*** are a mixture of broad-headed tree groupings with primarily grass understory planting. These are usually in picnic grounds, with multiple pathways and shade structures, and have a pedestrian focus.

6. ***Recreation - Low-Density Canopy Coverage*** consists of flat, expansive areas of grass, with limited tree plantings. It is intended for active and passive recreation at such facilities as the Tennis Center, Central Allée, multi-purpose sports field, and Nature Center. Like asphalt, the temperature and humidity in the heavily grassed areas is unhealthy on clear days in summer months.

7. ***Golf Course - Open Lawn*** consists primarily of a homogenous, rolling lawn with a mixture of stand-alone tropical trees and clusters of dense medium canopy trees. It is not unreasonable to describe the golf course foliage as average in quality, and random in species and placement.

8. ***Botanic Garden*** - Cultivated collections of specimen trees with botanically significant, varied, understory plantings usually arranged around small, naturalistic ponds that appear heavily polluted.

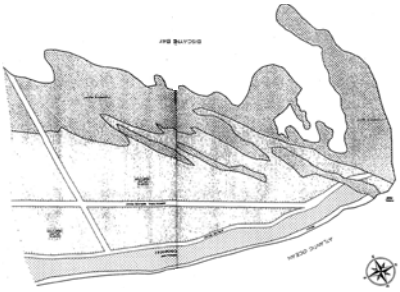
9. ***Coastal Edge*** - *Dunescape, Open Beach and Emergent Coastal Vegetation* is composed of a coconut palm monoculture clustered in an open beach like the condition at Crandon Beach. Here, palms and medium height trees are clustered in dune grasses, with the dunes providing topographic variation, and a disjointed ridge.

Vegetation Survey

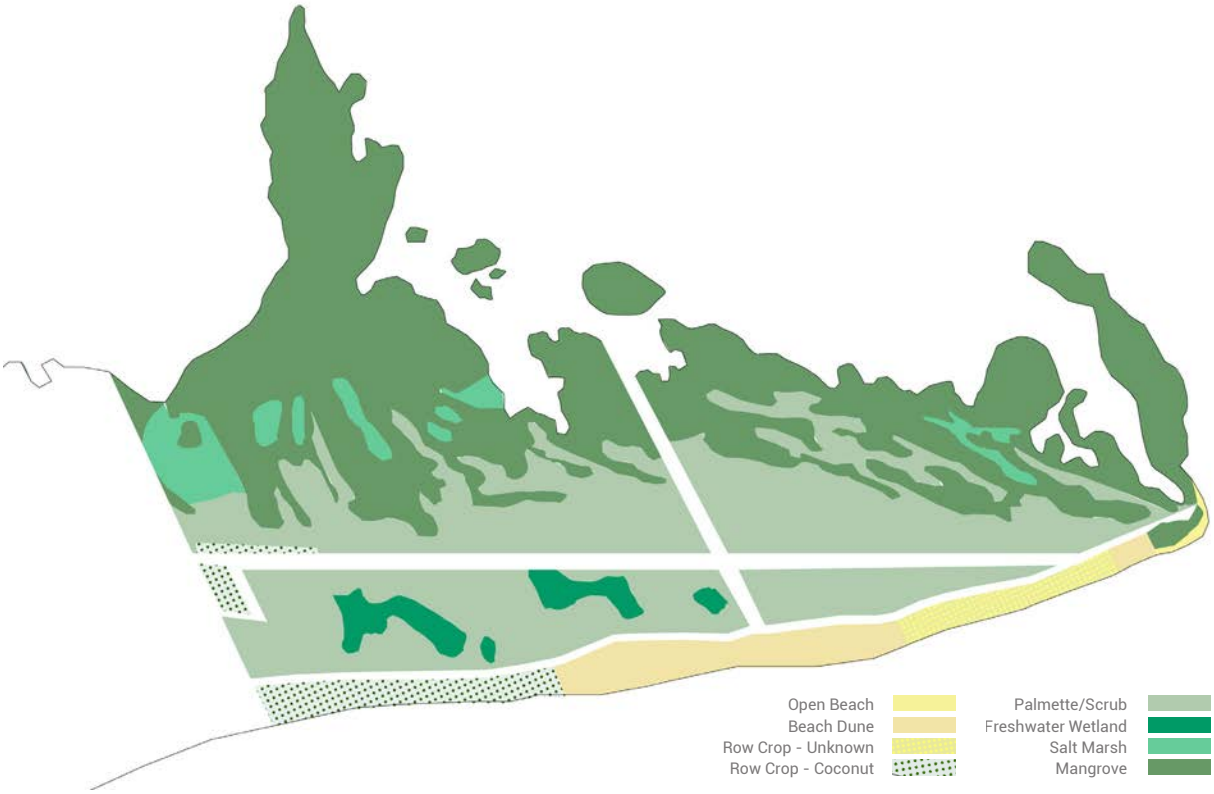
Considering that almost 46.7% (455.3 ac) of the land is dedicated to natural preserve and that 58.5% (571 ac) has tree canopy coverage, Crandon Park stands as one of the County's most ecologically significant public parks. Historically, the ecology of Crandon Park consisted of open beach, sand dunes, palmette scrub, patches of freshwater wetland, pools of salt marsh and mangroves. These generally followed a gradient, in which the beach vegetation and palmette/scrub were located closer to the Atlantic side of the island and the mangroves faced Biscayne Bay.[7]

Dredging in the 1940s near the marina and the tip of Bear Cut, however, greatly altered existing terra ecologies. Today, there are several biotic communities that can be found in the Park including sand dunes, coastal scrub, coastal strand hammock, salt marsh, mangroves and shallow water marine communities.

7. Miami-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1991), p. 21.



1925 Vegetation Survey



1925 Vegetation Survey map from Crandon Park Master Plan (1995) projected into diagam

Preservation and protection of each of these vegetative zones is critical for maintaining the environmental assets of Crandon Park that make it a unique and special visitor experience.[8]

According to the latest vegetation surveys from the early 1990s, there are at least 207 native plant species, of which five are considered rare and native only to Florida, such as beach jacquemontia (*Jacquemontia reclinata*).[9] About 15 percent of the Park's inventory are made up of exotic plants, and naturalists consider 16 of the 39 identified exotic species to pose a significant threat to the natural areas.[10] Bringing public awareness of the Park's ecological diversity is crucial to strengthening current preservation and protection efforts, and will help empower future generations of stewards.

This is consistent with the Park's Statement of Intent:

The Crandon Park Lands shall provide woodland and beach settings which contain special aesthetic beauty and offer priceless natural resources which are to be preserved and properly maintained for all time. The Crandon Park Lands shall provide a native and tropical woodland, a field and beach setting emphasizing passive recreation, serenity, beauty, and a retreat from the noise and congestion of the urban nature, and a return to nature for park patrons.[12]

Tree canopy coverage of 58%

8. Miami-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1991), p. 7.

9. Ibid

10. Metro-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan. October 1*, (1991), p. 7.

Crandon Park will be viewed as a rich and irreplaceable community asset that cannot be found anywhere else, with historical, cultural, environmental and ecological assets that of national import.[11]

11. "Cultural landscapes are landscapes that have been affected, influenced or shaped by human involvement. A cultural landscape can be associated with a person or event. It can be thousands of acres or a tiny homestead. It can be a grand estate, industrial site, park, garden, cemetery, campus, and more. Collectively, cultural landscapes are works of art, narratives of culture, and expression of regional identity. There are primarily four types of cultural landscapes, although any given landscape may fall under more than one typology: Designed Landscapes, Ethnographic Landscapes, Historic Sites, and Vernacular Landscapes" from About Cultural Landscapes" https://tclf.org/places/about-cultural-landscapes.

12. Richardson, *Crandon Park Master Plan* (1994), p.3.

Sand Dunes

Crandon Park is special because, in addition to Bill Baggs State Park, it has one of the County's two remaining natural dune systems. These sand dunes are typically populated with various beach grasses and plants: sea oats, beach tea, beach sunflower, beach elder, beach orach, railroad vine, spurge, salt grass and wild sage to name a few. The dunes also are home to the rare, native inkberry. However, this native species is at risk as it is being overtaken by the exotic inkberry.[13]

13. Metro-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1 October 1991), pp. 21-22.

Sea Oats
Uniola Paniculata

Railroad Vine
Ipomoea Pescaprae spp.Brasiliensis

Inkberry
Scaevola Plumieri

Beach Elder
Iva Imbricata

Beach Sunflowers
Helianthus Debilis

Wild Sage
Lantana Involucrata

Coastal Scrub

Covering a sliver just behind the dune are a variety of drought- and salt-tolerant woody species. These include Spanish dagger, saw palmetto, prickly pear, coral bean, necklace pod, seven-year apple, and bay cedar, and the endangered beach peanut.[14]

14. Metro-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1 October 1991), pp. 21-22.

Spanish Dagger
Yucca Aloifoila

Coral Bean
Erythrina Hervracea

Necklace Pod
Sophora Tomentosa

Prickly Pear
Opuntia Humifusa var.Austrina

Bay Cedar
Suriana Maritima

Seven-year Apple
Casasia Clusiifolia

Coastal Strand Hammock

A little further inland, the open sandy patches of this environs contain devil's potato, croton glandulosus, coinvine, blue curls, poor man's path, snowberry, beach creeper, and the endangered beach jacquemontia.

Within the sunniest patches of the hammock can be found Florida privet, silver palm, cocoplum, beach bean, blackbead, darling plum, myrsine, snowberry and soapberry, the rare rhacoma, Hercules club, prickly and ash.

Native coastal hammock trees include poisonwood, cabbage palm, persimmon, crabwood, lancewood, red bay, strangler fig, blolly and inkwood.

Native understory species include marlberry, white stopper, Spanish stopper and various ferns.[15]

15. Metro-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1 October 1991), pp. 21-22.

Poor Man's Path
Mentzelia Floridana

Cocoplum
Chrysobalanus Icaco

Devil's Potato
Echites Umbellata

Marlberry
Ardisia Escallonioides

Jacquemontia
Jacquemontia Reclinata

Florida Privet
Forestiera Segregata

Snowberry
Chiococca Parvifolia

Soapberry
Sapindus Saponaria

Spanish Stopper
Eugenia Foetida

White Stopper
Eugenia Axillaris

Blue Curls
Trichostema Suffrutescens

Beach Bean
Canavalia rosea

Salt Marsh and Mangrove

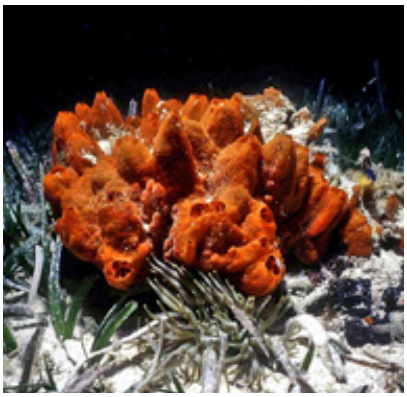
Able to grow in freshwater and saltwater, mangrove hammocks thrive along the northern tip of the island along the Bear Cut sandbar, Marina and on the Biscayne Bay coastline. Compositionally, there are primarily three types that include red and black mangroves found near open water and white mangroves further inland. Their "natural architecture" helps reduce the impact of high winds, and provides safe harbors for wildlife when they surround inlets.

Mangrove communities also help support many other forms of wildlife, including mermaid's wine cup, fire sponge, purple sponge, chicken liver sponge, acorn barnacles, oyster, plumed hydroid horned flatworm, feather duster worm, tub worm, shrimp, and sailfin molly.

Though most of the original salt marshes have disappeared because of the land's use for plantation crops, a few remain, including the one in the Bear Cut Preserve. Its flora include sea ox-eye daisy, salt wort, woody glasswort, sea blite, sea lavender, sea purslane, christmas berry, and saltmarsh cordgrass.[16]

16. Metro-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1 October 1991), pp. 22-23.

Christmas Berry
Lycium Carolinianum



Fire Sponge
Tedania Ignis

Horned Flatworm
Prostheceraeus Vittatus

Purple Sponge
Haliclona Permollis

Feather Duster Worm
Sabellastarte Magnifica

Sailfin Molly
Poecillia Latipinna

Saltwort
Batis Maritima

Sea Lavender
Limonium Carolinianum

Sea Oxeye Daisy
Borrichia Frutescens

Sea Purslane
Sesuvium Portulacastrum

Woody Glasswort
Salicornia Pacifica

Mermaid's Wine Cup
Acetabularia Antillana

Marine Ecology

Ideally located on one of the three Key Islands (Miami Beach, Virginia Key and Key Biscayne), Crandon Park has one of the most remarkable marine landscapes in the region. Unlike the beaches on barrier islands to the north, the Crandon Park beach is low energy and little surf because of offshore bars and reefs making it particularly safe and desirable for young children. Offshore waters support a rich variety of seagrasses (e.g., manatee grass, shoal grass and turtle grass) and algal communities that play key roles in sustaining local fish and invertebrates, filtering sediments, and supplying nutrients. The Park's protected waters are also critical for the survival of such endangered marine species as West Indian manatees, as well as other species of fish, crabs and turtles.[17]

Most notably, the fossilized reef, located just north of the Bear Cut Preserve, is of worldwide significance. Because of its rarity, the surrounding area was designated as an Environmental Protection Area by the Department of Interior in 1976, and as a Dade County Environmental Study Area in 1978. Over the past four decades, this 6,000-year old reef — composed of fossilized plant roots — has been gradually exposed as a result of coastal erosion. Its extent indicates just how far the island's historic coastline had once spanned. Also noteworthy, about 75 yards northwest from the Bear Cut Channel is the Half Moon Reserve, which is an Underwater Archaeological Preserve.[18]

Fossilized Reef has worldwide significancerich of rich

Previously documented in the C*randon Park Natural Areas Protection Plan* (1991), supported underwater species include tarpon, snook, snapper, striped mullet, Atlantic spadefish, barracuda, blue crab, lady crab, sea start, and grunt. Loggerhead turtles often lay eggs near quiet stretches of the beach. These turtle nesting grounds would be better protected by providing enhanced educational signage and by keeping illumination away from the Park shoreline.[19]

Other marine animal life includes species of fiddler crab (Uca. spp.), mangrove fox squirrel, American crocodile, racoon, gray fox, gray squirrel, mangrove crab, river otter, marsh rabbit, mangrove terrapin, mangrove water snake and diamondback rattlesnake.[20]

Fortunately, much of this delicate ecosystem is currently recognized for its environmental significance and as an interpretive tool in educating the local community and curious park visitors alike. While human development will continue to impact Crandon Park's marine ecology, many boating restrictions and permissible marine activities that are now in place and should continue to be enforced.

17. Miami-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1991), p. 13.

18. Miami-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1991), p. 24.

19. Miami-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1991), p. 15-16.

20. Miami-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan* (1991), p. 24-25.

Marine Fauna & Flora

American Crocodile
Crocodylus Acutus

Atlantic Spadefish
Chaetodipterus Faber

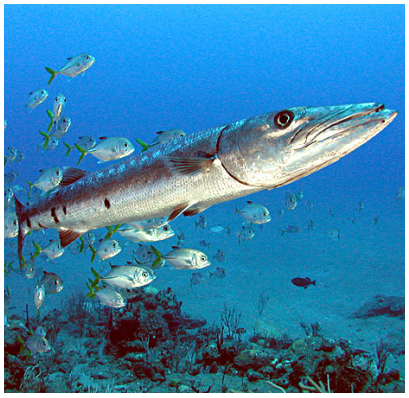
Blue Crab
Callinectes sapidus

Blue Striped Grunt
Haemulon sciurus

Diamond Terrapin
Malaclemys Terrapin

Eastern Diamondback Rattlesnake
Crotalus Adamanteus

Gray Fox
Urocyon Cinereoargenteus



Great Barracuda
Sphyraena Barracuda

Lady Crab
Ovalipes Ocellatus

Loggerhead Turtle
Caretta Caretta

Tarpon
Megalops Atlanticus

Mangrove Terrapin
Malaclemys Terrapin Rhizophorarum

Snapper
Lutjanus Campechanus

Snook
Centropomus Undecimalis

Striped Mullet
Mugil Cephalus

West Indian Manatee
Trichechus manatus

Mangrove Crab
Neosarmatium Meinerti

River Otter
Lontra Canadensis

Mangrove Water Snake
Nerodia Clarkii

Marsh Rabbit
Sylvilagus Palustris

Fiddler Crab
Uca Pugnax

Manatee Grass
Syringodium Filiforme

Shoal Grass
Halodule Wrightii

Shoal Grass
Halodule Wrightii

Existing Tree Palette: Documenting Native, Exotic and Invasive Species

Crandon Park has a rich array of native and exotic trees. The most stunning of the Park's tree palette are the iconic allées of coconut palm trees, planted along the median frontage of Crandon Boulevard, the Central Allée, and in clusters atop beach dunes. Though the palms are non-native species, having been originally imported to Key Biscayne as a crop plantation, they have come to attain great cultural significance and are considered integral to the Park's landscape identity. To Phillips, the iconic coconut palms represented the tropics above all other plants.[21]

Besides the coconut palms, early records of native broad-headed tree species that were part of Phillips's planting palette include sea grape, as well as 1,500 "'broad-headed' tall native trees" planted 25 feet apart along 75 parking strips. Species included: black olive, Pongam, West Indies Mahogany, Chinese Flower, and Tahitian flower almond along the access road. These were framed by marginal plantings of various size and texture, including oleanders, Bauhinia, Vitez, Izora, Gold shower tree, Sothereash Asian, Brazilian pepper tree. As the Park continued to evolve since its 1947 opening, certain species have "died out" due to hurricanes or disease, while other species were introduced and have flourished in areas like Crandon Gardens, the golf course, the Tennis Center, and the Marina.

