Basic Ecological Restoration Plan for the Pine Rockland at Coral Reef Park, Village of Palmetto Bay, Florida

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1.0 Introduction

This ecological restoration plan for the pine rockland at Coral Reef Park in the Village of Palmetto Bay (Village), Florida, has been prepared by The Institute for Regional Conservation (IRC) per agreement with the Village. It supports the Interlocal Agreement of September 23, 2003, between the Village and Miami-Dade County covering the transfer and management of Coral Reef Park, including approximately five acres of pine rockland, and adds to the 2003 management plan for the pine rockland cited in the Interlocal Agreement (sec. 2.4), as amended in November 2022. The pine rockland at Coral Reef Park is protected both through the Interlocal Agreement and through the 2019 official designation of 5.12 acres as Natural Forest Community by Miami-Dade County in response to a request from the Palmetto Bay Village Council. The pine rockland at Coral Reef Park has also been designated by the U.S. Fish and Wildlife Service as Critical Habitat for two federally listed plants (*Brickellia mosieri*, *Linum carteri* var. *carteri*). This plan provides recommendations for the restoration and ongoing management of pine rockland at Coral Reef Park focusing on the treatment of invasive species, the reduction of native hardwoods and palms, and the periodic application of prescribed fire. This plan was jointly developed by IRC and the Village of Palmetto Bay. It is informed by an IRC presentation at and discussion with the Village Tree Board on October 24, 2022, and by several site visits in 2022 and 2023.

The guidance presented herein is consistent with the Society for Ecological Restoration's International Principles and Standards for the Practice of Ecological Restoration (Fig. 1, Table 1; Gann et al. 2019, hereafter SER Standards), and invasive plant best management practices in Florida (e.g., Enloe et al. 2018). The SER Standards recommend the identification of target native reference ecosystems and conditions informed by reference models based on multiple indicators of six key ecosystem attributes (Table 1), which are discussed below. The SER Standards also call for meaningful, informed, reciprocal engagement with key stakeholders, preferably at the initial planning stage of a restoration project and continuing throughout the duration of a project or program. The Tree Board plays a key role in stakeholder engagement in the Village, but additional stakeholder engagement (e.g., public education and outreach about pine rocklands and their restoration and management, citizen science activities, volunteer events), will be key to long-term support.

This plan has been prepared in partnership with IRC's Pine Rockland Initiative (PRI), which aims to restore and manage remnant pine rockland patches on public and private lands throughout their natural range, including providing the thought leadership needed to move beyond "business as usual" and save this unique part of South Florida's natural heritage. This plan also incorporates emerging consensus on target metrics for pine rockland restoration developed through the multi-partner Pine Rockland Business Plan, which has been led by the US Fish and Wildlife Service and The Nature Conservancy. Plant names and data reported here are consistent with the Floristic Inventory of South Florida (FISF) database online (Gann et al. 2023c), which has been maintained by IRC continuously since 2001. As part of the FISF, IRC conducted floristic inventories of the pine rockland at Coral Reef Park in 1997, 2003, and 2023; floristic data for the park can be found here. In 2022, IRC also conducted ecological restoration activities within the pine rockland at Coral Reef Park, focusing on invasive species removal and native hardwood reduction.

Figure 1. Eight principles for ecological restoration (from Gann et al., 2019).

Table 1. Description of the key ecosystem attributes used to characterize the reference ecosystem, as well as to evaluate baseline condition, set project goals, and monitor degree of recovery at a restoration site. These attributes are suited to monitoring in Principle 5 and the Five-star System discussed in Principle 6. Reprinted from Gann et al. 2019.

Attribute	Description
Absence of threats	Direct threats to the ecosystem such as overutilization, contamination, or invasive species are absent.
Physical conditions	Environmental conditions (including the physical and chemical conditions of soil and water, and topography) required to sustain the target ecosystem are present.
Species composition	Native species characteristic of the appropriate reference ecosystem are present, whereas undesirable species are absent.
Structural diversity	Appropriate diversity of key structural components, including demographic stages, trophic levels, vegetation strata, and spatial habitat diversity are present.
Ecosystem function	Appropriate levels of growth and productivity, nutrient cycling, decomposition, species interactions, and rates of disturbance.
External exchanges	The ecosystem is appropriately integrated into its larger landscape or aquatic context through abiotic and biotic flows and exchanges.

2.0 Assessment

The five acres of pine rocklands at Coral Reef Park represent a small remnant of the 160,000-acre pine rockland forest that stretched from north of the Miami River south to Long Pine Key in what is now Everglades National Park. Due to pressures of agricultural expansion and urban development less than 2% of this forest remains outside of Everglades National Park, mostly in very small patches such as that found at Coral Reef Park. Historically, the pine rockland forest was dissected by wetland prairies and marshes that connected the interior Everglades to the coast. Coral Reef Park is located along the edge of one of those former drainageways (Fig. 2). A historical aerial image shows the edge of the pine rockland at Coral Reef Park to the west of SW 77th Avenue and north of Coral Reef Drive (Fig. 3). It's location within the urban matrix in the Village of Palmetto Bay makes it highly isolated from other pine rocklands, with extremely low connectivity to beneficial external ecological exchanges and highly vulnerable to external threats such as invasions by nonnative species.

