

# DRAFT CORAL SPRING-MOUNTAIN SPRING PROTECTED AREA ZONING PLAN (2014-2019)



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## **Acknowledgements**

(To be included)

## List of Acronyms

CS-MSPA	Coral Spring-Mountain Spring Protected Area
ES	Executive Summary
HHPZ	Habitat and Heritage Protection Zone
JNHT	Jamaica National Heritage Trust
MUZ	Multiple-use Zone
NRCA	Natural Resources Conservation Authority
NEPA	National Environment and Planning Agency
PZ	Preservation Zone
SHS	Special Historic Sites

## **Executive Summary**

### **Introduction**

The Coral Spring-Mountain Spring Protected Area (CS-MSPA) is located approximately 7.0 km east of the town of Falmouth and 9.0 km west of Duncans in the parish of Trelawny. It was designated a protected area on September 18, 1998 under section 5 (1) (b) of the Natural Resources Conservation Authority Act, 1991. It contains the largest remaining contiguous dry limestone forest along the north coast, being approximately 165 ha (1.65 km) in size. Over 90% of the area is on privately-owned lands. The CS-MSPA is a diverse habitat area composed of several ecosystems (e.g. forest, wetlands, and water bodies) which are all inter-related through their functional relationships.

The ecological/conservation value of the area was a significant contributory factor leading to the area being designated a protected area in 1998. This was also acknowledged by the Inter American bank which made the designation one of the special conditions for the Government of Jamaica, prior to the first disbursement of funds for the implementation of the Northern Coastal Highway Improvement Project in 2001.

Section 4 of the NRCA Act makes provision for the zoning of protected areas. The proposed zoning of the protected area was undertaken as a means to assist in ensuring the effective management of the area. This is critical in light of proposed development activities which may have irreversible impacts on the functions and services provided by the ecosystems. . The plan covers a period of five years and thereafter will be subject to review.

In the absence of specific regulations or management plan to guide/control the use and types of activities that would be allowed or prohibited within the protected area , the preparation of this zoning plan is a step in that direction. It was recommended that a zoning plan be developed to provide some level of management control.

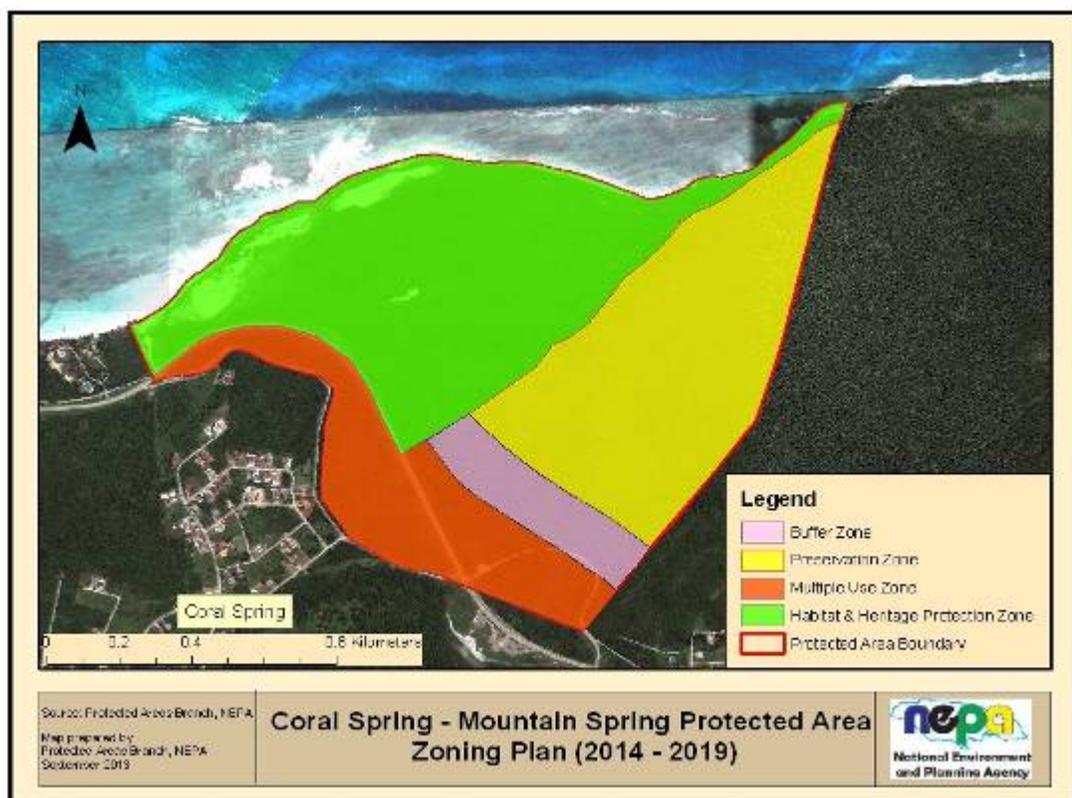
The proposed plan outlines a framework which is intended to provide protection for sensitive habitats/ecosystems while at the same time allowing for sustainable use of its resources. The plan covers a period of five (5) years.

This plan was compiled by the staff of the Protected Areas Branch with technical input from the Ecosystems Management Branch, the Local Area Planning Branch and the Map Registry and Data Management Unit of the National Environment and Planning Agency (NEPA).

### Proposed Zoning Scheme

The Zoning Plan provides a framework for the management of uses within the CS-MSPA. Activities are defined within each zone to ensure that resources within the protected area receive adequate levels of protection and socio-economic values are preserved.

The CS-MSPA has been divided into four (4) proposed major zones: Preservation Zone; Habitat Protection Zone; and Multiple Use Zone, and a smaller buffer zone. (ES-1) The proposed zones are illustrated in the map below.



*Figure ES-1 Map Showing the Proposed Zones of the CS-MSPA*

**1. Preservation Zone**

This zone encompasses the extensive area of Tall Thick Dry Limestone Forest located mainly in the eastern half of the protected area; this is at a higher elevation than the rest of the protected area. In this zone, the dry limestone forest is least disturbed and has the highest levels of endemism within the protected area. The first priority here is strict protection of the forest habitat and associated flora and fauna.

**2. Habitat Protection and Heritage Zone**

This zone is located in the north and north-western half of the protected area and consists of significant and sensitive natural and cultural/heritage features that require special protection (e.g. wetlands/inland water bodies, beach vegetation and heritage sites). It is recommended that the special habitats in these areas be preserved in their natural state and the heritage sites be protected, while allowing some level of ecotourism activities in the area which will have a minimal impact on the resources.

**3. Multiple-use Zone**

This zone is located in the southern and south-western section of the protected area with the North Coast Highway passing through it in the south-eastern part. It is considered to have lesser conservation value because of the barrier created by the North Coast Highway. It is the most disturbed section of the protected area and therefore could allow for a mixture of uses including residential and commercial activities which coincides with the objectives of the zoning plan. It is recommended however, that the “precautionary approach” principle should be adopted to strictly control/and or guide development activities in the area.

**4. Buffer Zone**

This zone is located between the Preservation Zone and the Multiple-use zone. Its establishment provides an additional layer of protection to the Preservation Area to the north which has resources of biodiversity importance. It is intended to reduce the “edge” effect on the Preservation Zone that may result from activities (developmental and otherwise) in the Multiple-use Zone. It is an area where only low impact activities

will be allowed, such as research, recreation, environmental education and any other that would not alter the landscape.