21. Jackson, Faith. *Pioneer of Tropical Landscape Architecture: William Lyman Phillips in Florida* (University of Florida, Miami, FL: 1997), p. 168.

Australian Pine
Casuarina Equisetifolia

Banyan
Ficus Benghalensis

Brazilian Pepper
Schinus Terebinthifolius

Coconut Palm
Cocos Nucifera

Gumbo Limbo
Bursera Simaruba

Kapok
Ceiba Pentandra

Mahogany
Swietenia Mahagoni

Red Mangrove
Rhizophora Mangle

Sabal Palm
Sabal Palmetto

Seagrape
Coccoloba Uvifera

Silver Buttonwood
Conocarpus Erectus

Strangler Fig
Ficus Aurea

Existing Habitat: Documenting Native, Exotic & Invasive Fauna

Similar to its eclectic mélange of exotic and native flora, Crandon Park hosts a wide range of resident and imported fauna. Native wildlife species include passerine birds, herons, egrets, terns, gulls, snakes, lizards, land crabs, toads, small rodents, and raccoons. Crandon Park is also particularly special for its location on a major north-south migratory flyway, and attracts some endangered or threatened species like the Atlantic Ridley, hawksbill, leatherback, loggerhead, and green sea turtles and West Indian Manatee.[22]

Some birds found on site include the Great white heron , little blue heron, tricolor heron, snowy egret, great egret, brown pelican, frigate bird, southern bald eagle, osprey, white ibis, mangrove cuckoo, Florida prairie warbler, black whiskered vireo, and white-crowned pigeon, roseate spoonbill, and the peregrine falcon.[23]

As a result of escapees from the former Crandon Zoo, the Park today serves as the home for some exotic species like peacocks which today can be seen roaming freely around the Crandon Gardens. The same is true for various species of exotic reptiles, such as the green iguanas, which were imported to the area around the 1950s and 60s, and have adapted so well that their populations have exploded in recent years to the point that they are now regarded as pests. It is also possible that they might pose a threat to the native tree snails. Further study by an Environmental Consultant to analyze the impact of the exotic wildlife on native species is needed to better understand how the Park's resident populations might be better preserved and native species protected. In addition, there should be an invasive fauna management plan to prioritize those species which are particularly detrimental.

22. Richardson. C*randon Park Master Plan* (1995): p. 20.

23. Metro-Dade County Park & Recreation Department, The Nature Conservancy, and Fairchild Tropical Garden. *Crandon Park Natural Areas Protection Plan.* (1 October 1991, pp. 24-25.

Brown Pelican
Pelecanus Occidentalis Carolinensis

Snowy Egret
Egretta Thula

White Ibis
Eudocimus Albus

Southern Bald Eagle
Halliaeetus Leucocephalus

Osprey
Pandion Haliatus

Great Egret
Casmerodius Albus

Great White Heron
Ardea Herodias

Tricolor Heron
Hydranass Tricolor

Little Blue Heron
Florida Caerulea

Green Iguana
Iguana Iguana

Peacock
Pavo cristatus

Green Sea Turtle
Chelonia Mydas

Historic Preservation and Conservation Challenges

A delicate balance between the preservation, protection and renewal of native and non-native species must be struck when evaluating the flora of Crandon Park. This balance must at once meet contemporary Florida and Miami landscape standards and codes, as well as distinguish those species that have gained cultural significance over time — as the coconut palm has. However, Phillips's inclusion of the exotic Brazilian red pepper is inconsistent with today's landscape standards, which classify the tree as an invasive species. Since the last vegetation survey is about 30years old, a current evaluation of the existing Park ecology is a priority in order to provide more-detailed recommendations and to better quantify and evaluate existing conditions.

Primary preserved areas; 47% of total Crandon Park area

In addition, the impact of dredging, infilling and mosquito ditches around the Marina and Bear Cut Preserve allowed for the growth of other invasive species like Australian Pine, cane grass and burma reed in upland areas.[24] Although Hurricane Andrew destroyed many of the Australian Pines that once occupied the upland in Bear Cut, this area still has deforested spots that have never recovered. Further analysis of the condition of this barren area should be examined with an Environmental Consultant.

24. Richardson. *Crandon Park Master Plan* (1995): p. 19.

Australian Pine - Invasive specie
Casuarina equisetifolia

Burma Reed
Neyraudia Reynaudiana

Cane Grass
Arundo Donax

Other Environmental Risks and Hazards

These include massive and toxic algae blooms (locally known as the "Red Tide") that affect Crandon Park along with many other Floridian beaches. The microalgae *K. brevis* produces a toxic chemical that attacks the nervous systems of marine animals and can cause respiratory conditions and eye irritation in humans. The most recent occurrence started in October 2017 and continued through the spring of 2018.[25]

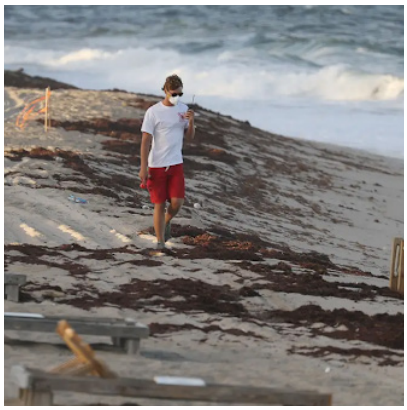
Since 2011, marine scientists have also been investigating the cause of large deposits of seaweed along the beaches of Key Biscayne, including that of Crandon Park. Often result in beach closures, these large deposits negatively impact the largest portion of Park visitorship. In 2019, for example, 39 beach advisories were reported.[26]

While some of these larger environmental hazards are beyond the scope of Park maintenance efforts, creative partnerships with other local and regional organizations will be key to helping Crandon Park continue to preserve and protect its unique fossilized reef and special coastal ecology and dune system for future generations. As a Miami-Dade County park, it is important to recognize that Crandon Park is but one piece of a larger ecological mosaic – one that with sensitive interventions can sustain a healthy and resilient Floridian coastline. Critical to its success will be cyclical and targeted management from human pollution, littering, and prescriptive strategies for monitoring and controlling domestic animals in the preserve areas.

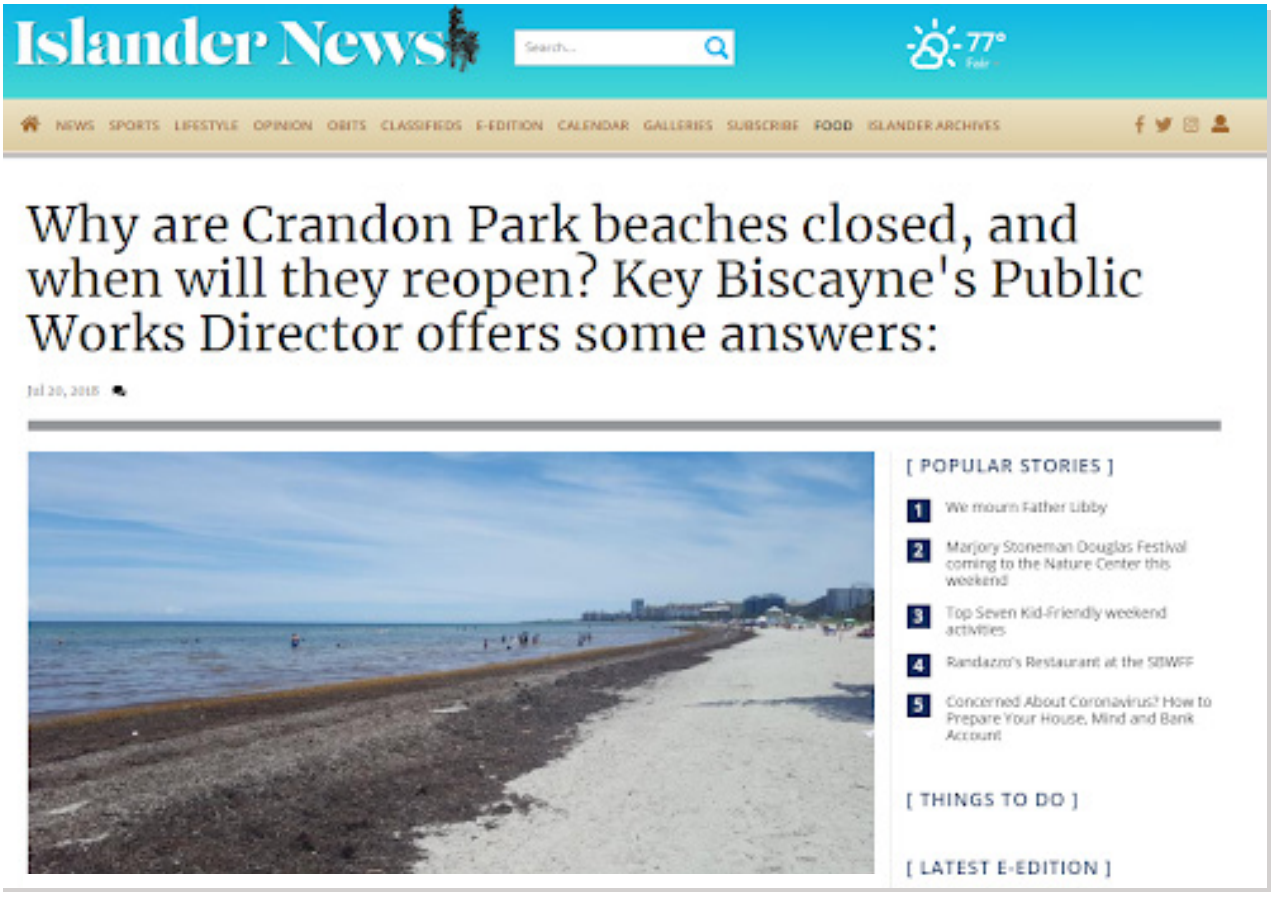
25. Florida Fish and Wildlife Conservation Commission, *"Tools for Tracking Red Tides,"* (2020): https://myfwc.com/research/redtide/tools/

26. Hanks, Douglas. *"This City Sits next to a sewage plant, but seaweed may be what's closing its beaches,"* Miami Herald (Jan 02, 2020): https://www.miamiherald.com/news/local/community/miami-dade/key-biscayne/article238733123.html

"Red Tide" plagues Key Biscayne's waters



There is currently no solution for how to dispose of the toxic algae



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NEWS SPORTS LIFESTYLE OPINION OBITS CLASSIFIEDS E-EDITION CALENDAR GALLERIES SUBSCRIBE FOOD ISLANDER ARCHIVES

Why are Crandon Park beaches closed, and when will they reopen? Key Biscayne's Public Works Director offers some answers:

Jul 20, 2018

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Unsightly algae blocks access to the water and causes the beaches to close occassionally

Findings

- **The Park has limited means of engaging and educating visitors about the its unique and valuable natural assets:** With the exception of Bear Cut, the rest of the preserves do not currently provide passive nature observation activities, such as nature study, hiking, birding, bicycling and walking on nature paths, canoeing or kayaking. From onsite observation, the West Point and Ibis Preserves are both impenetrable wildernesses that do not offer such activities or related programming, as advised in the current *Crandon Park Master Plan*. Not even natural trails or waterways for canoeing and kayaking led by trained naturalists are available nor promoted.

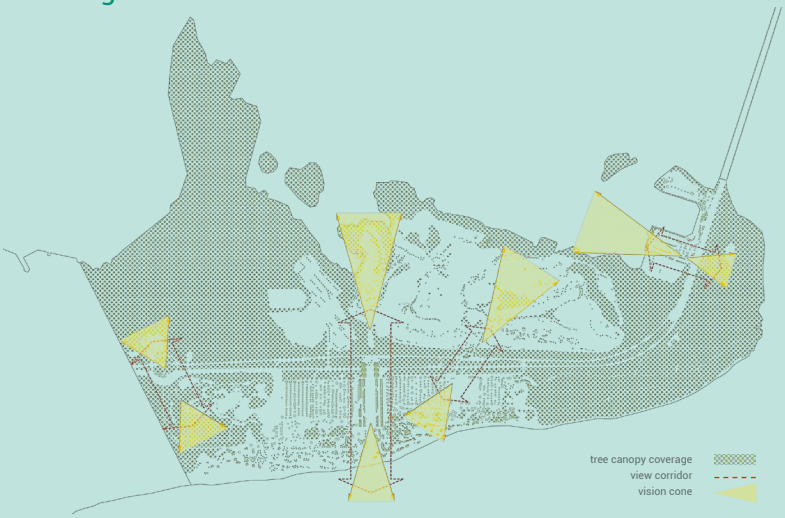
- **Invasive plant and animal species are degrading the preserve:** Onsite observation of various invasive flora and fauna indicate that these populations need to be better managed and maintained. The return of Australian pines along the boulevard reveals a chronic absence of routine practices to control exotic plant materials. The last study is now nearly 30 years old.

- **The Park lacks an effective program for removing seaweed from its beaches:** Since 2011, species of Sargassum seaweed have been deposited on the beaches of Crandon Park. While not toxic to humans, its accumulation mostly poses a nuisance to beachgoers, since the beaches are closed during cleaning periods. However, the high presence of bacteria as the seaweed starts to decay on the beaches can potentially harm some marine life, particularly the sea turtles during nesting season.

Recommendations

- **Renew and restore the heritage coconut plantings along Crandon Boulevard:** In honor of preserving Phillip's vision of a Crandon Boulevard lined with rows of coconut palms, it is recommended that the Park identify opportunities for the cyclical re-planting of coconut palms along the Boulevard. This will not only help restore the original character of the Boulevard as a parkway, but will also provide greater visibility for drivers and help reinforce visual and physical connectivity to Park programs.

- **Restore the view corridors from Crandon Boulevard:** As noted earlier, overgrowth of native plantings along the median and sides of Crandon Boulevard have created sections with limited or poor visibility. In particular, the area along the Central Allée near the lagoon could be an opportunity to re-establish the east-west axis outlined in Phillip's vision. In addition, each of the four identified Gateway moments can be enhanced by cleared and trimmed view corridors. To the extent Phillips' central plan was deficient, its magnitude is hardly observable at grade but magnificent at the level of hovering birds.



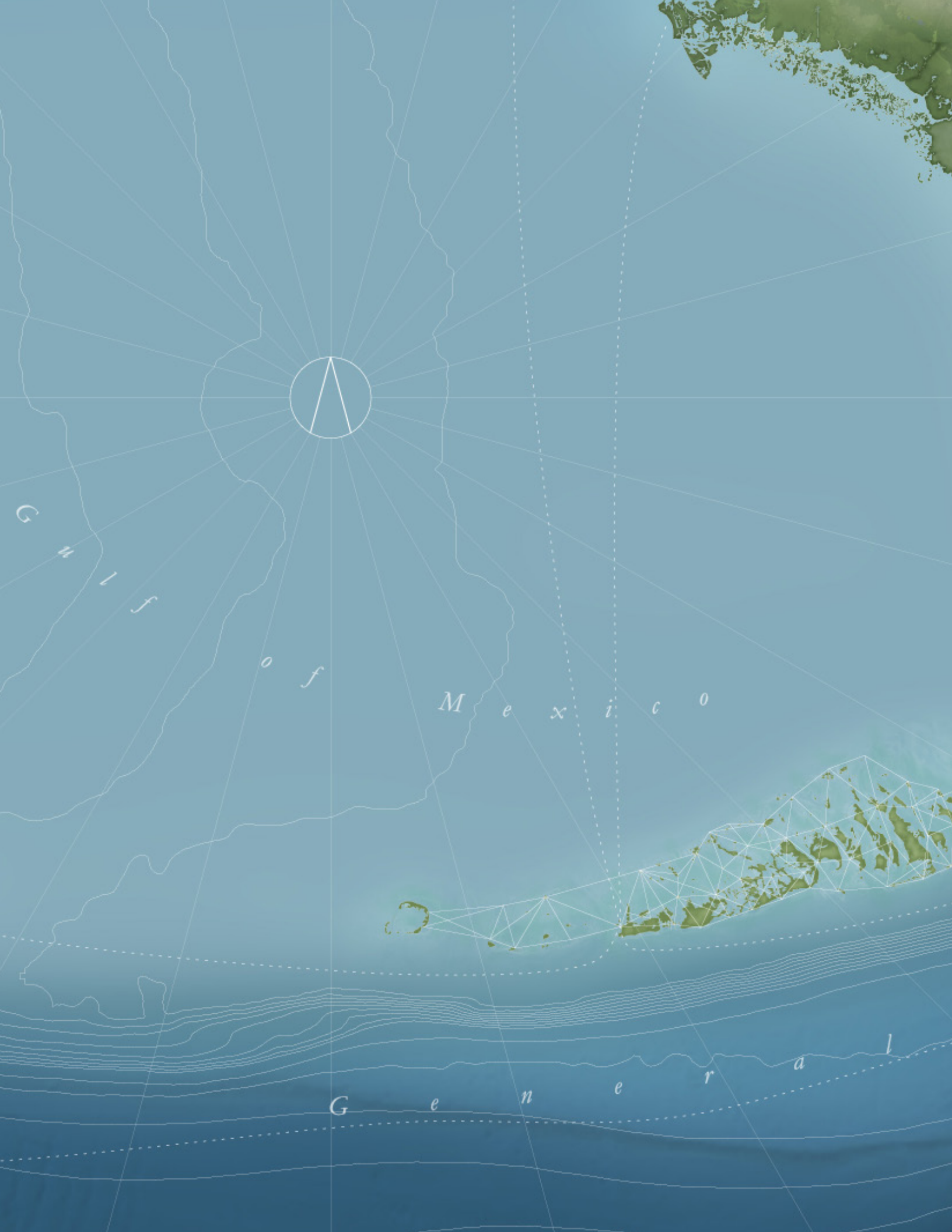
Restore vegetation overgrown view coridors of Key Moments on Crandon Boulevard

