

Rapid Assessment of Native Coastal Uplands at Red Reef Park, Boca Raton, Florida

George D. Gann

March 29, 2021



Submitted by:
The Institute for Regional Conservation
100 East Linton Boulevard, Suite 302B
Delray Beach, FL 33483



Submitted to:
Greg Stevens & Lindsey Nieratka
City of Boca Raton
201 W. Palmetto Park Road
Boca Raton, Florida 33432

Executive Summary

Red Reef Park is a valuable asset of the City of Boca Raton of regional and state-wide ecological importance. It contains important recreational space, including a golf course, access to the beach along the Atlantic Coast, boardwalks and nature trails, as well as the Gumbo Limbo Nature Center, where important work on sea turtles and other marine life is conducted. It also contains highly important remnant patches of native coastal ecosystems containing many rare and threatened species of native plants and animals. While many natural features and species remain, there have also been significant losses, including the almost complete loss of the shrubby coastal strand community due primarily to a lack of recognition of its ecological value. Management challenges are many including the persistent and growing problem of nonnative species, which have increased in diversity by an order of magnitude since preliminary surveys were conducted in the mid-1970s. Nevertheless, Red Reef Park retains significant natural values, including intact beach dune communities along the entire length of the park, and the preservation of portions of the historic Boca Raton Hammock in association with the Gumbo Limbo Nature Center. Opportunities for ecological restoration abound, including the removal of invasive plants, and the planting of appropriate native plants in conformance with best practices for ecological restoration. Rare plant species, in particular, can be augmented or reintroduced, thus bolstering the biological diversity of this important site. The assessment documented in this report will be followed by the development of restoration and management recommendations for Red Reef Park, including how best to incorporate participation by volunteers and community members.

Introduction

The assessment of coastal uplands at Red Reef Park, Boca Raton, Florida was jointly developed by the Boca Raton Recreation Services Department, the City's Office of Sustainability, and the Institute for Regional Conservation (IRC), as the first component of a three-part agreement (PO 070701). This report, which documents findings of the assessment, provides the foundation for the development of best practices and management recommendations for the restoration and long-term management of native coastal upland ecosystems at Red Reef Park, including beach dune, coastal strand, and tropical hammock forest. In addition, this assessment will be used to help develop a volunteer program for community groups, school groups, and others interested in participating in restoration and management efforts at the Park. The primary goal of the overall project is to establish best management practices that utilize both staff and community volunteers in the restoration of native biodiversity to native dunes, coastal strand, and tropical hammock forests. Of particular importance is the development of management practices that inhibit the re-establishment of invasive species and reduce the use of or need for harsh chemicals or expensive mechanical removal. This work is being conducted in partnership with IRC's [Restoring the Gold Coast program](#), which aims to restore the biological diversity of coastal uplands in southern Palm Beach County through the augmentation and reintroduction of rare native plants, removal of invasive vegetation, and other ecological restoration activities.

Methods

As established in the agreement, we compiled historical data, anecdotal evidence, and documented new observations of plant species present, habitats present and their health, and management practices by the City and community volunteers at Red Reef Park, including Gumbo Limbo Nature Center. A kick-off meeting was held in November 2019 to refine the scope of work, collect pertinent information, and identify key resources with the City. Attending were George Gann of IRC, Michael Kalvort (Recreation Services Director), Greg Stevens (Recreation Services Superintendent), Drew Leganik (Park Maintenance Administrator), Leanne Welch (Gumbo Limbo Nature Center Manager), and Lindsey Nieratka (Sustainability Manager). Topics of concern included coordination with other conservation programs (e.g., reintroduction of federally endangered beach clustervine [*Jacquemontia reclinata*]), nonnative animals, and the history of invasive species control at the park.

Site surveys were conducted by George Gann on December 5 and 31, 2019, and January 16, 2020. During the initial site visit, an orientation was conducted with Greg Stevens and Singletary Kinlaw of the Recreation Services Department. Over the three visits, the entire site was walked, including the boardwalk system and golf course surrounds on both sites of A1A, the interior of much the tropical hammock forest in the northeastern section of the park, the beach dune, and remnant patches of historical coastal strand. Plant species encountered throughout the park, including both natural and landscaped areas, were recorded and data collected were compared to those recorded by previous surveys. Plant names and data reported here are consistent with the [Floristic Inventory of South Florida](#) (FISF) database online (Gann et al. 2021), which has been maintained by IRC continuously since 2001. Plant data for [Red Reef Park](#) already available on the FISF were updated with information collected during this project.

