



SURVEY REPORT OF GRAND BAIE WETLANDS GRAND BAIE, MAURITIUS



Prepared for:

**MINISTRY OF THE ENVIRONMENT AND NDU
GOVERNMENT OF MAURITIUS**



Prepared by:

The Watershed Company
750 Sixth Street South
Kirkland WA 98033 USA

&

NWFS Consultancy
4050 Northwest Carlton Court
Portland OR 97229 USA

MAY 2008



*Republic of
Mauritius*



THE
WATERSHED
COMPANY



SURVEY REPORT OF GRAND BAIE WETLANDS

GRAND BAIE, MAURITIUS

Prepared for:

**MINISTRY OF THE ENVIRONMENT AND NDU
GOVERNMENT OF MAURITIUS**



Prepared by:



**750 Sixth Street South
Kirkland WA 98033**

**NWFS Consultancy
4050 Northwest Carlton Court
Portland, OR 97229**



12 May 2008

TABLE OF CONTENTS

	Page No.
EXECUTIVE SUMMARY	i
INTRODUCTION	1
Background	1
Goals and Objectives	2
Study Area and Characteristics.....	2
METHODS	3
Wetland Determination and Delineation.....	3
Vegetation Sampling	4
Soil and Hydrology Assessment	4
Ecological Surveys	4
Flora Survey	5
Fauna Survey	5
Vertebrate Survey	5
Invertebrate Survey	6
Wetland Mapping	7
Wetland Training	7
RESULTS	7
Grand Baie International Conference Centre	8
Wetland 1	8
Mare Michaux.....	11
Wetland 2	11
Wetland 3	14
Wetland 4	17
Mare Soyfoo	20
Wetland 5	20
Wetland 6	23
Grand Mare Longue	26
Wetland 7	26
Wetland 8	29
Wetland 10	33
Wetland 11	36
Wetland 12	39
South Study Area	42
Wetland 9	42
DISCUSSION AND FINAL REMARKS	45
LITERATURE CITED	48
Appendix A: Photographs	
Appendix B: Wetland Delineation Course Outline	
Appendix C: 1:5,000 Wetland Delineation and Land Ownership Maps	
Appendix D: Wetland Bounding Coordinates	
Appendix E: List of Vascular Plant Species Identified in Grand Baie Wetlands	
Appendix F: List of Fauna Identified during Grand Baie Wetlands Survey	

TABLE OF CONTENTS (cont'd)

	Page No.
List of Figures	
Figure 1. Comparison of Historical Wetland Area in Grand Baie.....	3
Figure 2. Plan view of Wetland 1 and 30-m buffer.....	9
Figure 3. Typical cross-section view of Wetland 1 (not to scale [NTS]).....	10
Figure 4. Plan view of Wetland 2 and a 30-m buffer.....	12
Figure 5. Typical cross-section view of Wetland 2 (NTS).	13
Figure 6. Plan view of Wetland 3 and 30-m buffer.....	15
Figure 7. Typical cross-section view of Wetland 3 (NTS).	16
Figure 8. Plan view of Wetland 4 and 30-m buffer.....	18
Figure 9. Typical cross-section view of Wetland 4 (NTS).	19
Figure 10. Plan view of Wetland 5 and a 30-m buffer.....	21
Figure 11. Typical cross-section view of Wetland 5 (NTS).	22
Figure 12. Plan view of Wetland 6 and 30-m buffer.....	24
Figure 13. Typical cross-section view of Wetland 6 (NTS).	25
Figure 14. Plan view of Wetland 7 and 30-m buffer.....	27
Figure 15. Typical cross-section view of Wetland 7 (NTS).	28
Figure 16. Plan view of Wetland 8 and a 30-m buffer.....	30
Figure 17. Typical cross-section view of Wetland 8 (NTS).	31
Figure 18. Plan view of Wetland 10 and 30-m buffer.....	34
Figure 19. Typical cross-section view of Wetland 10 (NTS).	35
Figure 20. Plan view of Wetland 11 and 30-m buffer.....	37
Figure 21. Typical cross-section view of Wetland 11 (NTS).	38
Figure 22. Plan view of Wetland 12 and a 30-m buffer.....	40
Figure 23. Typical cross-section view of Wetland 12 (NTS).	41
Figure 24. Plan view of Wetland 9 and 30-m buffer.....	43
Figure 25. Typical cross-section view of Wetland 9 (NTS).	44
Figure 26. Comparison of Historical and Current Wetland Area in Grand Baie.....	47

List of Tables

Table 1. Native and cryptogenic plants identified in Wetland 1.	10
Table 2. Fauna species identified in Wetland 1.	11
Table 3. Native and cryptogenic plants identified in Wetland 2.	13
Table 4. Fauna species identified in Wetland 2.	14

Table 5.	Native and cryptogenic plants identified in Wetland 3.	14
Table 6.	Fauna species identified in Wetland 3.	17
Table 7.	Native and cryptogenic plants identified in Wetland 4.	17
Table 8.	Fauna species identified in Wetland 4.	19
Table 9.	Native and cryptogenic plants identified in Wetland 5.	22
Table 10.	Fauna species identified in Wetland 5.	23
Table 11.	Native and cryptogenic plants identified in Wetland 6.	25
Table 12.	Fauna species identified in Wetland 6.	25
Table 13.	Native and cryptogenic plants identified in Wetland 7.	28
Table 14.	Fauna species identified in Wetland 7.	28
Table 16.	Fauna species identified in Wetland 8.	31
Table 15.	Native and cryptogenic plants identified in Wetland 8.	32
Table 17.	Native and cryptogenic plants identified in Wetland 10.	33
Table 18.	Fauna species identified in Wetland 10.	35
Table 19.	Native and cryptogenic plants identified in Wetland 11.	36
Table 20.	Fauna species identified in Wetland 11.	38
Table 21.	Native and cryptogenic plants identified in Wetland 12.	39
Table 22.	Fauna species identified in Wetland 12.	41
Table 23.	Native and cryptogenic plants identified in Wetland 9.	42
Table 24.	Fauna species identified in Wetland 9.	44

EXECUTIVE SUMMARY

This report presents the findings of a wetland delineation study of freshwater wetlands in and around Grand Baie, Mauritius. It is a subset of the larger Study of Environmentally Sensitive Areas in Mauritius and Rodrigues being conducted in response to the need for implementation of management regulations in the face of ongoing development. This study includes wetland identification and characterization, wetland boundary delineation, flora and fauna surveys, and mapping that includes both wetland boundaries and land tenure. Wetland boundaries were mapped using a hand-held global positioning system (GPS), which collected coordinate units at selected intervals. This GPS data were subsequently incorporated into mapping software for display at 1:5,000 scale. Maps show land ownership both within wetlands and in a surrounding 30-meter buffer area. The goal of the study is to provide guidance for use in developing a structure for wetland conservation.

The delineation of 12 Grand Baie wetlands revealed historic and ongoing pressures from backfilling and other disturbance. Evidence of the effects of this disturbance is present in the largely non-native and invasive plant and animal communities, and in area flooding and associated damages. Comparison to previous work also showed recent and past fragmentation of what were previously large, contiguous wetlands.

Wetland hydrology, soils, and habitat functions were found to be of generally poor or decreasing value in Grand Baie. This is due in most part to reductions in wetland size from backfilling, loss of functional buffers from backfilling and development, and vegetative cover made up primarily of non-native species. Ten wetlands are dominated by *Typha domingensis*, often in near-monospecific stands, and two are open-water-dominated. All wetlands function to store water, and most have had additional stormwater flooding pressure exerted on them due to decreases in wetland size and increasing impervious surface in surrounding areas. Habitat functions of wetlands are limited by the generally low vegetative structural and composition diversity and by buffers that are commonly disturbed and developed. Wetland buffers also tend to function poorly because of their common use for dumping construction materials and other debris, as well as their increasing urbanization.

A comparison of wetland area in Grand Baie over time reveals an estimated 23 percent decrease from 2000 to 2008. Previous inventories approximate that the wetlands decreased in area by 10 percent and 30 percent in the periods from 1980 to 1990 and from 1990 to 2000, respectively.

Backfilling of the Grand Baie wetlands has impacted and continues to impact wetland functions. Detrimental effects are likely to continue and increase in intensity if consideration is not given to wetlands in matters of development. It is therefore important that a framework for wetland management be implemented to avoid further wetland loss and degradation in Grand Baie.

WETLAND DELINEATION STUDY GRAND BAIE, MAURITIUS

INTRODUCTION

This report presents the results of a wetland delineation study conducted on wetlands in the Grand Baie area of Mauritius. This study is a subset of the larger Study of Environmentally Sensitive Areas in Mauritius and Rodrigues, which in turn is part of Mauritius' National Development Strategy and National Biodiversity Strategic Action Plan. The Grand Baie area includes previously unsurveyed freshwater wetlands. Fieldwork was conducted in February and March of 2008 and consisted of identifying and delineating wetlands; characterizing vegetation, soils, and hydrology; locating wetland boundaries using a global positioning system (GPS); and flora and fauna surveys.

Background

The Grand Baie area of northwest Mauritius supports a variety of land uses. These include residential, commercial, and recreational development, all of which have experienced rapid growth in the past 25 years.

Of particular concern is the increasing pressure on the area's coastal wetlands. As noted in the earlier Environmental Risk Report for Grand Baie (Government of Mauritius 2002), extensive backfilling of local wetland areas, road diversion works, and blocked drains have resulted in reduced capacity to alleviate flooding conditions. The majority of the Grand Baie area is now subject to frequent flooding during periods of heavy rain, threatening the health and safety of local residents.

Specific flood-prone areas in Grand Baie are described in the 2002 Environmental Risk Report and include the residential Camp Carol area west the wetland designated Wetland 7 in this report; the roads and commercial areas near Restaurant Méditerranée; Plaine des Papayes Road downstream of the Super-U store and parking lot; Village Hall Lane, behind the Grand Baie Government School and Village Hall; and the immediate vicinity of the Grand Baie International Conference Centre. The report concluded a "medium" risk level of flood damage in these areas. Damage at risk of occurring includes significant crop damage and flooding of properties, important roads, commercial areas, and industrial areas. Such flooding inconveniences local residents, leads to health hazards because of septic tank overflow, damages private property, and hinders travel and commerce.

The recent boom in tourism and general development in coastal areas has resulted in heavy pressure to develop land. Increased property values in these areas have created financial incentives to backfill previously unusable land with relative disregard for potential monetary penalties. The resulting loss of wetland area not only decreases potential water storage capacity and flood control, but also minimizes other wetland functions such as water quality improvement and wildlife habitat. The reduction of these latter functions may have future ramifications on the tourism industry as a result of decreased water quality in the surrounding coastal bays and reduction in wildlife, specifically migratory birds and other waterfowl.

Goals and Objectives

The overall goal of this study is to provide a document, including maps, for use in protecting and conserving freshwater wetlands in the Grand Baie area of Mauritius. Specific objectives of the project are:

- To locate and map previously unmapped non-coastal wetlands in the Grand Baie area;
- To characterize vegetative cover types, soils, and hydrology of the Grand Baie wetlands;
- To provide a resource for identifying land tenure of properties affected by the Grand Baie wetlands and potential wetland buffers; and
- To provide basic training in wetland identification, delineation, and mapping for NPCSS staff.

Study Area and Characteristics

For the purposes of this study of wetlands within the Grand Baie area, wetland inventories centered upon the known wetlands in and around Grand Mare Longue, Mare Michaux, and Mare Soyfoo. Additional wetlands that had been previously identified in earlier reports (Government of Mauritius 2002), as well as one large, previously un-inventoried wetland to the east of Grand Mare Longue, were also included in this study. Existing fragmented wetlands that historically comprised Grand Mare Longue, Mare Michaux, and Mare Soyfoo are labeled as such on the accompanying 1:5,000 maps (Appendix C).

The northern portion of Mauritius, which includes Grand Baie, can generally be described as an undulating plain formed during the late volcanic period. Because lava flows around Grand Baie occurred during the dying phases of volcanic activity, the depressions were not filled by subsequent lava flows. This resulted in topographic height differentials of up to 10 meters (m) (Government of Mauritius 2002).

Mauritius experiences its greatest precipitation in the summer months from December to March. Precipitation records from weather stations nearest the northwest coast report average long-term (1971-2000) means of 250 millimeters (mm) for February, which is consistently the wettest month. Average long-term precipitation in the northwest reaches its lowest in summer, ranging from 51 mm in October to 150 mm in April. Yearly long-term means from this time period from the same stations average 1,418 mm (Central Water Authority 2006).

Prior to the development of the northern portion of the island, large depressional areas were likely present and contained historic wetlands. Over time, these depressional areas have been gradually filled, resulting in a fragmented wetland mosaic. As a result, the surface water hydrology in the island's northern region has become disjointed. The wetlands in and around Grand Baie receive the majority of their water from rainfall and adjacent surface water runoff. As continued development pressure leads to increased backfilling activity within these wetland areas, the capacity to store stormwater during periods of heavy rain continues to decrease.

The wetlands within Grand Baie have been found to be relatively impermeable with very little contribution to groundwater (Government of Mauritius 2002). The Northern Plains

Aquifer, located in the northern region of the island north of the Port Louis mountain ranges, is fed primarily from the Central Plateau through a network of discontinuities in the northern rim of the central caldera. Additional sources come from rainwater and adjacent riverine systems. However, these latter items are not very significant since 1) the northern region receives relatively little precipitation compared to the rest of the island (approximately 1,500 mm annually) and 2) the north has a relatively poor defined network of surface water channels due to its highly permeable lava flows.

The *Study of Environmental Risks in Grand Baie* (Government of Mauritius 2002) reported a total of 10 wetlands. Of these, three are part of the former Grand Mare Longue, three wetlands are part of the former Mare Michaux, two wetlands are part of the former Mare Soyfoo, one wetland is located adjacent to the Grand Baie International Conference Center, and one wetland is located to the southwest of the Super U market, west of the intersection of Roads B11 (Plaines des Papayes Road) and B45 (Vingt Pieds Road). In that study, historical data of approximate wetland size was reported for the years 1975, 1988, 1998 and 2002. Data for 1975, 1988 and 1998 were based on aerial photo interpretation. Year 2002 data were based on topographic surveys. Based on these values, estimated areas were projected for the years 1980, 1990 and 2000 (Figure 1).

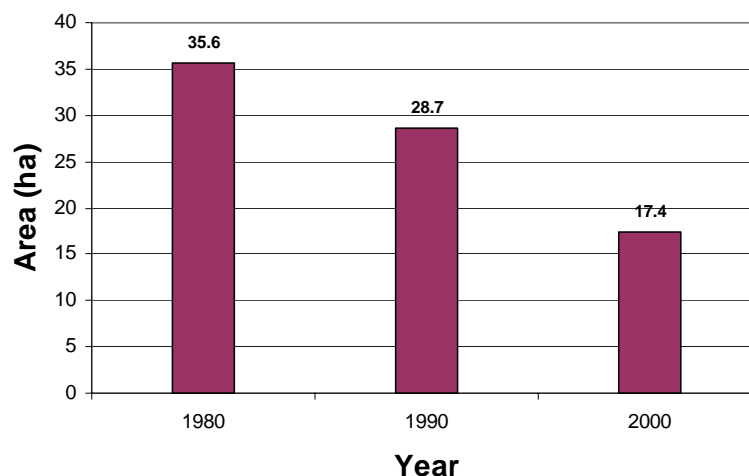


Figure 1. Comparison of Historical Wetland Area in Grand Baie.

This study uses these data to make a rough comparison to current conditions in Grand Baie (see Figure 26). The changing nature of the Grand Baie wetlands is apparent both from this analysis and from the results of the delineations described in this report.

METHODS

Wetland Determination and Delineation

Existing survey information was utilized as a guide to locating wetlands in the field. Sources included a 1990 1:25,000 map of the Pamplemousses District (Government of Mauritius 1990), the Ministry of the Environment (MOE) and NDU Final Technical Report entitled *Study of Environmental Risks in Grand Baie* (Government of Mauritius 2002), and Pamplemousses Development Strategy Maps (Government of Mauritius 2006).

Fieldwork was conducted in February and March 2008. Wetland presence was determined by a hierarchical examination of vegetation, hydrology, and soils. The presence of obligate wetland vegetation in a homogeneous or near-homogeneous stand was considered to be highly indicative of wetland conditions, although additional wetland characteristics were recorded in all wetlands. Permanent standing water was also used as a primary hydrologic indicator of wetland presence, as was organic soil.

Where the three primary indicators listed above were absent, secondary indicators were assessed. Secondary indicators were as follows: common wetland vegetative species (native and non-native); evidence of wetland hydrology, such as water-stained vegetation, surface scouring, and oxidized root zones; and soils showing hydric characteristics such as sulfidic odor, gleying, redoximorphic features, an organic component, and oxidized rhizospheres. Wetland determinations were made when at least two primary indicators, one primary and two secondary, or three or more secondary indicators were observed.

Wetland boundaries were located where vegetation, hydrology, and soils transition from typically hydric to non-hydric. Where these parameters were highly disturbed or otherwise unreliable, the presence of fill, debris, or other disturbance was used to demark the wetland edge (Appendix A, Photo 1).

Vegetation Sampling

Vegetative composition and structure were measured using survey and line intercept techniques. Composition and richness of the vegetative community were assessed by a comprehensive count of all species occurring in each wetland. Vegetation was identified to species. A qualified botanist examined each site and recorded all species located. Samples of unknown species were collected and identified using herbarium resources.

Soil and Hydrology Assessment

Soil and hydrology characteristics were assessed by examination of numerous pits dug to a depth between 0.25 m and 0.50 m. Soil chroma and value were defined using Munsell Soil Color Charts (Kollmorgen Instruments Corporation 1992). Soil texture, structure, moisture, and other features were noted. Depth at which saturation or inundation appeared was recorded. Salinity of standing water, where it occurred, was measured using a salinity refractometer.

Ecological Surveys

Ecological surveys covered the wetland flora (angiosperms and pteridophytes), vertebrate fauna (mammals, birds, reptiles, amphibians, and fish) and commonly used indicator groups of invertebrate fauna (butterflies and molluscs).

Species lists for the wetlands and their immediate vicinity were based on the findings of active searching for plants, animals, and the various categories of signs characterizing them such as calls, burrows, feeding signs, prints, droppings, and bones. No quantification of abundance of vertebrates and invertebrates was made due to the difficulties of correlating the recorded sights and signs to actual abundance, particularly given the limited time for the survey and the overwhelming dominance of the Mauritian fauna by alien species of no conservation importance (Cheke 1987). No night survey was conducted.

Plant and animal species were grouped as follows:

- Mauritian endemic: a native species known to occur only in Mauritius,
- Native: a species known to occur naturally both in Mauritius and elsewhere,
- Cryptogenic: a species that is possibly native to Mauritius, and
- Alien: a species introduced by human agency into Mauritius.

All native species were assessed for conservation status against the International Union for Conservation of Nature (IUCN) Red List criteria (IUCN 2001).

Flora Survey

A sample of each angiosperm and fern species found was collected, pressed, and dried. Identification was made using the *Flore des Mascareignes* volumes (Bossier *et al.* 1976-onwards) and comparing with collections held at the Mauritius Herbarium, MSIRI. The scientific names of the plant species follow the suprageneric classification of the Angiosperm Phylogeny Group with updates (Stevens 2001-onwards). Infrageneric names and their origin follow the *Flore des Mascareignes* (Bossier *et al.* 1976-onwards).

For the as yet unpublished families of the *Flore des Mascareignes*, including the Cyperaceae and Poaceae, other sources were used. For Cyperaceae, species origin was taken by crosschecking information from Bojer (1837), a manuscript from Vaughan (1932), and from an incomplete manuscript from Marais (198?), with genera and species names per the World Checklist of Cyperaceae (Govaerts *et al.* 2006). For Poaceae, the origin was determined by crosschecking information from Bojer (1837) and Hubbard and Vaughan (1940), with genera and species names per the GrassBase (Clayton *et al.* 2006-onwards).

The species classification was taken from the working list of the National Native Threatened Plants Committee when available. Otherwise, an indication of each species' status was assigned based on criteria from the Committee when the species has not been officially assessed.

Fauna Survey

Soil samples were taken to survey certain molluscs. Other groups were identified in the field. Family and author names follow ITIS (2008), the Reptile Database (J. Craig Venter Institute [JCVI] 2007), Vinson and Vinson (1969), and the Catalogue of Life (Bisby *et al.* 2005).

When available, classification was taken from the IUCN Red List 2001 and 2007. Otherwise, the best assessment possible was made using IUCN categories and criteria to allocate each species a category.