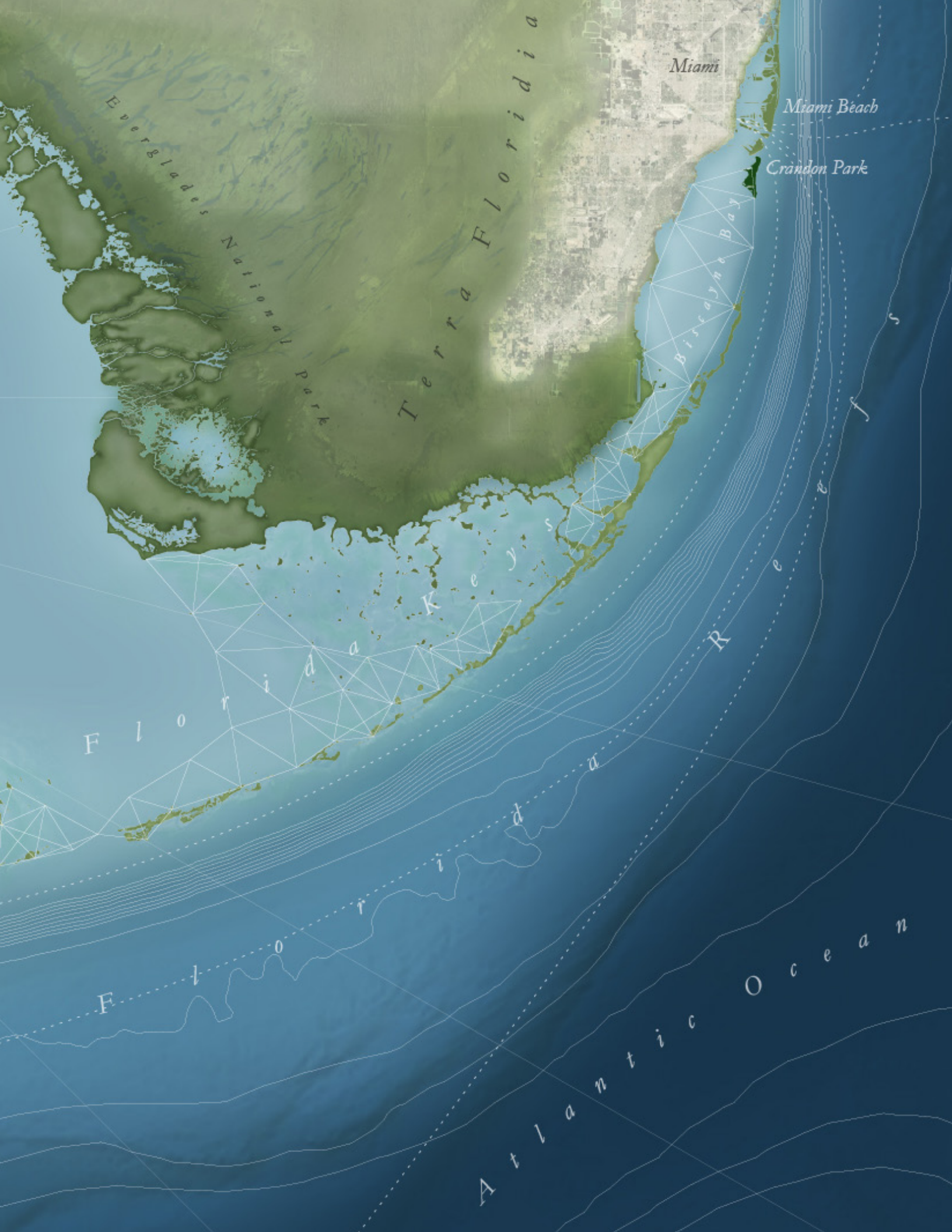
- **Commission an environmental consultant to conduct a topological and plant survey - and to analyze the site's erosion and degradation patterns:** Supplementing the on-site observations conducted in this study, there is great need for a more thorough and detailed quantitative survey of existing environmental conditions.

- **Leverage environmental conservation to help honor the Park's ecological heritage:** Considering that 455.3 acres or 46.7% of the land is designated as a preserve (Bear Cut, West Point and Mangrove Islands, Ibis, and Rookery Island), Crandon Park has a powerful opportunity to maximize its unique natural and ecological assets. Programmatically, however, these passive areas are underperforming, with only a third of these preserves are accessible to the public.

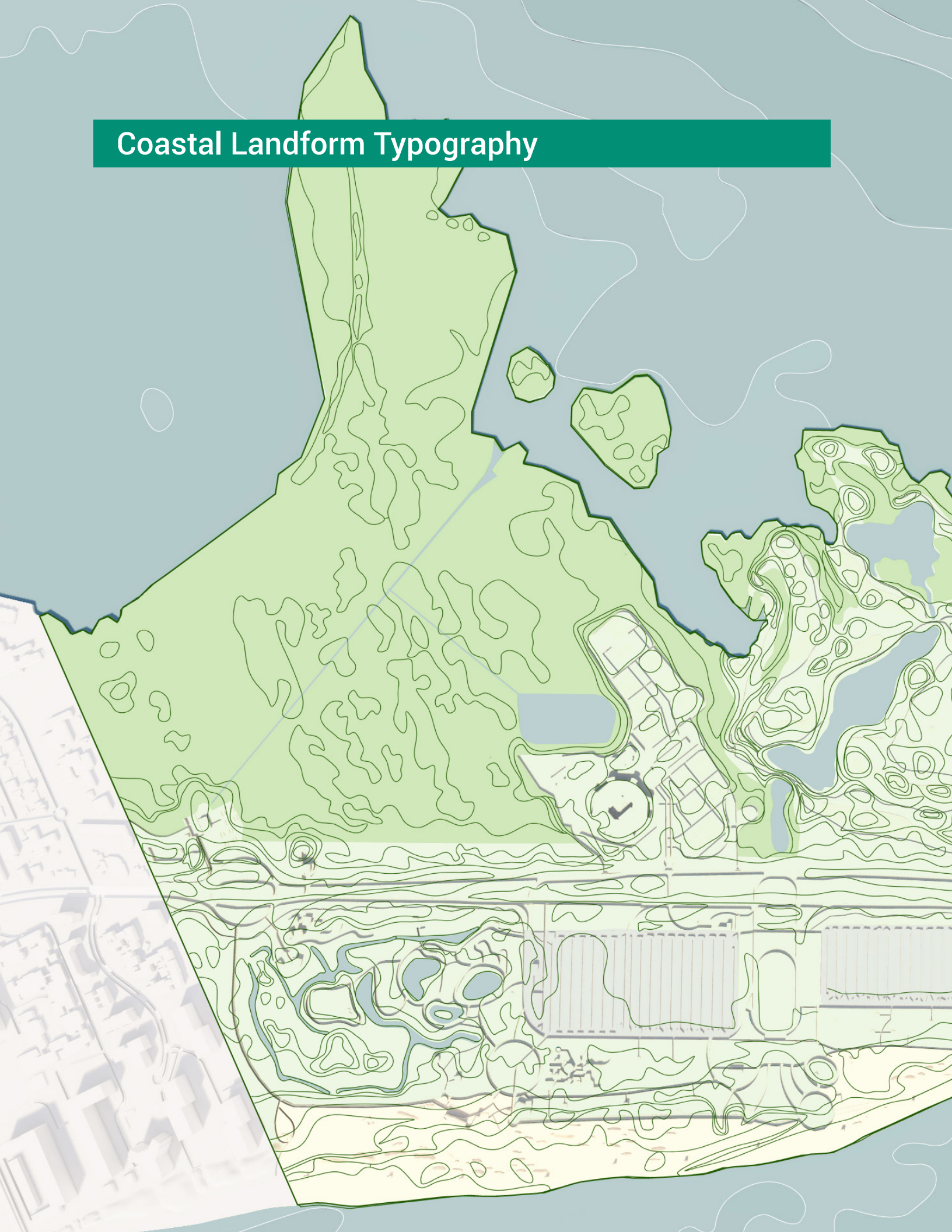
  While protecting these natural conservation areas is of paramount importance, it is equally essential to educate residents, visitors and the academic community about the Park's many inherent natural assets. The chance to leverage Crandon Park as an outdoor classroom is especially significant given its close proximity to the Village of Key Biscayne, educational institutions like MAST (Maritime and Science Technology) Academy, and scientific agencies like the NOAA (National Oceanic & Atmospheric Administration), among others. The Park could serve as an invaluable outdoor laboratory for children and scientists alike. Similar suggestions were supported by the authors of the *Crandon Park Natural Areas Protection Plan* (1991). Left entirely to the wilderness, not even nature observation activities can currently take place. Identified as an Eco-hub in the *Miami-Dade County Parks and Open Space Master Plan* (2007), Crandon Park could further enhance its unique ecological heritage, which would not only "provide passive, resource-based recreation that over programmed neighborhood and community parks may lack…[but also provide] the possibility of ecotourism, a potential source of revenue."[27]

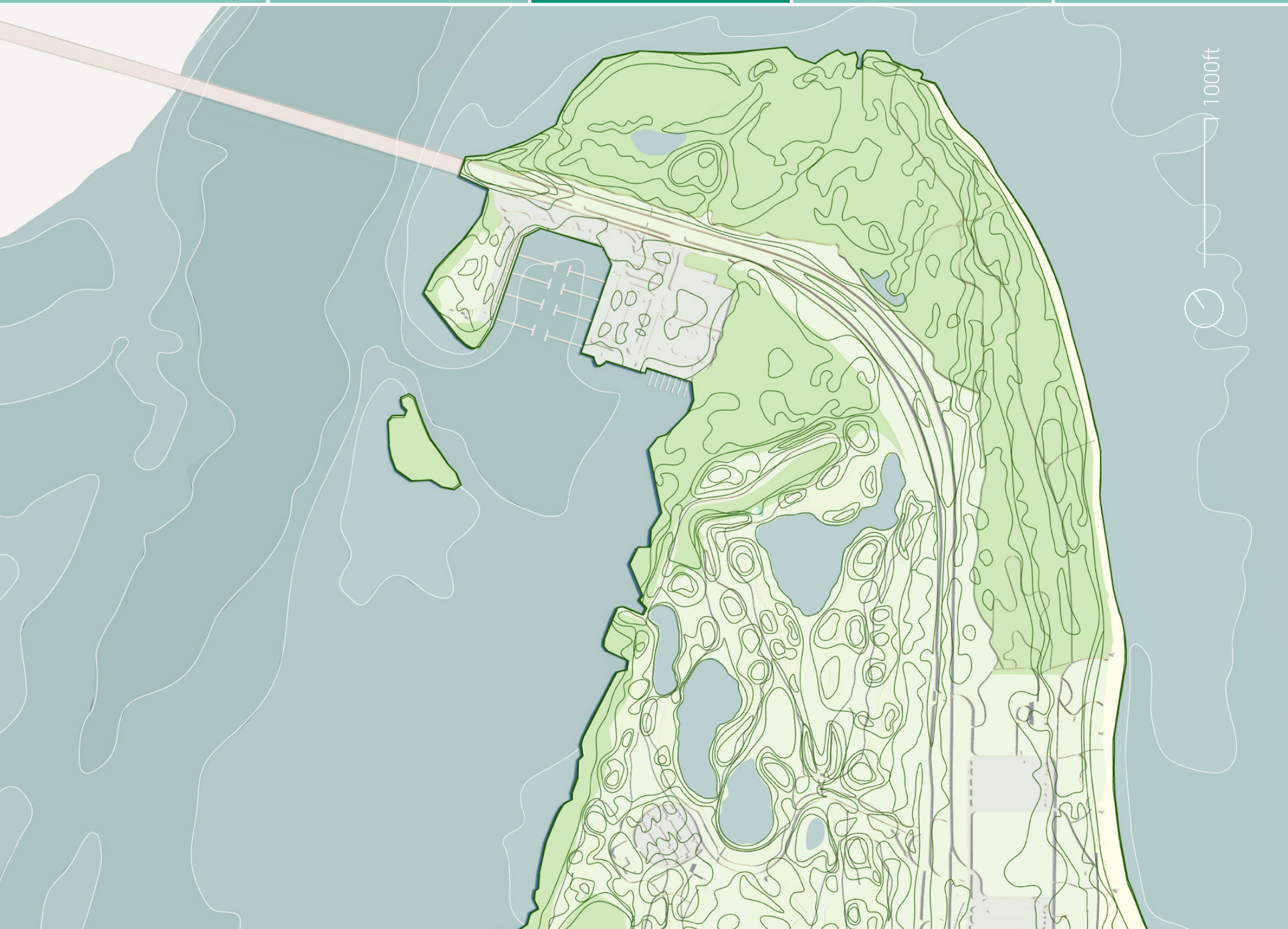
27. Miami-Dade County, *Miami-Dade County Parks and Open Space System Master Plan* (2007), p. 32.


Gulf of Mexico
General


Miami
Miami Beach
Crandon Park
Everglades National Park
Terra Floridia
Biscayne Bay
Florida Keys
Florida Reefs
Florida
Atlantic Ocean

Coastal Landform Typography

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Coastal Landform & Topography

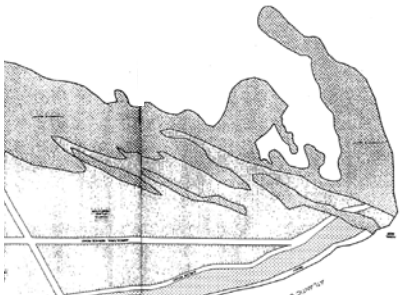
Historical Research & Analysis of Existing Conditions

Historic Land Formation

Crandon Park's coastal landform and topography have been shaped by a series of natural and human-made forces. Like other barrier islands, its geomorphology is in a constant state of flux. Left to its natural state with rising sea levels, shifting tides would have shaped the island, pushing it gradually closer to Florida's mainland. In fact, an 1850 *Plan of Key Biscayne* shows how the island would have appeared prior to much human development — portraying an elongated profile with saw palmetto vegetation along the Atlantic and salt marshes and mangroves on the Biscayne Bay side. All along the Bay side were indications of small coves, some of which have grown larger over time.

Similarly, a 1925 *Vegetation Survey* shows how the northern tip of the Park still retained the shape of its natural cove, populated with mangroves, which could grow in both salty and fresh waters. However, behind the sliver of beach plantations of coconut palms and three, utilitarian service roads can be seen cutting through some coastal upland vegetation areas. It was during this time that Crandon Park was used for agricultural production, until Tracts 1, 2 and 3 were finally deeded to Dade-County in 1940 under the condition that "the lands hereby conveyed shall be perpetually used and maintained for public park purposes only."[28]

1850

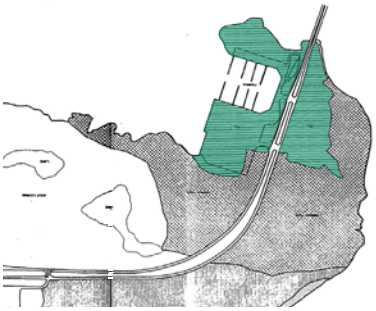


North tip of Key Biscayne prior to dredging

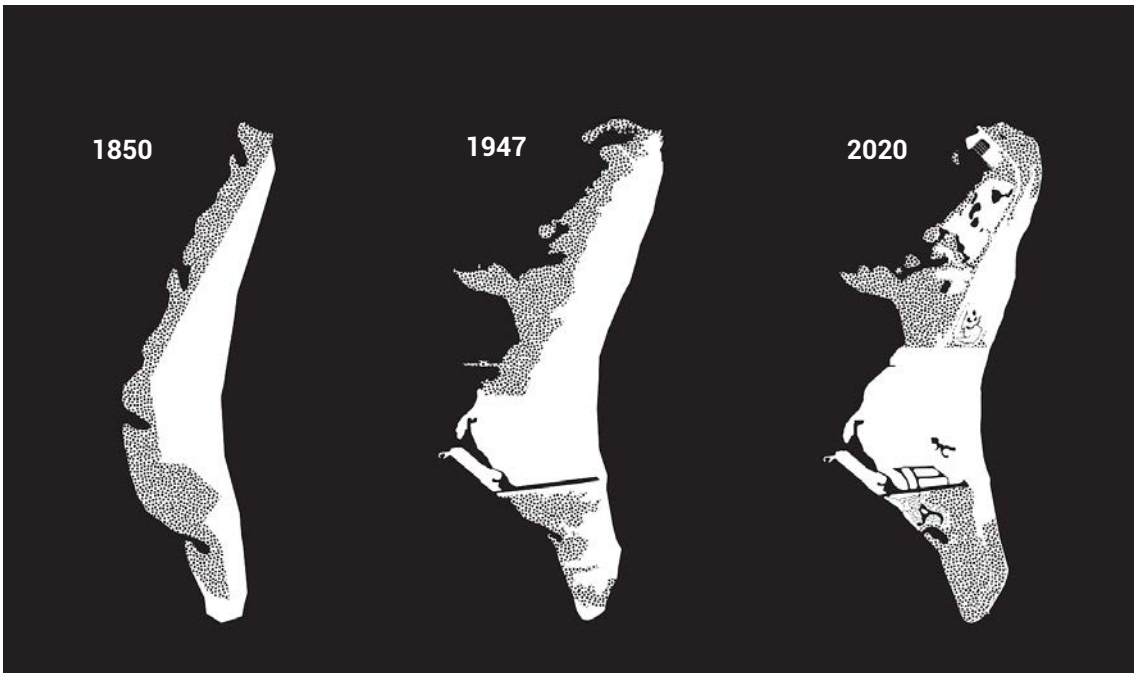
1947

Dredging occurred to construct the Marina

1992



The dredge was relocated upland in order to construct the Rickenbacker Causeway



Key Biscayne has morphed over time due to natural occurrences and man-made activity

Time lapse imagery and other early maps of Key Biscayne illustrate how the Park's unique morphology is largely the result of human intervention through processes of dredging and infill starting in the 1940s, particularly around the present-day Marina and the central part of the beach and picnic area. Driven by its founders' vision to build a public beach and marina, Crandon Park's naturally low-lying topography has been altered significantly since the mid-twentieth century. In particular, soil surveys from the 1940s illustrate how dredge was taken from the cove of the Marina and sand bar along the Beach to create infill for the Marina and the initial portion of Crandon Boulevard. In addition, mosquito ditches and various artificial lakes were constructed at different points in time.[29]

The Tennis Center was built on an unlawfully operated landfill that was and remains subject to injunctive relief issued in response to complaints by federal environmental agencies.[30] Compliance with environmental orders is the least that should be done along with exploration of remediation measures to eliminate the threat of contamination.