Results

Historical Background

The native coastal upland ecosystems of the City of Boca Raton have long been recognized as regionally important for their biological diversity and rare native plants (Austin & Coleman-Marois 1976, Austin et al. 1977, Cox 1988, USFWS 1996, Austin et al. 1997, Gann et al. 2002). The early works by Austin and colleagues focused on the coastal uplands associated with the historic Boca Raton Hammock, which comprised what is now Red Reef Park (including Gumbo Limbo Nature Center), South Beach Park, and areas now developed on private properties. Descriptions of vegetation and species lists were produced for the native beach dune, coastal strand, tropical hammock forest, and mangrove communities, as well as for disturbed sites. It was noted that important freshwater wetlands had already been lost by the mid-1970s due to salination of Lake Wyman and associated water bodies. In 1979, a comprehensive plan for Red Reef Park was published (Reynolds, Smith, and Hills Architects, Engineers, Planners, Incorporated, and Rett Roy Landscape Architect, Planner, Inc.) and significant multi-use site development has taken place since that time. These developments included removal of invasive Brazilian-pepper (*Schinus terebinthifolius*) trees and the installation of native trees, shrubs, and

groundcovers between the parking lot and the dune crest in the northeastern section of the park as outlined in the 1994 Dune Restoration plan.

Overview of Condition of Native Ecosystems

The historic upland ecosystems of Red Reef Park have been heavily modified, yet high quality beach dunes (Fig. 1) and tropical hammock forests (Fig. 2) remain. These two ecosystems contain many rare native plant species and provide significant habitat for native wildlife including butterflies and other invertebrate pollinators, and birds. Unfortunately, the coastal strand (or shrub zone) ecosystem has been nearly lost primarily due to a lack of understanding of its ecological value. Direct causes of loss include park development (e.g., golf course, roadways and parking lots, buildings, paths and boardwalks), the planting of native trees and shrubs as part of the 1994 Dune Restoration plan; Fig. 3-4), the expansion of seagrapes (*Coccoloba uvifera*), the invasion of nonnative plants, and fire exclusion (see Austin et al. 1977). Nearly throughout, native ecosystems are impacted and threatened by invasive plants, nonnative animals, and fragmentation. Some native plant diversity documented in the past, including listed species, has been lost, and native animals are threatened by feral cats (Florida Fish and Wildlife Conservation Commission 2021). Potentially, other nonnative wildlife (e.g. green iguana) threaten both native plants and animals.



Figure 1. Beach Dune ecosystem at Red Reef Park looking to the south from about the midpoint. Note dominance of seagrape (*Coccoloba uvifera*) extending downward from dune crest.



Figure 2. Edge of dense tropical hammock forest north of Gumbo Limbo Nature Center looking across A1A from the east. Note red berries of the invasive Brazilian-pepper.



Figure 3. Reference site of a coastal strand ecosystem at New Smyrna Beach (Gann 2020). This ecosystem has been mostly lost from Red Reef Park, although some areas could be restored.



Figure 4. Dying and dead saw palmetto (*Serenoa repens*) skeletons are commonly encountered under a canopy of Brazilian-pepper, other invasives, and outplanted native trees. Saw palmetto was the dominant species in the historical coastal strand at Red Reef Park.

Vascular Flora

Austin & Coleman-Marois (1976) recorded about 140 species of plants in the vicinity of Red Reef Park, including at least 120 natives and 18 nonnative exotics¹. Many species were reported as common, while others were frequent, occasional, or rare (Fig. 5). Austin et al. (1977) reported diversity by plant community as follows: mangroves 10, hammock 32, coastal strand 50, beach dune 18, and disturbed sites 39. These numbers included the invasive Portiatree (*Thespesia populnea*) in the mangroves, and Brazilian-pepper in the hammock and coastal strand. Of the nonnatives recorded at that time, 13 species have subsequently been listed as invasive by the Florida Exotic Pest Council (FLEPPC 2019).