## **1.0 Introduction**

### **1.1 Background**

The Coral Spring-Mountain Spring Protected Area (CS-MSPA) located approximately 6.0 km east of Falmouth and 7.5 km west of Duncans in the parish of Trelawny. It was designated a protected area on September 18, 1998 under section 5 (1) (b) of the Natural Resources Conservation Authority Act, 1991. It contains the largest remaining contiguous dry limestone forest along the north coast, being approximately 165 ha. in size. The area of dry limestone forest is ranked fourth in size in the island after Hellshire Hills (St. Catherine); Portland Ridge and Brazilletto Mountains (Clarendon). Over 90 percent of the protected area is on privately owned lands (White Bay Limited; New Court Development among others. (see Appendix 4 which shows land parcels within the CS-MSPA)

Several studies and habitat assessments conducted within the last fifteen (15) years have indicated that the CS-MSPA is a mosaic of ecosystems, which are interconnected and co-dependent. Within each, there are ecological processes, states and gradients which, if altered or destroyed, will stress the overall system and likely reduce or eliminate the important ecosystem services provided by CS-MSPA. The forest is composed of biological communities, whose species composition, both flora and fauna, are strongly associated with the underlying geology and hydrology. The community compositions and habitat physiognomies suggest stable forest dynamics (i.e., CS-MSPA is self-sustaining under natural disturbance regimes, such as tropical storms). The loss of any one ecosystem will adversely affect the others and with the area being relatively small, it is very unlikely that the systems would be able to recover from any significant induced disturbances.

The ecological/conservation value of the area was a significant contributory factor leading to the area being designated a protected area in 1998. This was also acknowledged by the Inter-American Development Bank which made the designation one of the special conditions for the Government of Jamaica, prior to the first disbursement of funds for the implementation of the Northern Coastal Highway Improvement Project in 2001.

The proposed zoning of the PA was undertaken as a means to assist in ensuring the effective management of the area. In the absence of specific regulations or a management plan to guide/control the use and types of activities that would be allowed or prohibited within the protected area the preparation of this zoning plan is a step in that direction. The proposed plan outlines a framework which is intended to provide protection for sensitive habitats/ecosystems while at the same time allowing for sustainable use of its resources.

## **1.2 Boundary Description of the CS-MSPA**

The boundary of the protected area is as follows:

“Starting at point (P1) with geographical coordinates 18°29’02’’N and 77°36’18’’W at Mountain Spring Bay, then south-easterly to a point (P2) where it intersects with the Falmouth to Duncans main road; then east-north-easterly, then south-easterly along the centerline of the Falmouth to Duncans main road for 1.475 kilometres at which point (P3) it intersects with the Jamaica Public Service Company Limited 138 kV line; then along the 138 kV line in a south-easterly direction to the point (P4) where it intersects the Falmouth to Duncans main road again; then north-north-easterly for 0.45 kilometres to a point (P5) with the geographical co-ordinates 18°29’50’’N and 77°35’55’’W along the property boundary of Jamerika Limited (section B); then from this point, along White Bay Limited property boundary (section A) in a straight line for 0.95 kilometre to a point (P6) at the high water mark; then along the high water mark in a south-westerly; then south-south-westerly, then west-north-westerly direction back to the starting point”<sup>1</sup>

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<sup>1</sup> Government of Jamaica (1998) *The Natural Resources Conservation (Coral Spring-Mountain Spring Protected Area) Order*.



*Figure 1: Map Showing Boundary of the CS-MSPA*

## **1.2 Purpose of and Basis for Zoning**

### **1.2.1 Zoning as a Management Tool**

Zoning in protected areas is a management tool that has been commonly used in many jurisdictions to protect sensitive protected area resources and to separate conflicting human activities in these areas. It is a system by which specific geographic areas within a PA are classified based on preservation requirements, as well as the site’s ability to accommodate various types of uses/activities.

The Zoning Plan provides the framework for the management of uses within the protected area. It defines the “limits of acceptable use” and the types of developments and activities that can and cannot occur in each zone. It outlines the proposed activities for various sections of the protected area to ensure that the resources receive adequate levels of protection and that socio-economic values are preserved. It rationalizes and regulates the use of the protected area and its resources, defining where activities can be undertaken without compromising the area’s management objectives

In the development of this draft Zoning Plan certain guiding principles (including bio-physical and socio-economic) which are outlined in Appendix 1 were considered.

The principal objectives of a Zoning Plan are usually:

- To ensure the conservation of the protected area resources;
- To provide protection for critical or representative habitats, ecosystems and ecological processes;
- To separate conflicting human uses;
- To protect the natural and/or cultural values of the protected area while allowing a range of reasonable human uses;
- To reserve suitable areas for particular human uses, while minimizing the effects of those uses on the protected area; and
- To preserve some areas of the protected area in their natural state undisturbed by humans except for the purposes of scientific research, monitoring or education.

### **1.2.2 Legislative Basis for Zoning the CS-MSPA**

The Coral Spring-Mountain Spring Protected Area was declared under Section 5 (1)(b) of the Natural Resources Conservation Authority (NRCA) Act, 1991. The NRCA Act is the main piece of legislation for declaring protected areas managed by the NEPA/NRCA and provides the basis for zoning the CS-MSPA.

Section 4 (2)(c) (ii) of the Act states:

*In performing the functions specified in subsection (1) the Authority may -  
“....in relation to prescribed national parks, marine parks, protected areas  
and public recreational facilities – provide for the zoning thereof for specified  
purposes .....*”

### **1.2.3 Objectives of Zoning the CS-MSPA**

The primary objective for the proposed zoning plan is to ensure sustainable use of the protected area natural resources.

It is anticipated that once an effective Zoning Plan is implemented then the outcomes would include:

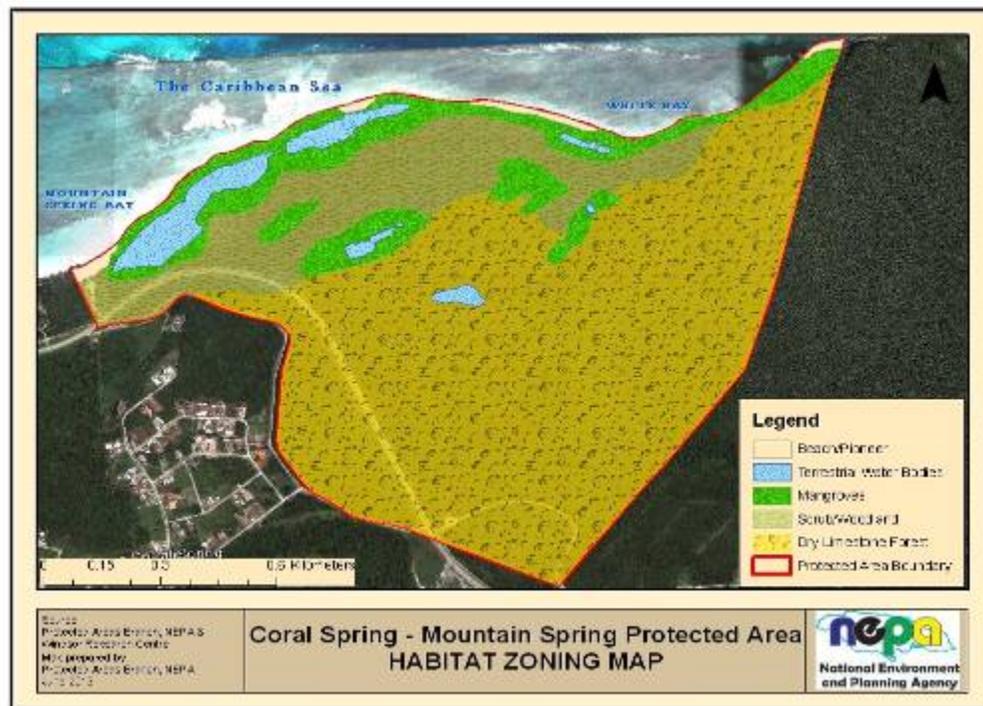
- Protection of critical habitats/endangered habitats
- Maintenance of viable wildlife populations
- Continual provision of ecosystem services/maintenance of essential ecological processes/functions
- Maintained the resilience of the dry limestone forest systems against natural hazards
- Minimize potentially conflicting uses
- Facilitate sustainable use of the resources

## 2.0 Description of the Environment

### 2.1 Habitats in the CS-MSPA

There are four main habitats present in the CS-MSPA, namely the Beach/Pioneer Habitat (Coastal vegetation); Wetlands (including Mangrove) Habitats; Scrub/Woodland Habitat (Short Dry Limestone Forest) and Dry Limestone Habitat (Tall Dry Limestone Forest)

Figure 2 illustrates the location of the habitat types found in the protected area.