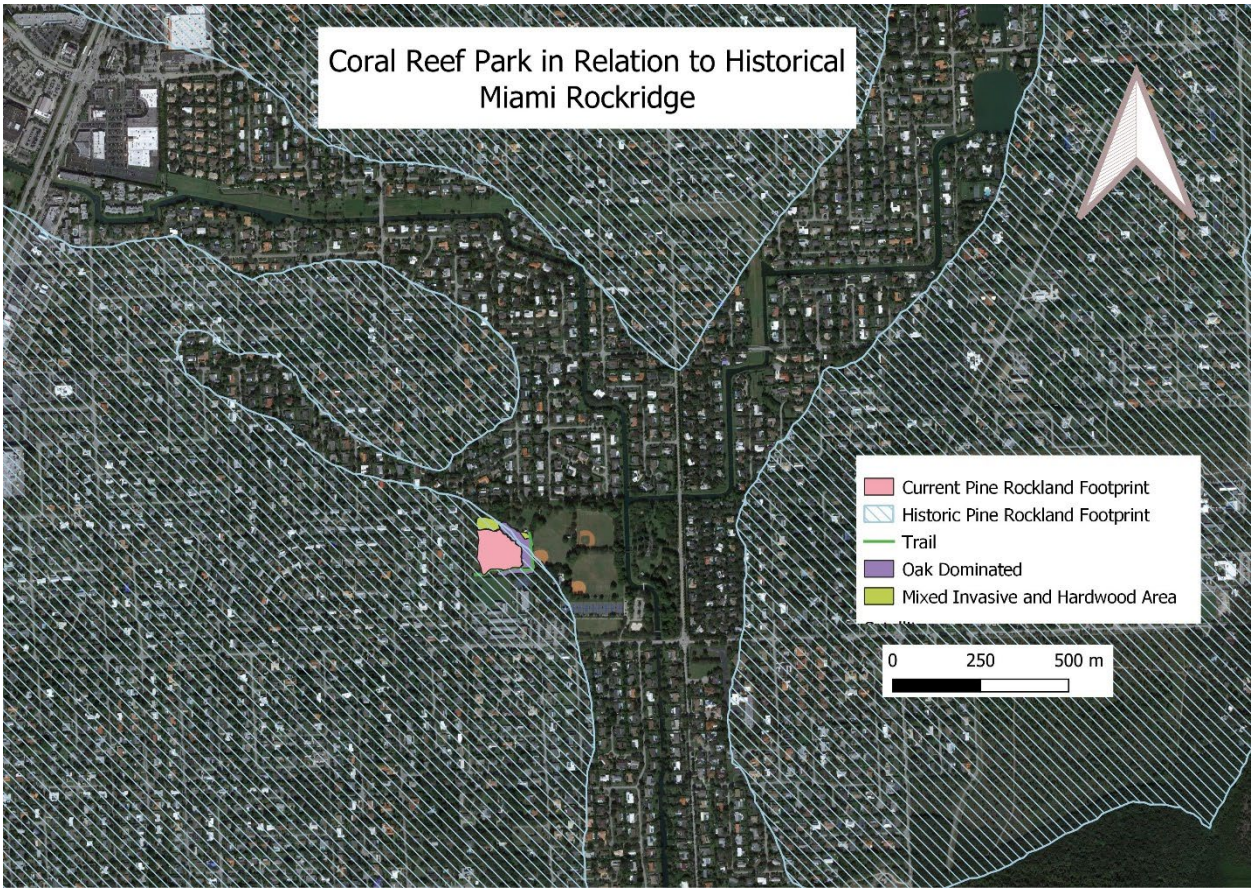

Figure 2. Location of the pine rockland at Coral Reef Park in relation to the Miami Rock Ridge (hatched area) and the historical drainageway (non-hatched area).