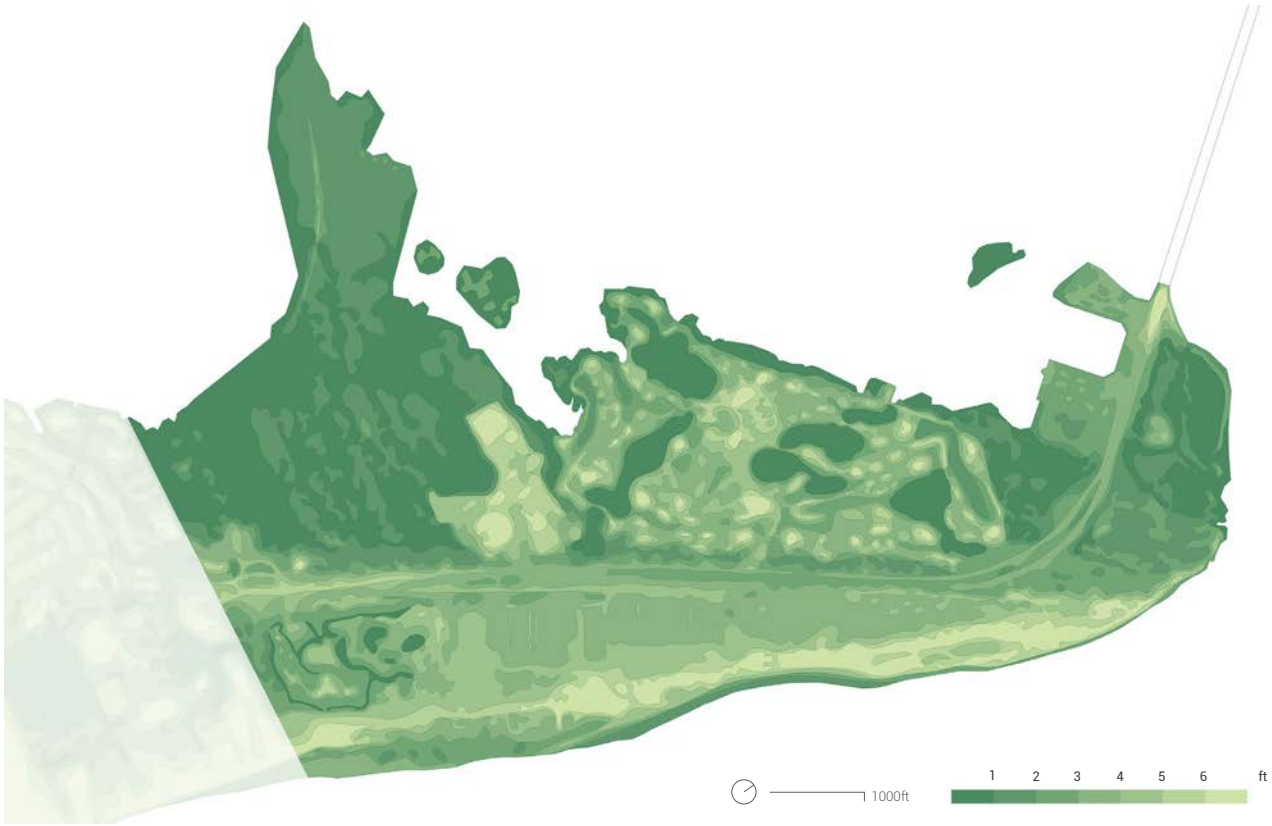
28. Richardson, *Crandon Park Master Plan* (1995), p. 2, fn. 4.

29. *"Bear Cut Preserve Historical Surveys"* in Richardson, Crandon Park Master Plan (1995), Appendix L.

30. White v. Metropolitan Dade County, 563 So. 2d 117 (1990), p. 27

Existing Topography

Like the rest of Key Biscayne, Crandon Park's existing topography is only a few feet above sea-level, with an approximate elevation of three feet. At this elevation, all of the West Point Preserve, the northern tip of the Bear Cut Preserve, the southwest portion of the Golf Course, and western side of Crandon Boulevard are the lowest lying areas. Most of the Golf Course, Beach Parking and Crandon Gardens sit at four-foot elevation. At five-foot elevation, the Tennis Center and a small sliver along the upland coast occupy the highest ground. A few high points of the Park sit at ten-foot elevation. With sea levels rising, all undertakings to replace facilities, paths and roadways should be at higher elevations.



Existing elevation diagram

Shifting Coastline

The expansion of Government Cut to the north and similar construction projects further north has considerably reduced what was once natural migration of sand onto beaches like that of Crandon Park.[31] Crandon Beach's shoreline has receded, in some instances dramatically. In the last 25 years alone, aerial images reveal a vastly eroded beach. In particular, the southern portion of the Beach used to extend all the way to the two-foot tidal flat that surrounds the island, which is represented in the bathymetric map. Further down the coast in the Village of Key Biscayne, recent reports have documented that approximately 7,000 cubic yards of erosion and five feet of shoreline is lost annually.[32]

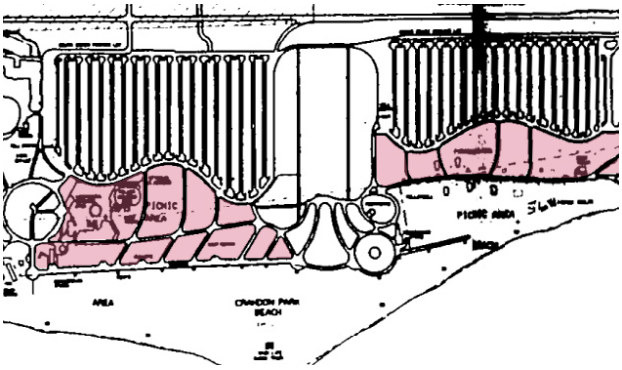
The importance of maintaining Crandon Beach's dune system has been documented since the late 1980s. Authors of *Crandon Park: The Next Fifty Years* (1989) advised for a "gradual phasing in of restored dunes and a phasing-out of the sand retention wall." [33] This system would need to be integrated with pedestrian crossovers and educational signage and environmental programs that would help educate Park patrons. Similarly, Richardson also called for measures; however, his *Master Plan* (1993) recommendations were never actually implemented. Indeed, he recommended "the development of a series of overlapping dunes and dune plantings which, together with the planting of additional groups of coconut palms and with the existing retaining wall along the east side of the promenade,"[34] in order to reduce the sand from coming inland. His draft *Master Plan* called for an undulating weave of continuous pathways from the Parking Lot through the Picnic Areas to the Beach.

31. Wanless, H.R., *Sediments of Biscayne Bay - Distribution and Depositional History*. University of Miami. 1969.

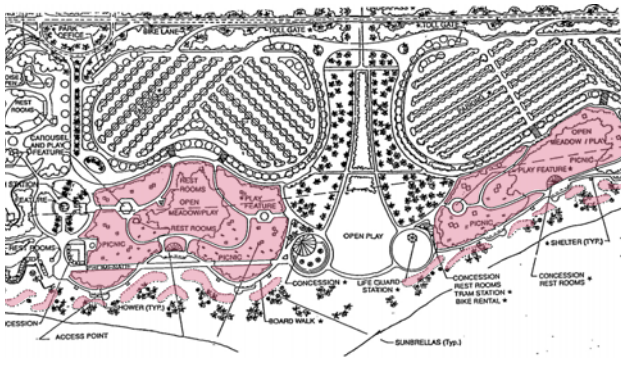
32. *"Beach Renourishment. Village of Key Biscayne."* (Village of Key Biscayne, FL: 2013): http://keybiscayne.fl.gov/index.

33. *Crandon Park: The Next Fifty Years* (1989), p. 33.

34. Richardson, *Crandon Park Master Plan* (1995), p. 88.



1995 Master Plan calls for a deeper dune area and more direct access paths from the parking lot to the beach. This design was never implemented.



Richardson's sketches explored various layouts to enhance the dune system and picnic area by the beach. None of these ideas were implemented.

Crandon Beach's Receding Shoreline

Satellite image 1995

Satellite image 1999

Satellite image 2002

Satellite image 2004

Satellite image 2005

Satellite image 2006

Satellite image 2007

Satellite image 2009

Satellite image 2010

Satellite image 2011

Satellite image 2013

Satellite image 2014

Satellite image 2016

Satellite image 2017

Satellite image 2018

Satellite image 2019

Bear Cut Preserve costline is eroding

Other portions of the Park's coastline are also in danger of erosion. In particular, the pinch point near the Bear Cut Bridge is eroding, its edge subject to the flows from the Atlantic Ocean into the Biscayne Bay. Following the update, much of this area (known as Pelican Point) appears to be stabilized by means of riprap and by enhancing the planting of mangroves. In addition to their ecological benefits, mangroves are natural coastal engineers, helping reduce wind swell and waves, storm surges, and coastline erosion. Seagrasses, which build large subtidal meadows, also play an important role in reducing sediment suspension. Preservation of the large tidal flats on the Bay side of the Park are also important to help dampen the effect of storm surges.

Sea-level Rise and Areas at Risk

Even with regular maintenance to restore the sandy beach of today, most of the island remains at great risk to the effects of sea-level rise, hurricanes and storm surges. Because of the porous limestone and temporary nature of sand, Key Biscayne is very vulnerable to sea level rise of even one foot. According to local expert Harold Wanless, with a 4 to 5 foot rise or a rapid rise, Key Biscayne would not be able to rebuild itself.[35]

According to NOAA analysis, by 2030 sea level will be one foot; and by 2060 it will be three feet; and by 2100 it will be 6.75 ft.[36] Based on these numbers, if no measures are taken beyond those already in place, almost all of the West Point Preserve, the Marina, the northern portion of the Bear Cut Preserve, parts of the south Beach, the southwestern part of the Golf Course, Crandon Gardens and stretches of the Boulevard will be underwater in 50 years. This adds up to about 550 acres of the current Park area. And in 80 years times, all but a small sliver of upland in the Bear Cut Preserve and tiny portion of the Tennis Center will be underwater.

35. Wanless, H.R., *The Ever-Changing River of Sand: How Biscayne and Virginia Key Formed and Where They Are Headed* (Presentation in Key Biscayne: April 2008)

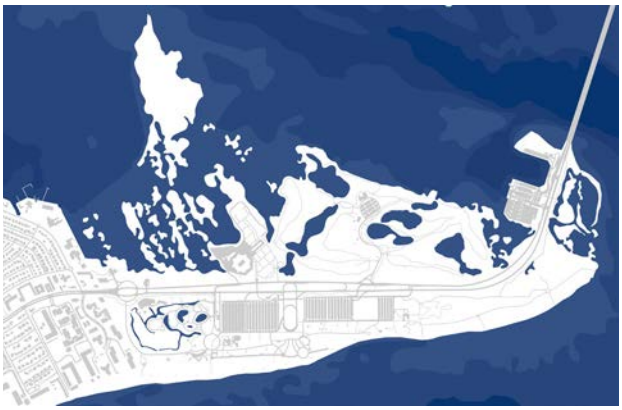
36. Toomey, Diane. "*At Ground Zero for Rising Seas*" Yale Environment 360 (14 July 2016): https://e360.yale.edu/features/florida_rising_sea_level_tv_weatherman_john_morales; NOAA Sea Level Rise Viewer: https://coast.noaa.gov/slr/#/layer/slr/3/-8922931.093404494/2964238.96951349/15/satellite/none/0.8/2050/interHigh/midAccretion

Existing dune system is fragmented, dunes size varies (average 30-100ft wide and 2-6 feet high)

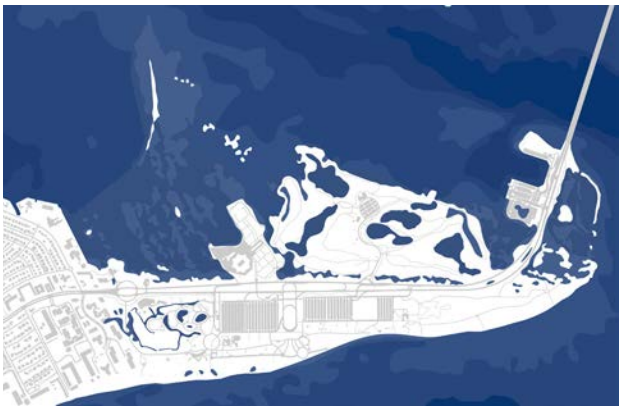
Dunes closest to the water are severely impacted by hurricanes, and also by beach-goers walking on them

Dunes are not protected by any means from visitors walking on them, which causes damage to the vegetation

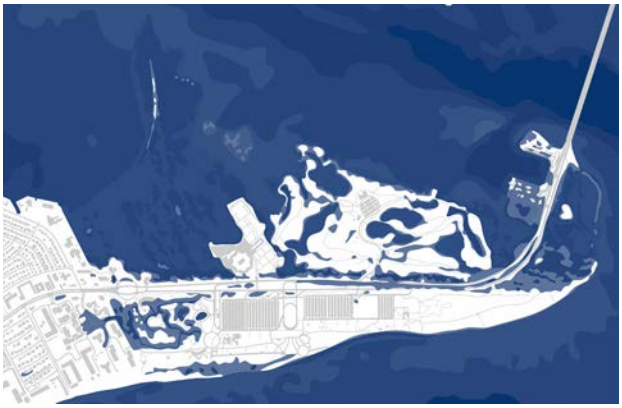
Key Biscayne 5 ft above sea level, NOAA estimated to ocurr prior to year 2100



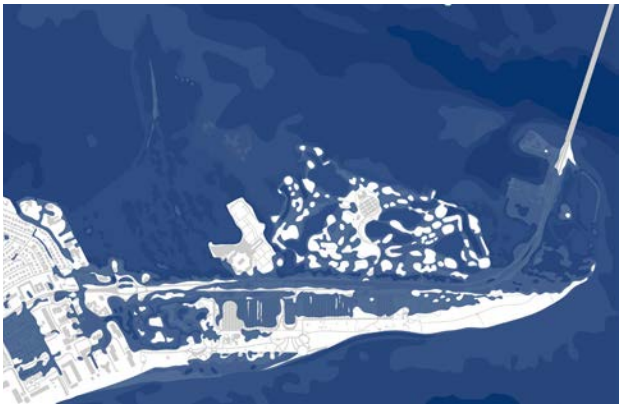
1 ft above sea level, NOAA estimate for year 2030



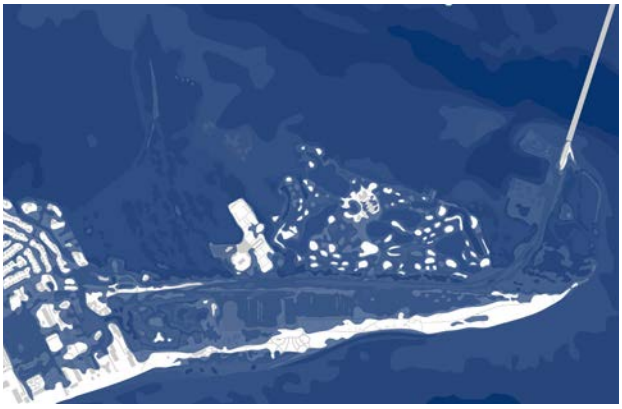
2 ft above sea level



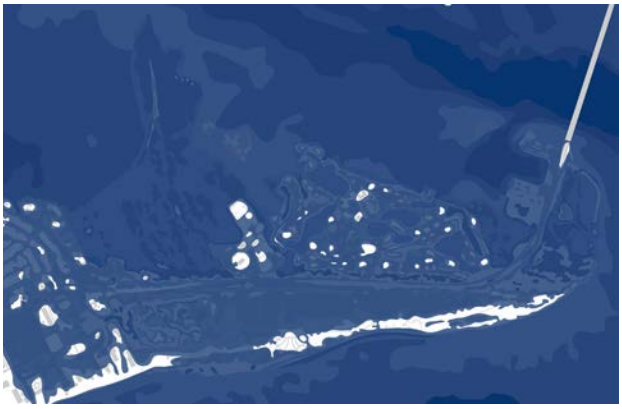
3 ft above sea level, NOAA estimate for year 2060



4 ft above sea level



5 ft above sea level



6 ft above sea level, NOAA estimate for year 2100

In addition to sea-level rise, Crandon Park is located in Hurricane Evacuation Zone A, which is at greatest risk for Category 1 storm surges and higher storms.[37] An average Category 2 hurricane has wind speeds between 96-110 mph and storm surges running between here and six feet. However, a Category 5 hurricane can have winds greater than 157 mph and storm surges of over nine feet, which would flood almost the entirety of the Park.[38] The Atlantic Hurricane season runs from early June to late November. Since the 1850s, there have been three Category 5 hurricanes: Florida Keys Labor Day Hurricane in 1935, Hurricane Andrew in 1992, and Hurricane Michael in 2018. In addition, there have been 11 Category 4 hurricanes, which have also wreaked havoc such as Hurricane Irma in 2017.[39]

An *Environmental Impact Survey* from 1992 shows that most of the upland areas in the northern part of Bear Cut Preserve and along Crandon Boulevard were severely disturbed.These areas were mostly overgrown with Australian Pine, an invasive species with a shallow root system that allows the tall trees to topple in high winds, but are surrounded by huge volumes of seeds and seedlings to take their place.[40] While some areas with pines lost to Hurricane Andrew have been replanted with mangroves and other wetland species, the pines are rapidly returning, killing off native flora in the process.