Excluding South Beach Park and adjacent private properties, the total native and naturalized flora of the area has nearly doubled, with about 250 kinds of vascular plants currently or historically recorded at Red Reef Park. Of these, 209 taxa were recorded during the 2019-2020 surveys, including 131 natives and 78 species of nonnative plants. This indicates a six-fold increase in reported nonnative diversity. An additional 44 nonnative species, including some native to other parts of Florida, were recorded as cultivated in landscaped areas or in the

¹ Four reported taxa are treated as false records as they are unknown from this region of Florida (*Arenaria lanuginosa*, *Indigofera keyensis* var. *mucronata*, *Rhynchosia parvifolia*, *Rhynchosia swartzii*). It is unknown what species were intended, except *Rhynchosia swartzii* probably referred to *R. minima*, which has been subsequently recorded at the site. *Portulaca oleracea* was treated as nonnative in 1976 and is treated as doubtfully native here. *Carica papaya* was treated as nonnative in 1976 but has subsequently been found to be native to South Florida.



Figure 5. Vascular plants at Red Reef Park recorded by Austin & Coleman- Marois (1976). Clockwise from upper left: *Cynophalla flexuosa*, *Remirea maritima*, *Yucca aloifolia*, *Schinus terebinthifolius*.

butterfly garden at Gumbo Limbo Nature Center. Of these, 24 have been classified as potentially invasive by IRC, indicating that there is a risk that they will naturalize and invade native ecosystems at Red Reef Park.

More than two dozen native plant species may now be extirpated at the site, some regionally common and some regionally or globally rare. Some of these (e.g., gopher-apple, *Licania michauxii*) are still present at South Beach Park and may be found at Red Reef Park in the future. Others, for example whitemouth dayflower (*Commelina erecta*), were not found during the 2019-2020 surveys, but are known to be present at the site from observations after the initial survey period.

Rare Native Plants

More than two dozen native plant species may now be extirpated at the site, some regionally common and some regionally or globally rare². Excluding false or dubious reports, Austin & Coleman-Marois (1976) and the 1979 comprehensive plan reported 10 species of native plants that would later be listed by the State of Florida as endangered or threatened (Table 1). One of those species, beach clustervine (*Jacquemontia reclinata*), was also listed as Endangered under

Table 1. Rare plants recorded by Austin & Coleman- Marois (1976) that were subsequently listed by the State of Florida³.

Scientific name	Common name	Habitat	Presence
Drypetes lateriflora	Guiana-plum Hammock	Tropical Hammock	Present
Glandularia maritima	Beach verbena Coastal Strand	Coastal Strand	Possibly extirpated
Jacquemontia reclinata	Beach clustervine	Coastal Strand	Presumed extirpated, now cultivated
Okenia hypogaea	Beach-peanut	Beach Dune	Presumed present
Opuntia stricta	Erect pricklypear	Beach Dune, Coastal Strand	Present
Pithecellobium keyense	Florida Keys blackbead	Coastal Strand	Present
Remirea maritima	Beachstar	Beach Dune	Present
Scaevola plumieri	Inkberry	Beach Dune	Present
Smilax havanensis	Havana greenbrier	Coastal Strand, Tropical Hammock	Present
Tephrosia curtissii	Curtiss' hoarypea	Coastal Strand	Presumed extirpated

² These are indicated as possibly or presumed extirpated at Red Reef Park on the [Floristic Inventory of South Florida](#) website.

³ Links to the [Floristic Inventory of South Florida](#) website are provided for all Tables and some in-line text.

the US Endangered Species Act. Some of these rare plants are still present at Red Reef Park, but others are thought to have been extirpated there. Additional listed species recorded for the site and thought to be native to the area include satinleaf (*Chrysophyllum oliviforme*), Simpson's stopper (*Myrcianthes fragrans*), stiff-leaved wild-pine (*Tillandsia fasciculata* var. *densispica*), and sea-lavender (*Tournefortia gnaphalodes*). Except for sea-lavender, which could have been historically present, these are all believed to be introduced to the park through cultivation.

As part of IRC's Restoring the Gold Coast Program, about 75 native plant species have been identified as depleted or extirpated in coastal uplands of southern Palm Beach County and top priorities for reintroduction or augmentation. Nearly 50 of these species have been reported for Red Reef Park, and many are still present (Fig. 6). About 20 of these are possibly extirpated and could be considered for reintroduction if not found in subsequent surveys.