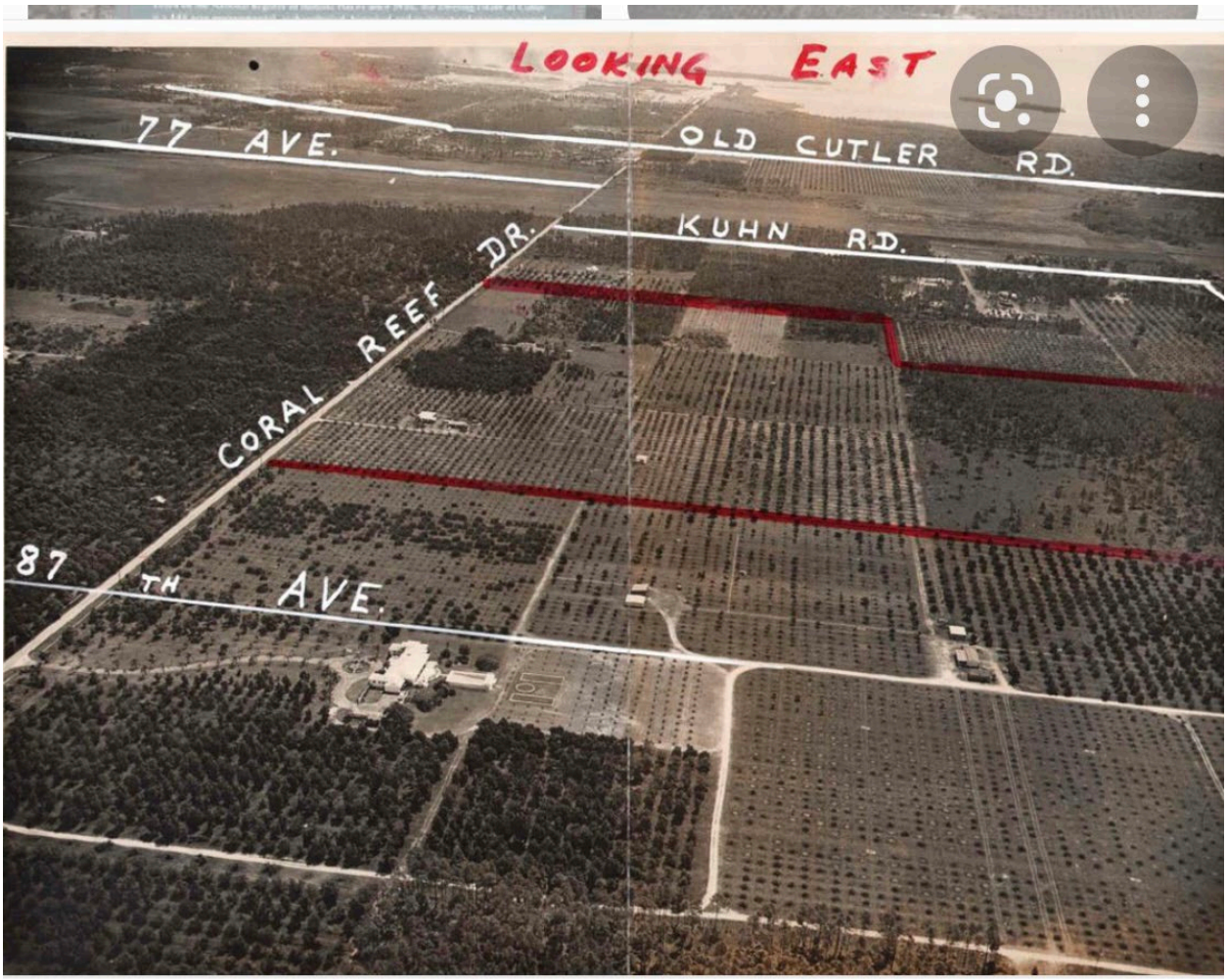

Figure 3. Location of the pine rockland at Coral Reef Park along the edge of the historical drainageway running west of SW 77th Avenue and north of Coral Reef Drive.

The substrate is mostly intact, but accumulations of pine needle duff and other organic material reduce the area of open habitat needed for biodiverse pine rockland groundcover (Fig. 4). On the surface and underground, the hydrology has been highly modified due to regional drainage and a lowered water table. Some pine rockland species that require wetter conditions, such as Gulfdune paspalum (*Paspalum monostachyum*), may no longer be viable at Coral Reef Park.

Fire is an essential natural disturbance process in pine rocklands, with periodic fire every 2-7 years needed to maintain pine rockland structure, composition, and resilience. Lack of fire in pine rocklands is a form of ecosystem degradation. Fire history for the site prior to 1993 is not known, but Tan and Raymond (CR17 FLAS) commented on a July 1990 herbarium specimen label that "Fire exclusion was evident in the eastern section, where exotic and invading species were present." A wildfire was known to have occurred in or just prior to 1993, and another wildfire event occurrent in April 1998 (Dozier 2003). In 2003, Woodmansee (1322 FTG) described the site on an herbarium specimen label as a "frequently burned pine rockland." No precise fire data since 2003 is known, but one additional fire likely occurred in the mid-2000s.

Figure 4. The accumulation of pine needles and other organic material reduces habitat for diverse pine rockland groundcover species.

Pine rocklands have a single canopy species, South Florida slash pine (*Pinus elliottii* var. *densa*), which was historically valued as high-quality timber. Presumably the entire site was logged by the 1940s or before (Fig. 5). However, natural regeneration and rare fire has allowed for the recovery of an uneven pine canopy typical of a high-integrity pine rockland.

Structurally, the site can be divided into three or four distinct units (Fig. 6.): a core higher quality pine rockland dominating the center, southern, and western portions of the site (Fig. 7); an area dominated by native hardwoods, especially live oak (*Quercus virginiana*), but also including substantial populations of rosary-pea (*Abrus precatorius*) and other nonnative invasive species as well as remnant pine rockland species (Fig. 8); a small area with larger native hardwoods on the southeastern corner (Fig. 9), which could be managed as a hardwood hammock to increase habitat connectivity and native biodiversity; and, areas in the northeast and northwest that are both dominated by native hardwoods and have severe infestations of nonnative invasive plants such as sewervine (*Paederia cruddasiana*) (Fig. 10). According to county records, Miami-Dade County Natural Areas Management conducted invasive species control from 1993 to 2003 and conducted at least some hardwood reduction in April 2003 before the property was transferred to the Village of Palmetto Bay. Intermittent invasive species control was conducted by the Village between 2003 and 2021. In 2022, IRC conducted both invasive species control and hardwood control in the core pine rockland, and some initial treatment of sewervine in the northwestern corner. In addition to the increase in native hardwood cover, the native cabbage palm (*Sabal palmetto*) and saw palmetto (*Serenoa repens*) have increased in height and cover, closing off essential open spaces needed for the biodiverse pine rockland groundcover (Fig. 11). As is typical of this part of the Miami Rock Ridge, there are few native shrubs in the understory but those too have increased in height and cover. The consequence of lack of fire throughout the site, including the highest quality areas, is that there is sparse native groundcover, and little bare ground and rock needed for many rare species.

More than 400 species of native vascular plants have been recorded growing in pine rocklands, about 25% of the entire South Florida flora. These native plants include trees, shrubs, vines, grasses and sedges, wildflowers, vines, epiphytes, and ferns. Most of the pine rockland diversity is in the groundcover layer, or plants growing within three feet of the ground. Excluding native weeds, about 130 species of pine rocklands plants have been recorded at Coral Reef Park, including the federally endangered deltoid spurge (*Euphorbia deltoidea*), and an additional 15 species of state listed plants. Four other species are ranked as critically imperiled in South Florida by IRC. Overall native diversity is falling at the site, with as many as 12 historical species not recorded in recent surveys, including deltoid spurge and the critically imperiled big threeawn (*Aristida condensata*), wiry flatsedge (*Cyperus filiculmis*), and viperina (*Zornia bracteata*). Based on prior experience, some of these species may have been overlooked or would be expected to re-emerge following restoration activities, whereas others may be considered for reintroduction. Of the 202 plant species that have been recorded at the site to date, 18 are native weeds and 53 are nonnatives, including 36 invasive species.

Figure 5. Evidence of past pine logging in the oak dominated area.

Figure 6. Current conditions of pine rockland at Coral Reef Park. All areas proposed to be restored to pine rockland except proposed hardwood hammock area in red.

Figure 7. Higher quality pine rockland showing scattered pines, dense palms, and hardwoods along edge.

Figure 8. Oak dominated area with cabbage palms and saw palmettos.

Figure 10. Proposed area of hardwood forest with specimen size gumbo-limbo (*Bursera simaruba*) on left.

Figure 11. Sewer vine draping over trees and shrubs in northwest section.

Figure 12. Open, grassy areas and bare rock and sand are essential to pine rockland biodiversity.