Vertebrate Survey

Mammals and Birds

Mammals and birds were surveyed during daylight. The surveys were carried out through both direct observation of the animals and through indirect cues such as footprints, calls, or nests found. Identifications were made on the spot using a pair of 10 x 42 binoculars and a

detailed field guide relevant to the avifauna of Mauritius (Barré *et al.* 1996). For the mammals, where only bats are native to Mauritius, Probst (1997) was used.

Fish

Surveys for fish were carried out during daylight in the field. The survey was done by direct observation of the animals in the water. Identifications were made using a field guide relevant to the freshwater fish of Mauritius (ARDA 2003). It is worthwhile to note that the freshwater vertebrate fauna of Mauritius is markedly low in diversity and endemism, with a total of 18 fish species of which five are introduced.

Reptiles and Amphibians

Diurnal reptiles and amphibians were surveyed during daylight hours by walking through the wetlands and their vicinities, and identifying all species observed in exposed positions. These data were supplemented by active search in appropriate microhabitats such as under tree bark where diurnal geckos tend to seek refuge when disturbed. Nocturnal reptiles were actively searched for beneath stones, rotting tree trunks, tree bark, and the wide range of debris dumped in the wetlands, like concrete slabs, rusting barrels, tires, etc. Indirect signs of presence such as shed skins were actively searched for. All species encountered were identified in the field. There are no native species of amphibians in Mauritius.

For reptiles, nomenclature follows Vinson and Vinson (1969) and the Reptile Database (JCVI 2007).

Invertebrate Survey

Butterflies

Butterflies were surveyed by direct observation. Identification of Mauritian species on the wing is possible in most cases. Close examination of wing patterns of resting butterflies is necessary for some groups, such as the Hesperidae, Lycaenidae, and Pieridae, and this was done on resting butterflies in the field by eye or using binoculars and a field guide (Williams 2007).

Land Snails

Land snail surveys were conducted for the freshwater snails by actively searching on submerged leaves of the vegetation and rocks in the wetlands. Shells scattered on the ground in partially or fully dried sections of the wetlands were also sampled.

The survey for the terrestrial species was completed by actively searching for large species (> 0.5 cm) by overturning rocks and logs under which they would be expected to be aestivating or hiding during moist days. Indirect evidence of presence, such as slime trails, empty shells, or shell fragments, was searched for. Any large snail found was identified on the spot. For smaller species, several soil samples were taken. These were sieved on site using a 5 mm mesh size sieve and stored in cloth bags where they were air-dried. Once dry, samples were immersed in water to concentrate shells in the floating fraction, which is then scooped, dried and examined for shells, snail eggs and shell fragments. Identification of micro-species was done under a binocular microscope (up to 40x magnification). Classification, species status, and distribution information follow Griffiths and Florens (2006).

Wetland Mapping

Mapping of wetland boundaries in Grand Baie was performed in the field during delineation activities using a hand-held GPS unit (Trimble GeoExplorer). The coordinate system used is UTM 40S and WGS 1984 datum. Upon determination of the wetland boundary location, point data were collected at inflection points along the wetland boundary in order to capture a high level of detail, including small shifts in boundary direction. Typical horizontal distances between points ranged from 5 to 30 m. Point data were recorded with a final level of accuracy of approximately 2 to 5 m after post-processing. After undergoing post-processing, the wetland point data were subsequently downloaded and exported into Geographic Information System (GIS) shapefiles using Trimble GPS Pathfinder 3.10 software (Trimble 2005). ArcView 9.2 software (ESRI 2006) was then used to create polygons of each wetland in order to assess total wetland area. These wetlands are depicted in plan view maps at 1:5,000 scale, as well as on maps showing land ownership and tenure within both the wetlands and 30-m buffers (see Appendix C). Land ownership and tenure information was obtained from the Mortgage Office (also known as the Registrar General's Department) and the Ministry of Housing and Lands (MOHL).

Each inventoried wetland was assigned a number (1 through 12) for reference throughout the project. Point data for each wetland were subsequently given a sequential identifier. For example, Wetland 1 data points begin with 1-1, 1-2...1-20, etc.

Maps of each of the 12 individual wetlands are provided in the results section to show greater detail, including bounding coordinates and approximate deepest point. Coordinates of wetland boundaries are included in Appendix D.

All GIS data are projected in both UTM 40S coordinates and the Mauritius National Grid. GIS projection files are provided in electronic format for use in viewing data files in either system.

Wetland Training

A wetland specialist and environmental engineer conducted a one-day course for MOE, NDU, MOHL, and NPCS staff on wetland identification, delineation, and mapping in the Grand Baie area. The course outline is included as Appendix B of this report. All instruction was conducted in the field at a large freshwater emergent wetland located north of Belle Mare.

RESULTS

Twelve wetlands were identified and flagged within the study area (Appendix C). They are described below in terms of physical characteristics and functional value.

The classification of a number of plant species as cryptogenic is indicative of the relatively late commencement of botanical studies in Mauritius. Most studies were implemented in the 19th century, when large areas along the coast had already been deforested and deforestation rates were high elsewhere on the island. In the case of *Typha domingensis*, a dominant species in Grand Baie wetlands, most sources classified it as alien in the 19th century, whereas more recent studies on species distribution consider that the species may be native to the Mascarenes (Marais 198X, Bosser *et al.* 1976-onwards). It is therefore classified as

cryptogenic for the purposes of this report. Refer to Appendix E for a complete list of vascular plant species identified in each wetland. Tables within the text contain only species of native and cryptogenic origin.

Grand Baie International Conference Centre

Wetland 1

Wetland 1 is an emergent wetland 0.476 ha (4,761m²) in size (Figures 2 and 3; Appendix A, Photo 2) adjacent to the Grand Baie International Conference Centre. Vegetative cover in Wetland 1 approaches 100% and is approximately 90% the emergent *Typha domingensis*. A shrub component totaling less than 10% is limited to wetland edges and a few scattered locations toward the center of the wetland. This provides the only structural diversity in the wetland. The total number of species identified in the wetland is 51, of which 17 are native, non-invasive species (Table 1).

Soils in the wetland are mucky loam with a small clay component. Color is generally very dark grayish brown (10YR 3/2 and 2/2; 2.5Y 4/2 and 3/2). There is very little stratification in soil color and texture in the wetland. Soils are saturated and inundated throughout the wetland, and redoximorphic features are not evident.

Hydrology within the wetland is standing water of significant depth, as great as 0.50m at the wetland edges at the time of observation. Salinity was 3 parts per thousand (ppt) when it was measured in February 2008.

The Grand Baie International Conference Centre parking lot is not fitted with stormwater control devices, and topography slopes slightly down from the Centre toward the wetland. This is a contributing source of hydrology to the wetland, along with direct precipitation and additional runoff from other boundaries. A drain cover located near a taxi stand adjacent to the wetland indicates underground drainage to the wetland from this area. The likely entry point of any such drainage is obscured by fill and other debris (Appendix A, Photo 3).

Fauna located in Wetland 1 are shown in Table 2. The two identified native species, *Zosterops borbonicus mauritanus* and *Leptotes pirithous*, are both species of “least concern” for which adequate data have been collected to make this determination. Non-native species include seven bird, two amphibian, and one snail species.

The buffer of Wetland 1 is highly degraded over much of the wetland’s perimeter. The wetland is contained by fill and intensive development, including roads, a parking lot, and residences. Construction of the Grand Baie International Conference Centre resulted in an approximately 50% reduction in the size of Wetland 1 (Government of Mauritius 2002). A maintained lawn buffers the wetland from the Conference Centre parking lot. This provides some potential for rainwater infiltration, but the lack of substantial vegetation in this area results in little protection of wetland functions.

Wetland 1 appears to be fairly well shielded from future backfilling. Bordered by the Conference Center and its adjacent parking lot, the Royal Palm Hotel, and its local access road, this wetland should not receive much additional development pressure. However, water storage function of this wetland has been noted to fail during periods of severe heavy rain.

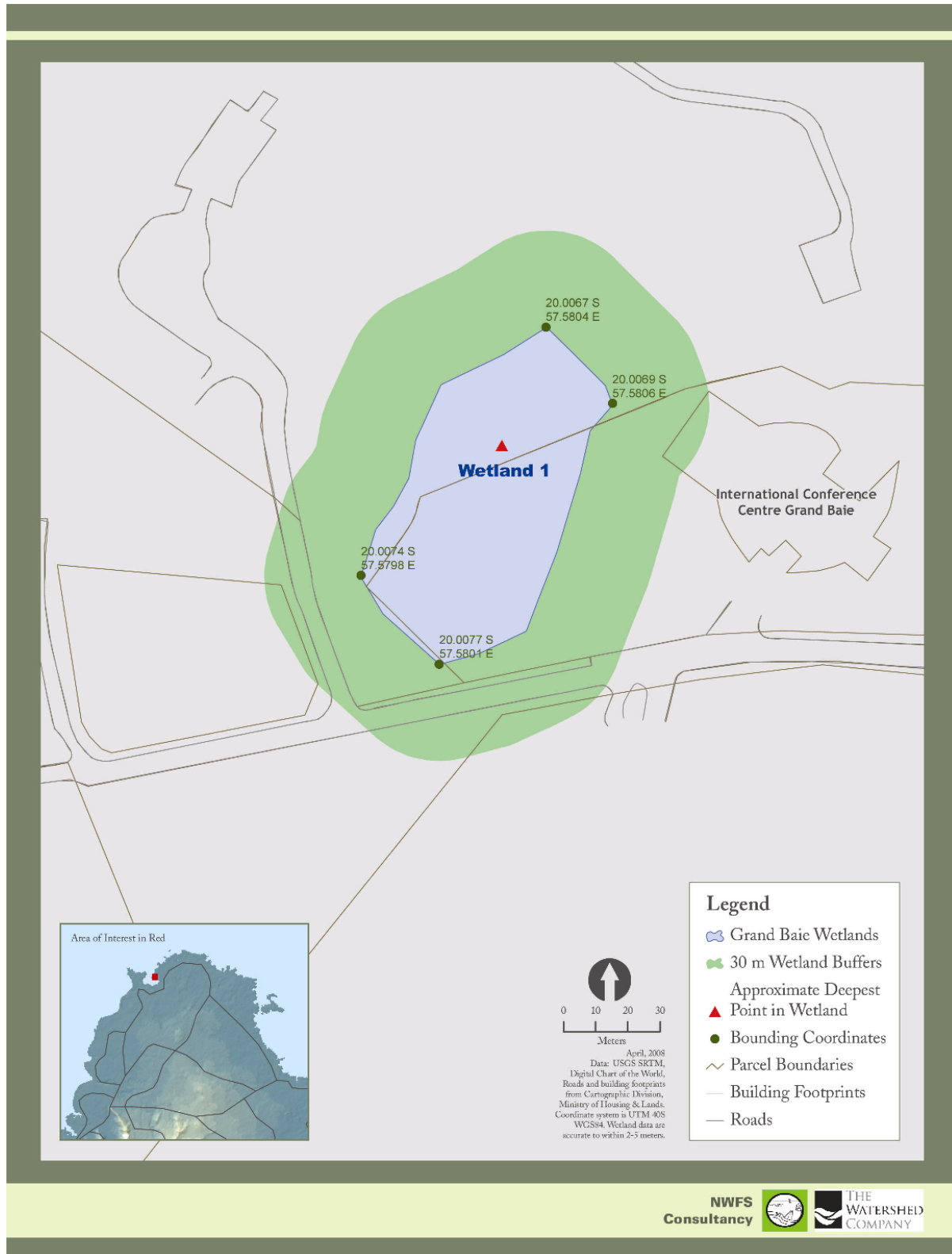


Figure 2. Plan view of Wetland 1 and 30-m buffer.

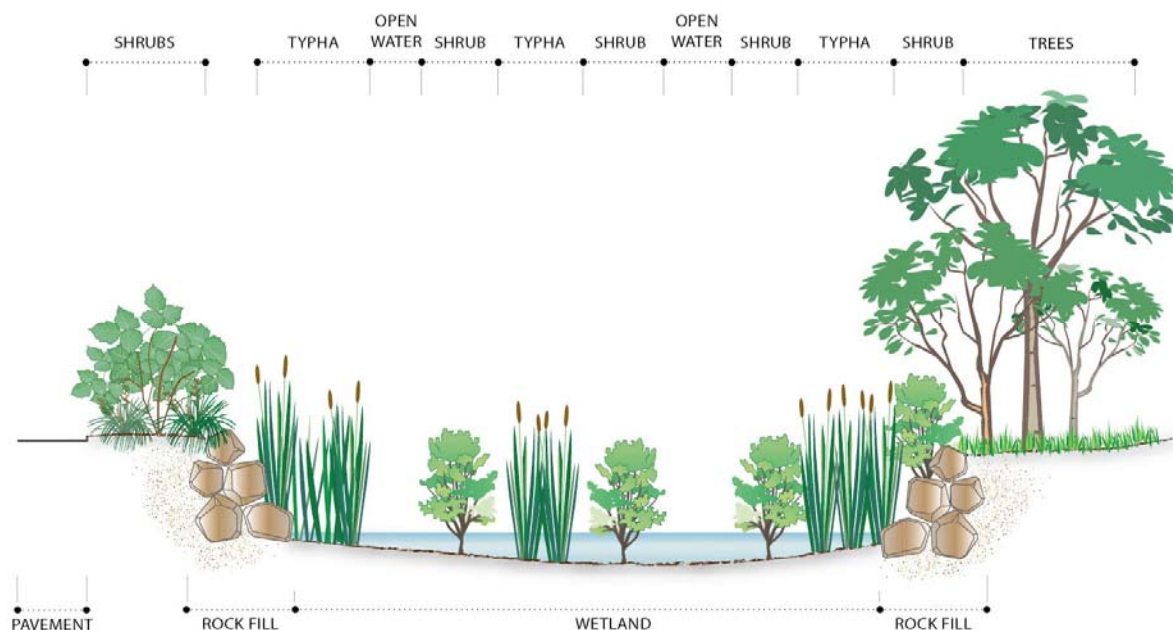


Figure 3. Typical cross-section view of Wetland 1 (not to scale [NTS]).

Table 1. Native and cryptogenic plants identified in Wetland 1.

Family	Species	Common Name	Origin	IUCN ¹
Aizoaceae	<i>Sesuvium ayresii</i>		Native	LC
Araceae	<i>Spirodela punctata</i> (G. F. W. Meyer) Thompson	Lentille d'eau	Native	DD
Boraginaceae	<i>Hilsenbergia petiolaris</i>	Bois pipe	Native	
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Convolvulaceae	<i>Ipomoea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatran	Native	LC
Convolvulaceae	<i>Ipomoea violacea</i>		Native	
Cyperaceae	<i>Cyperus rotundus</i>		Native	
Cyperaceae	<i>Kyllinga polyphylla</i> Willd. ex Kunth		Native	DD
Cyperaceae	<i>Pycnus cf. polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Fabaceae	<i>Canavalia rosea</i>	Cocorico	Native	
Lauraceae	<i>Cassytha filiformis</i> L.	Liane sans fin	Native	LC
Lemnaceae	<i>Lemna perpusilla</i>	Lentille d'eau	Native	
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

¹ LC = Least concern, DD = Data deficient

Table 2. Fauna species identified in Wetland 1.

Group	Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Birds	Zosteropidae <i>Zosterops borbonicus mauritianus</i> (Gmelin, 1789)	Pic-pic	Native	LC
		Estrildidae <i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien	
		Fringilidae <i>Serinus mozambicus</i> (S. Muller, 1776)	Serin, Yellow-fronted Canary	Alien	
		Ploceidae <i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien	
		Ploceidae <i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow, Moineau	Alien	
		Pycnonotidae <i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Boulboul, Kondé	Alien	
		Rallidae <i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien	
		Sturnidae <i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien	
	Amphibians	Ranidae <i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
		Bufo <i>Bufo gutturalis</i> (Power, 1927)	Toad, Krapo	Alien	
Invertebrates	Butterflies	Lycaenidae <i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
	Snails	Physidae <i>Physa acuta</i> (Draparnaud, 1805)		Alien	

¹ LC = Least concern

Mare Michaux

The Mare Michaux complex comprises three *Typha*-dominated wetlands, individually referred to as Wetlands 2, 3, and 4.

Wetland 2

The largest of the Mare Michaux wetlands, Wetland 2 is located north of the Super U supermarket (Figures 4 and 5). It is 0.758 ha (7,580 m²) in area and includes open water, emergent, and shrub cover types (Appendix A, Photo 4). Open water presently covers about 20% of the wetland. Shrub cover occurs in portions of the wetland's north and east edges and totals approximately 5% of the wetland. The remainder is emergent wetland dominated by *Typha domingensis*, with expanses of the invasive *Mikania micrantha* approaching 5% cover in total. Structural diversity is low. Native vegetative species in the wetland are listed in Table 3.

Soils in Wetland 2 are consistently black (2.5Y 2.5/1) clay loam with a strong sulfidic odor and distinct and prominent redoximorphic features. Soils transition to a brighter brown (10YR 4/3 and 5/3) clay loam with less distinct redoximorphic features toward the wetland edges. All parts of the wetland were either saturated or inundated during February 2008 site visits.

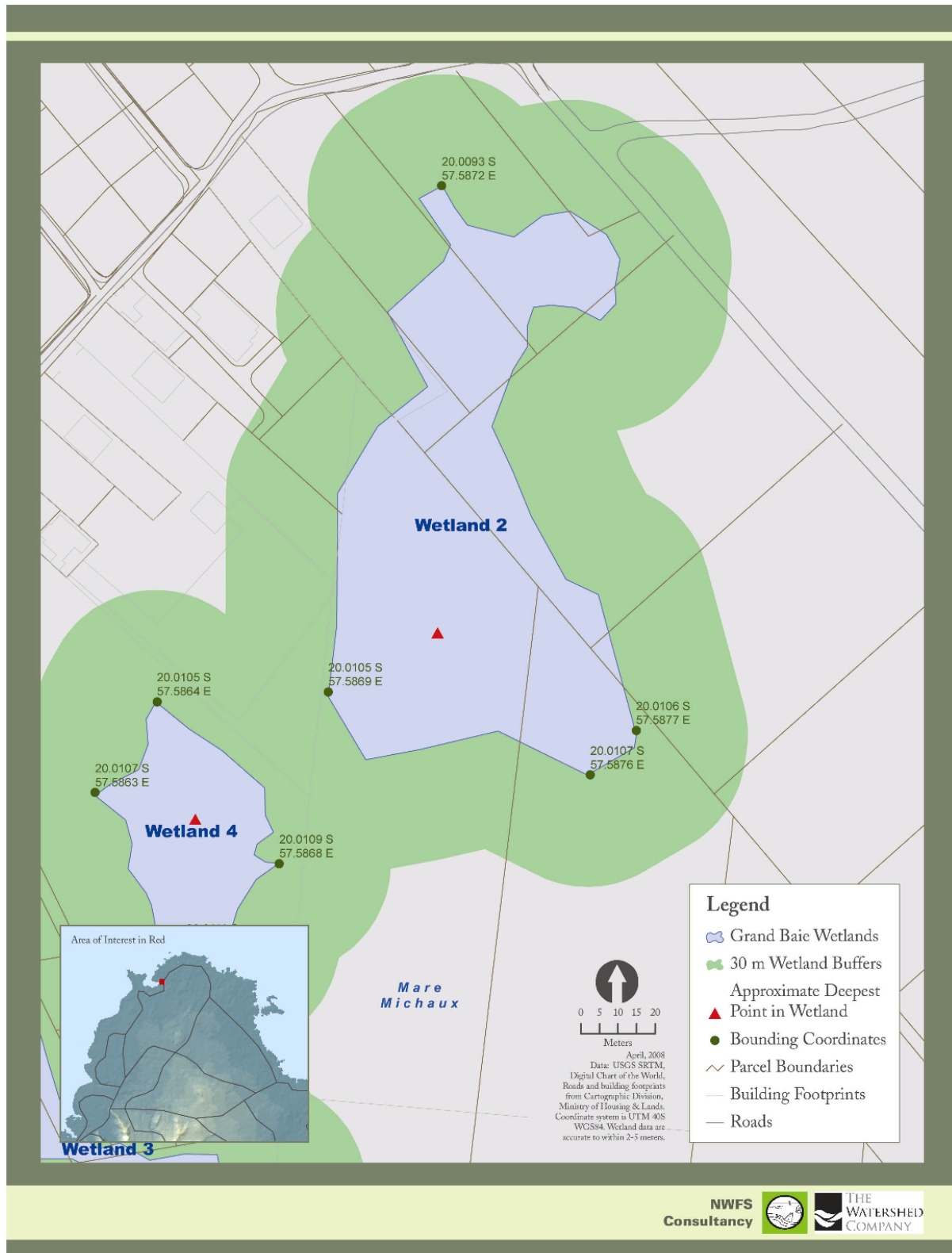


Figure 4. Plan view of Wetland 2 and a 30-m buffer.