Invasive Species

Invasive species pose a significant threat to the natural features of Red Reef Park and unattended, will increase long-term maintenance costs, reduce local biodiversity, and negatively affect site aesthetics (Fig. 7). While some invasive species have been eradicated or nearly eradicated at Red Reef Park since the 1976 survey (e.g., Australian-pine [*Casuarina equisetifolia*]), other species have expanded and matured (e.g., beach naupaka; Fig. 8), and other new species have become newly established (e.g., serpent fern [*Phymatosorus grossus*]), some through cultivation. Of the nonnative species recorded at the park, 19 are listed by FLEPPC as Category I invasive species, and 22 as Category II (Table 2), a 3-fold increase since surveys in the 1970s. Some plants native to the park can also become invasive in disturbed conditions (e.g., coinvine [*Dalbergia ecastophyllum*], some native vines), making the problem worse.

According to interviews with Recreation Services Department staff, a reasonably high level of invasive species work was conducted until the early 2010s, especially for larger well-known invasive species, but were scaled back because of budget constraints during the economic recession in that same period. Surveys during this project indicate that some areas may have been missed, including interior sections north of the north parking lot on the Oceanside, and portions of the forest at Gumbo-limbo Nature Center, where larger Brazilian-pepper trees and other nonnatives can be found. Since that time, however, invasive species control appears to have been mostly superficial, such as trimming back branches growing over the boardwalk or killing vines, native or nonnative. Recent concern with the use of synthetic herbicides such as glyphosate has led to a "hands-off" approach to invasive species management. Both of these events lead to expansion of invasive species populations. For example, large colonies of beach naupaka threaten the beach dune ecosystem and remaining habitat for coastal strand. Large populations of Brazilian-pepper and new invasions by multiple species can be found nearly throughout, including near the boardwalk at Gumbo Limbo Nature Center. To effectively control these invasive species and restore impacted native ecosystems, there is an even greater need for comprehensive treatment in the near future, including hand, chemical, and mechanical methods.



Figure 6. Rare vascular plants at Red Reef Park recorded during this project. Clockwise from upper left: *Croton punctatus*, *Drypetes lateriflora*, *Solanum bahamense*, *Echites umbellatus*.

Conclusion

Significant work is urgently needed to restore and manage the natural assets of Red Reef Park, including the restoration of coastal strand, the control of invasive species, and the augmentation or reintroduction of depleted or extirpated native biodiversity. Recommendations for this work will be covered in a subsequent document.



Figure 7. Invasive beach naupaka (*Scaevola taccada*) and tropical-almond (*Terminalia cataapa*) intermingled with native seagrape on the edge of the foredune.



Figure 8. Invasive beach naupaka growing in a giant mound next to the boardwalk.

Table 2. Invasive species recorded at Red Reef Park that are listed by the Florida Exotic Pest Plant Council. Invasive exotic plants are termed **Category I** invasives when they are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. This definition does not rely on the economic severity or geographic range of the problem, but on the documented ecological damage caused. **Category II** invasive exotics have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by **Category I** species. These species may become **Category I** if ecological damage is demonstrated.