While no comprehensive animal surveys have been completed, the presence of the Atala butterfly (*Eumaeus atala*), still very rare at the time, was noted in 2003 (Dozier 2003); it has since recovered from near extinction in Florida and is still present at Coral Reef Park. Numerous other animal observations have been posted iNaturalist, but most of these observations are recent and comprise primarily insects and arachnids; both native and nonnative fauna have been recorded. While acknowledging the paucity of data, it is important to note that remnant patches of native habitat in the Village are critical for the survival of native wildlife, including butterflies, bees, and other pollinators, birds, and small mammals, reptiles, and amphibians.

Some past threats to the site, particularly dumping and encroachment from recreational activities (Dozier 1993), have largely abated. Others, such as threats from invasive plants and animals, have increased. Still others, such as off-target damage to native invertebrates from insect spraying, persist as threats. Threats from invasive plants species can be found both within and outside of the pine rockland. Currently, 27 species of plants listed as invasive by the Florida Invasive Species Council (FISC), Everglades Cooperative Invasive Species Management Area (E-CISMA), or locally by IRC are known from within the pine rockland proper. However, there are also invasive species threats from trees cultivated in the park just outside of the pine rockland, such as yellow poinciana (*Peltophorum pterocarpum*; Fig. 13), and arjun (*Terminalia arjuna*; Fig. 14).

Figure 12. The locally invasive yellow poinciana planted just outside of the northeast corner of the pine rockland.

Figure 12. The locally invasive arjun planted along SW 80th Avenue.

3.0 Native Target Reference Ecosystems and Reference Models

Members of the Pine Rockland Business Plan Ecological Restoration Sub-Team have prepared a key resource titled *Integrated ecological and social vision, targets, goals, and objectives for the ecological restoration of pine rocklands in Miami-Dade and Monroe counties, Florida* (Gann et al. 2023b). This living document develops conceptual restoration targets for contemporary pine rocklands in Miami-Dade and Monroe Counties aligned with in the SER Standards. This work expands on guidance published in Maguire (1995), Possley et al. (2014), and Possley et al. (2018). A combination of information including from historical photography (Fig. 13), reference sites, ecological research publications, and practitioner experience have been utilized to build reference models to inform the targets, goals, and objectives of restoration throughout the range of pine rocklands in Florida. As indicated in Fig. 6, one small area could be considered for restoration to a rockland hammock. A reference model for this ecosystem could be developed from information in Gann et al. 2023a, Gann et al. 2023c, FNAI 2010, and other resources.

Figure 13. Historical image of pine rocklands in Miami-Dade County in the early 20th Century.

4.0 Vision, Targets, Goals, and Objectives

The Society for Ecological Restoration recommends developing a project Vision, Targets, Goals, and Objectives, and the use of monitoring indicators that are specific, quantifiable measures of attributes, to directly connect longer-term goals and shorter-term objectives (Gann et al. 2019, Principle 5). The following sample vision statement, and recommended targets, goals, and objectives are modified from Gann et al. (2023b).

4.1 Sample Vision Statement for Pine Rocklands in the Village of Palmetto Bay (modified from Gann et al. 2023b)

A broad coalition of stakeholders recover healthy pine rocklands within the Village of Palmetto Bay wherever they still exist and in areas where they have previously been converted to other uses, including at sites with recognized or previously unrecognized potential for restoration. These pine rocklands are cared for and enjoyed by the residents of Palmetto Bay, as well as visitors and scientists from around the world. This results in an elevated sense of social cohesion and a significant contribution toward sustainable ecosystem management, including the recovery of local biodiversity, the delivery of ecosystem services, and the mitigation of and adaptation to climate change. This vision operates consistent with the Society for Ecological Restoration's International Principles and Standards for the Practice of Ecological Restoration and is carried out in partnership with the United Nations Decade on Ecosystem Restoration (2021-2030) and aligned global initiatives. The restoration of pine rocklands becomes a flagship restoration program within the Village of Palmetto Bay and is promoted as an example of best practice restoration assessment, planning, implementation, ongoing management, and monitoring underpinned by sound science and broad community support.

4.2 Recommended Ecological Targets for Pine Rocklands at Coral Reef Park

Restored pine rocklands have an open canopy of South Florida slash pine (*Pinus elliottii* var. *densa*), with fewer than 70 mature trees per acre and less than 50% cover, a diverse understory layer (1-2 m), and an extremely diverse groundcover layer (<1 m). The understory and groundcover layers comprise a mix of endemic, temperate, and tropical species. Native hardwoods, vines, and palms are important components of pine rocklands, but comprise less than 50% total cover in the understory and groundcover layers. Epiphytes are rarely present but may be encountered, especially on the trunks of old cabbage palms (*Sabal palmetto*). The groundcover layer includes a mix of herbaceous graminoids (grasses, sedges, and similar plants), forbs (non-graminoid herbs, e.g., wildflowers), ferns and allies, creeping vines, and low woody groundcovers that have a combined cover of at least 30%; bare ground has a cover of at least 5%, and the combined total of native groundcover plants and bare ground is at least 50%. The pine rockland vegetation is expressed as a mosaic, and islands of species or groups of species are frequent. A wide diversity of native plants is present, and invasive or weedy plants and animals are minimized as practicable. Pine rocklands are habitat for an abundance of native wildlife, including pollinators, migratory birds, and small mammals; invasive animals are controlled. Rare,

threatened, and listed species are documented, protected, and augmented or reintroduced when and where appropriate. Bare substrate of limestone and sand is present within and between vegetation mosaics in heterogenous patterns, providing critical habitat for many plant and animal species. Pine needle and other organic litter and soil organic carbon are present within target ranges of variability. Ecosystem processes and functions, including periodic fire, pollination and dispersal, predation and herbivory, and recruitment, are present and operating. Pine rockland patches are enlarged whenever possible, and substrates, hydrology, and ecosystem processes like periodic fire are restored to the extent practicable; changes in regional hydrology and irreversible soil modifications are considered when assessing, designing, implementing, managing, and monitoring pine rockland restoration projects. Pine rockland ecotones are connected to other key ecosystems that share species and habitat, including rockland hammocks and freshwater wetlands.