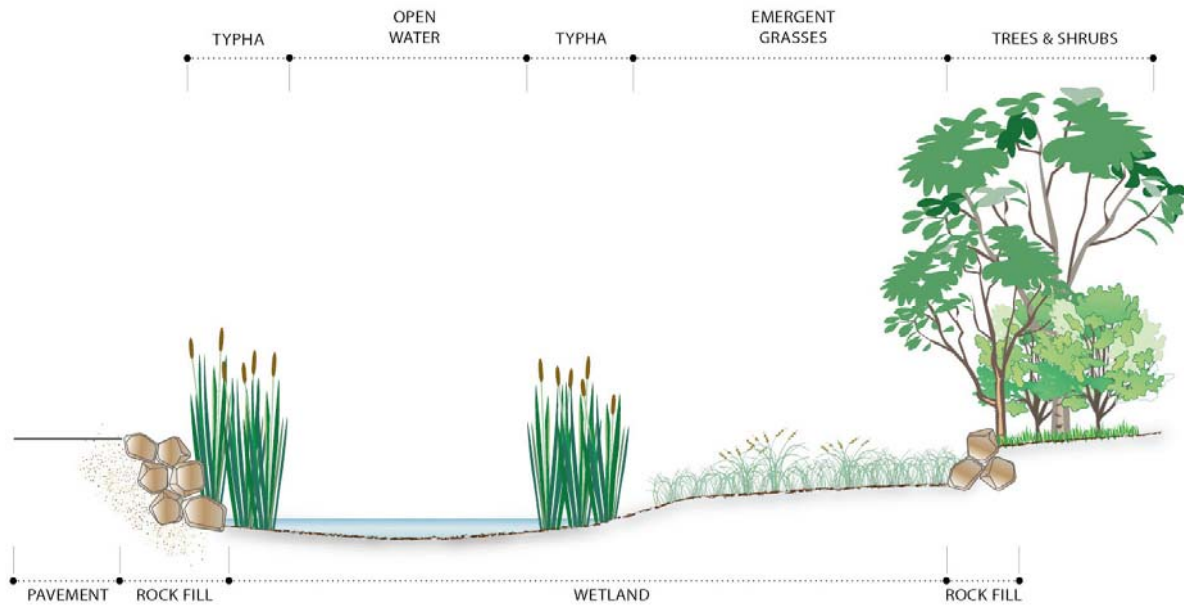


Figure 5. Typical cross-section view of Wetland 2 (NTS).

Table 3. Native and cryptogenic plants identified in Wetland 2.

Family	Species	Common Name	Origin	IUCN ¹
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Cyperaceae	<i>Cyperus stoloniferus</i> Retz.		Native	LC
Cyperaceae	<i>Pycnus</i> cf. <i>polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Fabaceae	<i>Canavalia cathartica</i> Thouars		Native	DD
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Sporobolus virginicus</i> (L.) Kunth		Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC
Vitaceae	<i>Cissus rotundifolia</i> (Forssk.) Vahl	Liane de boeuf	Cryptogenic	LC

¹ LC = Least concern, DD = Data deficient

Hydrology in Wetland 2 originates from runoff and precipitation. The Super U complex has no stormwater control facilities and flooding during rain and storm events enters the wetland after running off the Super U property (Appendix A, Photo 5). Salinity averaged 3 ppt during testing. Seven vertebrate and three invertebrate species were identified in Wetland 2 (Table 4). The two butterfly species, *Borbo borbonica* and *Leptotes pirithous*, located in the wetland are the only observed native species. Both are classified as species of least concern.

The edges of Wetland 2 are largely defined by fill and the adjoining buffers are highly degraded. Little vegetation apart from weedy invasives and vines adjoin the wetland, and the buffer functions poorly for water quality and quantity control. Garbage and other debris line much of the wetland, particularly along the highly developed west and south edges.

Table 4. Fauna species identified in Wetland 2.

Group	Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Birds	Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Ploceidae	<i>Ploceus cucullatus</i> (Muller, 1776)	Serin, Yellow-fronted Canary	Alien
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Boulboul, Kondé	Alien
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien
	Fish	Poeciliidae	<i>Gambusia affinis</i> (Baird & Girard, 1853)	Million	Alien
Invertebrates	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native LC
	Snails	Ariophantidae	<i>Macrochlamys indica</i> (Pfeiffer, 1846)		Alien

¹ LC = Least concern, DD = Data deficient**Wetland 3**

This portion of the Mare Michaux complex is 0.186 ha (1,856 m²) in area (Figures 6 and 7). Major cover types in the wetland are emergent vegetation and aquatic plants (Appendix A, Photo 6). Two *Typha* stands and one shrub area make up approximately 5% and 10% of the area, respectively, providing a small amount of structural diversity. Open water covers about 10% of the wetland, and the remaining area is emergent plant cover dominated by the native *Paspalidium geminatum* (Table 5), characterized as locally common. Salinity in the open water portions averaged 3 ppt.

Table 5. Native and cryptogenic plants identified in Wetland 3.

Family	Species	Common Name	Origin	IUCN ¹
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Cyperaceae	<i>Kyllinga polyphylla</i> Willd. ex Kunth		Native	DD
Hydrocharitaceae	<i>Hydrilla verticillata</i> (L. f.) Royle		Native	DD
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Ruppiaceae	<i>Ruppia maritima</i> L.		Native	DD
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

¹ LC = Least concern, DD = Data deficient

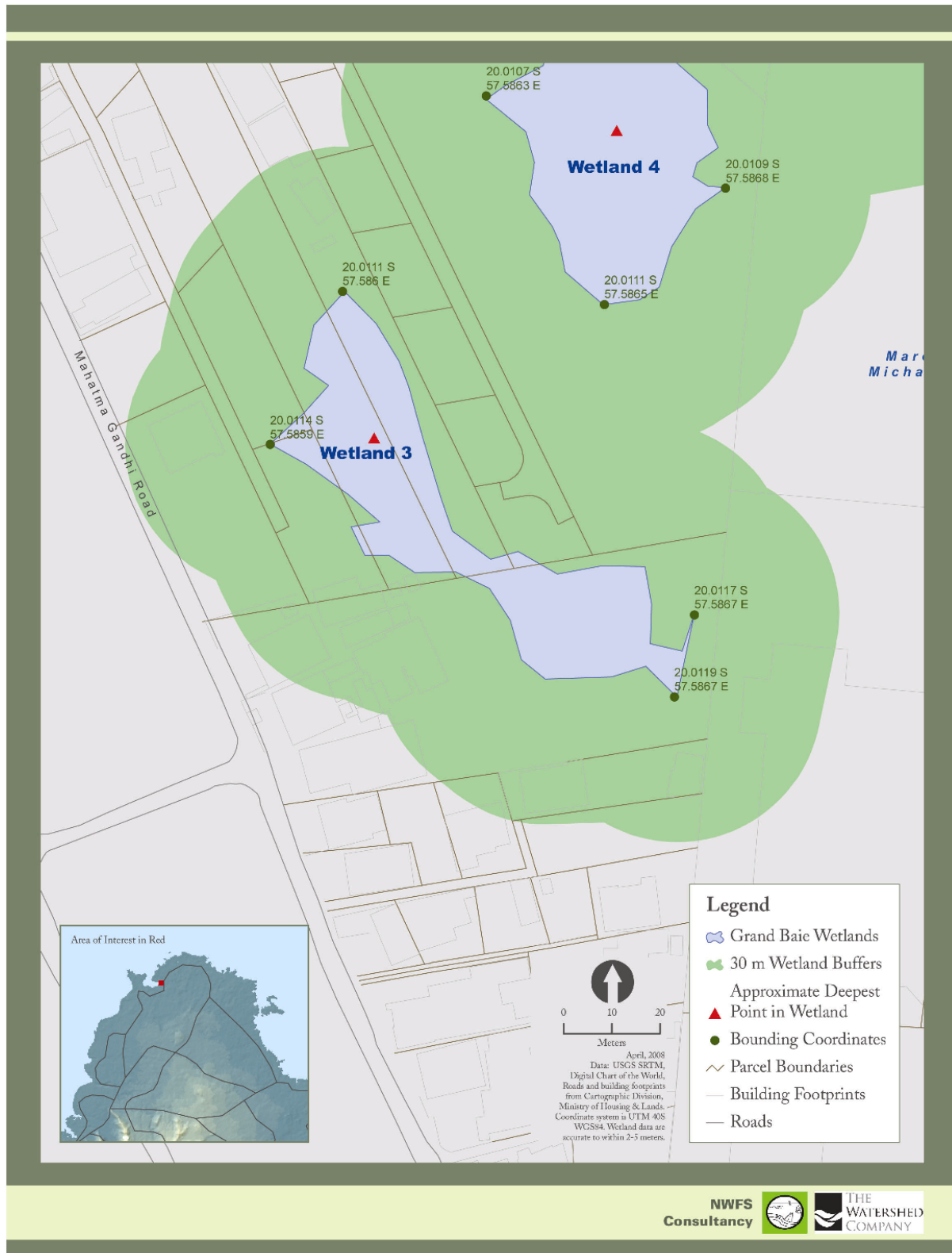


Figure 6. Plan view of Wetland 3 and 30-m buffer.

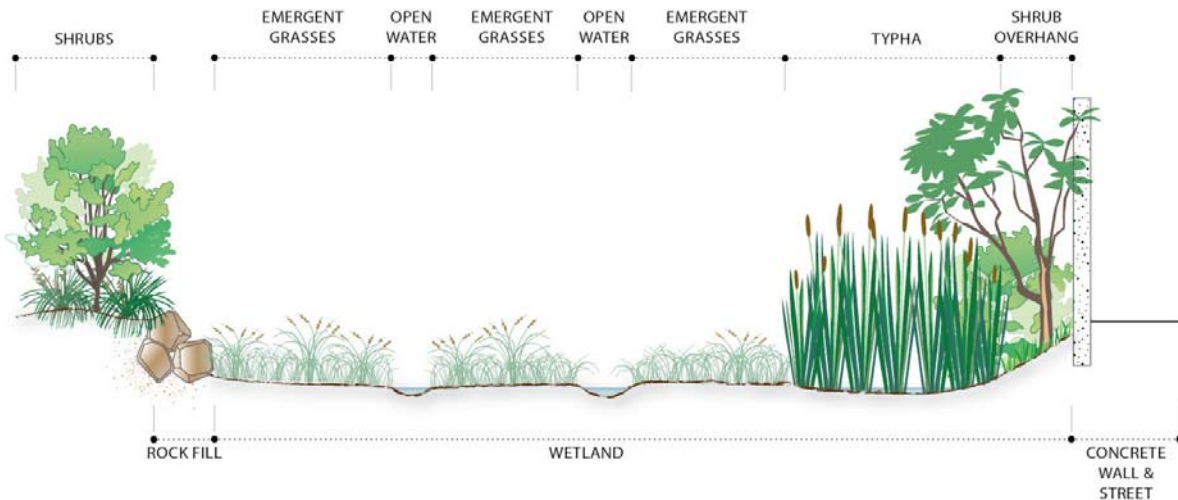


Figure 7. Typical cross-section view of Wetland 3 (NTS).

Soils in Wetland 3 are stratified with an approximately 10-cm surface horizon of black and very dark grayish brown (10YR 2/1 and 3/2) loam, underlain by a 10-cm stratum of dark grayish brown (10YR 4/2) sand followed by pale brown (10YR 6/3) sand to at least a 0.5-m depth. Redoximorphic features are not evident. Gravel and construction debris are present in the soil along wetland edges and in a few disturbed areas toward the center of the wetland. Soils have a strong sulfidic odor throughout the wetland. Saturation or inundated was present throughout during site visits.

Hydrology is from precipitation and runoff. A hydrologic connection may still exist between Wetlands 3 and 4. Large rock fill and debris obscure any connection, but topography between the wetlands and the clear historic connection suggest that water still flows between them along a retaining wall (Appendix A, Photo 7). Drainage also flows through a series of concrete channels to the northwest during periods of overflow.

Table 6 lists fauna identified in Wetland 3. Four native butterfly species, *Borbo borbonica*, *Leptotes pinithous*, *Catopsilia florella*, and *Eurema floricola* were observed. All of these species are rated as species of least concern. One non-native species each of butterfly, reptile, amphibian, mammal, and birds was also noted in Wetland 3 during surveys.

The buffer of Wetland 3 is made up of commercial and residential development. The commercial areas provide little value as habitat or for water quality and flow functions. Residential areas along the eastern boundary of the wetland are vegetated with non-native and cultivated species, which serve to reduce stormwater flow and treat water quality to some extent. Wildlife habitat in the buffer is poor, but of somewhat higher value in the vegetated areas than the commercial areas.

Table 6. Fauna species identified in Wetland 3.

	Group	Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Mammals	Canidae	<i>Canis familiaris</i> (Linnaeus, 1758)	Dog	Alien	
	Birds	Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien	
	Reptiles	Chamaeleonidae	<i>Calotes versicolor</i> (Daudin, 1802)	Agamid	Alien	
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
Invertebrates	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native	LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native	LC
		Pieridae	<i>Eurema floricola</i> (Boisduval, 1833)		Native	LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien	

¹ LC = Least concern**Wetland 4**

This 0.180-ha (1,801 m²) *Typha*-dominated wetland is situated between Wetlands 2 and 3, along the southwest edge of the Grand Baie Bazaar structure (Figures 8 and 9; Appendix A, Photo 8). Open water constitutes approximately 5% of the wetland and salinity measured 2 ppt during the February 2008 site visits. Shrubs, particularly the invasive *Lantana camara*, make up approximately 5% cover of the area and are limited to a patch along the southeast wetland boundary. Emergent grasses, including the native *Paspalum vaginatum*, constitute 5-10% of the wetland area in the southern extent. A monospecific *Typha domingensis* expanse covers the remainder of the area (Table 7).

Table 7. Native and cryptogenic plants identified in Wetland 4.

Family	Species	Common name	Origin	IUCN ¹
Cyperaceae	<i>Cyperus stoloniferus</i> Retz.		Native	LC
Fabaceae	<i>Abrus precatorius</i> L. var. <i>africanus</i> Verdc.	Herbe du diable	Native	LC
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Sorghum verticilliflorum</i> Stapf.	Millet sauvage	Native	DD
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

¹ LC = Least concern, DD = Data deficient



Figure 8. Plan view of Wetland 4 and 30-m buffer.

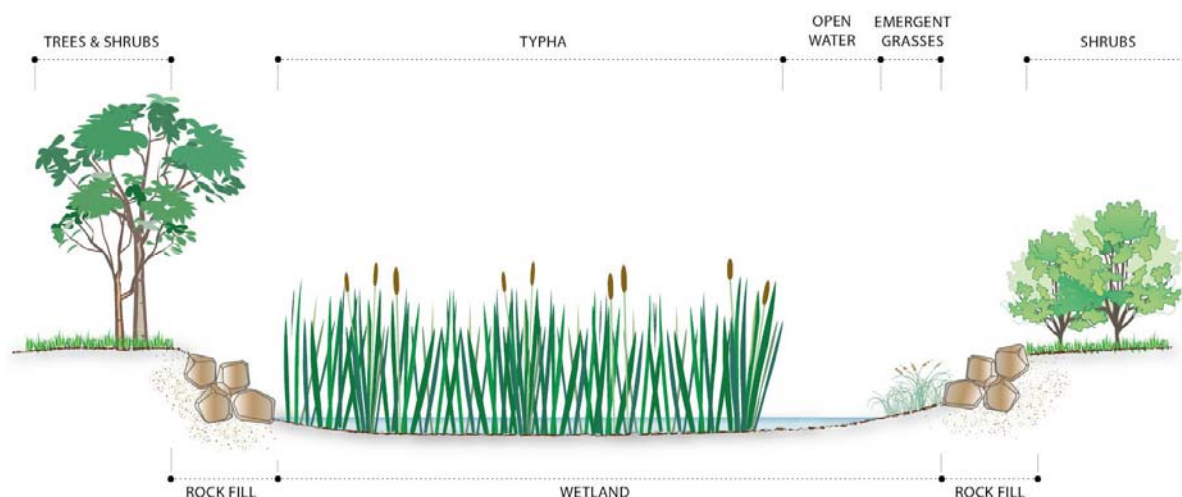


Figure 9. Typical cross-section view of Wetland 4 (NTS).

A very thin surface layer of black (10YR 2/1) loam overlays very sandy soils with a small clay component. Soil color from the loam layer to about 0.1 m very dark grayish brown, turning to light gray to at least 0.5 m depth. No redoximorphic features are apparent. A sulfidic odor is present in soils throughout the wetland, and soils were saturated or inundated throughout during February 2008 site visits.

Sources of hydrology in Wetland 4 are similar to those for Wetlands 2 and 3, coming from precipitation and runoff from developed areas. Water also appears to flow from Wetland 4 to Wetland 3, although the suspected connection is filled with debris and water was not visible during February 2008 site visits. Surface water also appears to drain from the wetland toward the north.

Fauna located in Wetland 4 during ecological surveys include two native butterfly species (Table 8) and seven non-native vertebrate species. Both native butterfly species are considered to be of least concern.

Table 8. Fauna species identified in Wetland 4.

Group	Family	Species	common name	Origin	IUCN ¹
Vertebrates	Mammals	Felidae	<i>Felis silvestris</i> (Schreber, 1775)	Cat	Alien
	Birds	Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Ploceidae	<i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow, Moineau	Alien
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien
	Reptiles	Chamaeleonidae	<i>Calotes versicolor</i> (Daudin, 1802)	Agamid	Alien

Group		Family	Species	common name	Origin	IUCN ¹
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
Invertebrates	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native	LC
		Nymphalidae	<i>Phalantha phalantha</i> (Drury, 1773)	Common leopard	Native	LC

¹ LC = Least concern

The entire boundary of Wetland 4 is demarcated by fill and development. Some vegetation exists along boundary, composed of invasive species growing atop construction fill. This sparse vegetation serves to slow stormwater flow somewhat to the wetland, but any such benefit is offset by the highly developed state of the remainder of the buffer. The wetland is being actively filled at the site of a house construction, and the wetland is nearly lost. Backfilling has left only a small patch of emergent vegetation and open water.

The proximity of Wetlands 2, 3, and 4 allows for the passage of faunal species among them. Thus, although the Mare Michaux wetlands are fragmented, they have value to vertebrates and invertebrates, particularly where a vegetated connection remains between them.

Mare Soyfoo

Two wetlands make up the Mare Soyfoo complex. The wetlands, Wetlands 5 and 6, are the only wetlands of the Grand Baie area not dominated by *Typha*, but by open water.

Wetland 5

Cover in the 0.499-ha (4,988 m²) Wetland 5 is predominately open water, surrounded by emergent grasses and other herbaceous species (Figures 10 and 11, Table 9). The open water component covers approximately 55% of the wetland, and the emergent component most of the remainder (Appendix A, Photo 9). Emergent cover is composed primarily of the native grass *Paspodium geminatum*. Shrub cover overhangs the wetland edges, but most shrub species are rooted outside of the wetland itself. There is little structural diversity in the vegetation within the wetland. The only substantial difference in vegetation height is between the grasses and one stand of *Typha* toward the east end of the wetland. Salinity in the open water averages 16 ppt, and a sulfidic odor is evident throughout.

A 0.05-m layer of black (10YR 2/1) loam covers the wetland. Beneath this is a layer of mixed soils composed of approximately 80% light gray (5Y 7/1) clay with a small loam component and the remainder greenish gray (5G 5/1) gleyed clay with brownish yellow (10YR 6/6) redoximorphic features ranging from few to many in abundance (Appendix A, Photo 10). This B horizon extends to at least a 0.30-m depth. Soil in all areas of the wetland were saturated or inundated during site visits.

Hydrology in Wetland 5 is largely from precipitation. While fill defines some of the wetland boundary, much of the buffer is vegetated with shrubs and small trees, and part of the eastern boundary is made up of cultivated species. Thus, stormwater is able to infiltrate in some of the wetland's surrounding buffer, tempering flood waters to the wetland.