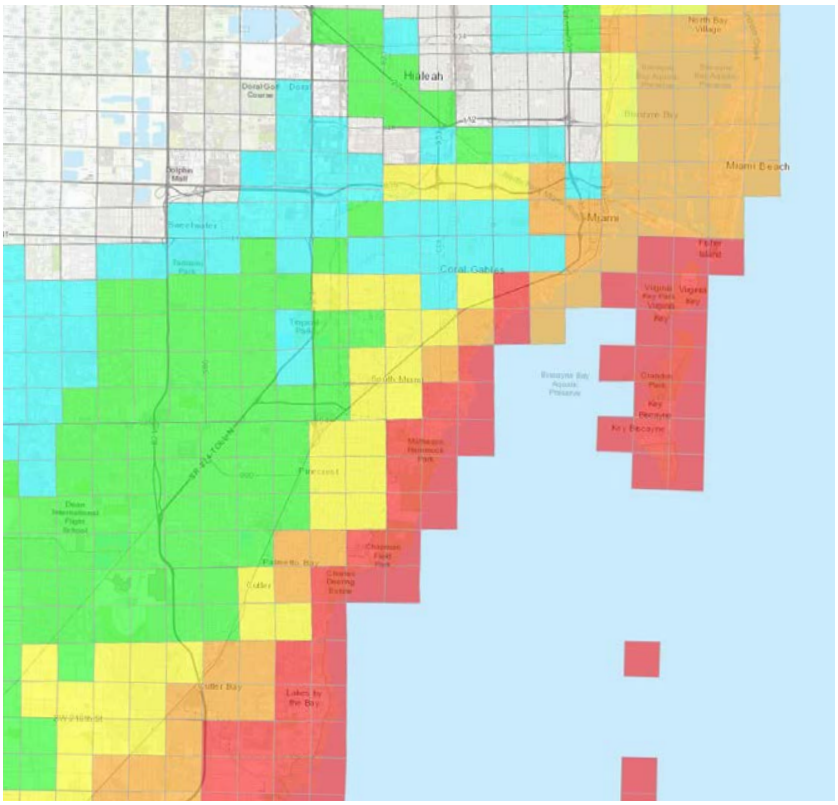
37. Miami-Dade County. 2019 Official Hurricane Readiness Guide (Miami, FL: 2019):p. 3. National Storm Surge Hazards Map: http://noaa.maps.arcgis.com/apps/MapSeries/index.

38. National Hurricane Center; Hurricane Research Division; Atlantic Oceanographic and Meteorological Laboratory *May 2018), "Continental United States Hurricanes," AOML (Miami, FL: United States National Oceanic and Atmospheric Administration's Office of Oceanic & Atmospheric Research) https://www.aoml.noaa.gov/hrd/hurdat/UShurrs_detailed.html

39. "Bear Cut Preserve Historical Surveys" in Richardson, Crandon Park Master Plan (1995), Appendix L

40. "Bear Cut Preserve Historical Surveys" in Richardson, Crandon Park Master Plan (1995), Appendix L.

Cape Florida State Park After Hurricane Andrew, 1992



Storm Surge Planning Zones by Miami Dade County; Key Biscayne is in Zone A

Hurricane Irma 2017 flooding in Miami's Brickell neighborhood

Coastal flooding of Crandon Park Beach due to king tides and global sea level rise

Findings

- **The dunes are eroding:** The current dune system consists of small elongated islands along Crandon Beach, which are populated with coconut palms and various dune grasses. While these lozenge-shaped sand dunes are visually pleasing and provide much-needed shade to beachgoers, they are constantly eroding. In addition, their scattered composition does not perform well as a coastal resilience solution: they would have to form a near continuous ridge to protect against sea-level rise and storm surges.

- **The beach is eroding:** Like the dunes themselves, the open beach shoreline is receding. As the primary attraction of the Park, maintaining the Beach is of utmost importance to the Park's future. A quantitative study of how the shoreline is receding each year — and an assessment of the recession's historic economic cost per annum — would help planners devise a beach management and maintenance program that meets present-day standards.

- **Much of the Park is at risk of flooding:** Because of its low elevation, most of Crandon Park is at high risk of flooding and storm surges. Lack of proper protection to existing Park facilities and program areas not only causes severe physical damage, but also has a great impact on the operational functions and economics of the Park.

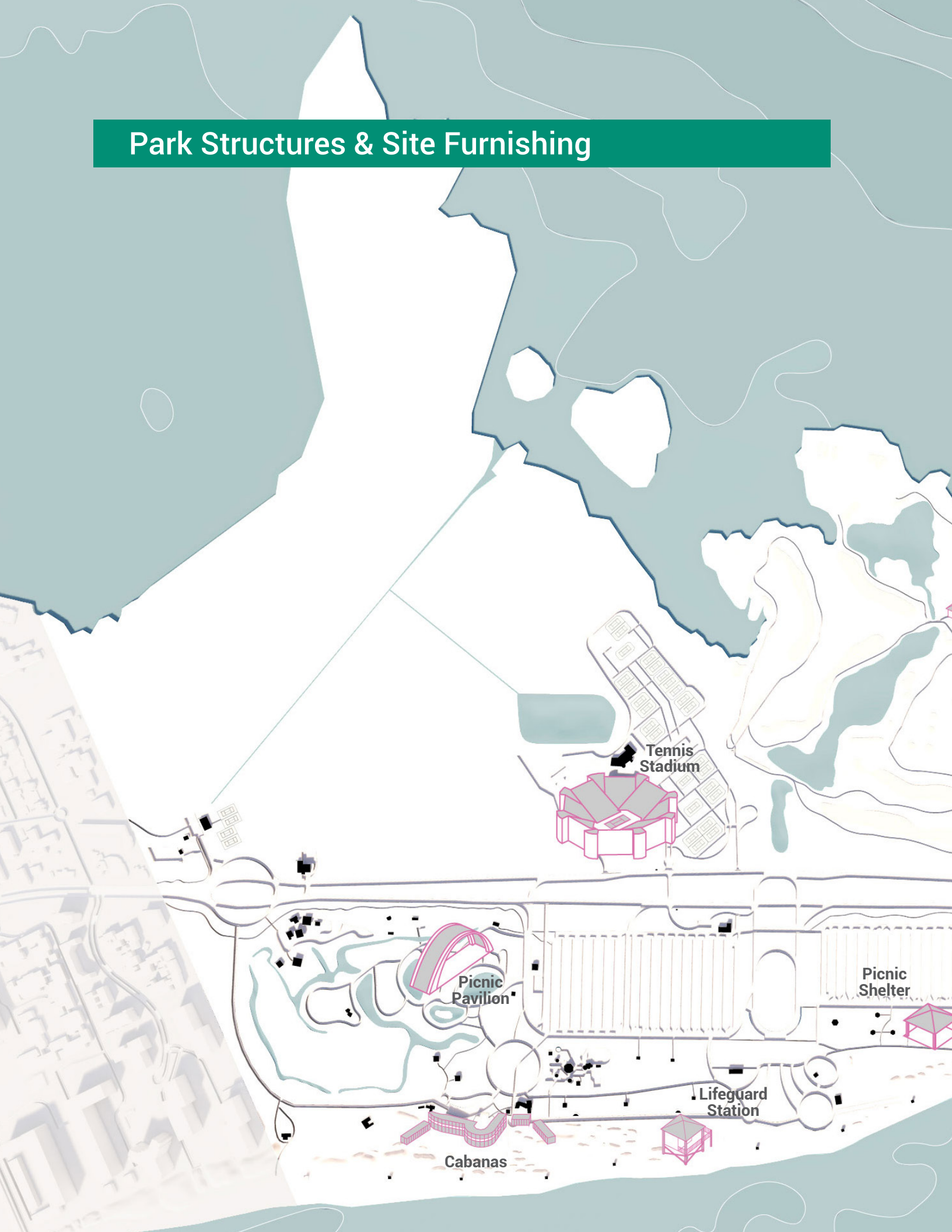
- **Minimal opportunities for engaging and educating visitors about the Park's unique natural habitats and ecologies.** While Crandon Park exists today as one of Florida's hidden gems, it would greatly enhance its mission to expand its public education programming. Educational content could focus more heavily on the Park's unique natural and cultural assets, including its reserves and dune system. Crandon Park's close proximity to Miami underscores its value as a public resource to this major population center. The Park should serve as a priceless asset for the education of urban youth, and for visitors from around the country and the world.

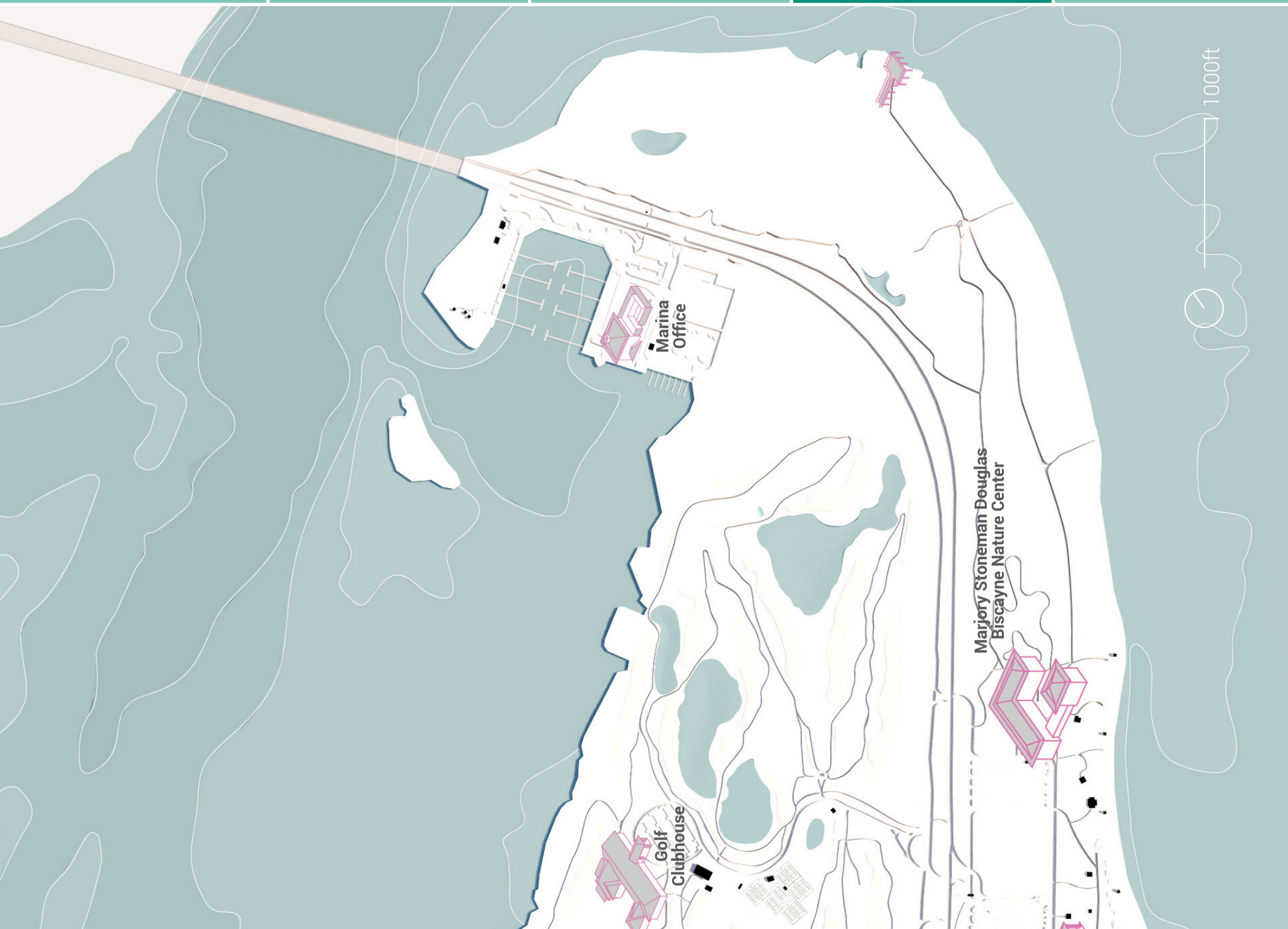
Recommendations

- **Enhance and restore the beaches:** Both C*randon Park: The Next Fifty Years* (1989) and Richardson's *Crandon Park Master Plan* (1993) proposed enhancement of the existing dune system. The 2000 document also called for numerous plantings of coconut palms along the beach, which would help stabilize the shoreline from erosion. Yet none of these recommendations were implemented. Today, the open beach and its dunes continue to erode. There are many resilient options available that have been utilized worldwide. Further studies based on an evaluation of the Park's existing conditions and unique design history are necessary in order to determine the best strategies for creating a resilient Park that honors its natural heritage.

- **Commission an environmental and hydrological consultant to conduct a topographical survey, plant and marine surveys, and analyze the site's erosion and degradation patterns:** It is crucial to assemble a group of experts to study and examine conditions and to evaluate options for making Crandon Park sustainable and resilient.

Park Structures & Site Furnishing




Marina Office
Marjory Stoneman Douglas Biscayne Nature Center
Golf Clubhouse
1000ft

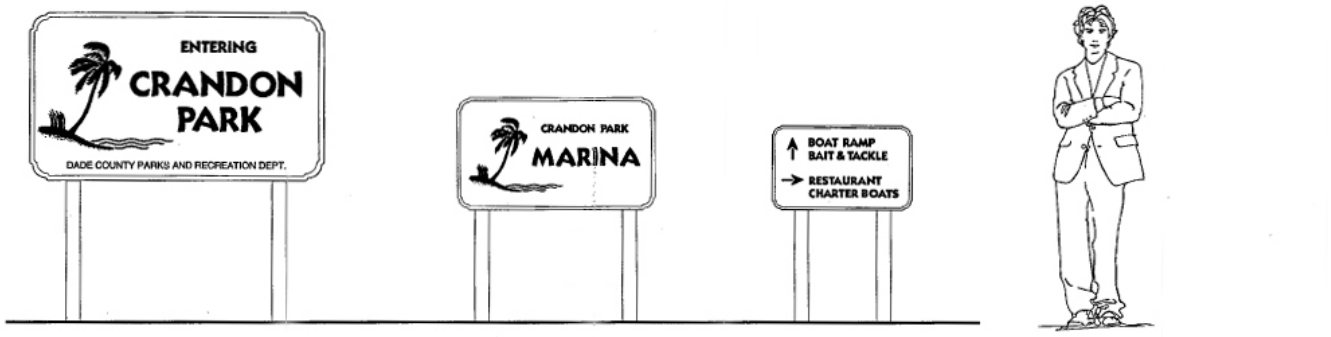
Park Structures & Site Furnishing

Analysis of Existing Situation

Park structures and site furnishings can function as attractors and useful touchstones in the landscape by creating memorable landmarks for visitors and by helping establish a unified identity unique to the Park. While many of the current park structures were built according to the South Florida Vernacular Architectural Style established by Richardson, there is an overall lack of visual unity and harmony in the site furnishing palette, signage, light design and others small-scale objects which are often generic and randomly distributed. In addition, much of the temporary signage is too diminutive and scattered.