*Figure 2: Map showing the Main Habitat Types in the CS-MSPA*

The Beach/Pioneer Habitat is most developed along the coastal strip from Burwood Beach extending eastwards. It plays a critical role in beach formation and stabilization. Pioneer plants constitute the initial vegetation which colonizes newly developed sand accumulations.

The wetlands are a significant feature of the landscape in the PA and comprises the Salinas, the mangroves and the inland pond systems. These provide very vital functions in the area including recharge of ground water; acts as sediment traps and purifies the storm water runoff before entering into the sea. Without these purification methods, the fringing coral reefs and beaches (which plays a major recreational role in the area) found along the coast would have been adversely affected by land base pollution. They also

provide a habitat and refuge and forging ground for a diverse group of wetland birds, both local and migratory. In addition to wetland birds, terrestrial birds and other terrestrial animals also find refuge in the mangroves either for feeding or roosting.. In addition they are nursery and spawning areas for a variety of marine life, most of whom inhabit the offshore and inshore coral reefs in the area.

The Scrub/Woodland Habitat (Short Dry Limestone Forest) lies between the fringing wetlands and the Dry Limestone forest. It is characterized by a low canopy and showed signs of anthropogenic disturbance in several areas. The average canopy height is approximately 2.5 meters with Red Birch (*Bersera simaruba*) being the only emergent trees. The area is dominated by tickets comprising of Agavae sp., cacti. Scrublands do have high ecological values in that it is an important element in natural forest succession and the restoration of mature forests and provides valuable habitat for many native plants and animals. This habitat helps to buffer other ecosystems (the Dry Limestone forest to the south of the protected area and the inland wetland systems (Figure 2) map) and provide specialized habitat for some threatened plants and animals. It is an early stage in the natural succession to dry limestone forest.

Further south, lies the Tall Dry Limestone Forest which although shows signs of disturbance in some areas, most of it is in pristine condition. It is the only intact stance of coastal primary Tall Dry Limestone forest. It contains very diverse and unique ecosystems; including a very diverse group of plants and animals, several of which are endemic. The forest area is part of the larger Martha Brae watershed; providing ground water that helps to sustain the wetlands found the area.

The habitats systems are connected and as such all play an integral role in protecting each other from habitat conditions in succession. Special habitats such as the pools of water collected in the base of the tank bromeliads' leaves house a complex ecosystem in and of itself. These pools or water support numerous organisms, some of which complete their life cycles in these pools.

### **2.1.1 Terrestrial Water Bodies**

It should be noted that the series of water bodies (Figure 2), both inland and coastal are all undoubtedly maintained by freshwater springs in the aquifer. These inland swamps are spring-fed and not maintained by rainfall as evidenced by the low annual precipitation experienced in the area (the water temperature is generally noticeably cool) and the use of the swamps by Blue-winged Teal (*Anas discors*), a species which does not tolerate high-salinity water. These swamps provide unique moist microhabitats within this area of low rainfall.

To achieve the objectives of maintaining a functional CS-MSPA, zoning requires that there be no changes in hydrology which would lead to the destruction of these natural features.

### **2.1.2 Terrestrial Plant Communities**

The plant communities in the CS-MSPA exhibit several characteristics which are highlighted below:

- Microclimate (maintained by a large, closed-canopy forest and by the presence of the inland swamps and tank bromeliads);
- Presence of pollinators (insects, birds, and bats);
- Seed dispersal mechanisms (including animal and wind as well as the presence of seed banks);
- Plant species diversity (including characteristic and keystone species, trophic diversity, species that ensure natural successional patterns and resistance to invasion by non-native species);
- Forest physiognomy and life forms - notably the presence/absence of tank bromeliads and other species with adaptations for the low rainfall and brackish/saline environments; for species with limited mobility or dispersal capabilities, the presence of tall trees in the woodlands and forest may be critical to their survival from storm-surge flooding; and
- Gradient of salt-adapted plant communities, with each linear community affording wind-break protection as one moves further inland. The broader

bands of vegetation inland increases buffering from strong winds, so there is a gradient of wind protection for both plants and animals<sup>2</sup>.

## 2.2. Fauna

From assessments conducted in the protected area, the high species diversity of birds recorded indicates, that it is an important bird habitat and foraging ground. Over ninety (90) species of birds including endemics, natives and migrants have been recorded within the area (see Appendix 2).

Although surveys for other fauna species have not been as spatially- or temporally comprehensive as those conducted for birds, preliminary assessments have revealed an incredible bat (Order Chiroptera) diversity: at least twelve (12) of Jamaica's 21 bat species have been detected, including the endemic tree-roosting Jamaican Fig-eat Bat (*Ariteus flavescens*)<sup>3</sup>. Acoustically-detected hunting buzzes of multiple insectivorous bat species suggest a robust diversity of nocturnal insects. Other native fauna found throughout the forest include: Hermit Crabs, Termites, Butterflies, Praying Mantis and Bromeliad-dependent Hylidae Frogs as well as the invasive alien Small Indian Mongoose (*Herpestes auro punctatus*).

## 2.3 Ecological Attributes

The CS-MSPA has a number of ecological attributes which highlights the importance of the protected area. Some of the key attributes for two main communities are highlighted below:

### A. Aquatic Communities

The aquatic communities include all the water bodies in the PA (coastal and inland) and their associated flora and fauna. Their key ecological attributes include:

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<sup>2</sup> Wind-break protection was directly observed by members/representatives of the Windsor Research Centre on 26th August 2008, when Tropical Storm Gustav was near Haiti, but strong, gusting winds were experienced in the CS-MSPA. Members/representatives of WRC were on-site, doing controlled bird banding and surveying to understand how birds react to an approaching storm. The buffering of wind from the sea across the gradient of Mangrove, Scrub/Woodland and Dry Limestone Forest was very noticeable. The Dry Limestone Forest serves as a less-windy refuge, which is particularly important in extreme windy conditions.

<sup>3</sup> For the majority of cave-roosting bats detected in CS-MSPA, the nearest known daytime roosts are either Windsor Great Cave, Trelawny (~ 14 km) or Runaway Bay Caves, St. Ann (~ 22 km).

- i) Water quality and chemistry in the inland water bodies (e.g. temperature, salinity, turbidity, dissolved oxygen)
- ii) Availability of foraging resources (vegetative inputs into the aquatic system; other aquatic organisms in the food web)
- iii) Dispersal/migration corridors<sup>4</sup> (e.g. baby crabs)

## B. Terrestrial communities

The terrestrial communities include all habitat types beach/pioneer; scrub/woodland (short dry forest) and the Tall Dry limestone forest. Their key ecological attributes include:

- i) Microclimate (including temperature, relative humidity, shading from direct sunlight)
- ii) Availability of food resources (food availability will be highly seasonal in dry habitats; as a consequence, plant diversity and large areas must be maintained)
- iii) Community composition, including trophic diversity
- iv) Natural relationships between predators and prey
- v) Habitat connectivity (across different ecosystems within the CS-MSPA; amongst the Dry Limestone Forests of the “North Coast Forest” proposed protected area identified in the Jamaica’s National Ecological Gap Assessment Report (2009); connectivity is required if different life stages of a single species use different ecosystems or for maintaining gene flow within a population)
- vi) Natural rates of reproduction, survival, immigration, and emigration that maintain stable, viable populations of fauna
- vii) Minimum viable population size and life stages that occur within the CS-SPA.

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<sup>4</sup> On 25 June 2008, during bi-monthly bird surveys, WRC reported observing several thousand baby crabs along the muddy edges of the large swamp on the eastern flank of the tidal inlet which suggests that this area acts as breeding habitats for crabs.

## 2.4 Significant Characteristics/Features

The area contains significant species of flora as well as a variety of natural landscapes, and historical features, which have made it one of relatively high conservation value.