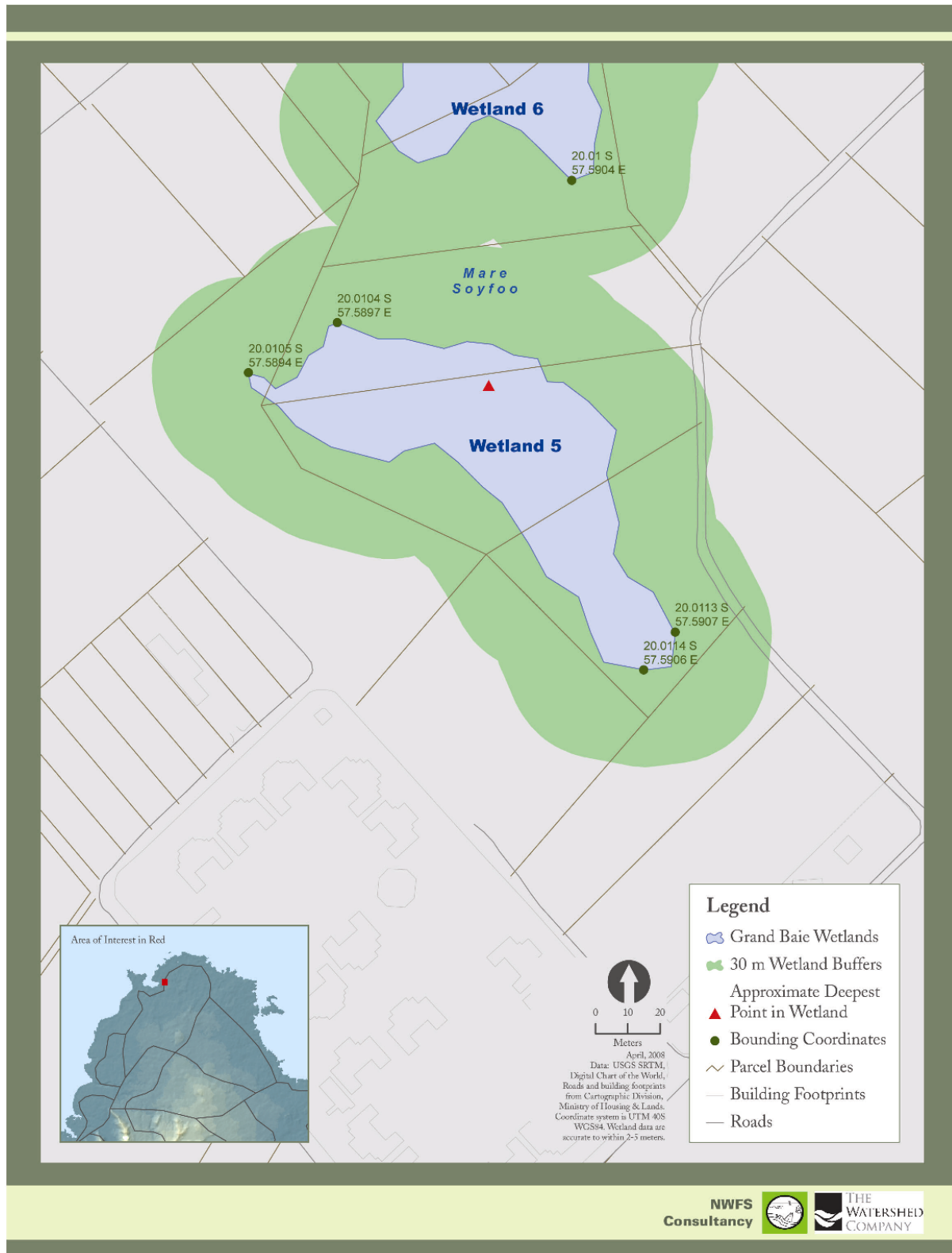


Figure 10. Plan view of Wetland 5 and a 30-m buffer.

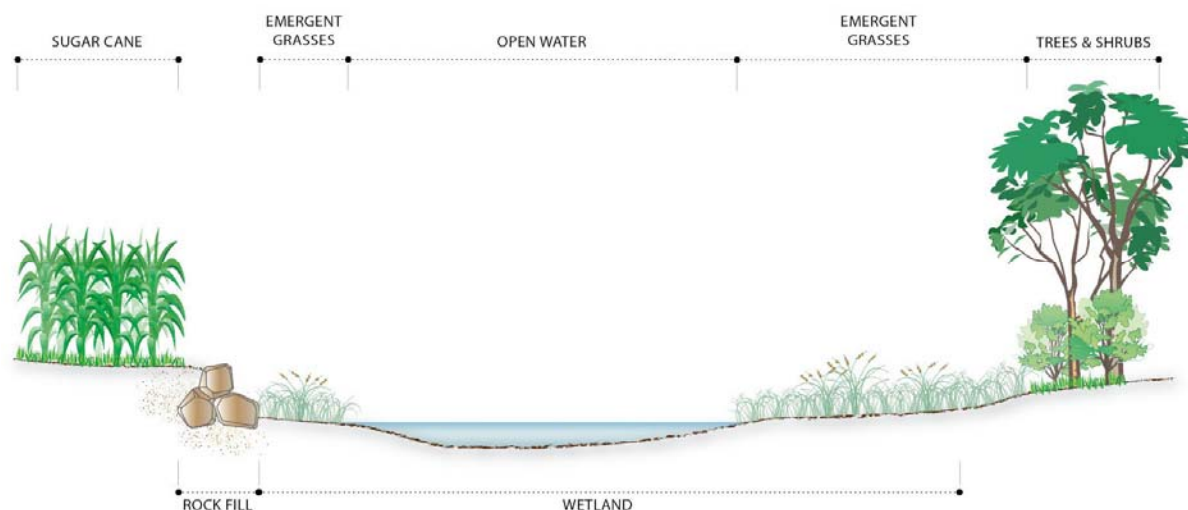


Figure 11. Typical cross-section view of Wetland 5 (NTS).

Table 9. Native and cryptogenic plants identified in Wetland 5.

Family	Species	Common name	Origin	IUCN ¹
Aizoaceae	<i>Sesuvium ayresii</i> Marais		Native	LC
Asteraceae	<i>Vernonia cinerea</i> (L.) Less	Ayapana sauvage	Cryptogenic	LC
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Cyperaceae	<i>Cyperus stoloniferus</i> Retz.		Native	LC
Cyperaceae	<i>Fimbristylis ferruginea</i> (L.) Vahl		Native	LC
Hydrocharitaceae	<i>Hydrilla verticillata</i> (L. f.) Royle		Native	DD
Malvaceae	<i>Thespesia populnea</i> (L.) Soland ex Correa	Porcher	Native	LC
Oleaceae	<i>Jasminum fluminense</i> Vell.	Jasmin du pays	Native	LC
Poaceae	<i>Dactyloctenium ctenoides</i> (Steud.) Bosser		Native	LC
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i>	Herbe bourrique	Native	LC
Poaceae	<i>Zoysia matrella</i>	Herbe pique fesse	Native	
Ruppiaceae	<i>Ruppia maritima</i> L.		Native	DD
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC
Verbenaceae	<i>Premna serratifolia</i> L.	Bois sureau	Native	LC
Vitaceae	<i>Cissus rotundifolia</i> (Forssk.) Vahl	Liane de boeuf	Cryptogenic	LC

¹ LC = Least concern, DD = Data deficient

The native butterfly species *Borbo borbonica* and *Melanitis leda* and native snail *Melanoides tuberculata* occur in Wetland 5 (Table 10). The native bird *Butorides striatus* and the migratory bird species *Tringa nebulana* were also observed using the wetland during March 2008 ecological surveys. Five non-native vertebrates were also noted. All native species are of classified as species of least concern.

Table 10. Fauna species identified in Wetland 5.

Group	Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Mammals	Leporidae	<i>Lepus nigricollis</i> (Cuvier, 1823)	Hare	Alien
	Birds	Ardeidae	<i>Butorides striatus</i> (Linnaeus, 1758)	Green Heron, Gasse	Native LC
		Scolopacidae	<i>Tringa nebularia</i> (Gunnerus, 1767)	Greenshank, Chevalier	Migratory LC
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien
	Reptiles	Chamaeleonidae	<i>Calotes versicolor</i> (Daudin, 1802)	Agamid	Alien
Invertebrates	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native LC
		Satyridae	<i>Melanitis leda</i> (Linnaeus, 1758)	Evening brown	Native LC
	Snails	Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native LC

¹ LC = Least concern

The buffer of Wetland 5 provides some water quality and quantity protection for the wetland, as described above. As well, it buffers wildlife from surrounding developed areas and increases the wetland's functional value as habitat. The proximity of Wetland 6, described below, also adds to the value of the wetland as wildlife habitat.

Wetland 6

This open water-dominated wetland is located north of Wetland 5, separated from it by fill covered by vegetation (Figures 12 and 13, Table 11). It is 0.707 ha (7,066 m²) in area. Cover is approximately 50% open water, 10% *Typha* (located in two distinct patches), and 40% emergent vegetation (Appendix A, photo 11). Dominant species in the wetlands are *Digitaria* sp. and *Paspalidium geminatum*, with a large expanse of the native *Sesuvium ayresii*, rated "least concern". Structural diversity is low in the wetland, but interspersions of the cover types is high.

Soils in Wetland 6 are a mix of clays beneath a surface horizon of black and very dark grayish brown (10YR 2/1 and 3/2) loam. Below this, greenish gray and grayish green (5G 5/1 and 5/2) gleyed clay is mixed with a largely clay soil with a small loam component of slightly varying color, ranging from pale olive (5Y 6/3) to light brownish gray (2.5Y 6/2). Ratios of clay:clay loam range from 9:1 to 1:3, depending on location of the sample. Soils exhibit a sulfidic odor and soil pits showed inundation, although saturation in the dense clay was difficult to determine even in inundated areas.

Hydrology and salinity in Wetland 6 is similar to that in Wetland 5, and the wetlands may be hydrologically connected below the ground surface. Buffers also function similarly. As explained above, wildlife can be expected to travel between the wetlands, increasing the habitat values of each.

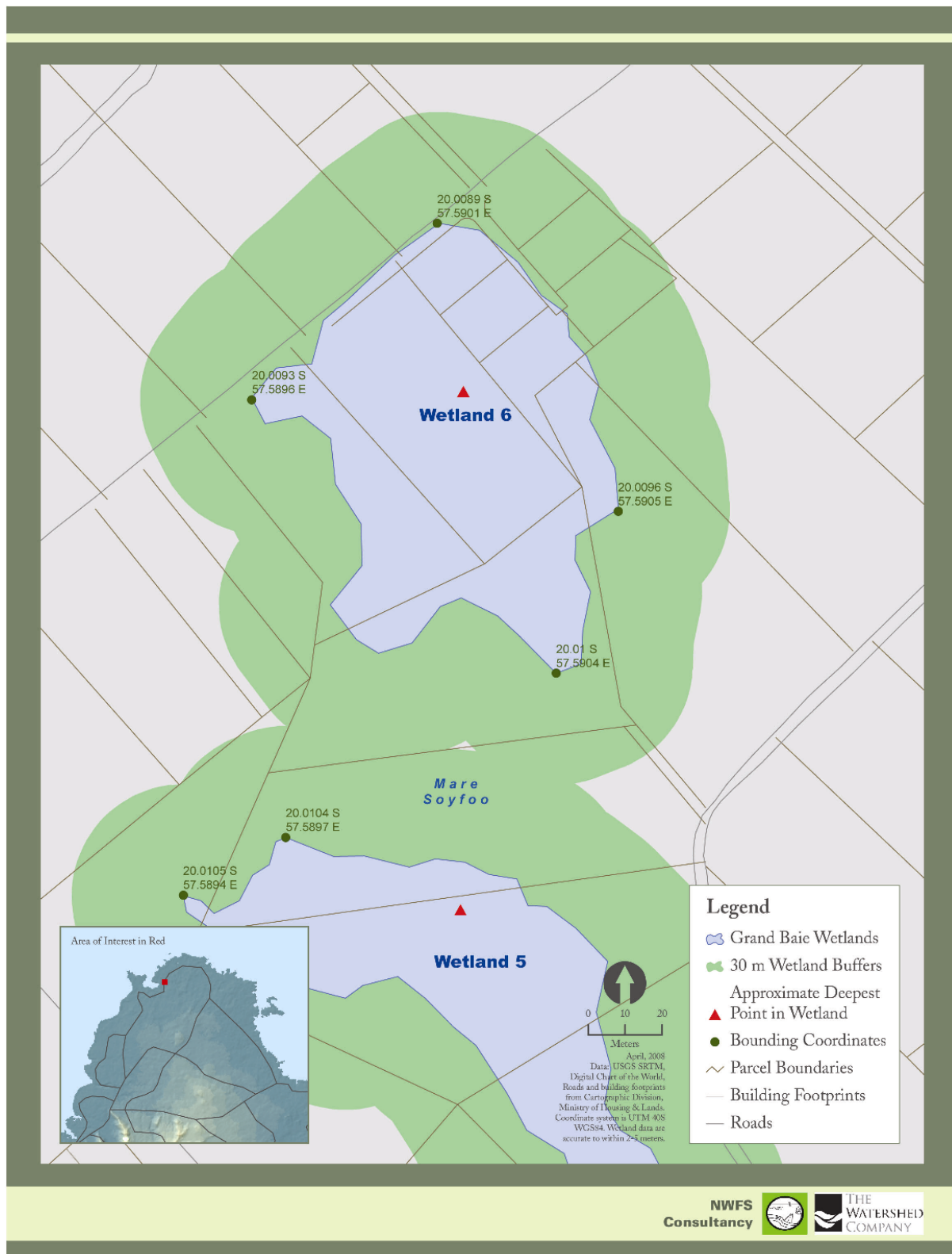


Figure 12. Plan view of Wetland 6 and 30-m buffer.

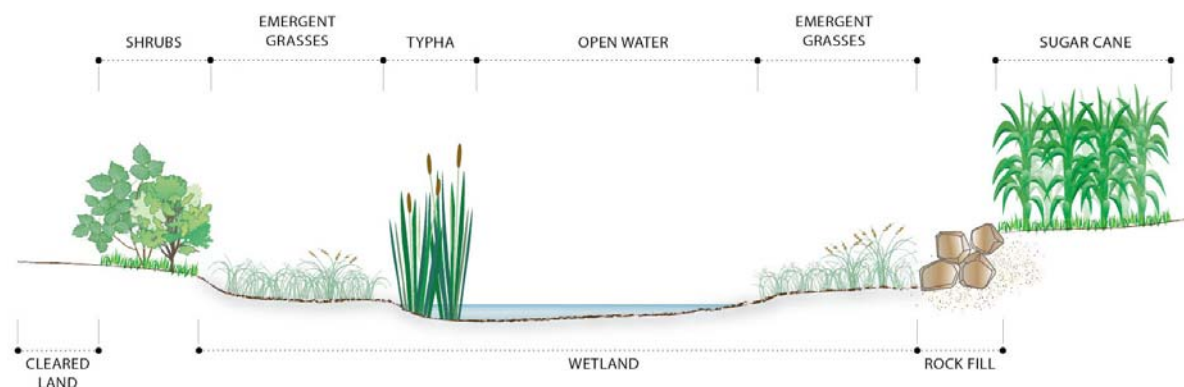


Figure 13. Typical cross-section view of Wetland 6 (NTS).

Table 11. Native and cryptogenic plants identified in Wetland 6.

Family	Species	Common name	Origin	IUCN ¹
Aizoaceae	<i>Sesuvium ayresii</i> Marais		Native	LC
Boraginaceae	<i>Hilsenbergia petiolaris</i>	Bois pipe	Native	
Cyperaceae	<i>Fimbristylis ferruginea</i> (L.) Vahl		Native	LC
Fabaceae	<i>Caesalpinia bonduc</i> (L.) Roxb.	Cadoque	Native	LC
Oleaceae	<i>Jasminum fluminense</i>	Jasmin du pays	Native	LC
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Poaceae	<i>Zoysia matrella</i>	Herbe pique fesse	Native	
Ruppiaceae	<i>Ruppia maritima</i> L.		Native	DD
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC
Verbenaceae	<i>Premna seratifolia</i>	Bois surreau	Native	
Vitaceae	<i>Cissus rotundifolia</i> (Forssk.) Vahl	Liane de boeuf	Cryptogenic	LC

¹ LC = Least concern, DD = Data deficient

One mammal, three bird, one amphibian, one fish, and one snail species were observed in Wetland 6 (Table 12). These include one native bird (*Butorides striatus*) and one native snail (*Melanoides tuberculata*) species, both classified as species of least concern.

Table 12. Fauna species identified in Wetland 6.

Group	Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Mammals	Leporidae	<i>Lepus nigricollis</i> (Cuvier, 1823)	Hare	Alien
	Birds	Ardeidae	<i>Butorides striatus</i> (Linnaeus, 1758)	Green Heron, Gasse	Native LC
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien
		Fringilidae	<i>Serinus mozambicus</i> (S. Muller, 1776)	Serin, Yellow-fronted Canary	Alien
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien

Group		Family	Species	Common Name	Origin	IUCN ¹
	Fish	Poeciliidae	<i>Gambusia affinis</i> (Baird & Girard, 1853)	Million	Alien	
Invertebrates	Snails	Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC

¹ LC = Least concern, DD = Data deficient

Grand Mare Longue

The Grand Mare Longue wetland complex includes the largest wetlands in the Grand Baie area. All are *Typha*-dominated and highly influenced by surrounding development.

Wetland 7

This large (2,988 ha, 29,881 m²) emergent wetland (Figures 14 and 15) is approximately 95% herbaceous cover, of which more than 55% is *Typha domingensis*. Other common herbaceous species in the wetland are *Paspalidium genimatum*, *Ricinus communis*, *Cyperus alternifolius*, and *Leucaena leucocephala*. Native species supported in the wetland are shown in Table 13. About 5% of the area is in shrub cover, and most of this in a cluster in the northern third of the wetland. *Typha* occurs throughout the southern two-thirds of the wetland. The northern third is predominantly the other herbaceous species listed above. The only structural diversity occurs in the shrub area. The western edge of the wetland is bordered by small houses, most of which are constructed on fill placed in the wetland itself (Appendix A, Photo 12). Fill, debris, and invasive species line the wetland along many of these houses (Appendix A, Photo 13).

Soils in Wetland 7 are predominantly sand and silty sand beneath a thin black loam horizon. Color in the B horizon is grayish brown to very pale brown (10YR 5/2, 6/3, and 7/3) with faint redoximorphic features. Soils near the homes along the southwest edge of the wetland are olive (2.5Y 4/3) clay loam with redoximorphic features. Areas of Wetland 7 with standing water exhibit a sulfidic odor.

Hydrology in Wetland 7 is from precipitation and runoff during storm events. Decreased water storage capacity resulting from filling portions of the wetland no doubt results in flooding of the nearby developed areas, and particularly the homes along the west edge. Several gardens and yards had standing water in them during the February 2008 site visits. Salinity averages 1 ppt in areas of standing water.

Twenty-two fauna species were identified in Wetland 7. These are listed in Table 14 and include five native butterfly species and four native snail species. All are species of least concern.



Figure 14. Plan view of Wetland 7 and 30-m buffer.

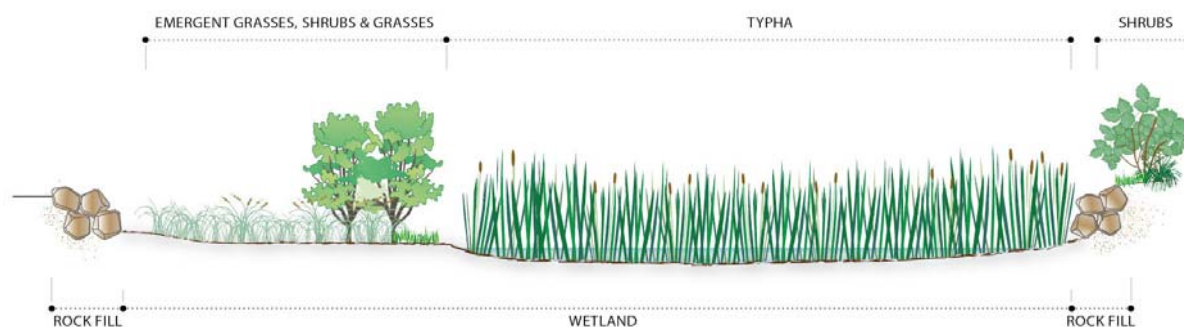


Figure 15. Typical cross-section view of Wetland 7 (NTS).

Table 13. Native and cryptogenic plants identified in Wetland 7.

Family	Species	Common name	Origin	IUCN ¹
Aizoaceae	<i>Sesuvium ayresii</i> Marais		Native	LC
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Convolvulaceae	<i>Ipomea violacea</i>		Native	
Convolvulaceae	<i>Ipomoea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatan	Native	LC
Cyperaceae	<i>Fimbristylis cymosa</i> R. Br.		Native	LC
Cyperaceae	<i>Fimbristylis ferruginea</i> L. (Vahl)		Native	LC
Cyperaceae	<i>Pycnus</i> cf. <i>polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Fabaceae	<i>Canavalia rosea</i>	Cocorico	Native	
Lythraceae	<i>Nesaea triflora</i> (L. f.) Kunth		Native	LC
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Sorghum verticilliflorum</i> Stapf.	Millet sauvage	Native	DD
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

¹ LC = Least concern

Table 14. Fauna species identified in Wetland 7.