Signage

Overall, the signage within Crandon Park is problematic, and compounds the site's egress/access issues. While the current graphic design of the existing signs shape one cohesive identity, their proportions are so small that they often appear dwarfed by the surrounding vegetation and are difficult to locate for pedestrians, cyclists and drivers alike. Secondly, many of the entrances have temporary signage that is scattered around so as to make it very difficult for general wayfinding and site orientation. In addition, their illogical distribution often makes the Park look unkempt. Part of the identity of a great park is reflected in its graphic image and hierarchy of signage and wayfinding.



Crandon Park's signage style, 1995 Master Plan

Welcome sign into Crandon Park is underwhelming

The entry signs on Crandon Blvd are not ideally located and are too small

Directional signage in fair condition

Bear Cut Preserve signage in fair condition

Nature trail signage in poor condition

Miami-Dade county signage throughout the site do not adhere to the standard style

Informational signs throughout site do not adhere to a standard style

Bear Cut Preserve informational signs are out-dated

Bear Cut Preserve informational kiosks are out-dated

Signs throughout the site for destinations and programs that do not exist

Caution signs are lost in the visual clutter created by all the other signage on site

Yet another signage style that is unsightly and out-dated

Temporary signage litters the site creating visual clutter

The vehicular signage is distracting, they visually dominate the park, which creates confusion for pedestrians

Protective dune signage is minimal and not easily noticed

Different Park rules throughout the site on different signs and sign styles

Yet another park rule on a different signage style

ADA signage in good condition

Different entry point into Crandon Gardens are closed and marked with signage

Many entrances into the beach parking lot are blocked and marked with signage

Temporary parking instruction signage sits in front of an abandoned pay kiosk

Temporary signage for pedestrian crossing is not a standard safety solution

Temporary signage for restricted areas accompanied by tape and ad hoc blockade

Yet another signage style

While in good condition and permanent, the pedestrian safety signage is lost in the mélange of vehicular signage

State of Florida health sign in good condition

Kiosks

Many of the parking lot structures are unused, such as the information kiosk at the Main Entry to the Beach Parking Lots and toll booths. This is largely because visitors pay for parking using digital apps today.

Pay stations and phone applications have replaced the function of the pay booths

Pay booths are no longer in use

Information Booth is rarely in use

Structure is abandoned and its function is replaced by temporary signage

Structures

Developed over the course of many years some facilities, like the Marina, Golf Course, Picnic Grounds, concession stands, bathhouse and restrooms were completed as part of Phillip's Vision (1942). However, others like the Tennis Center, Crandon Zoo (later Crandon Gardens), Calusa Park, and the Amusement Center were not part of the original vision. In addition to the above facilities, there are myriad utility and maintenance facilities scattered across the Park with little thought to their visual impact. They include the Florida Power and Light Company Substation (0.4 ac), the Park Service area (1.94 ac), and the Dade County Fire Station (0.58 ac).

Park offices in good condition, level of use unknown

The condition of existing structures falls into four categories: First, there are those designated for frequent public use, like the Golf Clubhouse, Marina facilities, Nature Center, cabanas, lifeguard stations, restrooms and bathhouses and are well maintained. Second, there are public facilities that are for public use, but are not well maintained and operationally defunct, like the Beach's food concessions, parts of the children's amusement area, the Tennis Stadium, areas of the Crandon Gardens (the petting zoo), and Parking Ticket Booths. Third, there are Park maintenance and utility facilities that are relatively well maintained, like the main Park Office, Fire Station and Substation. And forth, there are permanently closed or restricted structures that have been left to fall into decline and ruin like the zoo facilities in Crandon Gardens and some of the smaller Park Office buildings.

Golf Clubhouse is in fair condition, but out-dated

Nature Center is in good condition

Marina facilities are in good condition, but out-dated

Beach Cabanas are in fair condition and out-dated

Beach restroom facilities are in good condition

Tennis stadium is not in use

Most lifeguard stations are in good condition

Picnic shelter conditions vary, none were observed to be in-use during the week

Beach concessions in poor condition and not in use

Cabana benches in poor condition

Beach concessions not observed in use

Beach snack bar not observed in use

Watersports Center in fair condition

Beach picnic area not observed in high use

Play equipment in poor condition

Abandoned enclosure

Abandoned zoo structure

Crandon Garden pavilion not observed in use

Abandoned zoo structure

Abandoned zoo structure

Abandoned Playhouse at Calusa Park

Restroom structure at Calusa park in good condition

Fire station in excellent condition

Unknown structures by Cabana area in poor condition

Kayak rental area in poor condition

Various unknown structures scattered throughout the site

Since the current master plan was written, many of the existing facilities, which had an eclectic mix of contrasting architectural styles, were torn down and replaced according to "South Florida Vernacular Architectural Standards," which is elaborated on in Appendix A of the *Crandon Park Master Plan* (1995). In sum, structures built in this style are to be made of wood or reinforced concrete frames with exterior wood siding and gabled or hipped roof (with exposed trusses). Detailed guidelines for color codes and signage typologies and branding are also provided by Richardson. Although it depends on the limitations of each Specific Area, many of the existing structures also have very severe restrictions regarding the types of activities permitted, building footprint, location and size. In several instances, existing structures that have fallen into decay have never been rebuilt or repurposed (i.e. the Marina Restaurant and historic Playhouse). In such instances, this has resulted in the loss of major social and community program destination anchors.

Site Furnishings

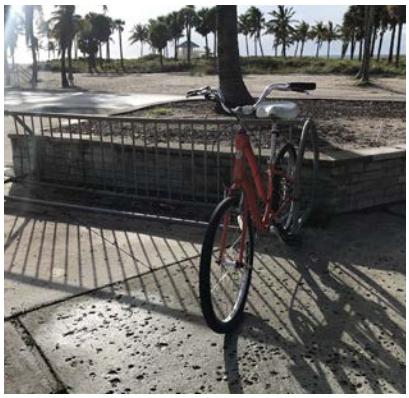
In contrast to the highly specific aesthetic of the Park's architectural structures, most of the Park furnishings are of standard design with no site-specific branding or identity. Indeed, any sign of branding or advertisement beyond reference to the Park or its specific flora and fauna is prohibited. Picnic tables, barbeque stands, trash receptacles and bicycles racks are scattered throughout the site and vary widely in the state of their condition.

Seating area by Nature Center in excellent condition, Coral stone features not used anywhere else within the Park





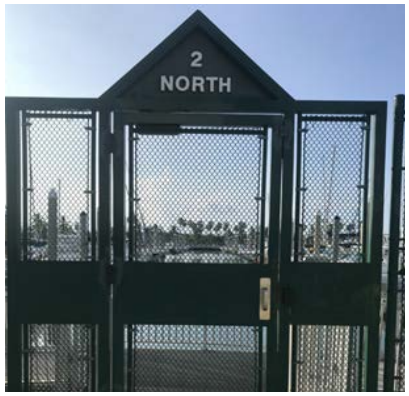


The Park hosts an array of furnishings with unrelated styles and materials, contributing to the fragmented identity of the site







Many different fence styles are found throughout the site, their conditions range from fair to poor






Many different light fixture styles are found throughout the site, the level and quality of light throughout the site also varies greatly












Many different bench styles are found throughout the site, most are in poor condition

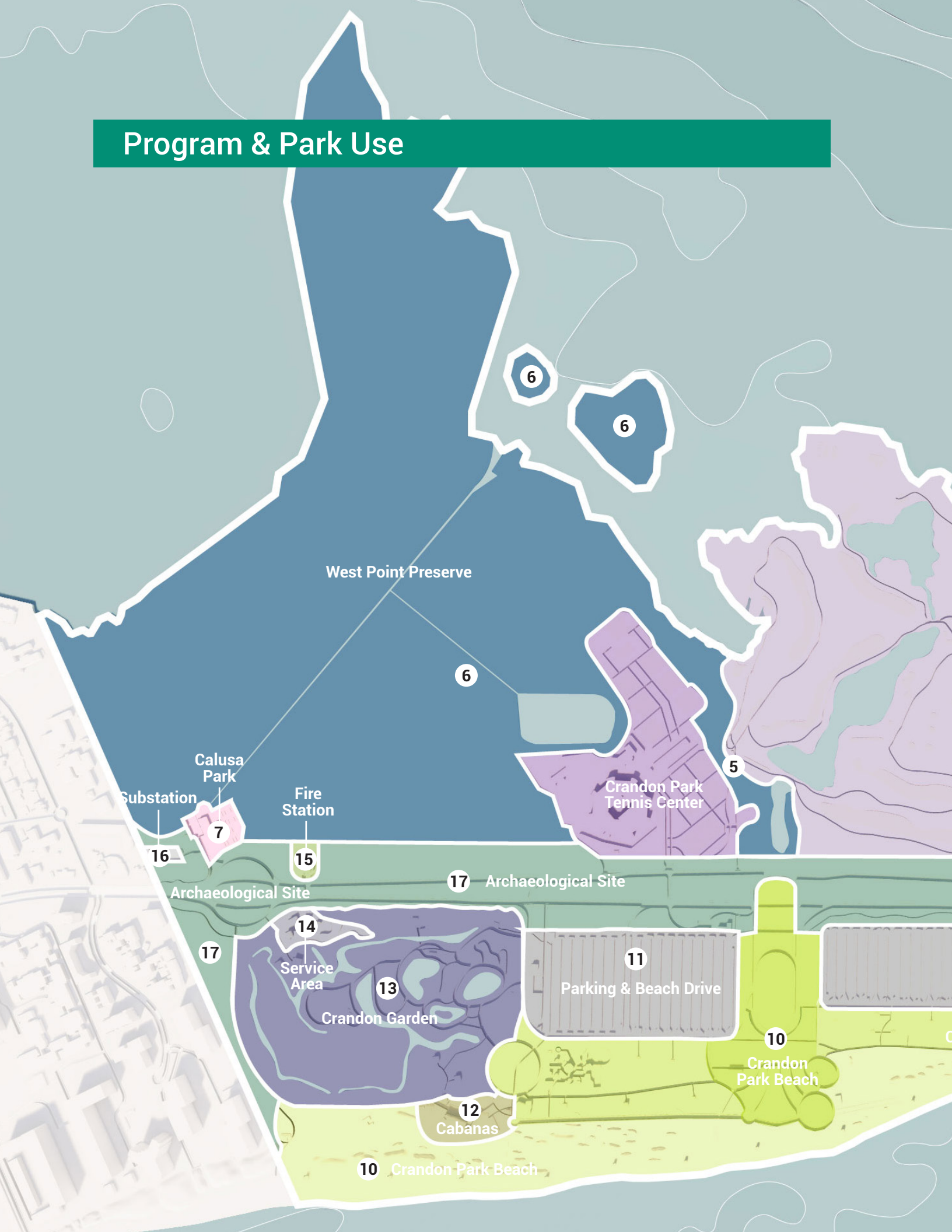
Findings

- **Signage has cohesive identity, is too small and is often placed randomly. being overtaken by the vehicular signage:**
- **Some kiosks are not in use and no longer needed.**
- **Some structures are in decline.**
- **Bathrooms are in good condition.**
- **Furnishings are inconsistent and lack continuity throughout.**

Recommendations

- **Maintain current signage typology, but upgrade and expand sizes and re-evaluate locations.**
- **Add and delete structures in a cohesive manner, that considers the larger site plan**
- **Upgrade or remove abandoned kiosks.**
- **Upgrade degrading structures.**
- **Install a cohesive suite of site furnishings and lighting design to unify the Park's identity.**

Program & Park Use




2
2
Crandon Park
Marina
4
Crandon Park
Golf Course
3
Ibis Preserve
8
Bear Cut Preserve
1
Crandon Boulevard
11
Parking &
Beach Drive
9
Nature
Center
17
Archaeological Site
Crandon Park Beach
10
1000ft

Program & Park Use

Analysis of Existing Situation

Whereas the topography provides the physical foundation of the Park's framework, its amenities and programmatic offerings have the potential to create critical social and cultural anchors for Key Biscayne residents and tourists alike. In essence, a park's program and amenity areas function as the organs of the Park. Crandon Park's amenity and program areas create a mosaic of active and passive park uses: swimming, golf, tennis, picnicking, boating, kayaking, fishing, bird-watching, and walking and biking along various nature trails. In its heyday during the 1950s and 60s, "Crandon Park was Miami's go-to family seashore."[41] Of the total 975 acres of park land, there are 17 Specific Areas or character zones as defined by Richardson in the *Crandon Park Master Plan* (1995).

41. James A. Kushlan and Kirsten Hines, *Images of America Key Biscayne* (Charleston, S.C: 2014), p. 67.

Specific Areas:

1. Crandon Boulevard
2. Crandon Park Marina
3. Ibis Preserve
4. Crandon Park Golf Course
5. Crandon Park Tennis Center
6. West Point Preserve
7. Calusa Park (originally titled Calusa Mangrove Trail)
8. Bear Cut Preserve
9. Marjory Stoneman Douglas Nature Center
10. Crandon Park Beach
11. Parking and Beach Drive
12. Crandon Park Cabanas
13. Crandon Gardens (former Crandon Zoo)
14. Crandon Park Service Area
15. Fire Station
16. Substation
17. Archaeological Sites

17. Archeological Sites (3 areas, boundaries undefiend)


1. Crandon Boulevard


2. Crandon Park Marina


3. Ibis Preserve


4. Crandon Park Golf


5. Crandon Park Tennis Center


6. West Point Preserve

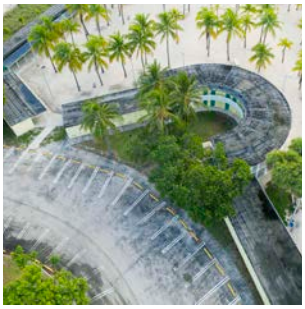

7. Calusa Park

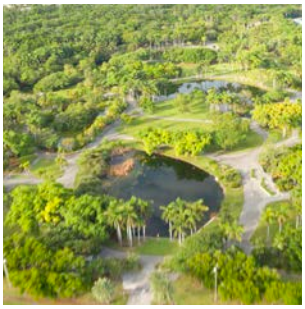

8. Bear Cut Preserve


9. Marjory Stoneman Douglas Nature Center


10. Crandon Park Beach


11. Parking & Beach Drive


12. Crandon Park Cabanas


13. Crandon Gardens


14. Crandon Park Service Area

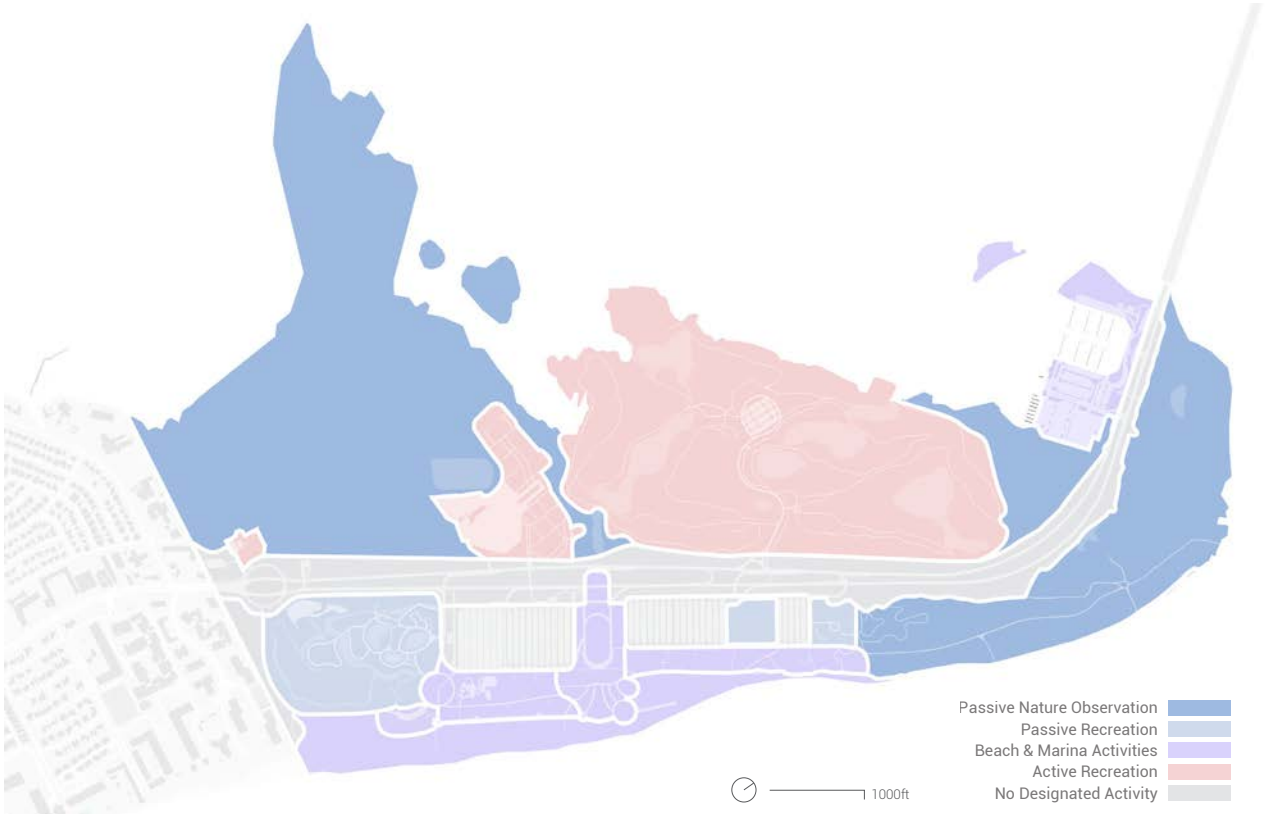

15. Fire Station


16. Substation

Program & Amenities

An overview of the distribution of active and passive programs and facilities reveals that while the programmatic offerings themselves are quite diverse and, even some like the Beach and Marina, are still major attractions, there are large overarching issues limiting the Park's use and enjoyment.