### 2.4.1 Unique Plant Species

The CS-MSPA has several endemic species of plants, including e.g. orchids (*Broughtonia sanguinea*; *Cordia bullata*, *Euphorbia punicea*, *Oncidium tetrapetalum*); Bone Okra (*Hylocereus triangularis*); Bell Flower (*Portlandia grandiflora*); Broom Thatch (*Thrinax parviflora*). The largest concentrations of the endemic plants are found located in the central region of the Tall Dry Limestone Forest, located in the eastern scettrion of the protected area (see Figure 3 below). This section of the protected area is also dominated by Wild pine (*Tillandsia utriculata*) and ‘Mr. Ripple’ (*Agave sp*).

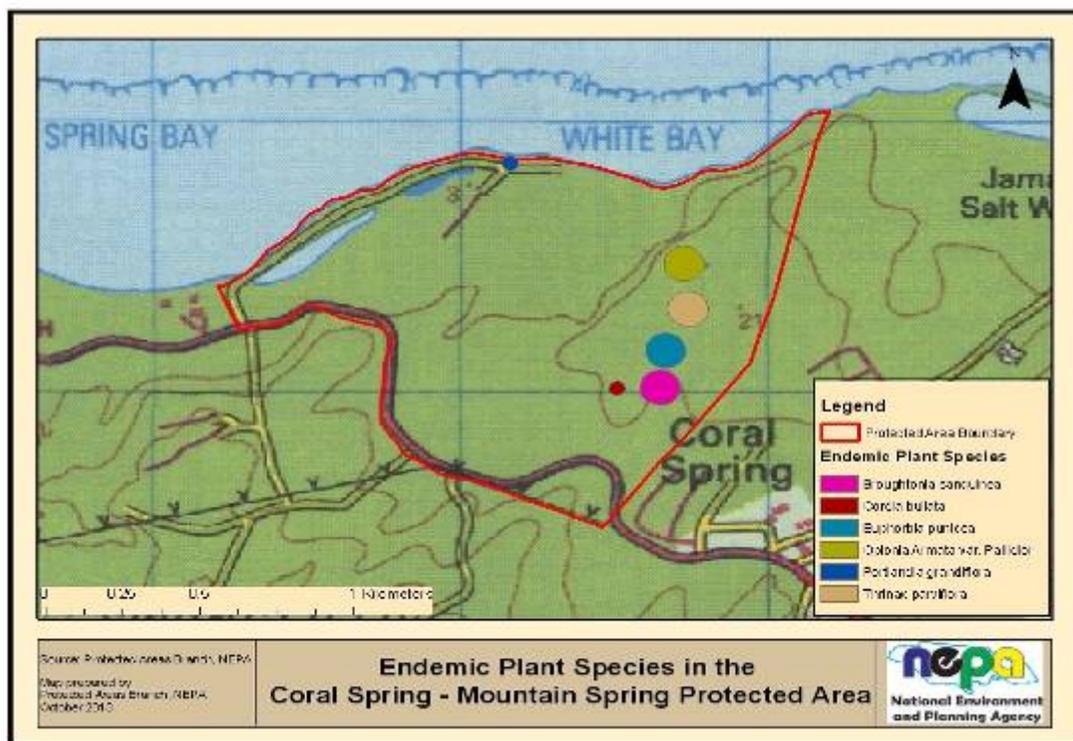
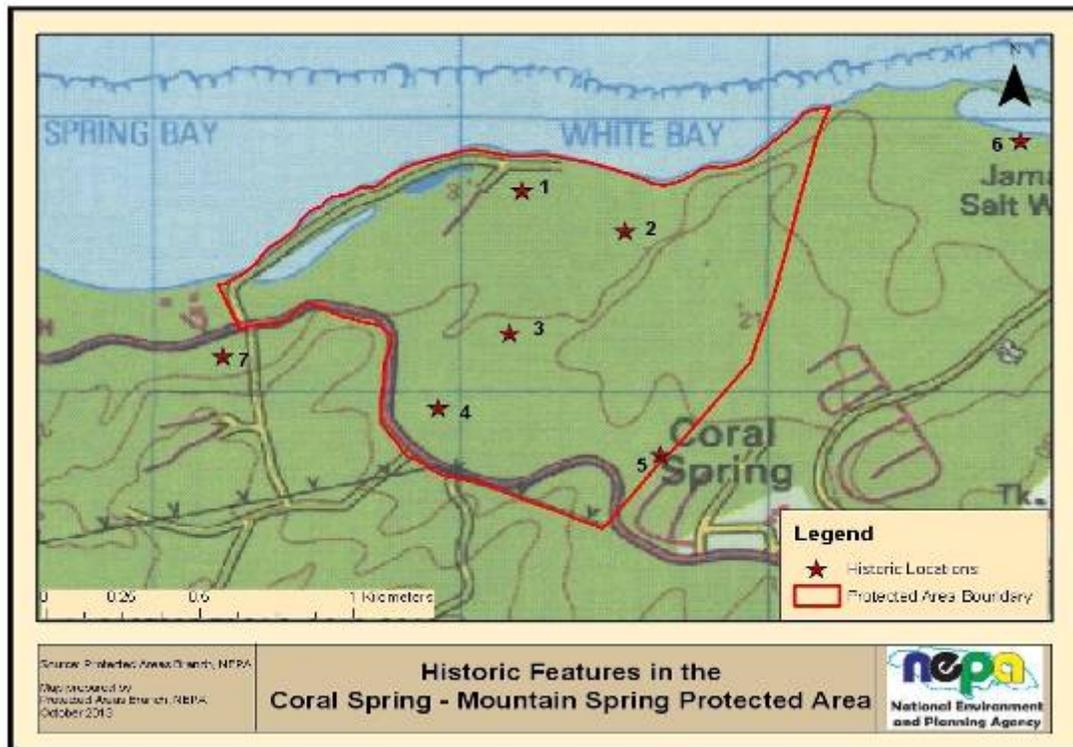


Figure 3: Main Locations of Endemic Plant Species in the CS-MSPA

## 2.4.2 Cultural/Heritage Sites

There are a number of cultural/heritage assets in the CS-MSPA and the adjacent areas. They include historic sites/features such as Taino site; historic foundations and remnant of wharf; assemblage of historic artefacts; historic foundations; historic stone foundations and Taíno site; historic salt works and historic stone wall. Their locations are indicated in Figure 4 below.



- |   |   |                       |
|---|---|-----------------------|
| 1 Historic foundations and remnant of wharf | 2 Assemblage of historic artefacts          |                       |
| 3 Historic foundation                       | 4 Taino site                                | 5 Historic stone wall |
| 6 Historic salt works                       | 7 Historic stone foundations and Taino site |                       |

**Figure 4: Map showing Historic Sites/Features in the CS-MSPA**

### **2.4.3 Geological Features/Hydrological Features**

The area is primarily of limestone origin and with its characteristic karst scenery, caves fissures and sinkholes. It is characterized by a major fault line that runs from north-east to the south-west through the centre of the protected area. There is an elevated cliff in the North West approximately 60 m above sea level overlooking White Bay and extends diagonally across the PA. There are also several caves in the area. Altitude increases from sea level to approximately 130 m above sea level; with no visible surface drainage. There are however, several bodies of water within the protected area; most of which are located along the coast; however, a few are located inland. The inland ones contain fresh water, while those near the coast tend to be brackish in nature. They serve as natural flood control measures for the site, wading and feeding grounds for waterfowls (including Blue-winged Teal (*Anas discors*) and Green-winged Teal (*Anas crecca*) and West Indian Whistling Duck (*Dendrocygna arborea*) as well as a source of water for faunal population inhabiting the adjacent dry lime stone forest.