Group	Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Mammals	Canidae	<i>Canis familiaris</i> (Linnaeus, 1758)	Dog	Alien
	Birds	Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien
		Columbidae	<i>Streptopelia chinensis</i> (Scopoli, 1786)	Grosse tourterelle, Spotted Dove	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Ploceidae	<i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow, Moineau	Alien

Group		Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Birds	Ploceidae	<i>Ploceus cucullatus</i> (Muller, 1776)	Serin, Yellow-fronted Canary	Alien	
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien	
		Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien	
	Reptiles	Gekkonidae	<i>Phelsuma madagascariensis</i> (Gray, 1831)		Alien	
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
Invertebrates	Butterflies	Danaidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)	African monarch	Native	LC
		Lycaenidae	<i>Zizula hylax</i> (Fabricius, 1775)		Native	LC
		Nymphalidae	<i>Phalantha phalantha</i> (Drury, 1773)	Common leopard	Native	LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native	LC
		Pieridae	<i>Eurema floricola</i> (Boisduval, 1833)		Native	LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien	
	Snails	Planorbidae	<i>Gyraulus mauritanus</i> (Morelet, 1876)		Native	LC
		Ellobiidae	<i>Laemodonta bella</i> (Adams, 1854)		Native	LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC
		Pomatiasidae	<i>Tropidophora fimbriata</i> (Lamarck, 1822)		Native	LC
		Planorbidae	<i>Bulinus cernicus</i> (Morelet, 1867)		Alien	
		Physidae	<i>Phisa acuta</i> (Draparnaud, 1805)		Alien	

¹ LC = Least concern

The function of Wetland 7's buffer is impaired by fill and development, and dumping is occurring. Filled areas along the east edge support invasive species and provide poor water quality and quantity protection, as well as no native habitat. Along the west edge, the fill is interspersed with gardens and vegetated areas, most of which support only invasive species but which may provide some protection from stormwater flooding. Although the wetland is no longer connected to Wetland 10 to the east, proximity to this other large wetland allows for wildlife passage between them and increases habitat function within both wetlands over their individual habitat values.

Wetland 8

This small (0.134 ha, 1,342 m²), emergent wetland is separated from Wetland 7 by a berm of fill material with shrub vegetation (Figures 16 and 17; Appendix A Photo 14). Subsurface flow may occur between the wetlands, but no surface connection exists. Vegetative cover is approximately 85% *Typha domingensis* with patches of *Paspaladium geminatum*, *Nesaea*, and *Cynodon dactylon*, interspersed with scattered other native (Table

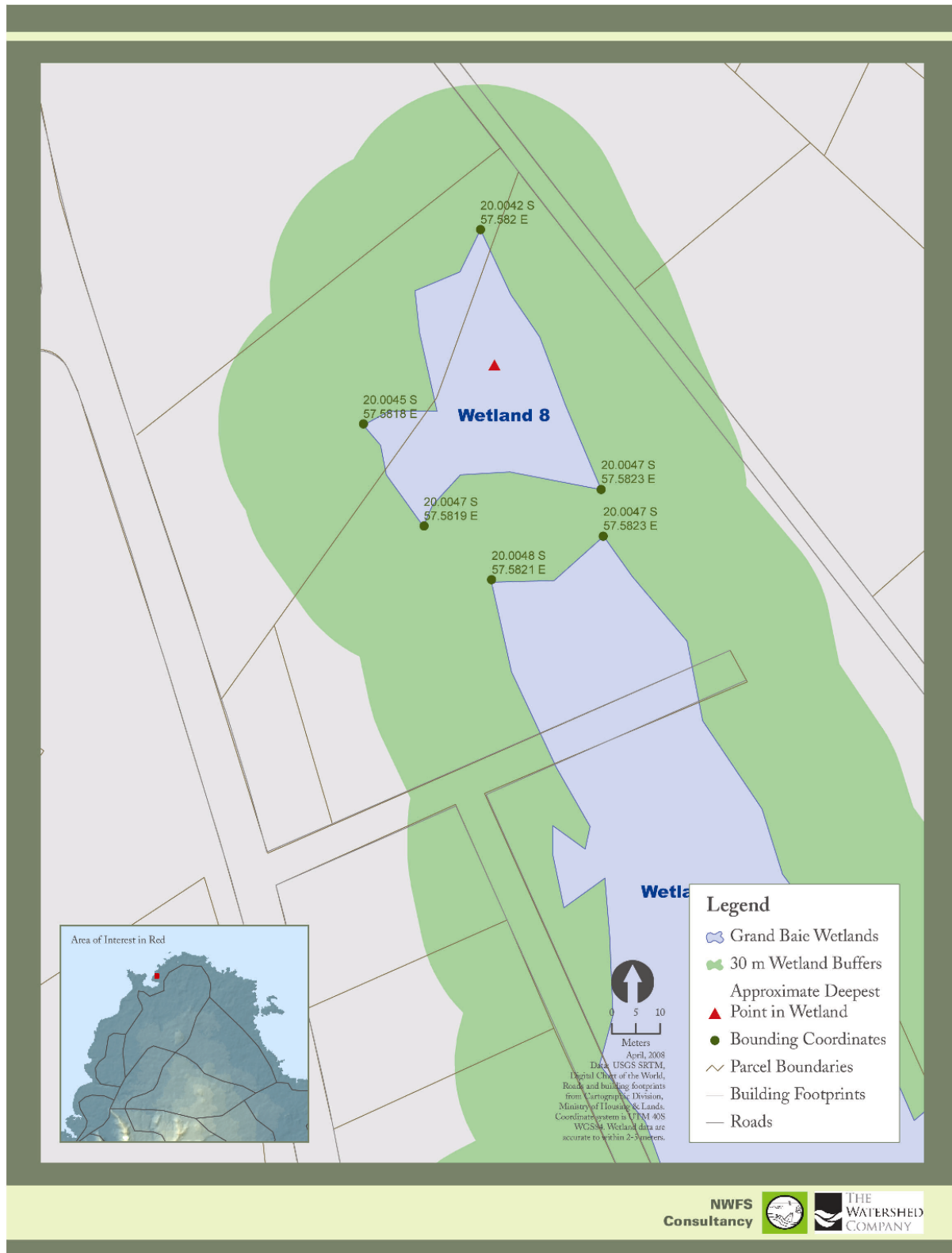


Figure 16. Plan view of Wetland 8 and a 30-m buffer.

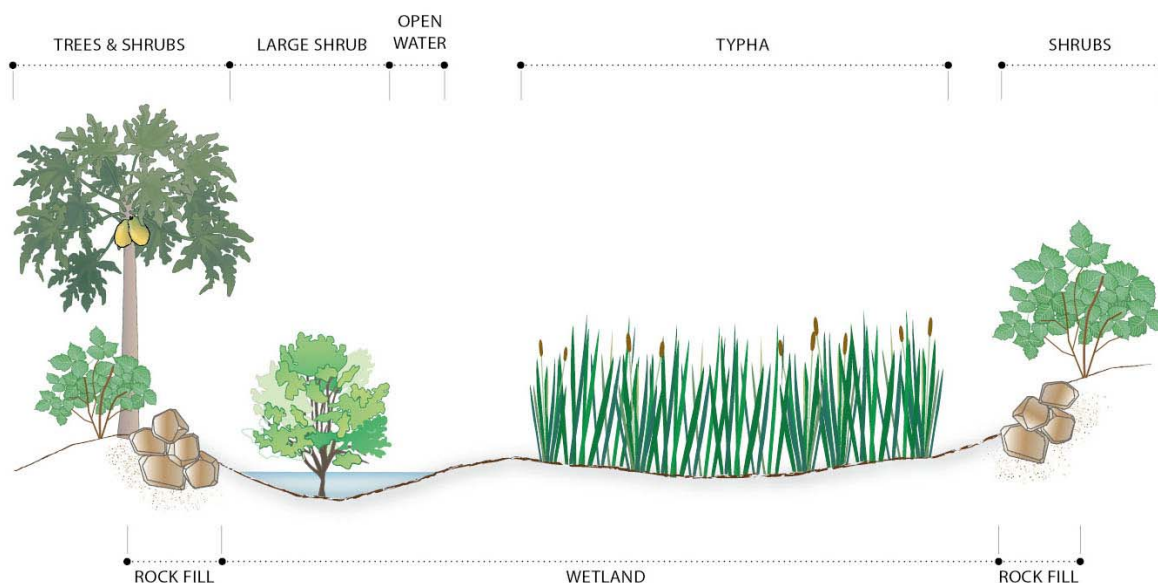


Figure 17. Typical cross-section view of Wetland 8 (NTS).

Table 16. Fauna species identified in Wetland 8.

Group	Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Birds	Ardeidae	<i>Butorides striatus</i> (Linnaeus, 1758)	Green Heron, Gasse	Native LC
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien
		Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien
	Reptiles	Chamaeleonidae	<i>Calotes versicolor</i> (Daudin, 1802)	Agamid	Alien
Invertebrates	Butterflies	Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native LC
	Snails	Planorbidae	<i>Gyraulus mauritanus</i> (Morelet, 1876)		Native LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native LC
		Pomatiasidae	<i>Tropidophora fimbriata</i> (Lamarck, 1822)		Native LC
		Achatinidae	<i>Achatina fulica</i> (Bowdich, 1822)		Alien
		Lymnaeidae	<i>natalensis</i> (Krauss, 1848)		Alien
		Ariophantidae	<i>Macrochlamys indica</i> (Pfeiffer, 1846)		Alien
		Physidae	<i>Phisa acuta</i> (Draparnaud, 1805)		Alien
		Subulinidae	<i>Subulina striatella</i> (Rang, 1831)		Alien

¹ LC = Least concern

15) and non-native species. One area of ponding makes up approximately 5% of the wetland, and a single shrub patch covers about 10%. Salinity is 15 ppt in the ponded area. The shrub patch provides structural diversity in the wetland, as does the mixture of tall and short herbaceous species, to a lesser extent.

Table 15. Native and cryptogenic plants identified in Wetland 8.

Family	Species	Common name	Origin	IUCN
Boraginaceae	<i>Hilsenbergia petiolaris</i>	Bois pipe	Native	
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Convolvulaceae	<i>Ipomoea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatran	Native	LC
Convolvulaceae	<i>Ipomoea violacea</i>		Native	LC
Cyperaceae	<i>Cyperus rotundus</i>		Native	
Cyperaceae	<i>Fimbristylis ferruginea</i> L. (Vahl)		Native	
Fabaceae	<i>Canavalia rosea</i>	Cocorico	Native	
Lemnaceae	<i>Lemna perpusilla</i>	Lentille d'eau	Native	
Lythraceae	<i>Nesaea triflora</i> (L. f.) Kunth		Native	LC
Oleaceae	<i>Jasminum fluminense</i> Vell.	Jasmin du pays	Native	LC
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe les mares	Native	
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Ruscaceae	<i>Dracaena concinna</i> Kunth		Native	EN
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

¹ LC = Least concern, EN = Endangered

Wetland 8 soils show three distinctive strata. A thin black loam layer is underlain by a 0.25-m layer of grayish brown (10YR 5/2) sandy silt loam with yellowish brown (10YR 5/6) redoximorphic features. Beneath this stratum is a layer of light gray (10YR 7/2) sand that extends to at least 0.5 m depth. All soils in Wetland 8 were saturated in February 2008.

Hydrology in Wetland 8 is primarily from precipitation. Recent filling and development to the west and north has decreased water storage capacity of the wetland, and runoff now likely contributes water to the wetland.

Fauna species identified in Wetland 8 include one native bird, two native butterflies, and three native snails (Table 16). One of the snail species, *Tropidophora fimbriata*, was not observed in any of the other wetlands during the March 2008 surveys. All native species noted in Wetland 8 are species of least concern. The snail *Gyraulus mauritanus* may also be endemic to the island. The wetland buffer is highly developed and development actively continues. All such development decreases the protection of the wetland's functions. Wetland 7 to the south provides a good buffer in this direction, as well and increasing the habitat value of Wetland 8. Other parts of the boundary provide poor protection of wetland functions, however.

Wetland 10

At 5.301 ha (53,008 m²), Wetland 10 is the largest remaining Grand Baie wetland (Appendix A, Photo 15). It is nearly exclusively *Typha*, with greater than 90% cover by *Typha domingensis*. Diversity, both compositional and structure, exists only along the winding edges (Figures 18 and 19, Table 17), created by fill in the wetland, where cultivated species, invasive vines, and shrubs are present.

Table 17. Native and cryptogenic plants identified in Wetland 10.

Family	Species	Common Name	Origin	IUCN ¹
Convolvulaceae	<i>Ipomoea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatran	Native	LC
Convolvulaceae	<i>Ipomoea violacea</i>		Native	
Cyperaceae	<i>Cyperus rotundus</i>		Native	
Cyperaceae	<i>Fimbristylis ferruginea</i> L. Vahl		Native	LC
Cyperaceae	<i>Pycnus</i> cf. <i>polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Fabaceae	<i>Canavalia rosea</i>	Cocorico	Native	
Lytraceae	<i>Nesae triflora</i> (L.) Kunth		Native	
Moraceae	<i>Ficus reflexa</i> Thunb	Lafouche bâtard	Native	LC
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

¹ LC = Least concern

Soils in Wetland 10 are a consistent very dark grayish brown (2.5Y 3/2) sandy loam with no prominent redoximorphic features. A sulfidic odor is present throughout the wetland. Very rocky areas of fill and debris also occur within the wetland.

Hydrology is primarily runoff from the highly developed surrounding areas. Most nearby land use is residential, and most residences are constructed on fill. Construction is ongoing and wetland edges are subject to dumping fill and other materials. Stormwater runoff to the wetland is therefore likely higher than historic levels. Some flow may occur between Wetlands 10 and 7, although no channels are evident.

Five native and 12 non-native fauna species were identified in Wetland 10 (Table 18). Five butterfly and one snail species make up the natives observed, and all are characterized as species of least concern.

The functional value of Wetland 10 is highest for water storage. The buffer stresses this function by providing little water storage itself, due to excessive fill. Vegetated areas protect the wetland from flow somewhat, and protect the habitat value of the wetland. As described above, habitat functional value is enhanced by the proximity of Wetland 7.



Figure 18. Plan view of Wetland 10 and 30-m buffer.

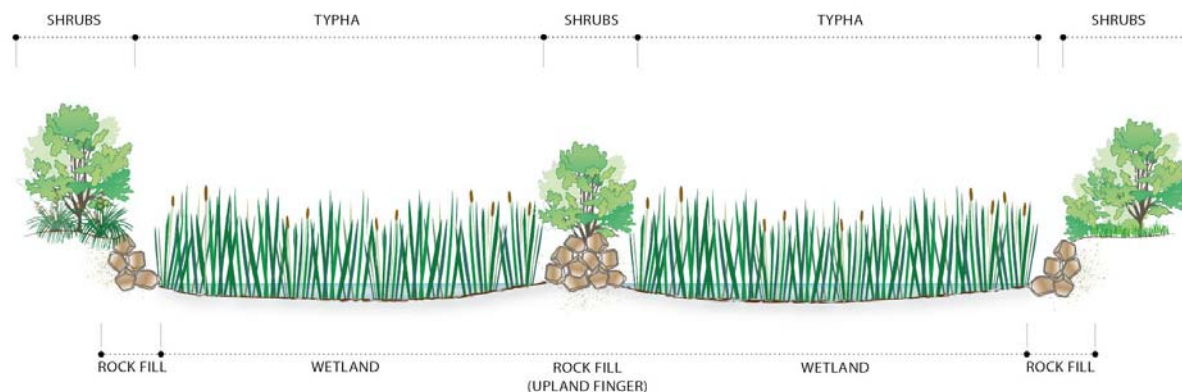


Figure 19. Typical cross-section view of Wetland 10 (NTS).

Table 18. Fauna species identified in Wetland 10.

Group	Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Birds	Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien
		Phasianidae	<i>Coturnix coturnix africana</i> (Temmink & Schlegel, 1849)	Common quail, Caille	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Ploceidae	<i>Ploceus cucullatus</i> (Muller, 1776)	Serin, Yellow-fronted Canary	Alien
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien
		Bufonidae	<i>Bufo gutturalis</i> (Power, 1927)	Toad, Krapo	Alien
	Fish	Poeciliidae	<i>Gambusia affinis</i> (Baird & Girard, 1853)	Million	Alien
Invertebrates	Butterflies	Danaidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)	African monarch	Native LC
		Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien
	Snails	Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native LC
		Physidae	<i>Phisa acuta</i> (Draparnaud, 1805)		Alien

¹ LC = Least concern

Wetland 11

Wetland 11 lies at the center of the Grand Mare Longue complex and covers 1.218 ha (12,182 m²) (Figures 20 and 21). Like Wetland 10, it is mostly pure *Typha domingensis* (Appendix A, Photo 16), with only small amounts of other species, the vast majority of which are non-native (Table 19, Appendix D). Structural and compositional diversity are extremely low, and the only interspersions of cover types occurs around two small non-wetland islands of fill in the northeast portion of the wetland. Salinity of standing water averages 2 ppt, and the wetland has a strong odor of sulfur.

Table 19. Native and cryptogenic plants identified in Wetland 11.

Family	Species	Common name	Origin	IUCN ¹
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Convolvulaceae	<i>Ipomea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatan	Native	
Cyperaceae	<i>Cyperus rotundus</i>		Native	
Cyperaceae	<i>Fimbristylis ferruginea</i> (L.) Vahl		Native	LC
Cyperaceae	<i>Kyllinga polyphylla</i> Willd. ex Kunth		Native	DD
Cyperaceae	<i>Pycnus cf. polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Oleaceae	<i>Jasminum fluminense</i> Vell.	Jasmin du pays	Native	LC
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Dactyloctenium ctenoides</i> (Steud.) Bosser		Native	LC
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

¹ LC = Least concern, DD = Data deficient

Soils in the wetland are black (2.5Y 2/1) sandy loam to a depth of approximately 0.20 m, and very dark grayish brown (2.5Y 3/2) sand below that. Inundation was present throughout the wetland during the February site visits. Hydrology sources are the same as those for the other Grand Mare Longue wetlands.

Wetland 11 supports at least eight native species observed in the Grand Baie wetlands during the 2008 ecological surveys (Table 20). None of the species is unique to the wetland, but the list does include the possible endemic *Gyraulius mauritianus*. All native species are rated as species of least concern.

Wetland 11 helps to protect surrounding areas by providing water storage. Like the other Grand Mare Longue wetlands, water storage functions are strained by ongoing filling and development in and around the wetland. Although habitat in the wetland and surrounding area is altered by fragmentation, the relative proximity of other large wetlands allow for Wetland 11 to function as wildlife habitat at a higher level than it would if it were more isolated from other wetland fragments.



Figure 20. Plan view of Wetland 11 and 30-m buffer.

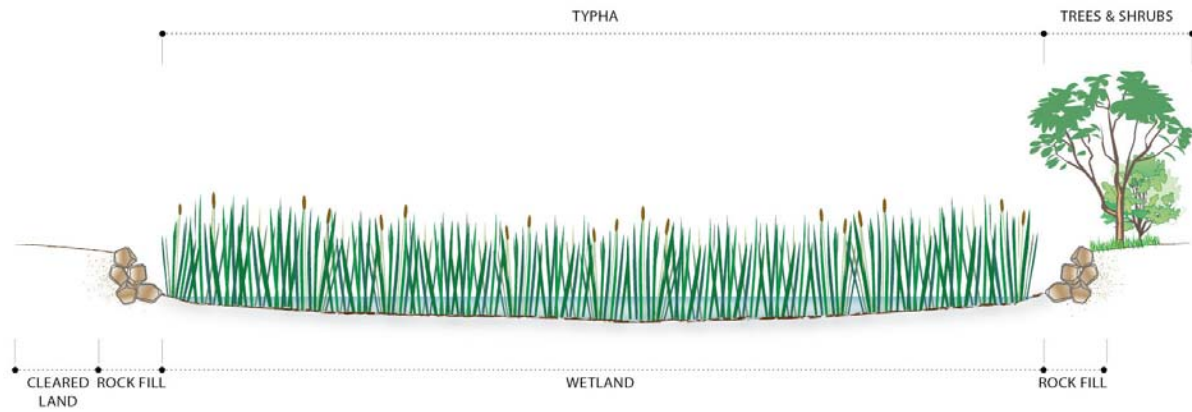


Figure 21. Typical cross-section view of Wetland 11 (NTS).

Table 20. Fauna species identified in Wetland 11.