4.3 Recommended Social Targets for Pine Rocklands at Coral Reef Park

Palmetto Bay residents and visitors benefit from restored, well-managed pine rocklands, with ample opportunities to experience pine rocklands through accessible nature trails, informal paths, and vistas, engage in citizen science and the arts, and participate as volunteers in restoration and management activities. Information about pine rocklands, their conservation, restoration, and management, and their contributions to preventing local and global extinctions of plants and animals, mitigating climate change, and providing essential ecosystem services are integrated into robust educational programs for students of all ages. Pine rocklands are considered green infrastructure that provide essential ecosystem services including improved air and water quality, reduction of urban heat effect, reduction in noise pollution, beneficial wildlife and native plant habitat, and improved aesthetics. Pine rocklands provide much needed green spaces that provide numerous contributions to mental health and human wellbeing in the largely urban landscape of South Florida. They are embraced and cared for by a wide constituency of stakeholders. This process is underpinned by the organization of a broad coalition of stakeholders representing local and national government, nonprofits and other community groups, schools, foundation and corporate funders, private owners of conservation lands, and the public. Private and public managers of pine rocklands are provided the technical and financial support essential to their restoration and ongoing management.

4.4 Long-term Goals (Social and Ecological). Unless indicated otherwise the time period is 20 years or more.

1. The collective area of protected and managed pine rocklands is maintained or increased as practicable, for example by removing invasives and restoring pine rockland groundcover in adjacent mowed areas;

2. The connectivity of pine rocklands sites to critical ecotonal habitats (e.g., rocklands hammocks, freshwater wetlands) is increased as practicable;

3. Substrate and hydrological conditions, including topographical variation on former cleared sites, are restored where possible;

4. Appropriate periodic fire, approximating a fire regime of 2-7 years, is planned and initiated within 5 years;

5. Wildfires are responded to in an appropriate way (e.g., minimizing damage to substrate, rare species, wildlife) and used to restoration advantage when safe and practical within 2 years;

6. Alternative techniques (e.g. hardwood and palm reduction) are applied as fire surrogates and to facilitate the use of prescribed fire within 1 year;

7. Slash pines are thinned or planted where needed to achieve and maintain appropriate canopy structure, with 30-70 mature trees per acre (>4" dbh) and <50% cover, within 10 years; dead pine snags are left standing as wildlife habitat except where they pose a threat to safety;

8. Palms (*Sabal palmetto*, *Serenoa repens*) are thinned or added (including *Coccothrinax argentata*) where needed to achieve appropriate structure, ranging from 10-25% cover in the groundcover layer and 1-25% in the understory layer within 10 years. Native palms may rarely occur above 2 m with a total cover of less than 1%;

9. Native hardwoods and vines are thinned or added where needed to achieve appropriate structure, ranging from 5 to 25% cover in the groundcover layer and 1-25% in the understory layer within 10 years; oaks (*Quercus pumila, Q. virginiana*) and coastalplain staggerbush (*Lyonia fruticosa*) may occur as scattered individuals or small groves with < 1% total cover above 2 m;

10. Pine rockland groundcover species in the groundcover layer are restored to comprise 30-75% cover, and areas of bare ground comprise 5-20% cover within 10 years; the combined total of native groundcover plants, bare ground, and open ground with litter is at least 50%; accumulated pine needles and other organic litter never exceeds 3 cm in thickness; native groundcover plants may extend into the understory layer when flowering or fruiting.

11. Previously cleared pine rocklands that have been maintained through regular mowing and other prior converted areas with potential for restoration are restored to a 4-star condition;

12. Depleted or extirpated populations of native plants and animals are restored, considering unsurmountable changes including changes to hydrology (including sea level rise), climate change, and fragmentation effect on wildlife populations;

13. Native species richness reaches an average of 95% of the reference model within 10 years, including rare, threated, and listed species (e.g., IUCN Red List, US Fish and Wildlife Service, State of Florida, The Institute for Regional Conservation);

14. Average cover of native invasive, ruderal, and nonnative plant species is reduced to <2% within 10 years following initiation of restoration;

15. Populations of invasive nonnative and nuisance animals are controlled to the extent practicable or extirpated within 10 years;

16. Pine rocklands are protected from point and non-point source pollution, including insect spraying, to the extent practicable within 5 years;

17. Restoration implementation is monitored throughout the 20-year period;

18. Grade-school, adult, and targeted public education and outreach about pine rocklands is doubled within 10 years;

19. Monitoring data of the restoration of the pine rockland at Coral Reed Park contributes to peer-reviewed papers covering a component of pine rockland ecology, conservation, restoration, or ongoing management within 10 years;

20. A community-based pine rockland restoration corps of practitioners, including volunteers, nonprofits, schools, and Certified Ecological Restoration Practitioners is formalized within 10 years, and formalized training and guidance is in place to support the restoration corps.

21. Community access to pine rocklands through accessible trials, informal paths, and vistas are maintained and improved;

22. Long-term funding adequate to support these goals and objectives is secured within 10 years, and the Village of Palmetto Bay participates in an organized yet decentralized network that curates and facilitates the sharing of guidance and data on pine rockland restoration, including GIS data layers, site assessments, restoration monitoring reports, and technical guidance.

4.5 Shorter-term Objectives (Social and Ecological). Unless indicated otherwise the time period is 10 years.

OBJECTIVES (ecological and social) as measured by specific indicators

1. The collective area of pine rocklands is increased by 5% by removing invasives and restoring pine rockland groundcover within adjacent mowed area;

2. The connectivity of pine rocklands to each other and to critical ecotonal habitats (e.g., rockland hammocks, freshwater wetlands) is initiated;

3. Restoration of substrate and hydrological conditions, including topographical variation on former cleared sites, is initiated where possible;

4. The assessment of the use of prescribed fire as a management tool is completed within 1 year;

5. Wildfire response plans are in place within 1 year;

6. Fire surrogate techniques and plans are developed and agreed within 1 year;

7. Initial quantitative assessment of slash pine density and structure is completed within 1 year;

8. Overly dense stands of palms are thinned within 2 years, and introductions of palms to sites with no or few palms are initiated within 10 years;

9. Overly dense stands of native hardwoods are thinned within 1 year, and introductions of hardwood shrubs to sites with no or few hardwood shrubs are initiated within 10 years;

10. Native pine rockland groundcover restoration is initiated within 2 years, and half of potential area of bare ground comprises 5-20% cover within 3 years.