### **2.5 Values/Services in the CS-MSPA**

The values/services of the CSMSPA include the following:

#### **A. Ecological**

The area:

- is the largest intact coastal dry limestone forest along the north coast;
- is a component of the “North Coast Forest” which was identified in the Jamaica’s National Ecological Gap Assessment Report (2009) as an area of Triple Priority Overlap: marine, freshwater, and terrestrial. The Conservation Targets depend upon the functional integrity of this area
- contains at least 30% of species of common higher plant species of dry limestone forest;
- consists of several vegetation habitats/communities e.g. mangroves, wetlands, scrub/woodland and dry limestone forest;
- maintains the health of associated reefs and seagrass beds in the adjacent marine environment;
- contains critical habitats for avifauna (local and migratory) and other endemic and native fauna e.g. yellow snake (*Epicrates subflavus*);
- is an important spawning/nursery area for several species of fish; and

- contains several species of orchids

## **B. Hydrological/Geological Features**

The protected area:

- is a significant component of the Martha Brae Watershed Management Unit
- filters water flowing from the surrounding limestone slopes into the marine environment; and
- contains several caves

## **C. Recreational**

The area:

- provides opportunity for bird watching, nature trails, and Game Bird hunting

## **D. Scientific Research**

The area:

- provides opportunities to conduct resource assessments (e.g. of the flora and fauna; heritage and geological features); and
- offers an outdoor learning experience for students

## **E. Socio-economic**

The area:

- provides opportunities for nature tourism activities (e.g. nature trails; hiking;)
- provides bait for offshore fishing
- provides areas for artisanal fishermen to moor their boats
- allows for recreational beach use at Burwood Beach currently used by patrons from within and outside of the parish. The beach is also used by stop-over tourists from the Falmouth Cruise Ship Pier.

## **2.6 Threats to the Resources**

Over 90% of the protected area is on privately owned lands. Within the last few years, the area has come under intense pressure from land owners and prospective developers who desire land for development activities, particularly, hotel/resort facilities. There is also the threat from charcoal burning activities, which if left unregulated, could cumulatively lead to the degradation of the forest resources. The dumping of garbage by users of the adjacent Burwood Bathing Beach particularly in the coastal mangrove habitat area is also a serious issue of concern. The eastern section of the protected area has deposits of limestone which has some economic potential for mining and production of dolomite and construction aggregate

Recognizing that the functional integrity of the CS-MSPA depends upon the protection and maintenance of the ecological processes, states and gradients outlined in Section 1.3: Description of Resources/Values of the CS-MSPA, the threat potential for all proposed activities must be determined with regards to:

- Severity - what level of damage to any/all ecological process will be caused (e.g. no change, slightly impair, moderately degrade, seriously degraded, destroy or eliminate);
- Scope - are the effects of the threat localized or widespread;
- Irreversibility - if a change is not permanent, what will it cost to rehabilitate or restore the damaged functionality

Changes in the ecological processes, states, and gradients which maintain the CS-MSPA ecosystem will place stresses on the functional integrity of the system. The extent to which the system is resilient and can re-establish its dynamic equilibrium will depend upon the severity, geographic scope, and irreversibility of the stresses (i.e., the human activities that threaten the integrity of the ecosystem). Activities that will cause changes to the above-listed ecological processes should not be allowed in the CS-MSPA.

### **3.0 The Zoning Planning Process**

The development of this draft zoning plan was undertaken between 2009 and 2013. .

As a first step, a literature review was conducted. This included published and unpublished research on the CS-MSPA and internet publications. Prior to this project, a rapid ecological assessment was conducted in 1997 by the then Biodiversity Branch, Natural Resources Conservation Authority as a precursor to the area being designated a protected area in 1998. The findings provided useful information on the biological resources in the area. More recently field assessments were conducted by the in 2009 by a consultant botanist who was hired to undertake an assessment of the vegetation habitats within area. A rapid socio-economic survey was also undertaken in 2009 by NEPA in the adjacent Coral Springs residential development.

In 2010 a first draft zoning plan was prepared for the area which was circulated internally for comments. In the 2011-2012 financial year, a second draft was prepared based on additional data/information on the site including: the geological and hydrological characteristics as well as the historical/cultural heritage resources and land use data on adjacent communities. In February 2013 a workshop was held with representatives from Windsor Research Centre (WRC) and NEPA with a focus on developing the plan based on sound planning principles and taking into account the ecological functions/values/services provided by the protected area.

The plan has since been revised based on internal comments and was discussed at a consultation workshops to be held with key stakeholders and will be the subject of review over a two-months wider consultation period in December 2013 and January 2014. It is expected that the document will be revised at the end of February 2014 based on comments received during the consultation process; following which it will then be presented to the NRCA for consideration for approval.

## **4.0 Proposed Zoning Scheme and Guide to Activities**

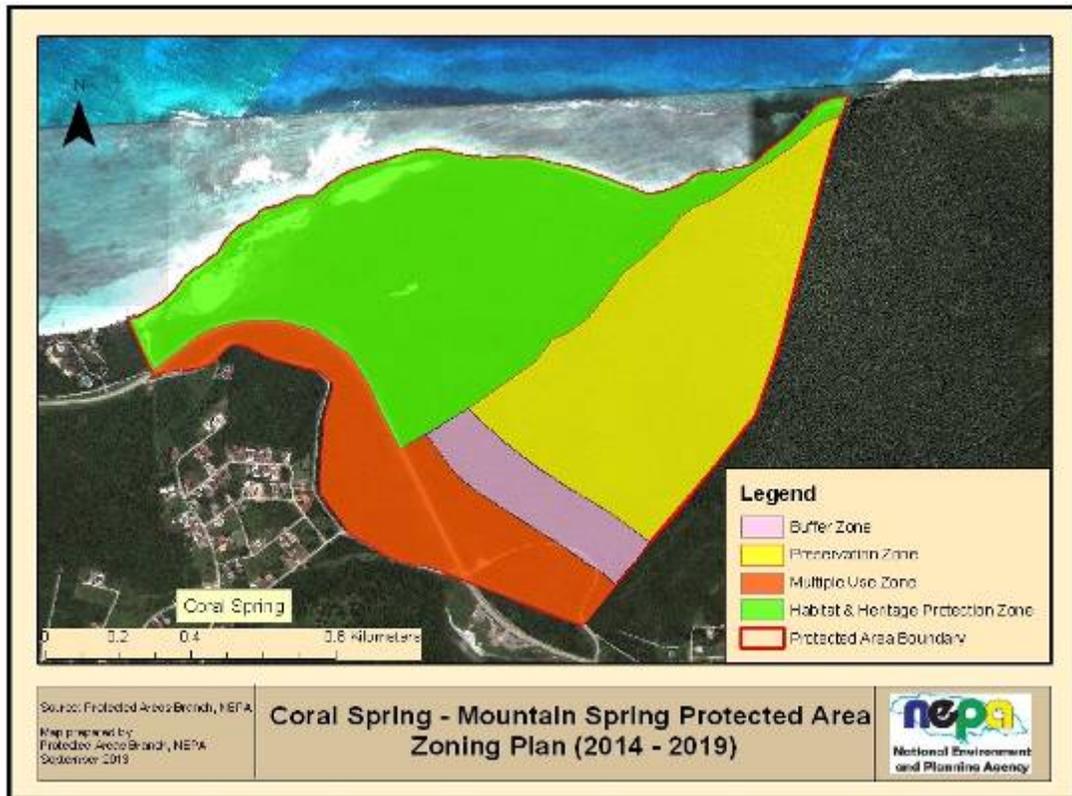
### **4.1 Overview**

The area was designated a protected area, based on its ecological value and also to mitigate the impacts of the North Coast Highway on the dry limestone forest system. It is clear therefore that human use of the area should not override that of ensuring its conservation. This includes protection for critical or representative habitats, ecosystems and ecological processes. It is significant to note that the protected area falls within the Conservation Area proposed in the Provisional Trelawny Development Order, 2013 which considered the need to protect this area.

This chapter presents the objectives, rationale and a list of proposed approved and prohibited activities for each zone in the zoning regime.

The CS-MSPA consists of four (4) zones: the Preservation Zone, Habitat Protection Zone, Multiple-use Zone and Buffer Zone (Figure 5).

There are also five Special Historic Features (SHF's) within the area; namely: historic foundations and remnant of wharf; assemblage of historic artefacts; historic foundation and Taino site and historic stone wall.