Group		Family	Species	common name	Origin	IUCN ¹
Vertebrates	Birds	Columbidae	<i>Streptopelia picturata</i> (Temminck, 1813)	Turtle dove	Cryptogenic	LC
		Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien	
		Phasianidae	<i>Coturnix coturnix africana</i> (Temminck & Schlegel, 1849)	Common quail, Caille	Alien	
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien	
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien	
		Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien	
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
	Fish	Poeciliidae	<i>Gambusia affinis</i> (Baird & Girard, 1853)	Million	Alien	
Invertebrates	Butterflies	Danaidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)	African monarch	Native	LC
		Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native	LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
		Nymphalidae	<i>Phalantha phalantha</i> (Drury, 1773)	Common leopard	Native	LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native	LC
		Pieridae	<i>Eurema floricola</i> (Boisduval, 1833)		Native	LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien	
	Snails	Planorbidae	<i>Gyraulus mauritianus</i> (Morelet, 1876)		Native	LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC

Group		Family	Species	common name	Origin	IUCN ¹
Invertebrates	Snails	Lymnaeidae	<i>Lymnaea natalensis</i> (Krauss, 1848)		Alien	
		Physidae	<i>Physa acuta</i> (Draparnaud, 1805)		Alien	

¹ LC = Least concern

Wetland 12

Wetland 12 (Figures 22 and 23) is the northernmost wetland in the study area (Appendix A, Photo 17) and was not previously identified in the earlier Environmental Risk Assessment (Government of Mauritius 2002). It is 2.733 ha (27,332 m²) in size. Houses encroach on it on all sides, and roads closely border it in areas. It can be generally classified as a *Typha*-dominated wetland, although the outer portions support a diversity of species, most of which are cultivated species from the surrounding areas or invasives that have proliferated as a product of fill and disturbance (Table 21, Appendix D). The irregular wetland border provides some diversity to habitat, although most of the species found there are non-native and invasive. One island of upland shrub and tree species occurs within the wetland at the south end. Just north of this, the wetland narrows to a very small channel that connects to a larger *Typha* pond surrounded by houses constructed on fill.

Table 21. Native and cryptogenic plants identified in Wetland 12.

Family	Species	Common name	Origin	IUCN ¹
Arecaceae	<i>Dictyosperma album</i> (Bory) H. Wendl. et Drude ex Scheff	Palmiste blan, Hurricane palm	Native	CR (but commonly planted)
Convolvulaceae	<i>Ipomoea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatran	Native	LC
Cyperaceae	<i>Pycnus</i> cf. <i>polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Oleaceae	<i>Jasminum fluminense</i> Vell.	Jasmin du pays	Native	LC
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Paspalum geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

¹ LC = Least concern, CR = Critically endangered

Wetland 12 soils vary from light brownish gray (10YR 5/2 and 6/2) sandy clay in areas of standing water to dark brown (10YR 3/3) clay loam with dark yellowish brown (10YR 4/6) redoximorphic features in saturated-only emergent areas. Salinity averages 2 ppt. Hydrology sources are runoff and precipitation.

Five native fauna species, including the possible endemic *Gyraulus mauritanus*, were observed in Wetland 12 (Table 22). All are species of least concern.

The wetland buffer is highly developed and hinders wetland functions by draining stormwater to the wetland, providing little native vegetation, and fragmenting habitat.



Figure 22. Plan view of Wetland 12 and a 30-m buffer.

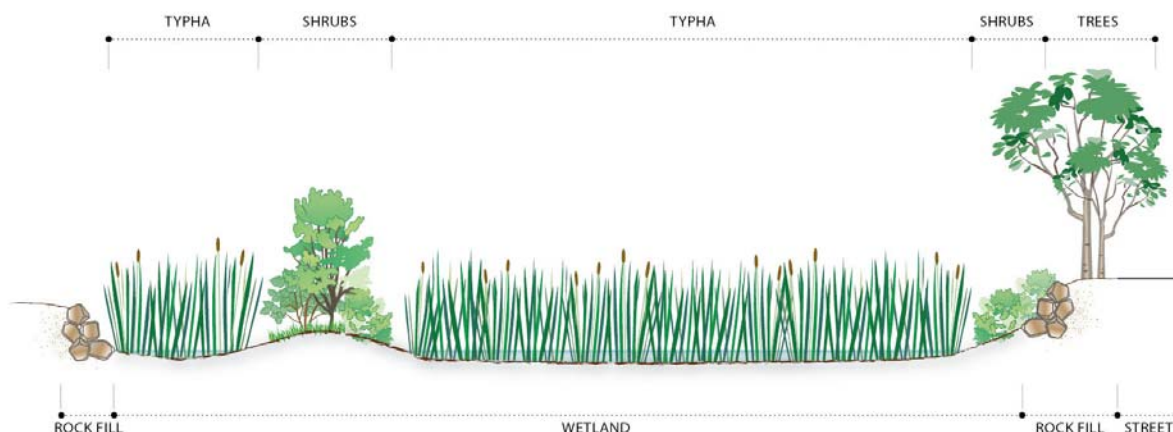


Figure 23. Typical cross-section view of Wetland 12 (NTS).

Table 22. Fauna species identified in Wetland 12.

Group		Family	Species	Common Name	Origin	IUCN ¹
Vertebrates	Birds	Columbidae	<i>Streptopelia picturata</i> (Temminck, 1813)	Turtle dove	Cryptogenic	LC
		Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien	
		Columbidae	<i>Streptopelia chinensis</i> (Scopolis, 1786)	Grosse tourterelle, Spotted Dove	Alien	
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien	
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien	
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien	
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien	
		Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien	
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
Invertebrates	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native	LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
		Nymphalidae	<i>Phalantha phalantha</i> (Drury, 1773)	Common leopard	Native	LC
	Snails	Planorbidae	<i>Gyraulus mauritianus</i> (Morelet, 1876)		Native	LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC
		Achatinidae	<i>Achatina fulica</i> (Bowdich, 1822)		Alien	

Group	Family	Species	Common Name	Origin	IUCN ¹
Invertebrates	Snails	Spiraxidae	<i>Euglandina rosea</i> (Ferrusac, 1818)		Alien
		Lymnaeidae	<i>Lymnaea natalensis</i> (Krauss, 1848)		Alien
		Ariophantidae	<i>Macrochlamys indica</i> (Pfeiffer, 1846)		Alien
		Physidae	<i>Physa acuta</i> (Draparnaud, 1805)		Alien
		Subulinidae	<i>Subulina striatella</i> (Rang, 1831)		Alien

¹ LC = Least concern

South Study Area

Wetland 9

The southernmost wetland in the Grand Baie area is a fragment surrounded entirely by fill located near the junction of Plaines des Papayes Road B11 and Vingt Pieds Road B45 (Figures 24 and 25; Appendix A, Photo 18). *Typha domingensis* covers more than 90% of the 0.292-ha (2,919 m²) area. Other species occur at the wetland edges and in three small patches within the wetland (Table 23). Compositional and structural diversity are low in the wetland, and there is little interspersions of cover types.

Table 23. Native and cryptogenic plants identified in Wetland 9.

Family	Species	Common name	Origin	IUCN ¹
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Convolvulaceae	<i>Ipomoea pes-caprae</i>	Batatan	Native	LC
Cyperaceae	<i>Cyperus rotundus</i>		Native	
Cyperaceae	<i>Fimbristylis ferruginea</i>		Native	LC
Cyperaceae	<i>Pycnus</i> cf. <i>polystachys</i> (Rottb.) P. Beauv.		Native	LC
Lythraceae	<i>Nesaea triflora</i> (L. f.) Kunth		Native	LC
Moraceae	<i>Ficus reflexa</i> Thunb	Lafouche bâtard	Native	LC
Oleaceae	<i>Jasminum fluminense</i> Vell.	Jasmin du pays	Native	LC
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe les mares	Native	LC
Poaceae	<i>Paspalum geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC
Vitaceae	<i>Cissus rotundifolia</i> (Forssk.) Vahl	Liane de boeuf	Cryptogenic	LC

¹ LC = Least concern



Figure 24. Plan view of Wetland 9 and 30-m buffer.

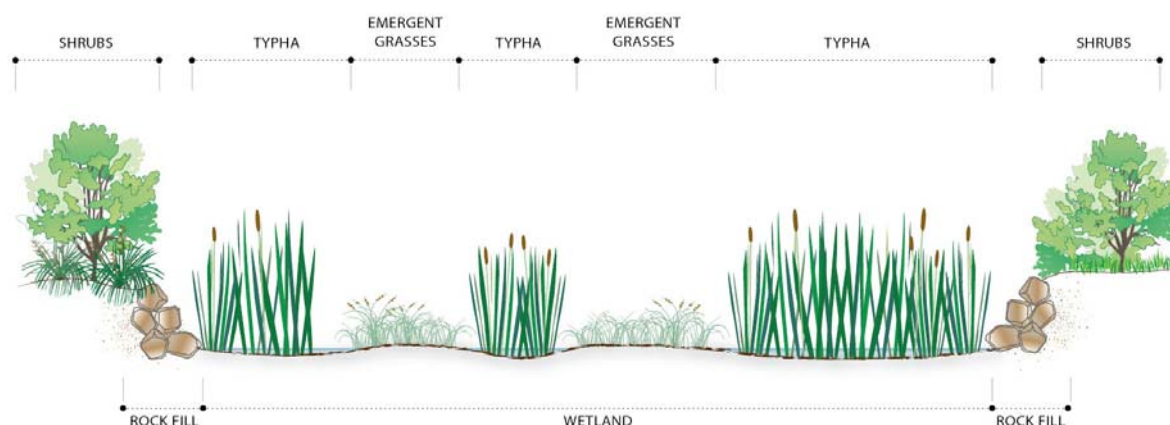


Figure 25. Typical cross-section view of Wetland 9 (NTS).

Soils in Wetland 9 are black (2.5Y 2.5/1) clay loam to approximately 0.30 m, and thereafter dark olive gray (5Y 3/2) clay loam. Redoximorphic features are not apparent. The wetland does not have a sulfidic odor, and salinity was 0 ppt during the February site visit, which took place after heavy rain.

Wetland 9 supports at least 10 native species, the highest species richness observed in the Grand Baie wetlands during the March 2008 surveys (Table 24). These include the endemic *Phelsuma ornata* gecko and endemic *Maurennia poutrini* snail. Two additional native snail species, *Quickia concisa* and *Streptostele acicula*, and one butterfly, *Henotesia narcissus narcissus*, were not observed in other wetlands of Grand Baie during the 2008 surveys. All native species are species of least concern.

Table 24. Fauna species identified in Wetland 9.

Group	Family	Species	common name	Origin	IUCN ¹
Vertebrates	Mammals	Leporidae	<i>Lepus nigricollis</i> (Cuvier, 1823)	Hare	Alien
	Birds	Columbidae	<i>Streptopelia picturata</i> (Temminck, 1813)	Turtle dove	Cryptogenic LC
		Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien
		Fringilidae	<i>Serinus mozambicus</i> (S. Muller, 1776)	Serin, Yellow-fronted Canary	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien
	Reptiles	Gekkonidae	<i>Phelsuma ornata</i> (Gray, 1825)		Endemic LC
		Gekkonidae	<i>Hemidactylus frenatus</i> (Schlegel 1836)		Alien
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien

Group		Family	Species	common name	Origin	IUCN ¹
Invertebrates	Butterflies	Bufonidae	<i>Bufo gutturalis</i> (Power, 1927)	Toad, Krapo	Alien	
		Danaidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)	African monarch	Native	LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native	LC
		Pieridae	<i>Eurema floricola</i> (Boisduval, 1833)		Native	LC
		Satyridae	<i>Henotesia narcissus narcissus</i> (Fabricius, 1798)		Native	LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien	
	Snails	Streptaxidae	<i>Maurennea poutrini</i> (Germain, 1918)		Endemic	LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC
		Succineidae	<i>Quickia concisa</i> (Morelet, 1868)		Native	LC
		Streptaxidae	<i>Streptostele acicula</i> (Morelet, 1877)		Native	LC
		Achatinidae	<i>Achatina fulica</i> (Bowdich, 1822)		Alien	
		Spiraxidae	<i>Euglandina rosea</i> (Ferrusac, 1818)		Alien	
		Subulinidae	<i>Subulina octona</i> (Bruguère, 1792)		Alien	
		Subulinidae	<i>Subulina striatella</i> (Rang, 1831)		Alien	

¹ LC = Least concern

Wetland 9 is relatively isolated from other wetlands and from valuable habitat patches. While this detracts from its functional value in most respects, it renders its value as a refuge within the developed area. Although the buffer is composed of fill, structures and roads do not directly border the wetland. The presence of a vegetated buffer, albeit on piles of fill and made up largely of invasive species, offers some screening to the habitat within the wetland.

DISCUSSION AND FINAL REMARKS

Functions and values refer to the benefits provided by a wetland, and how well a wetland is able to provide these benefits. Functions can be categorized into three groups: water quality, hydrologic, and habitat functions. All wetlands perform some or all of these functions, to greatly varying extents. Water quality functions are performed when a wetland has the physical characteristics needed to slow and filter water, and when the need is present (i.e., untreated runoff or contaminated water is able to enter the wetland). Hydrologically, wetlands are important for flood and stormwater storage and aquifer recharge, and a wetland's value for these functions increases when there are homes or natural resources proximate to the wetland. Coastal marine wetlands provide erosion control functions; these wetlands are not included in the scope of this study.

Wetlands also supply habitat for the foraging, breeding, and rearing activities of wildlife. Habitat functional values are measured by considering vegetative structure and composition, presence of special features, buffer quality, and proximity of other natural areas.

Any discussion species diversity in the Grand Baie wetlands is complicated by the abundance of alien species present in all wetlands. Thus, complete lists of native and endemic species is included in the individual results sections for each wetland. While biodiversity is not overtly threatened in the Grand Baie wetlands, it is of great concern that this type of ecosystem is not presently represented in any national reserve or park in Mauritius, with one small exception on Flat Island. This puts the ecosystem as a whole at risk of permanent loss.

Function of all Grand Baie wetlands is impaired by wetland and buffer filling and degradation. Due to their proximity to urban areas around Grand Baie, all of the inventoried wetlands are at continued risk of urbanization (i.e., conversion to non-agricultural uses such as residential, commercial, or industrial). Specifically, the wetlands in the Grand Mare Longue, Mare Michaux, and Mare Soyfoo complexes are highly threatened by the risk of urbanization. Backfilling of these wetlands is actively taking place, as observed during the present study.

Presently, approximately 15.4 ha of wetland exists in Grand Baie, along with 23.9 ha of associated buffer (based on 30-m regulatory buffers). Of this, about 0.6 ha (4%) of wetland and 1.9 ha (8%) of buffer are located on state-owned land. The remaining 14.8 ha (96%) of wetland and 22.0 ha (92%) of adjoining buffer area is privately held. Private holdings of wetlands and buffer zone area are titled to 144 individual owners. Seven of these owners are registered businesses. Pressures on remaining wetlands and buffers may vary depending on whether the land on which they occur is state-owned or private. Similarly, ownership may impact the relative ease or difficulty with which wetlands can be practicably protected and monitored, and consideration should be given to ownership factors during development and implementation of land use regulations and management plans for wetlands in the area.

In comparing total wetland area over time, it is clear that while wetland area is not decreasing as rapidly as it did between 1990 and 2000, loss of wetland area is still occurring. At first glance, it appears that much less change has occurred between 2000 (17.4 ha) and 2008 (15.4 ha). However, this 2008 study included the inventory of a 2.7-ha portion of Grand Mare Longue (Wetland 12) that was previously unsurveyed. Therefore, assuming the size of Wetland 12 is unchanged since 2000, the 2000 results would be 20.1 ha instead of 17.4 ha. Accounting for this adjustment, the percent loss of wetland area was 19% between 1980 and 1990, 30% between 1990 and 2000, and 23% between 2000 and 2008 (Figure 26).

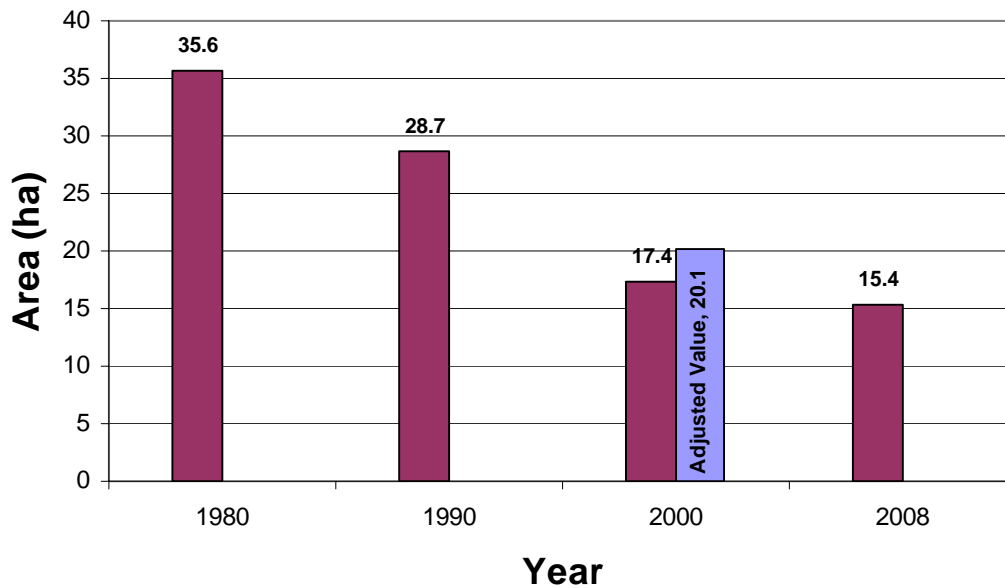


Figure 26. Comparison of Historical and Current Wetland Area in Grand Baie.

Backfilling of the Grand Baie wetlands has impacted and continues to impact wetland functions. Hydrology of the remaining wetland area is altered by the reduction in water storage available volume within the wetlands and by increased runoff as impervious surface in surrounding areas increases. The most visible and perhaps most detrimental effect of this is flooding. In Grand Baie, low-lying areas regularly flood during periods of heavy rain. Private residences, public roadways (including several major roads), and commercial and industrial areas are all commonly affected, resulting in property damage and inconveniences to residents. Significant crop damage is also possible, and health hazards increase due to septic tank failure. Flooding is exacerbated by blocked drains and poor or non-existent drainage systems.

Even a slight change in wetland hydrology can result in drastic changes in the plant species composition within the wetlands and ecosystem functions, including flood control and water quality control, and vertebrate and invertebrate habitat (UNESCO 1998). Changes in hydrology in turn alter soils, further impacting vegetation uniquely adapted to hydric soils. The proliferation of non-native and invasive plants and animals in the Grand Baie wetlands is evidence of past and likely permanent damage to these ecosystems.

Pressure to reclaim wetlands is especially intense in developing urban areas, such as the Grand Baie study area. Ironically, the loss of wetlands in such areas can have the greatest detrimental effects and affect the most people in just such areas. Thus, it is vital that a framework for wetland management be implemented to avoid further wetland loss and degradation in Grand Baie.

LITERATURE CITED

- ARDA. 2003. Premier inventaire des poissons et des macrocrustacés d'eau douce des principales rivières pérennes de l'île Maurice. Rapport de résultats. Ministère de l'Aménagement du Territoire et de l'Environnement, France. 53pp.
- Barré, N., A. Barau, and C. Joaunin. 1996. Oiseaux de la Réunion. Les éditions du Pacifique. Paris, France.
- Bisby, F. A., M.A. Ruggiero, K.L. Wilson, M. Cachuela-Palacio, S.W. Kimani, Y.R. Roskov, A. Soulier-Perkins, and J. van Hertum (eds). 2005. Catalogue of life: 2005. Annual checklist. CD-ROM. Reading, UK.
- Bojer, W. (1837). Hortus Mauritianus. Aimé Mamarot et Compagnie, Mauritius.
- Bosser, J., Cadet, Th., Gueho, J. and W. Marais. 1976-onwards. Flore des Mascareignes. MSIRI/ORSTOM-IRD/Kew. Government of Mauritius and IRD. Mauritius and Montpellier, France.
- Central Water Authority. 2006. National Hydrology Handbook. Water Resources Unit of the Central Water Authority, Mauritius.
- Cheke, A. S. 1987. An ecological history of the Mascarene Islands. Pages 5-89 in A. W. Diamond, ed. Studies of the Mascarene Islands Birds. Cambridge University Press. Cambridge, UK.
- Clayton, W. D., K.T. Harman, and H. Williamson. 2006-onwards. GrassBase - The Online World Grass Flora. <http://www.kew.org/data/grasses-db.html>.
- ESRI. 2006. ArcView 9.2. Geographic Information System (GIS) software. Redlands, CA. USA.
- Griffiths, O. L. and F. B. V. Florens. 2006. A field guide to the non-marine molluscs of the Mascarene Islands (Mauritius, Rodrigues, Réunion) and the northern dependencies of Mauritius. Bioculture Press, Mauritius.
- Govaerts R R., D.A. Simpson., P. Goetghebeur, K. Wilson, T. Egorova, and J. Bruhl. 2006. World Checklist of Cyperaceae. The Board of Trustees of the Royal Botanic Gardens, Kew. <http://www.kew.org/wcsp>.
- Government of Mauritius. 1990. Pamplemousses 1:25,000 Map (SHEET 1). Series Y881 (DOS 329). Edition 6-OSD 1990. Ordnance Survey (UK), Southampton, UK.
- Government of Mauritius. 2002. Study of Environmental Risks in Grand Baie. Final Technical Report. Ministry of Environment and NDU. Port Louis, Mauritius.
- Government of Mauritius. 2006. Development Strategy Maps. Outline Planning Scheme for Pamplemousses /Rivière du Rempart District Council Area. Final Version. Ministry of Housing and Lands (Planning Division). Port Louis, Mauritius.
- Hubbard, C. E. and R.E. Vaughan. 1940. The grasses of Mauritius and Rodriguez. Waterlow & Sons Limited. London, UK.