11. Restoration of previously cleared pine rocklands that have been maintained through regular mowing is initiated within 5 years;

12. Half of the depleted or extirpated populations of plants and animals are restored as practicable within 10 years;

13. Species richness of native plants is maintained at or reaches an average of 90% of the reference model within 3 years, including rare, threated, and listed species (e.g., IUCN Red List, US Fish and Wildlife Service, State of Florida, The Institute for Regional Conservation); potential for the restoration of animal populations (e.g., butterflies and other pollinators) is assessed within 5 years.

14. Average cover of native invasive, ruderal, and nonnative plant species is reduced to <2% within 5 years following initiation of restoration;

15. Populations of nonnative, invasive, and nuisance animals are reduced by 50% within 10 years, where practicable;

16. Plans are developed to protect pine rocklands from point and non-point source pollution, including insect spraying, within 3 years;

17. Develop agreed upon monitoring methods and initiate long-term monitoring of restoration within 1 year;

18. Increase grade-school, adult, and targeted public education and outreach about pine rocklands by 50% within 5 years, and formalized training and guidance is in place to support the restoration corps has been initiated;

19. Initiate sharing of monitoring data on the restoration of pine rockland at Coral Reed Park within 3 years;

20. Initiate the development of a community-based pine rockland restoration corps of practitioners, including volunteers, nonprofits, schools, and Certified Ecological Restoration Practitioners within 5 years;

21. Community access to pine rocklands through accessible trials, informal paths, and vistas are maintained and improved;

22. Long-term funding adequate to support these goals and objectives has significantly increased, and the Village of Palmetto Bay participated in an organized yet decentralized network that curates and facilitates the sharing of guidance and data on pine rockland restoration.

5.0 Discussion and Recommendations

A proposed scope of work for the implementation of hardwood and palm reduction and invasive plant control outside of the higher quality core area has been prepared (Appendix A). This time sensitive work can be accomplished through contracting. According to the terms of the Interlocal Agreement of September 23, 2003, the implementation of any component of this plan must conform to the management plan prepared by Miami-Dade County Park and Recreation in 2003, as amended. The 2022 amended management plan (Stern and Collins 2022; Appendix 2), calls for three primary activities: 1) invasive plant control; 2) hardwood reduction; 3) prescribed fire and pine planting. Furthermore, the work must conform to the Natural Forest Community (NFC) Permit REE-11772 (NFC2021-031), issued on 24 June 2021 (Appendix 3). There as several inconsistencies between this plan and the Miami-Dade management plan and NFC permit that should be addressed: 1) palm reduction is not mentioned in the management plan nor NFC permit and should be included per best practice described above; 2) the management plan prescribes hand pulling or spot treatment of invasives and hardwoods, whereas the NFC permit allows for cutting; 3) the NFC permit requires that “All cut plant material shall be removed from the NFC area and disposed of properly,” where the recommended scope of work below allows for material less than 1.5” in diameter to remain on site within conditions; 4) pine seedling planting mentioned in the management plan following fire should be optional depending on pine stand structure and pine thinning may be needed if overly dense pine stands develop; 5) allowing for the restoration of a small area of rockland hammock to increase a rare ecotone and overall native biodiversity. Based on prior communication with Miami-Dade County, allowances for these differences should be considered reasonable. Finally, given current capacities, accepting the proposal by Miami-Dade County in the 2022 management plan to conduct prescribed burning should be strongly considered by the Village of Palmetto Bay.

6.0 Acknowledgements

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7.0 Citations

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APPENDIX A

Proposed Scope of Work for Hardwood and Palm Reduction and Invasive Plant Control, Coral Reef Park Pine Rockland Natural Forest Community

Prepared for
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May 22, 2023

Background

Coral Reef Park (CRP), located within the Village of Palmetto Bay, Florida, contains an important remnant patch of South Florida pine rockland, a globally imperiled ecosystem. Among the 130 species of native pine rockland plants recorded at the park are more than a dozen plant species listed by the State of Florida as endangered or threatened (Gann et al. 2023). Important plants recorded at CRP include the federally endangered deltoid spurge (*Euphorbia deltoidea*) as well as pineland croton (*Croton linearis*), the sole larval host of the federally endangered Bartram's scrub-hairsteak butterfly (*Strymon acis bartramii*). In 2019, at the request of the Village of Palmetto Bay, approximately 5.12 acres of historical pine rockland at CRP was designated as Natural Forest Community by Miami-Dade County. This parcel is in the northwestern part of CRP adjacent to SW 80th Ave (Fig. 1). The current condition of the site is highly variable, with the highest quality pine rockland condition found in the mapped area indicated as Current Pine Rockland Footprint (Fig. 2), representing the core area of the NFC.

The northern and eastern perimeter of the historical pine rockland has been heavily invaded by native live oak (*Quercus virginiana*) and cabbage palm (*Sabal palmetto*), which have outcompeted and shaded out most of the native pine rockland groundcover, resulting in a loss of native biological diversity and a decline in pine rockland health. However, some native pine rockland species remain in those areas, including South Florida slash pine (*Pinus elliottii* var. *densa*), saw palmetto (*Serenoa repens*), and pine fern (*Anemia adiantifolia*). Intermixed in these areas with the live oak and cabbage palm are infestations of the nonnative sewer vine (*Paederia cruddasiana*), rosary-pea (*Abrus precatorius*), and other nonnative invasive and weedy species.