**Figure 5: Map Showing the Proposed Zones of the CS-MSPA**

## 4.2 Preservation Zone (PZ)

This zone encompasses approximately 33% (54 ha) of the protected area includes the extensive area of Tall Thick Dry Limestone Forest which is at a higher elevation than other sections. In this zone, the dry limestone forest is least disturbed and has some of the best preserved natural values. The first priority here is strict protection of the forest habitat and associated flora and fauna.

### 4.2.1 Objectives

1. To provide for the protection of areas which have unique endemic flora in locations where the natural dry limestone forest is less disturbed.
2. To facilitate the protection of ecologically valuable species
3. To provide environments for research and educational purposes

#### 4.2.2 Rationale/Justification

The sites within the PZ were so identified based on the following criteria:

1. Ecological characteristics: endemic plants; e.g orchids (species include. (*Broughtonia sanguinea*); *Cordia bullata*, Jamaican Poinsettia (*Euphorbia Punicea*) God Okra, Bromeliad (*Tillandsia adamsii*), Broom Thatch (*Thrinax parviflora*); Bell Flower (*Portlandia grandiflora*)
2. Core area of dry limestone forest which shows very little sign of human disturbance and in some areas are in pristine condition
3. Habitat for forest-dependent wildlife
4. Has several key indicator species e.g. Red birch (*Bursera simaruba*).

#### Approved and Prohibited Activities for the Preservation Zone

This zone will allow for preservation purposes/non-extractive activities. Low impact recreational and as well as activities associated with research will be allowed. The activities that will be allowed and those to be prohibited are outlined in Box 1 below.

#### Box 1: Activities to be Allowed/Not Allowed in Preservation Zone

##### Allowed

- ✓ Research/educational activities with permit
- ✓ Recreational activities e.g. nature tourism activities e.g. bird watching; sightseeing
- ✓ Habitat restoration

##### Not Allowed

- X Construction of permanent structures
- X Establishment of new trails
- X Modification of substrate
- X Mining/quarrying or industrial activities
- X Collection of specimen without a permit
- X Introduction of non-native /invasive species.

### **4.3 Habitat and Heritage Protection Zone (HHPZ)**

This zone is located in the north-western half of the protected area and covers approximately 44% (73 ha) of the area. It consists of significant and sensitive natural and cultural/heritage features that require special protection (e.g. wetlands/inland water bodies, beach vegetation and heritage sites). It is recommended that the special habitats in these areas be preserved in their natural state and the heritage sites be protected, while allowing some level of ecotourism activities in the area which will have minimal impact on the resources.

The area supports a diversity of coastal vegetation (three mangroves species - black, red, white). The wetlands themselves act as a buffer against storm surges and saltwater intrusion thus protecting the water resources behind the wetlands. In this zone are important habitats for local and migrant bird species (e.g. West Indian Whistling Duck (*Dendrocygna arborea*); Little Blue Heron (*Egretta caerulea*), Black-crowned Night-Heron (*Nycticorax nycticorax*), Black-necked Stilt (*Himantopus mexicanus*), Spotted Sandpiper (*Actitis macularius*). There are also several historic features located in this area.

#### **4.3.1 Objectives**

The objectives of HHPZ are to:

1. provide for the conservation of the PA through the protection and management sensitive habitats; free from potentially damaging activities.
2. safeguard threatened and sensitive ecosystems habitats.
3. provide opportunities for reasonable use (e.g. eco-tourism, controlled Game Bird shooting activities).

#### **4.3.2 Rationale/Justification**

The sites within the HHPZ were selected based on the following criteria:

1. Sensitive habitats including terrestrial water bodies and their associated flora and fauna (at least 60 species of birds have been identified using the ponds).
2. Ecological characteristics: presence of both fresh and brackish water bodies;

3. Opportunities for research and educational purposes
4. Level of connectivity between inland water bodies and the marine environment e.g. the largest pond connected by a tidal inlet to sea allowing juvenile fish to grow in this area until they are mature enough to travel out to sea.
5. Critical role of beach pioneer vegetation in beach formation and stabilization. The pioneer plants constitute the initial vegetation which colonizes newly developed sand accumulations.
6. Coastal wetlands which are utilized for the mooring of boats by the few artisanal fishermen in the area.

### **Approved and Prohibited Activities for the Habitat and Heritage Protection Zone**

The area comprising the HHPZ is reserved for the purposes of ecological conservation and restoration and in the case of the pond systems for strict preservation. Very low impact recreational/educational and ecotourism activities will be allowed. All activities are subject to the granting of relevant approvals. The activities that will be allowed and those to be prohibited are outlined in Box 2 below.

**Box 2: Activities to be Allowed/Not Allowed in the Habitat and Heritage Protection Zone**

**Allowed**

- ✓ Conservation/rehabilitation/habitat enhancement activities (e.g. mangrove replanting)
- ✓ Research/educational activities
- ✓ Recreational activities (e.g. nature tourism activities - bird watching, sightseeing, hiking; sun bathing and beach picnics at Burwood Beach)
- ✓ Bird hunting (subject to monitoring/permit granted under the Wild Life Protection Act)
- ✓ Low impact development associated with nature/ecotourism facilities (e.g. boardwalk over tidal inlet; maintenance of trails, but no opening of the canopy)

**Not Allowed**

- X High intensity/impact developments
- X Camping
- X Dumping
- X Opening up of new trails
- X Modification of water bodies or mangrove swamps
- X Mining/quarrying or industrial activities
- X Introduction of non-native /invasive species.

#### **4.4 Multiple-use Zone**

This zone is located in the southern section of the PA; which is separated in the most part from the larger area of the protected area to the north by the by the North Coast Highway. This zone covers approximately 17% (28 ha) of the protected area and has the lowest conservation value. In this area, allowance is made for a mixture of uses including residential and commercial activities. However, the “precautionary approach” principle should be adopted to strictly control and guide development in the zone. The intensity of development should decrease towards the Preservation and Habitat Protection Zones.

##### **4.4.1 Objectives**

The objectives of the Multiple-use Zone are to:

1. allow for low impact development, limiting potentially negative impact on the larger area of the protected area
2. facilitate development of permanent structures in a section of the PA using best practices which will assist in the conservation of the resources in the wider protected area

##### **4.4.2 Rationale/Justification**

The designation of the Multi-use Zone was selected based on the following criteria:

1. There are no significant species in this area that require special conservation measures. The North Coast Highway disconnects it from the main part of the protected area and as such developments in this area would not have a significant impact on the rest of the CS-MSPA.
2. This area has been more extensively disturbed by human activities including charcoal burning and timber extraction.

##### **Approved and Prohibited Activities for the Multiple Use Zone**

This zone will allow for the construction of residential and commercial facilities. Nevertheless, all activities within this zone are subject to the granting of relevant approvals and must be undertaken in a manner that is sustainable and in keeping with the area’s general carrying capacity. The activities that will be allowed and those to be prohibited are outlined in Box 3 below.

### **Box 3: Activities to be Allowed/Not Allowed in the Multiple Use Zone**

#### **Allowed**

- ✓ Construction of low impact residential commercial facilities subject to the granting of relevant approvals
- ✓ Recreational activities
- ✓ Research/educational activities e.g. research/study visits
- ✓ Ecological restoration activities
- ✓ All activities associated with the sustainable management of the area

#### **Not Allowed**

- X Multi-storey developments
- X High intensity/impact developments
- X Introduction of non-native /invasive species
- X Mining/quarrying or industrial activities
- X Any activity that is determined to be unsustainable by the relevant agencies

## **4.5 Buffer Zone**

This zone is located between the Preservation and the Multiple-use zones. It covers approximately 6% (10 ha) of the protected area and extends for an average of 150m.in width. Its establishment provides an additional layer of protection to the Preservation Zone to the north which has resources of biodiversity importance. This will further protect the integrity of the value of the sensitive resources within the Preservation Zone from encroachment of development activities that may occur within the Multiple-use Zone. It is expected to be a low impact area which will allow activities such as research, recreation, environmental education, low density development and other activity that will not significantly alter the landscape.