In the case of both active and passive programming, neither is performing optimally to meet contemporary park standards and current visitor needs.[42]



Active & Passive Program diagram

Crandon Boulevard, for instance, segregates the active and passive programs such that all of the active program areas — Golf Course, Tennis Center, and Calusa Park — are concentrated on the western side of the Boulevard, yet have few pedestrian or bike-friendly crossings. In addition, limitations on the maintenance and construction of existing and new facilities on the Golf Course and Tennis Center severely limit the Park's ability to be flexible to changing visitor needs. Finally, the West Point and Ibis Preserves, Mangrove Islands, and Rookery Island are currently inaccessible and appear to be completely unmaintained.

The following text summarizes the program distribution across the Park and definition of the types of activities permissible as described in the current Master Plan. For an in-depth analysis of each Specific Area, refer to Volume 2 | Part II - Specific Area Analysis.

Waterfront recreation - Crandon beach

42. Miami-Dade County defines a Model Park System as having the following qualities: "*Seamlessness, Beauty, Access, Equity, Sustainability, and Multiple Benefits.*" For the full description, see Miami-Dade County, Miami-Dade County Parks and Open Space System Master Plan (2007), p. 16.

Active Recreation
Golf, Tennis and Calusa Park

Approximately 248.76 ac or 25.5% of Crandon Park land is dedicated to active recreation. Highly active recreational areas include: The 18-hole championship Golf Course (213 ac), which fronts Biscayne Bay, is complete with a restaurant, pro shop, and ten tennis courts. The Tennis Center Complex (32 ac) holds 24 courts and a clubhouse, as well as a 7,500-permanent seat Stadium, which used to host the Miami Open, a 12-day tennis tournament, until 2018. Now the courts are for Park patrons only. Calusa Park (3.76 ac) is a small recreational community park with four tennis courts and restrooms, combined with a picnic shelter.

Active recreation is defined as "structured, organized and competitive tennis and golf tournaments sited within the Golf Course and Tennis Center Sites. Except during the Tennis Tournament . . . there shall be no activities of any kind unrelated to Tennis on the Tennis Center Site."[43]

Recreation court at Calusa Park is used frequently throughout the week

Tennis stadium no longer hosts organized events, but is used occassionally for informal play

Description

43. Richardson, *Crandon Park Master Plan* (1995), p. 45

Waterfront Recreation
Beach & Marina

About 118.38 ac or 12.1% of Crandon Park is dedicated to beach and marina-related programming, which is defined as "swimming, sunbathing, walking, jogging, family and informal or non-structured group gathering and sports, including football, soccer, volleyball and other similar activities."[44] Passive beach recreation areas include the Crandon Park Beach and Drive, which has 48 acres of palm-lined beaches that extend nearly two miles along the island's Atlantic Ocean side. Complementing the Beach is a nearby Family Amusement Center (3.68 ac) complete with a roller rink and playground. Visitors can also enjoy tree-shaded picnic tables with grills and shelters (30.7 ac), food concessions, beach volleyball courts, and a multi-purpose sports field.

According to the *Master Plan's* General Provisions the "Beach and Picnic Areas and the multi-purpose Sports Field shall be used for passive recreation only."[45] Cabanas for rental, restrooms, a bathhouse and lifeguard stations are also scattered along the coast to service beachgoers. And lastly, the 240-wet slip Marina (36 ac) is complete with a bait and tackle shop, diver's shop, charter boats and dry storage.

44. Richardson, *Crandon Park Master Plan* (1995), p. 45

45. Ibid

Kayak rental is available on weekends only

The Marina facility is used frequently during the weekends

Passive Recreation & Nature Observation
Nature Center, Crandon Gardens and Preserves

Approximately 499.9 ac or 51.2% of Crandon Park is dedicated to passive nature observation areas where 29% is accessible to the public. This includes the following: The Crandon Gardens (44.6 ac), which occupies the ruins of a former zoo (closed in 1980), contains two picnic shelters, meandering paths and swing lookouts. Repurposed as a tropical botanic garden, the Gardens contain a series of canals and small lakes for observation of exotic wildlife, including peacocks which escaped from the previous zoo and continued to live on site. This Specific Area is limited to "passive walking, canoeing, nature appreciation, social gathering, limited functional non-commercial art observation, and historical island interpretation."[46]

Crandon Gardens is rarely used during the week

The Bear Cut Preserve (133.4 ac) and Nature Center (875 sf) also provide a range of nature trails, an observation tower/ restroom pavilion, and boardwalk to the unique fossilized reef. The West Point Preserve and Mangrove Islands (292.4 ac) along the western and southwestern side of the park adjacent to the Tennis Center is a protected natural area with a five-acre lake dedicated only to passive nature observation activities.
Similarly, the Ibis Preserve, south of the Marina, provides 26 acres of protected wetland, as does the 3.5-acre Rookery Island off of the channel entrance near the Marina, on which all human visitation is prohibited.

The nature trails at Bear Cut Preserve are rarely used during the week

According to the *Crandon Park Master Plan's* General Provisions, the "Mangrove Islands, the Ibis Preserve, the West Point Preserve and the Bear Cut Preserve shall only be used for passive nature observation, with the exception of limited active recreational facilities at the West Point Preserve (Calusa Park) which are expressly described and permitted by [Richardson's] Plan."[47]

46. Richardson, *Crandon Park Master Plan* (1995), p. 45

47. Ibid

Nature Preserves

Primary Preserve Areas

About 455.3 ac or 46.7% of Crandon Park is designated as a preserve (Bear Cut, West Point & Mangrove Islands, Ibis, and Rookery Island) and "shall not be disturbed in the future (including disturbance by application of pesticides, herbicides or other chemicals); except when necessary to construct the boardwalks or remove invasive exotic, nuisance or feral animals and vegetation, and with the limited application of safe herbicides, to replace these with native flora and historic Coconut Palms."[48] Within the Bear Cut Preserve passive nature observation activities are permitted and visitors can enjoy several different types of nature trails and a paved bike path.

The Ibis Preserve allows passive nature observation activities, such as "limited marine grass and mangrove tours led by trained naturalists"[49]; however, no such tours seem to be currently offered nor are existing trails evident.

Mangrove nature areas are inaccessible to visitors

48. Richardson, *Crandon Park Master Plan* (1995), p. 49

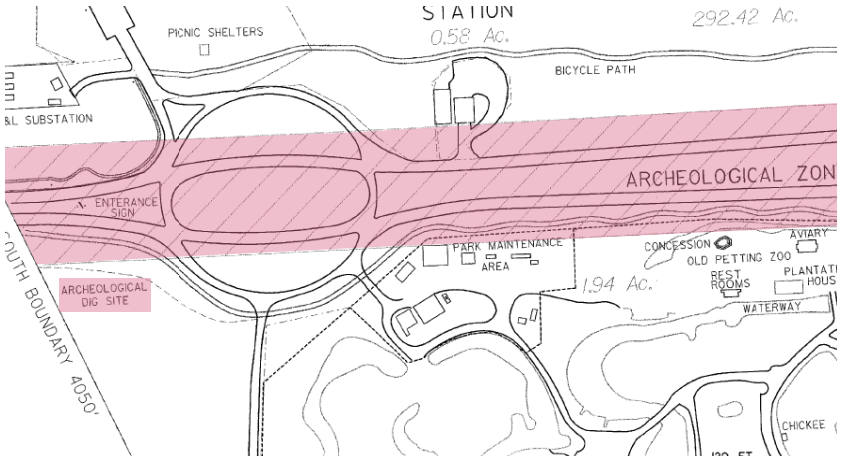
49. Richardson, *Crandon Park Master Plan* (1995), p. 62

Similarly, the West Point Preserve and Mangrove Islands are designated as passive nature observation areas where it is permissible for visitors to explore the canals and lake, "which are navigable by canoes and kayaks, and shall be maintained and remain open to the public, with limitations and with the guidance of trained naturalists."[50] The current *Master Plan* proposes the construction of a Calusa Mangrove Trail, a 3,500 foot-long boardwalk that would "provide an interpretative and sensory excursion westward into the mangroves with vistas of Biscayne Bay and offering native variety to the Crandon Park experience." [51] However, as with the Ibis Preserve, none of these nature learning or sensory experiences is offered or advertised. These areas thus seem wholly disconnected from the rest of the Park, which further underscores the visual and programmatic disconnection between the eastern and western sides of the Park.

Other Sensetive Areas

Archaeological Zones

Although neither is demarcated nor publicly accessible, there are also three Native American archaeological sites, which were discovered following the aftermath of Hurricane Andrew in 1992: the Bear Cut Dune Site (8DA5247), the Crandon Median Site (8DA5248), and the Crandon Dune Site (8DA5249).[52] These areas are protected zones. Any future changes pertaining to these areas should be made in consultation with an Archaeologist.



Archeological Zone and Archelogical Dig Site projected in Crandon Park Master Plan (1995)

50. Richardson, *Crandon Park Master Plan* (1995), p. 77

51. Richardson, *Crandon Park Master Plan* (1995), p. 78

52. Richardson, *Crandon Park Master Plan* (1995), p. 31-32

Boardwalk in Bear Cut Preserve leads to the unique fossilized reef, this path was not observed in use

Findings

- **The Park's program areas are isolated from one another:** The current allocation of active and passive amenity spaces are not unified, largely because of the split caused by Crandon Boulevard. Destination areas such as the Golf Course's Clubhouse and parking lot are also embedded deep within, making them difficult to access from the eastern side of the Park. In addition, inter-park pedestrian and bicyclist circulation between these different program areas is limited, making it difficult for visitors to travel from one part unless by car

- **The majority of passive recreation and nature observation zones are either inaccessible or in poor condition:** Except for the Bear Cut Preserve, Crandon Gardens and Nature Center, all of the other natural preserve areas are not accessible to public despite the fact that the current *Master Plan* designates them as areas for nature observation. This accounts for approximately 29% of the Park that is not currently open to visitors. In addition, passive recreation areas, such as Crandon Gardens, have become increasingly abandoned and dilapidated, making them unattractive destinations for Park visitors. Other sensitive areas, such as the three archaeological zones on site appear to be not well protected and are not identified through interpretive signage.
- **The majority of active recreation areas do not adequately serve local constituent recreation need:** Since the Miami Open changed venue, the Tennis Center complex has lost the primary purpose of its function. Its gigantic stadium and many tennis courts are not suitable for recreational tennis. However, restrictions imposed by the current Master Plan do not allow for this program area to adapt to meet shifting local constituent needs or improve its facilities like the Clubhouse. Instead, the land of the Tennis Center is poised to return to wetland.

The Village of Key Biscayne's Calusa Park is a community park that currently does not adequately serve its constituents needs and has not been permitted to adapt to meet the times. In addition, the Golf Course has not been well-maintained and is not protected from sea-level rise or storm surges.

- **The current Master Plan places stringent terms on the types of permissible activities:** Restrictions originally written into the 1993 Settlement Agreement between the County and Matheson Family were carried forward into the current *Master Plan*, limiting the types of activity that can occur within different Park zones. While some of these measures have ensured the protection and preservation of sensitive environmental zones, which was appropriate for the time following the disastrous aftermath of Hurricane Andrew, these areas are not well managed for invasive species. In addition, highly prescriptive lists of permissible activities do not allow for the Park to adapt to current community needs and interests.

Recommendations

- **Enhance pedestrian and bicycle circulation between the different Park program areas:** Creating an inter-park network or loop for pedestrians, bicycles and other forms of sustainable mobility will help create spatial unity within the Park. In addition, promoting these "greener" forms of transport also contribute to contemporary park standards to create healthy, environmentally-friendly and equitable access for all Park visitors to enjoy.

- **Balance the protection of sensitive environmental areas and habitats and people's access to nature:** By working with an Environmental Consultant and also understanding the recreational needs of constituents, the Park should attempt to find an equilibrium that best addresses both of the needs from nature and the community. One first step could be implementing the current Master Plan's recommendation to create boardwalks or trail networks that will bring visitors into the natural preserves. These could be led by trained naturalists. Bear Cut and the adjoining Nature Center already offer excellent opportunities for school children and Park visitors to learn more about the island's coastal ecology.

- **Understand and work with constituents on creating active recreation amenities that serve present community needs:** Active areas such as the Tennis Center, Golf Course and Calusa Park must be allowed to be able to respond and adapt to the changing needs of its visitors. Community surveys and public discussions can help facilitate a dialogue with key decision-makers to take the next steps for creating a tailored program that fits the Parks diverse constituents and finding a balance to meet the varying needs.

- **Create flexible Park policies that accommodate for Park development and growth:** Based on the findings from the Park's economic analysis, current capacities and traffic analysis, a new set of policies should be devised to help the Park develop and grow to meet current times.

Summary

Synthesis of Findings & Recommendations

Cyclists along the Crandon Beach Promenade

The Team's study of Crandon Park renders the following summary of Key Findings and Recommendations. These pertain to the five Framework Components and seventeen Specific Areas. Suggestions for means of conducting quantitative analysis are also provided.

Synthesis of Findings & Recommendations

- **The Park Needs to Create a Cohesive Identity and Unity:** Phillips's ***Vision Plan*** (1942) established a strong formal axis along Crandon Boulevard off of which programmed areas were clearly tied to and looped back into one another. But the current distribution of the program seems generally disconnected and fragmented. By creating a strong, clearly articulated spatial and visual connectivity between the various program areas, Crandon Park will strengthen its internal network and its anatomy of program areas. This will create a more healthy and unified cultural landscape.

- **The Park Must Manage Vegetation Overgrowth and Natural Preserves:** Over the years, carefully curated moments throughout the Park — once part of Phillips's vision — have been gradually lost, or have been overtaken by unbridled vegetation. Areas like the median in Crandon Boulevard have also lost their original landscape character, having originally been planted as rows of coconut palms. Over time, these areas have been gradually replaced with dense native plantings that obscure key visual relationships and view corridors. It is critical to identify key moments to recapture and frame intended views of the surrounding landscape. This will help orient visitors and enrich their Park experience. This will also help better knit back together program areas that are currently segregated and lack connectivity with each other. In addition, developing and monitoring a plan for vegetation management and renewal is as essential in developing a stewardship strategy. Removing overgrowth will allow the natural preserve areas to be more accessible for visitors to engage with and observe nature.

- **Create a Contiguous Circulation System and Improve Bike and Pedestrian Connectivity:** Crandon Park as a whole lacks a cohesive circulation structure that provides a hierarchy for the Specific Areas and sequence of Park experiences. Crandon Boulevard bisects the Park, splitting its eastern and western halves in a way that segregates its program areas. Further, insufficient and poorly designed bike and pedestrian connections between the two sides have further divided the Specific Areas, while placing an increased emphasis on vehicular circulation. By introducing greater safety measures for cyclists and pedestrians, while also streamlining vehicular circulation and parking, and articulating a hierarchy for bike and pedestrian networks, visitors will enjoy far greater opportunities for freedom of safe movement among the Park's program areas.

- **Minimize Coastal Erosion and Boost Resiliency:** As a barrier island confronting ever-increasing environmental pressures from sea-level rise and storm surges, Crandon Park's shoreline suffers from accelerating erosion, particularly near Bear Cut and along its Beach. By studying the existing topography of the coastline and enhancing the existing dune system and beach shoreline, Crandon Park will not only preserve and protect its own natural assets and facilities, but will also serve a greater purpose by creating a more resilient edge for Miami itself.

- **Create Flexible Programming that Meets the Needs of Today's Patrons:** Crandon Park is approaching three-quarters of a century since its opening day. Over time, its program has changed to meet the various needs of Park users. Limitations that have gone unchallenged for a quarter century that are a part of the current *Crandon Park Master Plan* should be re-evaluated today., In order for Crandon Park to successfully serve its present-day visitors, it too must evolve in a way that honors its mission while also meeting the needs of all.

- **Optimize Opportunities for Stewardship and Learning:** While the Nature Center offers a variety of educational opportunities to the locals and visitors in Miami-Dade County about the unique environmental assets of Crandon Park, many of the preserve areas that were originally designated for nature observation have suffered from years of deferred maintenance where nature has been allowed to take its course, so much so that they have become inaccessible for the public. Unfortunately, the current *Master Plan* remains inflexible to alternate forms of stewardship and engagement that limits any access at all. By opening up limited public access to other preserve areas in the park and curating appropriate programming, Crandon Park has the chance to become a better understood and valued ecological jewel in Miami-Dade County's collection of parks and open spaces.

- **Improve the Operational Performance of Amenities and Maintenance to Existing Park Structures and Furnishings:** As Crandon Park has changed over time, many of the earlier facilities have become dysfunctional or fallen into decay. Whether it is by means of adaptively reusing or by tearing down and building new facilities, the continued upkeep and maintenance of the Park's facilities is fundamental to establishing a baseline for its operations and future success.