Scientific name	Common name	FLEPPC listing
<i>Asystasia gangetica</i>	Chinese-violet, Ganges primrose	II
<i>Bischofia javanica</i>	Javanese bishopwood	I
<i>Calophyllum antillanum</i>	Santa Maria, Galba	I
<i>Calophyllum inophyllum</i>	Beautyleaf, Alexandrian laurel	I
<i>Casuarina equisetifolia</i>	Australian-pine, Horsetail casuarina	I
<i>Chamaedorea seifrizii</i>	Bamboo palm	II
<i>Cocos nucifera</i>	Coconut palm	II
<i>Colubrina asiatica</i>	Latherleaf, Asian nakedwood	I
<i>Cupaniopsis anacardioides</i>	Carrotwood	I
<i>Dactyloctenium aegyptium</i>	Crow's-foot grass, Durban crowfootgrass	II
<i>Epipremnum pinnatum</i> cv. Aureum	Golden pothos	II
<i>Eugenia uniflora</i>	Surinam-cherry	I
<i>Ficus microcarpa</i>	Laurel fig, Indian laurel	I
<i>Jasminum sambac</i>	Arabian jasmine	II
<i>Kalanchoe pinnata</i>	Common liveleaf, Cathedral bells, Life plant	II
<i>Lantana camara</i>	Shrubverbena	I
<i>Livistona chinensis</i>	Chinese fan palm	II
<i>Melinis repens</i>	Rose Natalgrass	I
<i>Momordica charantia</i>	Wild balsam-apple, Balsampear	II
<i>Nephrolepis brownii</i>	Asian sword fern	I
<i>Nephrolepis cordifolia</i>	Tuberous sword fern	I
<i>Panicum maximum</i>	Guineagrass	II
<i>Panicum repens</i>	Torpedo grass	I
<i>Phoenix reclinata</i>	Senegal date palm	II
<i>Phymatosorus grossus</i>	Serpent fern, Wart fern	I
<i>Psidium guajava</i>	Guava	I
<i>Pteris vittata</i>	China brake	II
<i>Ptychosperma elegans</i>	Solitaire palm, Alexander palm	II
<i>Richardia grandiflora</i>	Largeflower Mexican clover	II
<i>Ricinus communis</i>	Castor-bean	II

Sansevieria hyacinthoides	Bowstring-hemp, Mother-in-laws tongue, Snake plant	II
Scaevola taccada	Beach naupaka	I
Schefflera actinophylla	Australian umbrellatree	I
Schinus terebinthifolius	Brazilian-pepper	I
Sphagneticola trilobata	Creeping wedelia, Creeping oxeye	II
Terminalia catappa	Tropical-almond, West Indian-almond	II
Thespesia populnea	Portiatree	I
Tradescantia spathacea	Oysterplant, Moses-in-the-cradle, Boatlily	II
Tribulus cistoides	Punctureweed, Burrnut, Jamaican feverplant	II
Vitex trifolia	Simpleleaf chastetree	II
Washingtonia robusta	Desert palm, Washington fan palm	II

Citations

Austin DF, Coleman-Marois K (1976) Plants of the Boca Hammock (Red Reef Park), 1976. *In* Reynolds, Smith, and Hills Architects, Engineers, Planners, Incorporated, and Rett Roy Landscape Architect, Planner, Inc. (1979) Red Reef Park Comprehensive Land Use Plan, Boca Raton, Florida.

Austin DF, Coleman-Marois K, Richardson DR (1977) Vegetation of southern Florida, II-V. *Florida Scientist* 40(4): 331-361. <https://www.jstor.org/stable/24320068>

Austin DF, Bass S, Honeychurch P (1997) Coastal hammock & mangrove guide: a pocket guide to the common trees, shrubs, and vines of S.E. Florida's hammock and mangrove communities. Gumbo Limbo Nature Center of South Palm Beach County, Inc. West Palm Beach, FL.

City of Boca Raton (1994) Red Reef Park Dune Restoration Plan.

Cox, AC (1988) Distribution and species composition of tree islands in Martin and Palm Beach counties. Master's Thesis. Florida Atlantic University, Boca Raton, FL.

FLEPPC (2019) List of Invasive Plant Species. Florida Exotic Pest Plant Council. Internet: www.fleppc.org

Florida Fish and Wildlife Conservation Commission (2021) Feral Cats, <https://myfwc.com/wildlifehabitats/nonnatives/feral-cats/>. Accessed March 10, 2021.

Gann GD, Bradley KA, Woodmansee SW (2002) Rare Plants of South Florida: Their History, Conservation, and Restoration. The Institute for Regional Conservation. Miami, FL.

Gann GD, Stocking CG and Collaborators. (2001-2020). Floristic Inventory of South Florida Database Online. The Institute for Regional Conservation. Delray Beach, Florida.
www.regionalconservation.org

Reynolds, Smith, and Hills Architects, Engineers, Planners, Incorporated, and Rett Roy Landscape Architect, Planner, Inc. (1979) Red Reef Park Comprehensive Land Use Plan, Boca Raton, Florida.

(USFWS) United States Fish & Wildlife Service (1996) Recovery plan for Beach Jacquemontia (*Jacquemontia reclinata*). Jacksonville: United States Fish & Wildlife Service.