### **4.5.1 Objectives**

The objectives of the Buffer Zone are to:

1. contribute to the protection of the protected area
2. enhance the protection of sensitive species within the Preservation Zone
3. facilitate development adjacent to the Preservation Zone with limited potential for negative impact

### **4.5.2 Rationale/Justification**

The designation of the Buffer Zone was based on the following criteria:

1. The area has been impacted by human activities and is a transition zone between the more severely impacted area in the south and the more pristine area to the north

### **Approved and Prohibited Activities for the Buffer Zone**

The activities to be allowed in this zone includes: research/educational activities as well as very low impact development activities. The activities that will be allowed and those to be prohibited are outlined in Box 4 below.

#### **Box 4: Activities to be Allowed/Not Allowed in the Buffer Zone**

##### **Allowed**

- ✓ Research/educational activities e.g. research/study visits
- ✓ Recreational activities e.g. trails, bird watching; bird hunting
- ✓ Ecological restoration/conservation activities

##### **Not Allowed**

- X Development activities that will change the landscape e.g. residential, hotel/resort
- X Vegetation clearance (clear cutting)
- X Introduction of non-native /invasive species
- X Mining/quarrying or industrial activities
- X Dumping

## **4.6 Special Historic Sites (SHS)**

The SHS identified in the protected area falls within the HHPZ and forms part of Jamaica's cultural assets (Figure 5). They are considered special sites to be managed to protect their values. Management of these sites would fall under the jurisdiction of the Jamaica National Heritage Trust (JNHT). The sites include: the historic foundations remnant of a wharf, historic foundation, an assemblage of historic artifacts, and Taino site and historic stone wall.

### **4.6.1 Objectives**

The objectives of protecting these historic sites/features are to:

1. Conserve the cultural heritage resources in the protected area
2. Provide opportunities for research in the cultural/heritage resources of the protected area

### **4.6.2 Rationale/Justification**

The designation of the SHS was based on the following criteria:

1. Presence of historical/cultural features which were identified by the JNHT
2. Need for opportunities for research/assessments of cultural/heritage resources

### **Approved and Prohibited Activities for the Special Historic Sites**

Activities to be allowed at SHS would be those that would not have a deleterious impact on the existing features. The activities that will be allowed and those to be prohibited are outlined in Box 5 below.

### **Box 5: Activities to be Allowed/Not Allowed at Special Historic Sites**

#### **Allowed**

- ✓ Research/educational activities e.g. research/study visits
- ✓ Ecotourism activities (including sightseeing; bird watching)
- ✓ Archaeological restoration/conservation activities
- ✓ All activities associated with the JNHT's management objectives for the historical sites/features

#### **Not Allowed**

- ✗ Mining/quarrying or industrial activities
- ✗ Construction activities (including residential and resort development)
- ✗ Removal or disturbance without relevant permit of historic features
- ✗ Any activity which contravenes JNHT requirements that may have a deleterious effect on the historical features

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## Appendix 1

### Appendix 1: Criteria for Zoning the Coral Spring-Mountain Spring Protected Area

#### *Governing Principle*

**“To conserve the unique values (environmental, social, cultural and economic) of the protected area and to ensure its sustainable use.”**

#### **A. Bio-physical Guiding principles:**

- ***Comprehensive***: includes the full range of habitat types in no-take areas recognized at an appropriate scale;
- ***Adequate***: protects enough area to maintain the ecological viability and integrity of populations; species and communities;
- ***Representative***: ensures that the examples of each biodiversity feature included in no-take areas are typical of that feature.

Criteria	Principle	Explanation
Habitat representation	Represent a minimum amount of each ‘habitat type’ in no-take areas	Protect examples of each habitat type to ensure maintenance of habitats and associated biodiversity within the Protected Area.
Size and replication	Include adequate size and replication of ‘habitat types’ in no-take areas	Each habitat type should be protected in more than one no-take area to protect the full range of habitat types as a precaution against major localized damage.
Connectivity	Provide connectivity within the network of no-take areas	Specially protected areas in a network should be adequately spaced to ensure the movement of species.
Vulnerable habitats	Protect in no-take areas an adequate amount of vulnerable habitats	Vulnerable terrestrial habitats and associated plants and animals need to be effectively protected in no-take areas. The extent of protection depends on the degree of vulnerability of the habitat.
Species and areas of special interest	Include species, populations and areas of special interest in no-take areas	Species and populations of conservation concern such as threatened, rare, endangered need to be effectively protected in no-take areas. Areas of special interest, such as areas with geomorphologic features; naturalness, amenity or cultural values; or areas of conservation concern need to be effectively protected in no-take areas.
Ecosystem linkages	Include consideration of ecosystem links/connectivity among habitats and of adjacent land uses in determining no-take areas	Areas that support other habitats (ecosystem links), or are dependent on other habitats, need to be protected. Past and present uses may have influenced the integrity of biological communities, and need to be considered when choosing no-take areas.

<b>Criteria</b>	<b>Principle</b>	<b>Explanation</b>
Resilience	Provide for future resilience against natural or human-induced changes or threatening processes	Areas that are less likely to be subject to impacts and have a high degree of naturalness (i.e. less exploited) need to be considered for no-take areas to ensure greater resilience against future threats or change.
Adaptive management	Design a protected area to provide for scientific assessment of zoning effectiveness	Decisions about design of the zoning should be soundly based on scientific evidence which will support the governing principle of the Protected Area. Design of the zoning should therefore take into account scientific best practice in experimental design and monitoring.

## **B. Socio-economic Guiding Principles**

- Meet conservation goals while minimizing the impact on other users; and
- Be compact, not fragmented, to ensure efficient management and enforcement.

<b>Criteria</b>	<b>Principle</b>	<b>Explanation</b>
Balancing conservation and sustainable use	Ensure that the final selection of zones recognizes social, economic, cultural and environmental costs and benefits	The final zoning selection needs to be made recognizing the costs and benefits to the community. This acknowledges the objective to achieve a balance between conservation goals and the need for continued sustainable use.
Minimize impacts	Minimize the impact of zoning on human interactions within the Protected Area including access, activities and, values	Any zoning should minimize impacts on users of the Protected Area. Engagement of stakeholders and the community in a participatory process that is open and transparent should be ongoing.
Management complementarity	Complement where possible, other management mechanisms and arrangements that affect the Protected Area	In considering zoning options, other arrangements that may protect and/or manage the protected area should be taken into account to minimize conflict and provide greater operational clarity. Other environmental conservation legislation, management of use and major initiatives to protect the protected area's values should be considered.
Efficient and practical	Maximize the understanding of the Protected Area and the manageability of zones	The final zoning plan should consider operational and implementation issues to help provide for efficient management and enforcement. Uses in the Protected Area should be consistent, where practicable, with other Protected Areas. An awareness campaign to maximize the understanding of the Protected Area should also be conducted

## Appendix 2

### List of Bird Species Identified in the CS-MSPA

<b>RESIDENT &amp; MIGRANT SHOREBIRDS</b>	<b>Wetlands</b>	<b>Woodland</b>
Brown Pelican	Y	
Magnificent Frigatebird	Y	
Great Blue Heron	Y	
Great Egret	Y	
Snowy Egret	Y	
Little Blue Heron	Y	
Tricolored Heron	Y	
Reddish Egret	Y	
Cattle Egret	Y	
Green Heron	Y	Y
Yellow-crowned Night-Heron	Y	Y
Glossy Ibis	Y	
Blue-winged Teal	Y	
Northern Shoveler	Y	
Black-bellied Plover	Y	
Wilson's Plover	Y	
Semipalmated Plover	Y	
Killdeer	Y	
Black-necked Stilt	Y	
Greater Yellowlegs	Y	
Lesser Yellowlegs	Y	
Willet	Y	
Spotted Sandpiper	Y	
Ruddy Turnstone	Y	
Sanderling	Y	
Least Sandpiper	Y	
Unidentified Sandpiper, possibly Western	Y	
Short-billed Dowitcher	Y	
Royal Tern	Y	
Belted Kingfisher	Y	