- ITIS. 2008. Integrated taxonomic information system. <http://www.itis.gov/index.html>.
- International Union for Conservation of Nature (IUCN). 2001. IUCN Red List Categories and Criteria. Version 3.1. Gland, Switzerland.
- IUCN. 2007. IUCN Red List 2007. <http://www.redlist.org>.
- J. Craig Venter Institute (JCVI). 2007. Reptile Database. <http://www.tigr.org/reptiles/search.php>.
- Kollmorgen Instruments Corps. 1992. Munsell Soil Color Charts. Newburgh, NY. USA.
- Marais, W. 198X. 202. Cyperacées. Flore des Mascareignes. Unpublished manuscript.
- Prosbt, J-M. 1997. Animaux de La Réunion – guide d'identification des oiseaux, mammifères, reptiles et amphibiens. Azalées éditions. La Réunion, France.
- Stevens, P. F. 2001-onwards. Angiosperm Phylogeny Website. Version 8, June 2007. <http://www.mobot.org/MOBOT/research/APweb/>.
- Trimble. 2005. GPS Pathfinder Office 3.10. Global Positioning System (GPS) software. Trimble Navigation Limited. Westminister, CO. USA.
- UNESCO. 1998. Wetlands of the Humid Tropics. International Hydrological Programme Humid Tropics Programme Series No. 12.
- Vaughan, R. E. 1932. Cyperaceae of Mauritius. Unpublished manuscript.
- Vinson, J. and J-M. Vinson. 1969. The saurian fauna of the Mascarene Islands. Mauritius Institute Bulletin 6:203-230.
- Williams, J. R. 2007. Butterflies of Mauritius. 2nd ed. Bioculture Press, Mauritius.

APPENDIX A

Photographs



Photo 1: Wetland boundary defined by fill.



Photo 2: Wetland 1 at Grand Baie Conference Centre.



Photo 3: Possible location of in-flow to Wetland 1 obscured by debris.



Photo 4: Wetland 2 north of Super-U supermarket.



Photo 5: Impervious surface runoff from Super U property to Wetland 2.



Photo 6: Wetland 3.



Photo 7: Probable hydrologic connection between Wetlands 3 and 4.



Photo 8: Wetland 4 bordering Grand Baie Bazaar.



Photo 9: Wetland 5.



Photo 10: Clay soils with gleying and redoximorphic features in Wetland 5.



Photo 11: Wetland 6.



Photo 12: House construction on fill bordering Wetland 7.



Photo 13: Fill and debris along the edge of Wetland 7.



Photo 14: Wetland 8 with berm of fill material in background.



Photo 15: Wetland 10.



Photo 16: Wetland 11.



Photo 17: Wetland 12.



Photo 18: Wetland 9.

APPENDIX B

Wetland Delineation Course Outline

DELINEATION TRAINING OUTLINE

I Identifying wetlands and determining boundaries

- A. Gathering preliminary data (easily observed primary indicators)
 - 1. Obligate vegetation (*Typha domingensis*)
 - 2. Hydrologic (presence of standing water outside of flooding or other stormwater events)
- B. Further investigation for determining the presence of wetlands
 - 1. Identifying other plants commonly found in wetlands
 - 2. Characterizing wetland soils
 - a. value and chroma
 - b. texture
 - c. redoximorphic features
 - d. other characteristics associated with reducing soil conditions
- C. Observing and/or inferring wetland hydrology
 - 1. Observation of saturation and inundation
 - 2. Inference of saturation/inundation outside of the growing season
- D. Other factors
 - 1. Assessing environmental conditions
 - 2. Topography
- E. Atypical conditions
 - 1. Disturbed wetlands
 - 2. Problem areas

II Surveying wetland boundaries

- A. Use of professional judgment for boundary determination
- B. Flagging boundaries for survey crew
 - a. Numerical, alphabetical, or alphanumeric system
 - b. Locate transects for vegetative representation
 - c. Soil pit locations for verification by others
- C. Use of GPS for wetland boundary mapping
 - a. Coordinate systems (global vs planimetric)
 - b. UTM coordinate system using WGS 1984 datum





APPENDIX C

1:5,000 Wetland Delineation and Land Ownership Maps

Grand Baie Wetland Survey

Survey Location

Legend

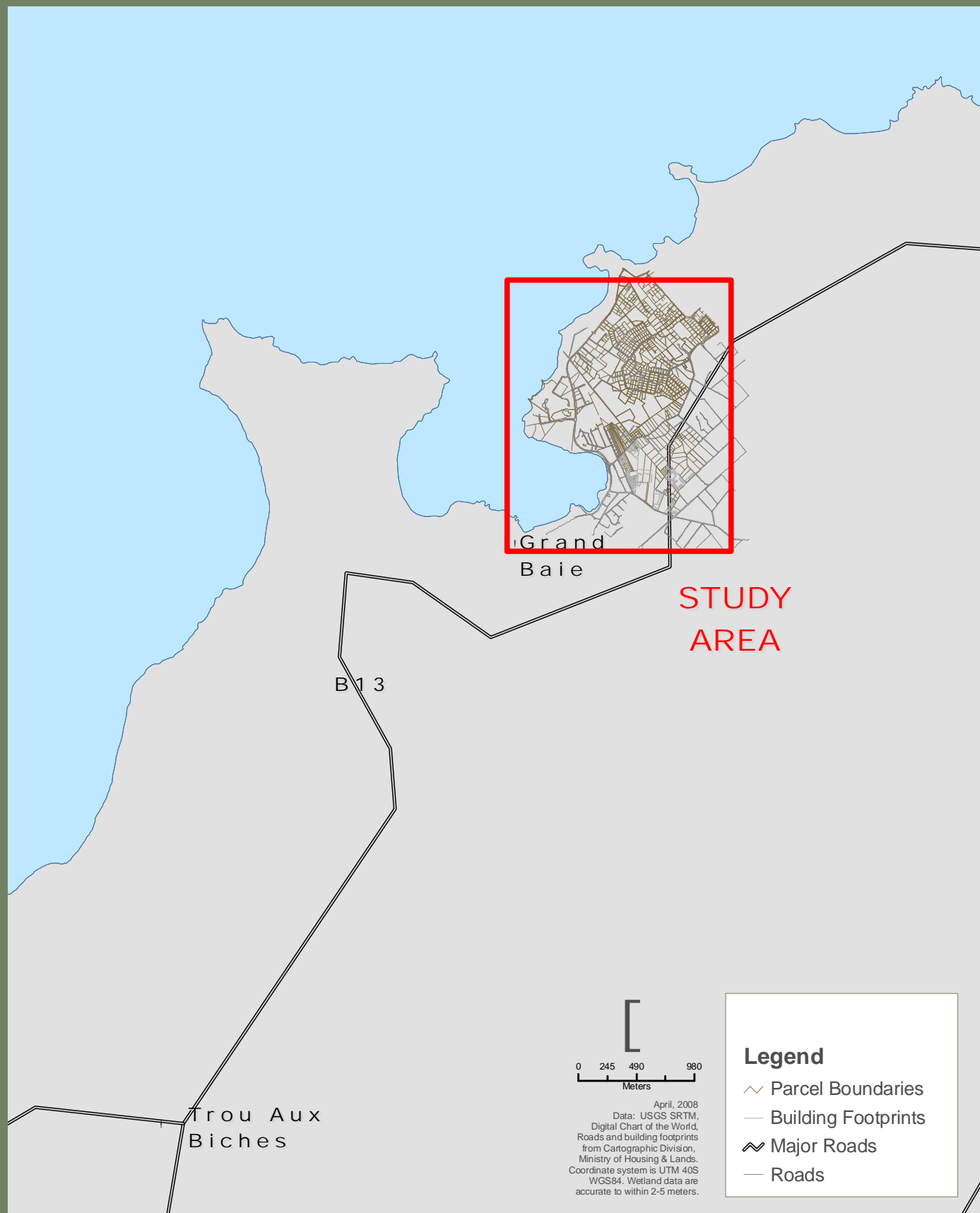
-  Project Area
-  Major Roads
-  Major Rivers
-  Lakes