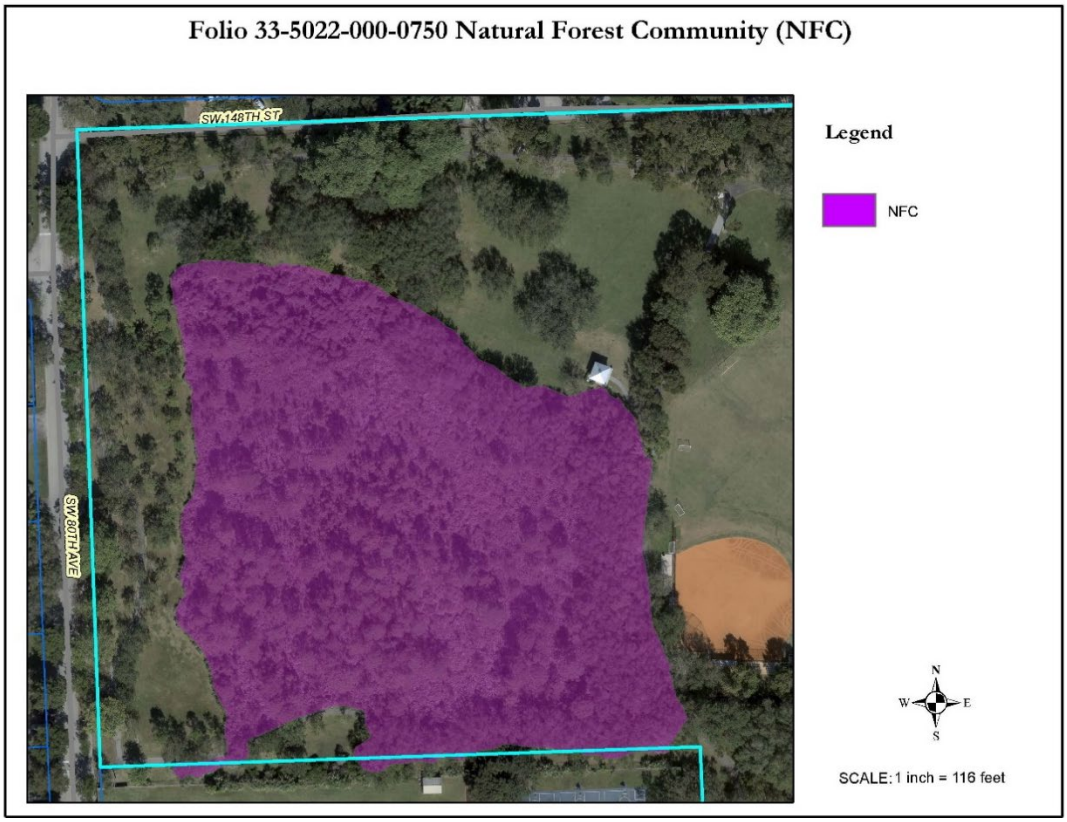

Figure 1. Delineation of Natural Forest Community at Coral Reef Park.

Figure 2. Current condition of pine rockland at Coral Reef Park.

The total area heavily impacted by live oak and cabbage palm is approximately 1.75 acres. Included are areas designated as Oak Dominated, Hardwood and Invasive Dominated, and Proposed Hardwood Hammock (Fig. 2). The proposed hardwood forest will be left for the benefit of the community (shade) and wildlife (cover and foraging).

General Conditions

The Contractor shall be responsible for the removal or treatment of 100% of target vegetation identified in this Scope of Work, within the areas designated in Figure 2 as Oak Dominated, and Hardwood and Invasives Dominated. The Village of Palmetto Bay's (VPB) decision regarding the overall compliance is final. All non-compliance must be resolved within one month of notification unless otherwise directed or approved by VPB. If non-compliance is delayed, the Contractor shall be responsible for treatment of new growth. Inspections and non-compliance notifications may occur during or after work activities cease.

VPB will designate a Project Manager. Coordination of work efforts shall be maintained by the Contractor with the Project Manager.

Work activities shall be recorded in a Daily Progress Report each day. The Daily Progress Report shall be used to compile a Weekly Progress Report that shall be submitted to the Project Manager. At the discretion of the VPB, the Daily Progress Reports may be requested and must be provided. The Contractor shall also record noteworthy observations in the field, including weather events, nesting birds, rare species locations, additional nonnative plants, nonnative wildlife, hazardous site conditions, and evidence of illegal activities. The Contractor shall report all noteworthy observations to the Project Manager in a timely manner.

The Contractor shall follow all laws and regulations including but not limited to those set forth by the United States Environmental Protection Agency (EPA), Florida Fish and Wildlife Conservation Commission (FWC), Florida Department of Environmental Protection (FDEP), and Florida Department of Agriculture and Consumer Services (FDACS). The Contractor shall comply with all applicable permits.

Regulatory authorization for the work will be under the existing authorizations granted by the NFC Permit Number: TREE-11772 (NFC2021-031), or as revised or reauthorized. All special and general permits therein are incorporated into these general conditions. Heavy machinery is prohibited from use inside the NFC boundary. No tree larger than 18" dbh (i.e., a specimen tree) is to be cut or treated with herbicide without field inspection, photo documentation, and approval in writing by the Project Manager, except for those nonnative plants listed in General Conditions item 4 in the above-mentioned NFC Permit.

Treatment Protocols

1) Task 1: Hardwood and Palm Removal

All live oak, gumbo-limbo (*Bursera simaruba*), willow-bustic (*Sideroxylon salicifolium*), and West Indian mahogany (*Swietenia mahagoni*) greater than six feet (6') in height are to be cut down to a level one foot or below from the ground level. In addition, any cabbage palm greater than six feet (6') in height, but without a five foot (5') clear trunk (i.e., without leaves or leaf bases for at least five feet from ground level), are to be cut down; cabbage palms with a five-foot clear trunk are to be left in place. Native pine rockland vegetation including South Florida slash pine, saw palmetto, and silver palm (*Coccothrinax argentata*) shall not be cut down or otherwise damaged. All debris material 1.5 inches in diameter or larger are to be removed from the site and lawfully disposed of offsite. Debris material less than 1.5 inches in diameter can be left on site, however the depth and/or height of the remaining debris shall not exceed 1 foot from ground level, and no branch left onsite shall be longer than five feet (5') in length.