\*endemic

<b>RESIDENT LAND BIRDS</b>	<b>Wetlands</b>	<b>Woodland</b>
Turkey Vulture	Y	Y
Red-tailed Hawk	Y	Y
American Kestrel	Y	Y
White-crowned Pigeon	Y	Y
Plain Pigeon	Y	Y
Ring-tailed Pigeon*		Y
White-winged Dove	Y	Y
Zenaida Dove		Y
Common Ground-Dove	Y	Y
Caribbean Dove	Y	Y
Ruddy Quail-Dove		Y
Olive-throated Parakeet	Y	Y
Green-rumped Parrotlet	Y	Y
Yellow-billed Parrot*		Y
Mangrove Cuckoo		Y
Jamaican Lizard-Cuckoo*		Y
Smooth-billed Ani		Y
Northern Potoo		Y
Jamaican Mango*		Y
Red-billed Streamertail*	Y	Y
Vervain Hummingbird		Y
Jamaican Tody*		Y
Jamaican Woodpecker*	Y	Y
Jamaican Elaenia*		Y
Sad Flycatcher*	Y	Y
Rufous-tailed Flycatcher*	Y	Y
Stolid Flycatcher		Y
Loggerhead Kingbird	Y	Y
Cave Swallow	Y	Y
Jamaican Crow*		Y
White-chinned Thrush*	Y	Y
Northern Mockingbird	Y	Y
Jamaican Vireo*	Y	Y
Bananaquit	Y	Y
Jamaican Spindalis* (aka Tanager)		Y
Yellow-faced Grassquit		Y

Yellow-shouldered Grassquit*	Y	Y
Greater Antillean Bullfinch	Y	Y
Orangequit*		Y
Greater Antillean Grackle	Y	
Jamaican Oriole	Y	Y
Jamaican Euphonia*		Y
Peregrine Falcon	Y	
Osprey		
Antillean Nighthawk	Y	
Gray Kingbird		Y
Barn Swallow	Y	
Gray Catbird		Y
Black-whiskered Vireo	Y	Y
American Redstart	Y	Y
Black-and-white Warbler	Y	Y
Black-throated Blue Warbler		Y
Common Yellowthroat	Y	Y
Hooded Warbler		Y
Northern Parula		Y
Prairie Warbler	Y	Y
Swainson's Warbler		Y
Tennessee Warbler		Y
Worm-eating Warbler	Y	Y
Yellow Warbler	Y	Y
Unidentified Warbler		Y
Ovenbird		Y
Northern Waterthrush	Y	Y
Indigo Bunting		Y
<b>TOTAL PER SITE</b>	<b>65</b>	<b>61</b>
<b>TOTAL NUMBER SPECIES FOR AREA</b>	<b>94</b>	

Source: Annual banding reports (2007-2009), including results from CS-MSPA surveys, submitted to NEPA by Windsor Research Centre 2013 (Adapted); data also archived electronically on <http://www.ebird.org>

### Appendix 3

#### Bat species detected in the CS-MSPA

Species	Feeding Guild	Roost Ecology	Preferred habitat <sup>1</sup>
<i>Pteronotus parnellii</i>	Insectivore	Cave	Cluttered forest
<i>Pteronotus macleayii</i>	Insectivore <sup>2</sup>	Cave	Top-of-canopy, edge forest
<i>Pteronotus quadridens</i>	Insectivore <sup>2</sup>	Cave	Top-of-canopy, edge forest
<i>Mormoops blainvillei</i>	Insectivore <sup>2</sup>	Cave	Top-of-canopy, edge forest
<i>Noctilio leporinus</i>	Piscivore	Cave	?
CHMI or GLSO <sup>3</sup>	*	Cave	*
<i>Erophylla sezekorni</i>	Nectari-omnivore	Cave	Forest
<i>Ariteus flavescens</i>	Frugivore	Tree; opportunistic cave	Forest, mixed agriculture
<i>Artibeus jamaicensis</i>	Frugivore	Cave	Forest, mixed agriculture, gardens
<i>Tadarida brasiliensis</i>	Insectivore <sup>2</sup>	Cave, building	Open space
Possible <i>Nyctinomops</i>	Insectivore	.	.
Unidentified insectivore	Insectivore	.	.
Unidentified		.	.

<sup>1</sup>Habitat preference based on acoustic surveys conducted by WRC in Windsor, northern Cockpit Country, Trelawny, from May 2011-present; see also Emrich *et al. in prep*

<sup>2</sup>Hunting buzzes detected.

<sup>3</sup>The acoustic call signatures of *Chilonatalus micropus* (3-gram insectivore) and *Glossophaga soricina* (10-gram nectari-omnivore) are difficult to distinguish on sonograms. Mist nets would need to be deployed to capture bats and confirm species identity

N.B.: Bat species detected between November 2012 and January 2013

Source: Windsor Research Centre, 2013

## Appendix 4

### Land Parcels in the CS-MSPA

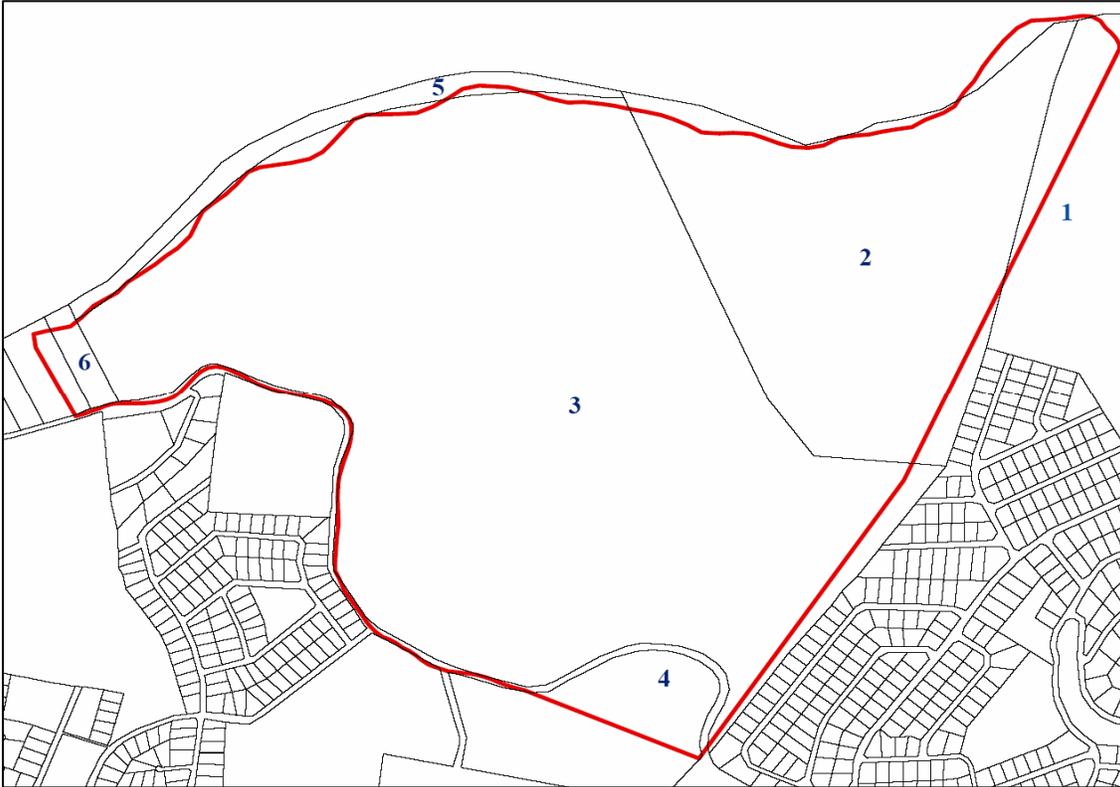


Figure 6: Land Parcels within the CS-MSPA. Prepared by the Local Area Planning Branch, NEPA (2011)

**Table 1: Size of Land Parcels within the CSMSPA**

<b>Land Parcels</b>	<b>Size/Area (ha)</b>	<b>Ownership</b>
2	35.2	Private
3	116.1	Private
4	12.5	Private
5	2.4	Public