The Need for Quantitative Analysis

- **A Topographical Survey** is necessary to collect information about the natural and cultural features of the land as well as its elevations. This is absolutely critical to better understand and to inform any future decisions for restoring and renewing the Park's eroding shoreline, identifying potential upland areas, maintaining the dune system, as many other rehabilitation efforts. In particular a number of Specific Areas may require more detailed survey work since slight changes in elevation can greatly impact changes in the Park's ecology and vulnerability to sea-level rise and flooding. These detailed surveys will need to be conducted on an as-need basis.

- **A Traffic Analysis** is critical for analyzing current traffic patterns and conflicts, as well as for an understanding of contemporary parking needs, alternatives, and capacities. In addition, it is also necessary for identifying dangerous points of conflict in the circulation network between cars, bikes and pedestrians.

- **An Environmental and Hydrological Analysis** will help capture the current ecological and marine profile of Crandon Park. It has been thirty years since the last vegetation analysis was conducted in the Park, which while it was very thorough, is outdated. In order to determine an appropriate management strategy to deal with the mix of exotic and native species, an accurate current understanding is essential. In addition, Crandon Park's complex history of landmaking and/or regrading makes it difficult to assess which areas are natural and which have been human-made. In addition to documenting native and exotic flora and fauna, an environmental impact survey is also critical, especially for evaluating the condition of areas like the Tennis Center, which sits on a former landfill. The available sources used to research this Report, however, provide little documentation of the landfill. An environmental impact survey will help decision-makers understand what types of remediation efforts may be necessary.

- **A Vegetation Survey** is required to accurately surmise the current status of native and invasive flora species. While onsite observations can indicate the presence of a number of invasive species, a current vegetation survey is essential and could provide a quantitative portrait of the situation today. This foundation knowledge will help determine the Park's ecological performance today as well as enable the Park's maintenance staff to adjust and refine current management and maintenance planning efforts to address invasive species.

- **Expert Opinions from Ecologists, Hydrologists and Marine Biologists will help elucidate the delicate and complex nature** of Crandon Park's coastal ecosystem, hydrology, and marine ecology. Considering that the Park is the only place in the world with a fossilized reef exists speaks to the uniqueness and significance of the resource. Consultation with the appropriate marine experts will help inform any future recommendations.

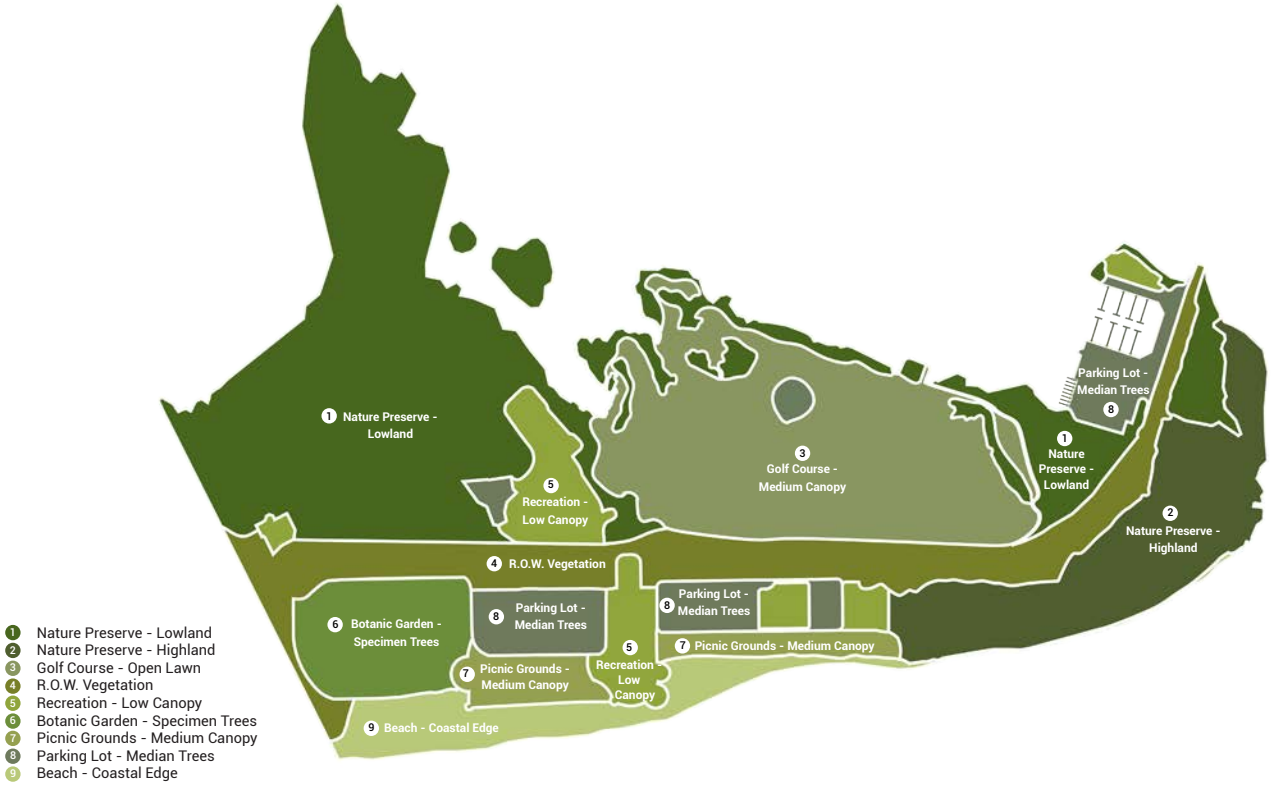
- **An Economic and Operations Analysis** of the Park's current funding model is needed in order to assess the Park's economic health and performance. In addition, this analysis would offer insight into how the Park's current revenue sources could be modified or improved to help strengthen management, maintenance and ongoing stewardship efforts.

- **Community Engagement** is needed from members of the Miami-Dade County, the Village of Key Biscayne and other local and regional partners to understand current Park user's needs in terms of desired programming, universal access and equity. This information is absolutely critical for understanding current carrying capacities and ensuring that Crandon Park is fulfilling its mission to create a park for the people: "The Crandon Park Lands belong, for all time, to the people of Dade County, so that every man, woman and child, rich or poor, who frequents the Crandon Park Lands, may say "this is my park and I have a right to be here."[53]

53. Richardson, *Crandon Park Master Plan* (1994), p.3.

Tree Catalog

Landscape Typologies Overview



1. Nature Preserve - Lowland
Australian Pine *Casuarina equisetifolia*
Black mangrove *Avicennia germinans*
Red mangrove *Rhizophora mangle*
White mangrove *Laguncularia racemosa*

2. Nature Preserve - Highland
American persimmon *Diospyros viginiana*
Australian Pine *Casuarina equisetifolia*
Blolly *Guapira discolor*
Brazilian pepper *Schinus terebinthifolius*
Crabwood *Ateramnus lucidus*
Darling plum *Reynosia septentrionalis*
Gumbo Limbo *Bursera simaruba*
Hercules club *Zanthoxylum clava-herculis*
Inkwood *Exothea paniculata*
Lancewood *Nectandra coriacea*
Mahogany *Swietenia mahagoni*
Poisonwood *Metopium toxiferum*
Redbay *Persea borbonia*
Sabal palm *Sabal palmetto*
Satin leaf *Chrysophyllum oliviforme*
Sea grape *Coccoloba uvifera*
Silver buttonwood *Conocarpus erectus - sericeus*
Silver palm *Coccothrinax argentata*
Strangler fig *Ficus aurea*

3. Golf Course - Open Lawn
Coconut palm *Cocos nucifera*
Gumbo Limbo *Bursera simaruba*
Mahogany *Swietenia mahagoni*
Royal palm *Roystonea regia*
Sabal palm *Sabal palmetto*

4. R.O.W. Vegetation
Australian Pine *Casuarina equisetifolia*
Coconut palm *Cocos nucifera*
Everglades Palm *Acoelorrhaphe Wrightii*
Green buttonwood *Conocarpus erectus*
Gumbo Limbo *Bursera simaruba*
Mahogany *Swietenia mahagoni*
Pygmy Date Palm *Phoenix Roebelenii*
Royal palm *Roystonea regia*
Sabal palm *Sabal palmetto*
Saw palm *Saw palmetto*
Sea grape *Coccoloba uvifera*
Silver buttonwood *Conocarpus erectus - sericeus*

5. Recreation - Low Canopy
Banyan *Ficus benghalensis*
Coconut palm *Cocos nucifera*
Kapok *Ceiba pentandra*
Pygmy Date Palm *Phoenix Roebelenii*
Royal palm *Roystonea regia*
Sea grape *Coccoloba uvifera*
Shortleaf fig *Ficus citrifolia*
Silver buttonwood *Conocarpus erectus*
Strangler fig *Ficus aurea*

6. Botanic Garden - Specimen Trees
Carambola *Averrhoa carambola*
Coconut palm *Cocos nucifera*
Copper Pod *Peltophorum pterocarpum*
Floss Silk *Chorisia speciosa*
Gumbo Limbo *Bursera simaruba*
Jacaranda *Jacaranda mimosifolia*
Kapok *Ceiba pentandra*
Live oak *Quercus virginiana*
Mahogany *Swietenia mahagoni*
Pygmy Date Palm *Phoenix Roebelenii*
Red silk cotton *Bombax ceiba*
Royal palm *Roystonea regia*
Royal Poinciana *Delonix regia*
Sabal palm *Sabal palmetto*
Shortleaf fig *Ficus citrifolia*
Silver palm *Coccothrinax argentata*
Strangler fig *Ficus aurea*
Wild Tamarind *Lysiloma latisiliquum*
Yellow Shower *Cassia fistula*
Yellow Trumpet Tree *Handroanthus Chrysanthus*

7. Picnic Grounds - Medium Canopy
Brazilian pepper *Schinus terebinthifolius*
Coconut palm *Cocos nucifera*
Gumbo Limbo *Bursera simaruba*
Kapok *Ceiba pentandra*
Pygmy Date Palm *Phoenix Roebelenii*
Sabal palm *Sabal palmetto*
Sea grape *Coccoloba uvifera*
Silver buttonwood *Conocarpus erectus*

8. Parking Lot - Median Trees
Bauhinia *Bauhinia variegata*
Black olive *Bucida buceras*
Brazilian pepper *Schinus terebinthifolius*
Chinese flower *Magnolia Liliiflora*
Darling plum *Reynosia septentrionalis*
Golden shower *Cassia fistula*
Gumbo Limbo *Bursera simaruba*
Oleander *Nerium oleander*
Sabal palm *Sabal palmetto*
Pongam *Pongamia pinnata*
Tahitian flower almond *Terminalia catappa*
Wild Tamarind *Lysiloma latisiliquum*

9. Beach - Coastal Edge
Coconut palm *Cocos nucifera*
Silver buttonwood *Conocarpus erectus*
Sea grape *Coccoloba uvifera*

Tree catalogue source: Appendix J of the Crandon Park Master Plan (1995).

Red Mangrove
Rhizophora Mangle

Category: native
Landscape zone: 1*
Canopy width: 30'
Trunk: multistem

Black Mangrove
Avicennia Germinans

Category: native
Landscape zone: 1*
Canopy width: 20'
Trunk: multistem

White Mangrove
Laguncularia Racemosa

Category: native
Landscape zone: 1*
Canopy width: 20' - 30'
Trunk: multistem

Silver Buttonwood
Conocarpus Erectus - Sericeus

Category: native
Landscape zone: 2*/ 4 / 5 / 7 / 9
Canopy width: 20'
Trunk: multistem

Australian Pine
Casuarina Equisetifolia

Category: invasive
Landscape zone: 1 / 2*/ 4
Canopy width: 15' - 35'
Trunk: single stem

Mahogany
Swietenia Mahagoni

Category: non-native
Site location: 2*/ 3
Canopy width: 40' - 60'
Trunk: multistem

American Persimmon
Diospyros Virginiana

Category: native
Landscape zone: 2*
Canopy width: 25'
Trunk: single stem

Blolly
Guapira Discolor

Category: native
Landscape zone: 2*
Canopy width: 10'
Trunk: multistem

Inkwood
Exothea Paniculata

Category: native
Landscape zone: 2*
Canopy width: 20'
Trunk: multistem

Satin Leaf
Chrysophyllum Oliviforme

Category: native
Landscape zone: 2*
Canopy width: 20'
Trunk: single stem

Redbay
Persea Borbonia

Category: non-native
Landscape zone: 2*
Canopy width: 40'
Trunk: single stem

Crabwood
Ateramnus Lucius

Category: native
Landscape zone: 2*
Canopy width: 10'
Trunk: single stem

Lancewood
Nectandra Coriacea

Category: native
Landscape zone: 2*
Canopy width: 15'
Trunk: single stem

Poisonwood
Metopium Toxiferum

Category: native
Landscape zone: 2*
Canopy width: 10'
Trunk: multistem

Darling Plum
Reynosia Septentrionalis

Category: non-native
Landscape zone: 2*/ 8
Canopy width: 12'
Trunk: single stem

Hercules Club
Zanthoxylum Clava-herculis

Category: native
Landscape zone: 2*
Canopy width: 20'
Trunk: single stem

Everglades Palm
Acoelorrhaphe Wrightii

Category: native
Landscape zone: 4*
Canopy width: 25'
Trunk: single stem

Royal Palm
Roystonea Regia

Category: native
Landscape zone: 3 / 4*/ 5 / 6
Canopy width: 25'
Trunk: single stem

Green Buttonwood
Conocarpus Erectus

Category: native
Landscape zone: 4*
Canopy width: 20'
Trunk: single stem

Banyan
Ficus Benghalensis

Category: non-native
Landscape zone: 5*
Canopy width: 80'
Trunk: multistem

Shortleaf Fig
Ficus Citrifolia

Category: native
Landscape zone: 5*/ 6
Canopy width: 45'
Trunk: multistem

Strangler Fig
Ficus Aurea

Category: non-native
Landscape zone: 5*
Canopy width: 40'
Trunk: multistem

Kapok
Ceiba Pentandra

Category: non-native
Landscape zone: 5*/ 6
Canopy width: 50'
Trunk: single stem

Silver Palm
Coccothrinax Argentata

Category: native
Landscape zone: 2 / 6*
Canopy width: 5'
Trunk: single stem

Live Oak
Quercus Virginiana

Category: native
Landscape zone: 6*
Canopy width: 70'
Trunk: single stem

Carambola
Averrhoa Carambola

Category: non-native
Landscape zone: 6*
Canopy width: 25'
Trunk: single stem

Red Silk Cotton
Bombax Ceiba

Category: non-native
Landscape zone: 6*
Canopy width: 50'
Trunk: single stem

Floss Silk
Chorisia Speciosa

Category: non-native
Landscape zone: 6*
Canopy width: 45'
Trunk: single stem

Royal Poinciana
Delonix Regia

Category: non-native
Landscape zone: 6*
Canopy width: 50'
Trunk: single stem

Jacaranda
Jacaranda Mimosifolia

Category: non-native
Landscape zone: 6*
Canopy width: 25'
Trunk: single stem

Yellow Trumpet Tree
Handroanthus Chrysanthus

Category: non-native
Landscape zone: 6*
Canopy width: 25' - 35'
Trunk: single stem

Copper Pod
Peltophorum Pterocarpum

Category: non-native
Landscape zone: 6*
Canopy width: 35'
Trunk: single stem

Sea Grape
Coccoloba Uvifera

Category: native
Landscape zone: 4 / 5 / 7*/ 9
Canopy width: 20' - 40'
Trunk: multistem

Gumbo Limbo
Bursera Simaruba

Category: native
Landscape zone: 2 / 3 / 4 / 6 / 7*/ 8
Canopy width: 30'
Trunk: multistem

Pygmy Date Palm
Phoenix Roebelenii

Category: non-native
Landscape zone: 4 / 5 / 6 / 7*
Canopy width: 6' - 8'
Trunk: single stem or clumped

Brazilian Pepper
Schinus Terebinthifolia

Category: invasive
Landscape zone: 2 / 7* / 8
Canopy width: 15' - 25'
Trunk: single stem

Golden Shower
Cassia Fistula

Category: non-native
Landscape zone: 8*
Canopy width: 15' - 25'
Trunk: single stem

Black Olive
Osmanthus Buceras

Category: non-native
Landscape zone: 8*
Canopy width: 35' -
Trunk: single stem

Bauhinia
Bauhinia Variegata

Category: non-native
Landscape zone: 8*
Canopy width: 30'
Trunk: single stem

Wild Tamarind
Lysiloma Latsiliquum

Category: native
Landscape zone: 6 / 8*
Canopy width: 35'
Trunk: single stem

Tahitian Flower Almond
Terminalia Catappa

Category: non-native
Landscape zone: 8*
Canopy width: 40'
Trunk: single stem

Pongam
Pongamia Pinnata

Category: non-native
Landscape zone: 8*
Canopy width: 20'
Trunk: multistem

Chinese Flower
Magnolia Lilliflora

Category: non-native
Landscape zone: 8*
Canopy width: 12'
Trunk: multistem

Sabal Palm
Sabal Palmetto

Category: native
Landscape zone: 2 / 3 / 4 / 6 / 7 / 8*
Canopy width: 15' - 25'
Trunk: single stem

Coconut Palm
Cocos Nucifera

Category: non-native
Landscape zone: 3 / 4/ 5 / 6 / 7 / 9*
Canopy width: 25'
Trunk: single stem

***Right**: Shaded Picnic Grounds near Crandon Beach*

Credits

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See *Crandon Park: A Call for Change - Executive Summary* for full list of Acknowledgments.

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