2) Task 2: Invasive Plant Control and Cut-stump Treatment of Hardwoods

The Contractor shall systematically traverse, locate, and treat 100% of the Florida Invasive Species Council (FISC) listed, Early Detection and Rapid Response (EDRR) invasive plants currently listed for the Everglades Cooperative Invasive Species Management Area, and other invasive species listed below, within the designated areas, with a minimum of 97% of target plants being killed. FISC Category I and Category II recorded for the site include *Abrus precatorius* (rosary-pea), *Albizia lebbeck* (woman's tongue), *Nephrolepis brownii* (Asian swordfern), *Paederia cruddasiana* (sewer vine), *Pteris vittata* (China brake), *Schinus terebinthifolius* (Brazilian-pepper), and *Spermacoce verticillata* (shrubby false buttonweed). Other nonnative species known to be invasive in South Florida and recorded for the site include *Alysicarpus vaginalis* (white moneywort), *Filicium decipiens* (Japanese fern tree), *Peltophorum pterocarpum* (yellow poinciana), *Tabebuia heterophylla* (white-cedar), and *Zamia furfuracea* (cardboard palm). In addition, the Contractor shall treat all cut stumps resulting from Task 1.

Due to the aggressive and resistant nature of some species (e.g., skunk vine) or a persistent and long-lived seed bank (e.g., rosary-pea), treatment will be conducted quarterly for one year (four treatments total).

GPS tracks are used for monitoring treatment. GPS units shall be used to identify and document treatment area boundaries for each day worked. Each Crew Leader must carry a Garmin GPS, a smart phone with an application capable of recording GPS tracks, or equivalent. The Contactor shall save project tracks and, if requested by the Project Manager, provide tracks to the VPB. These tracks may be provided on-site or via email or other electronic means.

Ground Crew Supervisors must obtain an FDACS license in the category of Natural Areas Management prior to treatment. The Contractor shall provide a list of herbicides and methods to be used for prior approval by the Project Manager.

All herbicides must be EPA/FDACS registered or have the appropriate Florida Special Local Needs (Section 24(c) FIFRA) registration. ALL HERBICIDES SHALL BE USED IN ACCORDANCE WITH THE EPA LABEL. The Contractor is liable for any penalty, fines, or damages resulting from the misuse of herbicides.

All herbicide applications shall be carried out in a manner consistent with EPA and Special Local Need 24(c)(SLN) herbicide labels. Crews will have access to all appropriate labels and Safety Data Sheets while transporting, mixing, or applying herbicides. The Contractor shall comply with all pertinent regulations set forth by FDACS.

The Contractor shall monitor and wind speed and direction when preparing to apply or applying herbicides. The Contractor shall follow the most restrictive wind law or policy when there are conflicting thresholds between laws/policies. Contractors shall follow all laws regarding herbicide wind restrictions including but not limited to the Florida Organo-Auxin Herbicide Rule 5 E-2.033 (http://edis.ifas.ufl.edu/wg051). Herbicide applications shall not occur when wind speeds are greater than 10.0 miles per hour (mph). The Contractor shall take all precautions to minimize and mitigate herbicide drift.

At least 97% of treated plants must be dead at least six months following final treatment. All parts of the plant must be dead, not simply defoliated. If 100% of the area is not treated or 97% kill rate is not achieved for any area after one to six months post final treatment, one additional thorough treatment shall be the responsibility of the Contractor at no cost to the VPB. Non-compliance re-treatment tracks must be turned in to the Project Manager. The Contractor is not responsible for the recruitment of any invasive species following the final treatment, unless such recruitment is due to negligence by the Contractor.

Treatment Methods

Manual treatment: Includes hand pulling, and using chainsaws, weed whackers, and loppers to cut vegetation. Seedlings may be hand pulled to reduce the impact of herbicides on non-target vegetation. Pulled seedlings should be bagged and removed from the site or piled where roots do not contact the soil to prevent regrowth. Plants known to propagate by vegetative means should be bagged and removed from the site.

Directed foliar: Herbicide is diluted in water and applied to leaves or target species using backpack applicators or spray bottles.

Stump treatment: After felling vegetation, herbicide is applied to the cut stump surface.

Basal bark: Herbicide is applied with a backpack or spray bottle directly to the bark around the circumference to each stem/tree. Herbicide must be in an oil-soluble formulation.

Frill, girdle, and hack and squirt: Cuts into the cambium are made completely around the circumference of each stem/tree no higher than one foot off the ground and herbicide is applied completely around the girdle.

All methods above have been found to be effective under specific circumstances; however, many factors can affect the performance of an herbicide application and results can vary. Choice of application method, herbicide, and rate for individual species depends on environmental conditions and professional experience. Marker dyes are required to keep track of what vegetation has been treated.

Additional information on recommended control methods for invasive plants can be found in the University of Florida's Institute of Food and Agricultural Sciences publication Integrated Management of Invasive Plants in Natural Areas in Florida (Enloe et al. 2018).

Protected Species

The Contractor shall be responsible for compliance with all Federal and State laws regarding protected species including but not limited to the Endangered Species Act.

The Contractor shall be familiar with threatened and endangered plant and animal species, their identification, and any restrictions or protocols associated with them. When working in an area where these species may be present, the Contractor must follow any established restrictions or protocols including those of U.S. Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWC).

The contractor shall not harass, injure, kill, or otherwise interfere with native wildlife, including snakes, that may be encountered during the work being conducted under this contract. Any notable encounters with nonnative wildlife shall be immediately reported to the Project Manager.

It shall be the Contractor’s responsibility to exercise care and reasonably protect native vegetation at the project site noting the need for cutting and hauling large plants. The Contractor is responsible for the restoration or replacement of all native vegetation unreasonable damaged during the project to the satisfaction of the VPB, at no cost to the VPB.

The Contractor is responsible for protecting non-targeted species including those species with a similar appearance to the targeted species. The Contractor shall be responsible for replacement of non-targeted species damaged by work activities including those damaged due to herbicides.