April, 2008
Data: USGS SRTM,
Digital Chart of the World

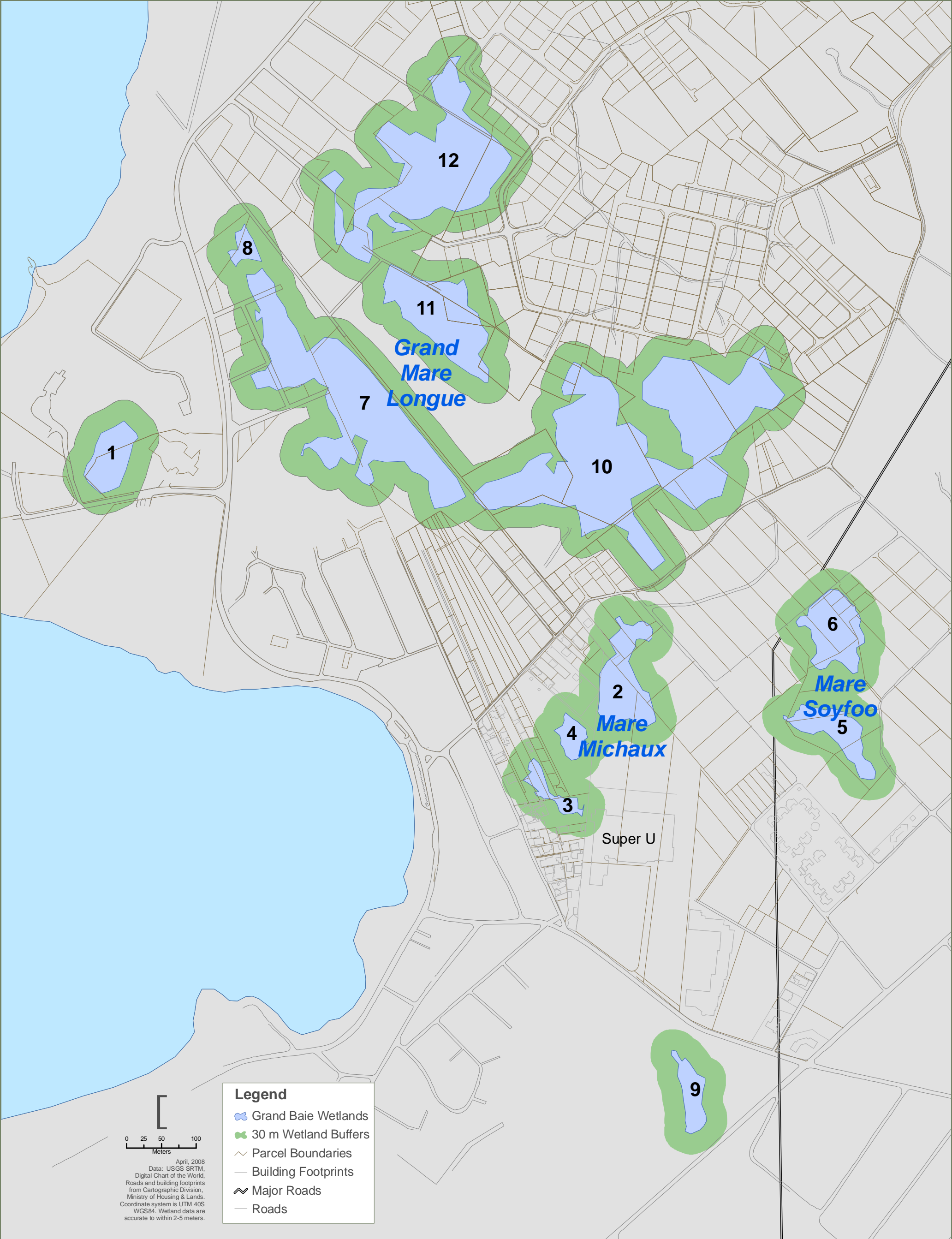
Grand Baie Wetland Survey

Grand Baie Study Area



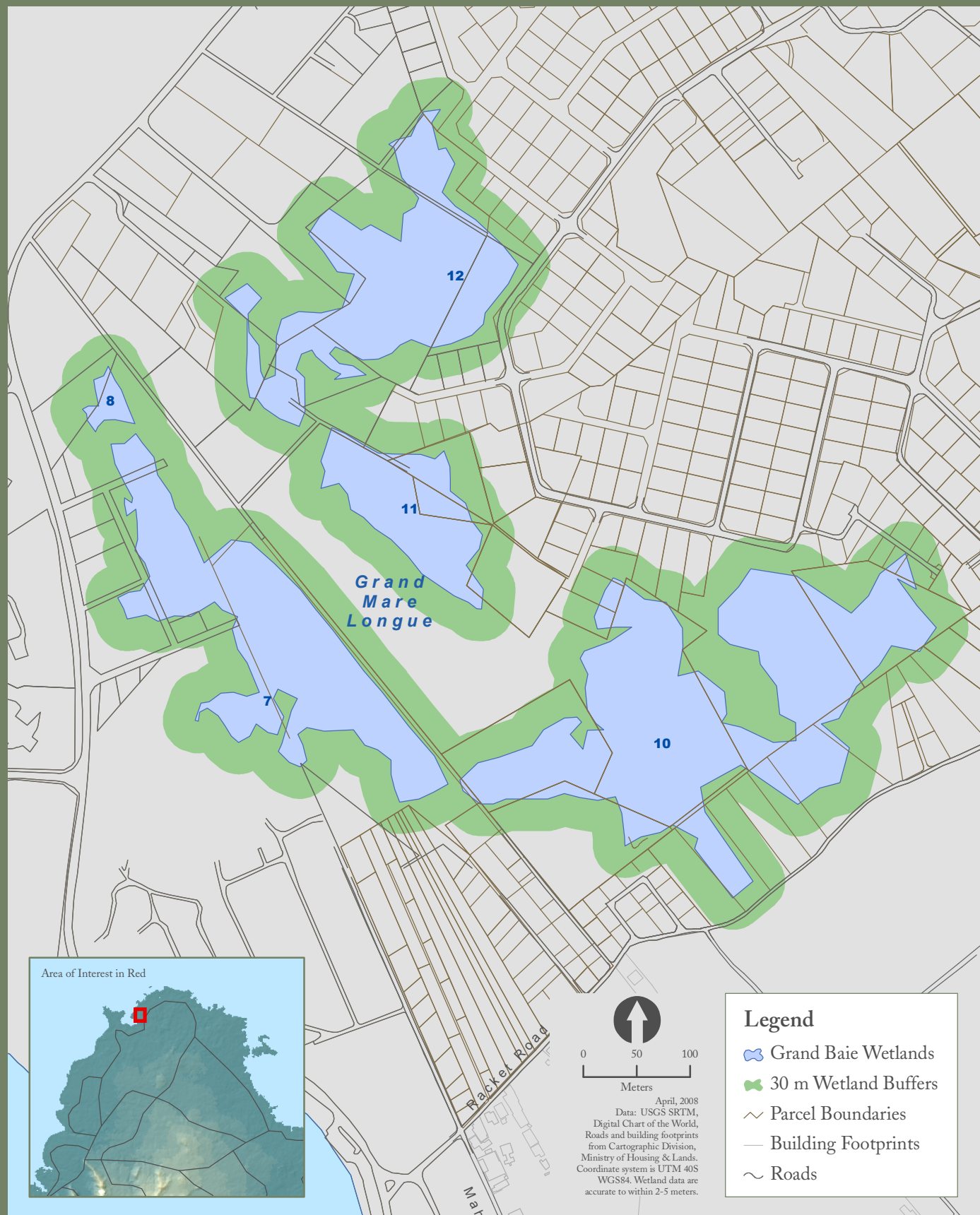
Grand Baie Wetland Survey

All Wetlands in Grand Baie



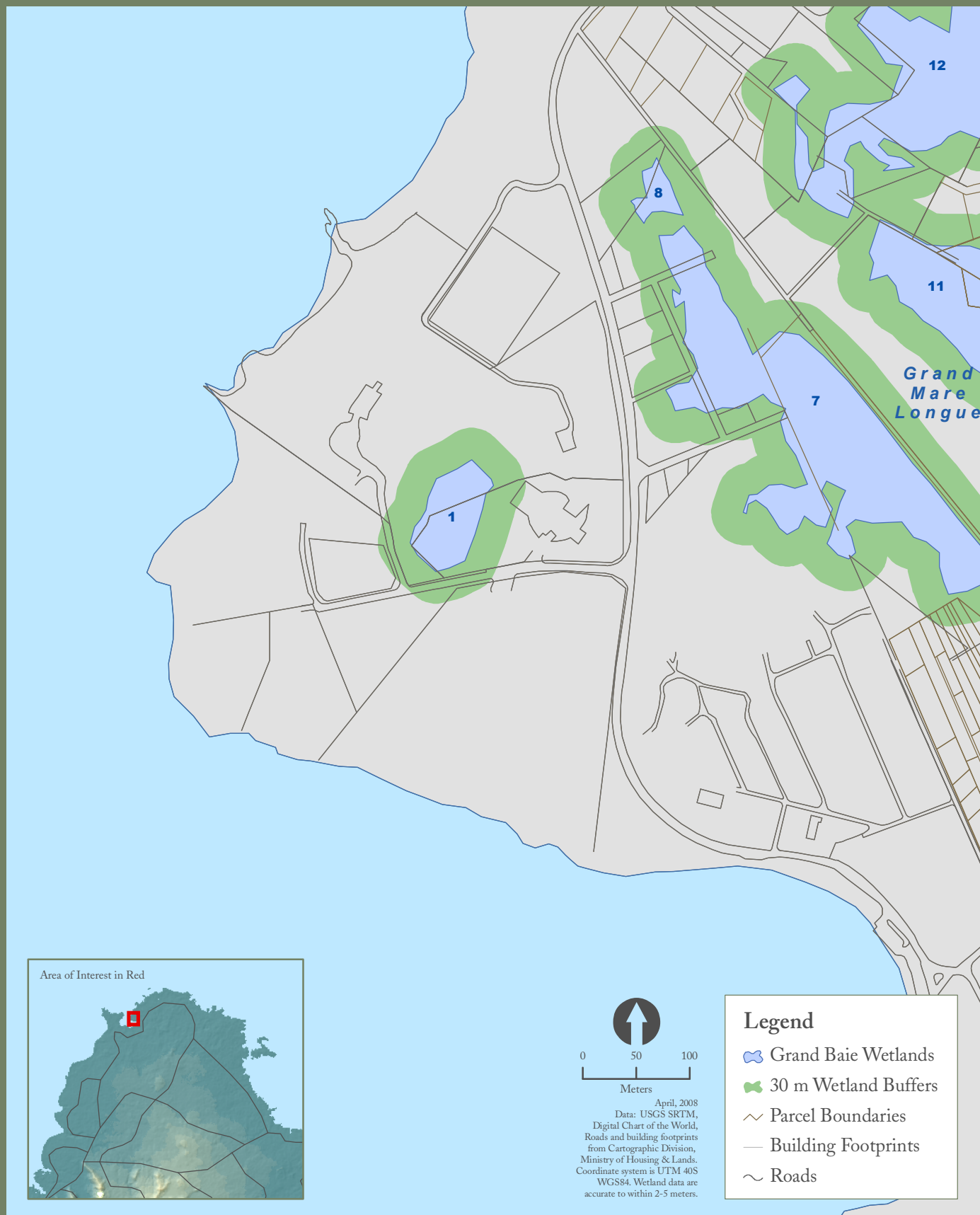
Grand Baie Wetland Survey

Northern Extent, Part 1 of 2



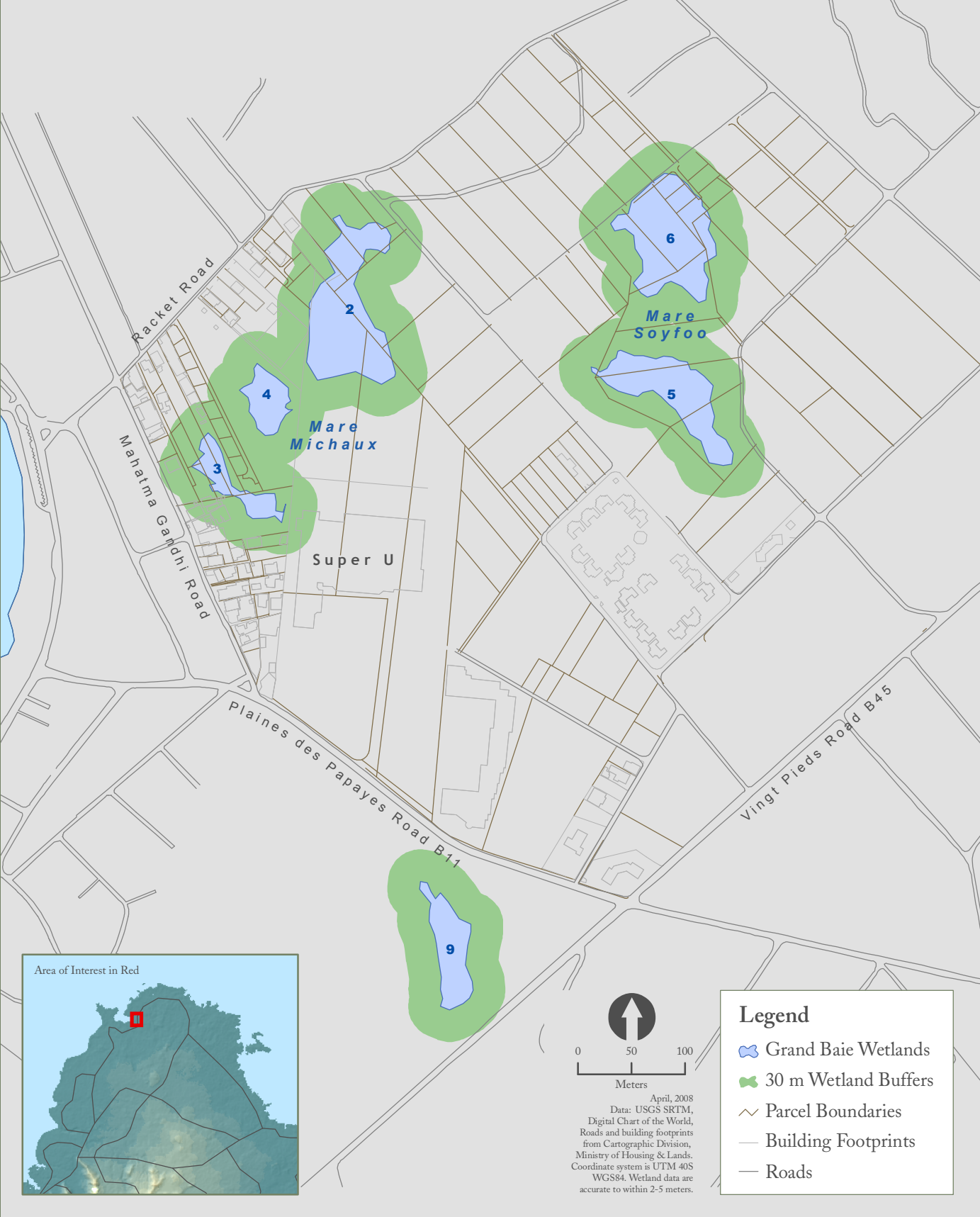
Grand Baie Wetland Survey

Northern Extent, Part 2 of 2



Grand Baie Wetland Survey

Southern Extent



Grand Baie Wetland Survey: *Wetland 9 Property Ownership (South Extent)*

Grand Baie Wetland Survey:
Property Owners South Extent

No.	NAME OF OWNER	EXTENT (m²)	T.V No
1	Mr. Mohammad Ehsaan TOOFANNY & Others.	718.00	2401 / 38
2	Mrs. Bibi Sadeka EMAMBUX	3 503.33	1910 / 19
3	Mr. Issop DAMREE	2 110.44	1120 / 32
4	Mr. Mahomed Bhaye JOOSUB	1 266.26	1897 / 48
5	Mrs. Anourpattee RUGHOONAUTH	317.40	3528 / 30
6	Mr. Soodaramdeo RUGHOONAUTH	580.40	3528 / 30
7	Mr. Soubouwondeo RUGHOONAUTH	580.40	3528 / 30
8	Mr. King On Leung Pah Hang	3 925.30	1781 / 8
8/1	Mr. Rajendra Kumar DURGA	169.00	3271 / 14
9	Mr. Ragoonundun SUMRAH	10 214.50	1808 / 97
10/1	Mr. Ramnarain MOOTHOR	586.13	1629 / 112
10/2	Mr. Sunilduth MOOTHOR	203.15	5520 / 19
10/3	Mr. Dewantee MOOTHOR	222.90	5520 / 19
10/4	Mr. Camla MOOTHOR	219.00	5520 / 19
10/5	Mr. Dhanwantee MOOTHOR	244.00	5520 / 19
10/6	Mr. Sohunlall MOOTHOR	228.85	5520 / 19
10/7	Mr. Amarnath MOOTHOR	227.85	5520 / 19
10/8	Mr. Mohunlall MOOTHOR	233.35	5520 / 19
10/9	Mr. Renukha MOOTHOR	242.30	5520 / 19
10/10	Mr. Sookunlall MOOTHOR	245.55	5520 / 19
11	Mr. Goorduth AGADOO	1 941.60	540 / 183
12	Mrs. Rajawantee CHUMMUN	1 983.81	1895 / 90
13	Mr. Nund Kishore NEERMAULL & Others.	440.00	4457 / 7
14	Mr. Lutchmee Narain CHUMMUN	569.82	1532 / 83
15	Mrs. Poolmutee RUGHOONAUTH	411.53	1529 / 97
16	Mr. Premnath SOOPHUL	854.73	1590 / 23
17	Mrs. Chenarakala NEERMAULL & Others.	Solde 1 097.42	4457 / 7
18	Mr. Patee RAGOONATH	4 136.45	573 / 193
19	Mrs. Marie Veronique SAB	200.98	3526 / 60
20	Mr. Serge Gabriel SAB	278.26	3526 / 60
21	Mr. Jean Clifford SAB	308.52	3526 / 60
22	Mr. Jules Clement SAB	268.26	3526 / 60
23	Mrs. Marie Guilmette SAB	403.26	3526 / 60
24	Mrs. Marie Stella COMPASSIE	444.38	3526 / 60
25	Mr. Francois Philippe Barazer DE LANNURIEN	21 104.04	3907 / 72
26	Societe De Cepage	20 139.88	3910 / 62
27	Mr. Saherab KHODABUCCUS & Others.	4 094.37	4357 / 2
28	Mr. Patrick YEONG FONG TSIN SA AH VI & Others.	4 727.37	3627 / 18
29	Mr. Abdool Ahad DAMREE	5 402.71	1730 / 70
30	Mrs. Bibi Khairun Nesha RAJABALLY	373.35	3521 / 18
31	Mr. Nazim RAJABALLY	394.95	3521 / 18
32	Mrs. Bibi Aziza RAJABALLY	495.80	3521 / 18
33	Mr. Hassenjee RAJABALLY	373.35	3521 / 18
34	Mr. Abdass Salam RAJABALLY	394.95	3521 / 18
35	Mr. Adil RAJABALLY	485.35	3521 / 18
36	Mr Kritadeo RAMDASS	326	5389 / 57
37	Keematec RAGOOBARSING	288.20	5569 / 70
38	Bibi Faroza MONEBAHAL	290.60	5420/ 57
39	Mr Nasser MOORADUN	292.40	5687/ 47
40	Mr Mohammad Reshad CHUMROO	294.60	6164 / 14
41	Mr Shariff RUMMUN	294.60	5949 / 54
42	Mr. Mohammad Reza NATHUDKHAN	298	5791 / 34
43	Mr. Mohammad Reza NATHUDKHAN	299.30	5791 / 34
44	Sawcatally BOYRAGEE	4642.96	1302 / 21
45	Sorjewatee RUGHOONAUTH	295.46	3528 / 30



Grand Baie Wetland Survey: Wetlands 2,3,4,5, & 6 Property Ownership (South Extent)



Grand Baie Wetland Survey: *Property Ownership Northern Extent*

S/N	Owner	Extent (arpent / m²)	T.V No
1	Seewochurn Jugdis	686m2	2790/1
2	Oodhan Dharamraj	686m2	3236/20
3	Seewochurn Jugdis	686m2	2790/5
4	Ramgothee Mahendra	686m2	2665/3
5	Giannotti alan Lloyd	686m2	4169/62
6	Seewochurn Jugdis	442m2	2790/2
7	Busgeeth Sunkurnath	254m2	4099/54
8	Dookarun Coontee	343m2	3664/67
9	Gookooluck Sunilduth	343m2	3769/69
10	Seewochurn Jugdis	686m2	2790/4
11	Seegoolam Veenaye & Jaysing	686m2	3004/29
12	Burahee Hassem	2616.95m2	1540/118
13	Burahee Beebee shaberah	1368.86m2	3904/6
14	Edoo Abdool Latiff	1332.5m2	2895/49
15	Burahee Beebee Taherah	2701.37m2	1540/118
16	Burahee Bibi Saherah	2638.06m2	1540/118
17	Burahee Swaley	2680.27m2	1540/118
18	Burahee Hassen	593.05m2	4178/3
19	Bundhun Mohammad Salim	509.85m2	4178/3
20	Aumjeedally Mahmud Sidick	502.6m2	4178/3
21	Burahee abdool Anwar	528.3m2	4178/3
22	Burahee Anwar	523m2	4178/3
23	Cassim Laila	4220.9m2	3633/18
24	Kullup Mooneea	7175.51m2	744/155
25	Luchmunpersad Peewantee	2321.49m2	1581/81
26	Kadayer Mahmud Rafeek	2427.01m2	1628/146
27	Kadayer Mahmud Rafeek	2427.01m2	1628/146
28	Gengadu Atchamah	3292.28m2	2077/32
29	Jhumun Indranund	3292.28m2	3854/74
30	Ghanty Anwar abdool Hamid	320m2	4304/83
31	Yadallee Mohammad Shameer	320m2	4057/28
32	Keenoo Abdool Taleb	320m2	4480/21
33	Ruhomally Farook	320m2	4480/22
34	Beegun Nazruddin	285m2	4487/25
35	Moothoor Ambika	270m2	4041/21
36	Thacoor Pria	288m2	4184/15
37	Noormamode Naguib	288m2	4267/30
38	Goonah Abdool Rashid	358.78m2	1717/47
39	Auleear Osman	534.36m2	2024/80
40	Dookee Seewoochan	1329.58m2	2000/127
41	Cie Technocom Limited	0A46 9/10	2080/35
42	Cie Technocom Limited	0A47 1/2	2080/35
43	Cie Technocom Limited	1750m2	2080/35
44	Koosanny Jeekaria	4811.81m2	814/139
45	Poisson Willy	0A23.90p	1761/2
46	De Rosnay Desire Gerard Jacques Fromet	0A17.60p	1770/86
47	De Rosnay Desire Gerard Jacques Fromet	0A20.10p	1770/87
48	Chitbahal Goolam Farook	0A20.90p	2112/82
49	Lot 92 Morc. Swan	0A51.90p	1268/195
50	De Rosnay Desire Louis Jean Paul Fromet	0A64.70p	1634/82
51	Sonoo Luximon	0A17p	1623/15
52	Vithilingum Shomousondrum Pillay	0A15.70p	2054/8
53	Joomun Meean Farook	0A15.70p	1515/177
54	Toulet Philippe Gerard	0A15.20p	1676/63
55	Lew Yew Pha Jean Marie	0A18.10p	1443/217
56	Societe du Nord	0A24.40p	1803/16
57	Chung Kiong Kow Roland	0A18.80p	1414/25
58	Leong Son Luc Patrick	0A15.70p	1454/192
59	Chung Fat Michel	0A15.70p	1414/24
60	Lot 79 Morc. Swan	0A15.70p	1268/195
61	Mathieu Gerard Marcel	0A15.10p	1659/180
62	Lim Yin Jimmy	0A15.30p	1390/163
63	Soong Fat Ah Koon Henry	0A15.70p	1933/36
64	Lot 73 Morc. Swan	0A15.70p	1268/195
65	Ducasse Emile Guy Cyril Marcelin	0A15.70p	1410/178
66	Societe Clofran	0A15.70p	1435/167
67	Xavier Lucien Joseph Gilbert	0A17.70p	1779/22
68	Law Yee Chin Roland Eugene	0A17.60p	1697/173
69	Lot 69 Morc. Swan	0A17.60p	1268/195
70	Sooben Radhakrishnan	0A17.20p	1438/111

S/N	Owner	Extent (arpent / m²)	T.V No
70	Sooben Radhakrishnan	0A17.20p	1438/111
71	Ganoo Alan	0A17.20p	1773/47
72	Moosun Mohamed Eshan Said & Others	0A17.60p	1983/11
73	Rambocus Chintaman	0A14p	1445/178
74	Poirier Desire Lucien Robert	0A19.90p	1412/161
75	Lot 58 Morc. Swan	0A20.50p	1268/195
76	Margeot Marie Joseph Yves	0A15.70p	1770/102
77	Felicite Marie Rosmay Benjamine	0A35p	1643/91
78	L'Homme Alain Charles Mrs	0A73p	1543/89
79	Antelme Leopold Edouard Mrs	3842m2	1737/105
80	Dalais Marie Guy Robert Rey	3842m2	1737/106
81	Wong Tong Chung	2A10.05p	1516/205
82	Paturau Hector Roger France Mrs	0A74.65p	1220/213
83	Baissac Gabriel Jean Claude	0A23.30p	1385/182
84	Wiehe Henri Hyacinthe Georges Mrs	2165.39m2	2101/37
85	Rousset Marie Jean François Bernard	2355.08m2	2101/37
86	Rousset Henri Joseph Jean François	635m2	2618/48
87	Desvaux de Marigny Arnaud Fernand Maxime Mrs	635m2	2618/48
88	Rousset Marie Michel Patrice	3583.94m2	2101/37
89	Wong Tong Chung	0A24.50p	1516/205
90	Onix Enterprise (Store 2000)	1120m2	L.B.89/28
91	Attraction Limited	600m2	L.B. 3/87
92	Compagnie La Case Rodriguaise Ltd	2110m2	L.B. 89/42
93	Auckloo C	600m2	State Land
94	Capiron Ignace	190m2	State Land
95	Veerapen Armoogum	330m2	State Land
96	Jewelry,Arts & Crafts Limited	800m2	State Land
97	Swan Properties Ltd.	0A36.7p	4852/35
98	Swan Properties Ltd.	0A27.3p	4852/35
99	Swan Properties Ltd.	0A78p	4852/35
100	Jean Maurice Roger Julienne	0A15.8p	1781/25
101	Swan Properties Ltd.	0A16.9p	4852/35
102	Renganaden Soopramanien	0A91p	1515/105
103	Swan Properties Ltd.	0A35.6p	4852/36
104	Swan Properties Ltd.	0A28.4p	4852/36
105	Compagnie Melville Ltd.	4A50p	1237/149
106	Pierre Piat Dalais	Surplus of 2A85p	486/261

The map displays the Grand Baie Wetland area, divided into 12 numbered wetlands. Wetlands 1, 7, 8, 10, 11, and 12 are shaded in light green with diagonal lines, while Wetlands 2, 3, 4, 5, 6, 9, and 13 are shaded in light grey. A 30m buffer around the wetlands is shown in a darker green. Building footprints are outlined in red, roads in black, and parcel boundaries in thin black lines. The map includes a legend in the bottom right corner, a scale bar (0 to 100 meters), and a north arrow. Various land parcels are labeled with owner names and areas, such as 'Chetty Hotels Limited (Ventura Hotels) L.B. 89/62' and 'Verandah Hotels Limited L.B. 89/25 6373m2'. The map also shows the coastline, a football ground, and the 'PG LINE'.

LEGEND

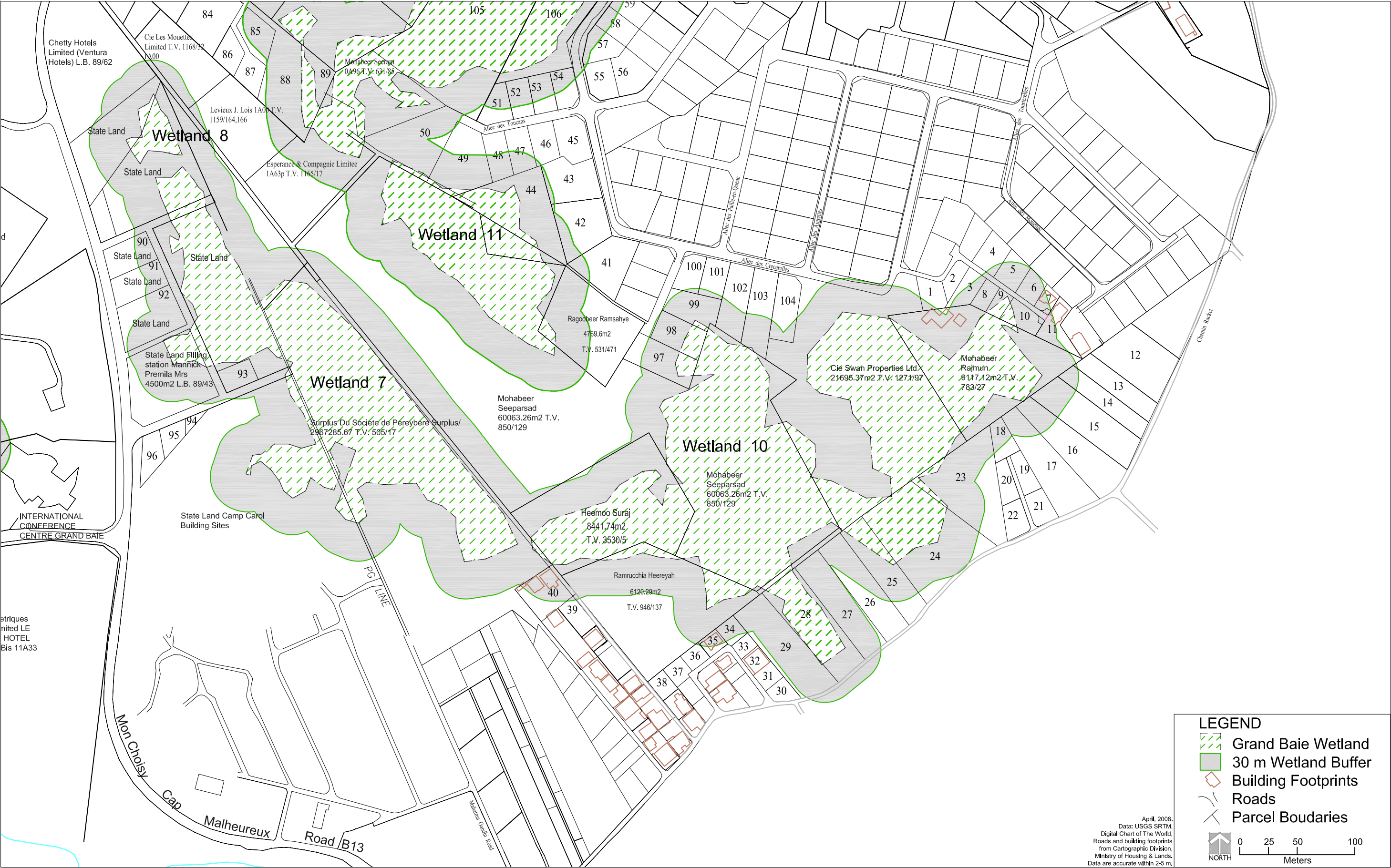
- Grand Baie Wetland
- 30 m Wetland Buffer
- Building Footprints
- Roads
- Parcel Boudaries

April, 2008.
Data: USGS SRTM,
Digital Chart of The World,
Roads and building footprints
from Cartographic Division,
Ministry of Housing & Lands.
Data are accurate within 2-5 m.

0 25 50 100
Meters

NORTH

Grand Baie Wetland Survey: Wetland 10 Property Ownership (North Extent)



[illegible]

APPENDIX D

Wetland Bounding Coordinates

Grand Baie Wetlands Bounding Coordinates

Wetland	X	Y
1	560729.3757	7787644.7570
1	560727.1931	7787650.8289
1	560718.3558	7787656.3747
1	560716.7352	7787661.2872
1	560709.1008	7787668.9418
1	560695.5646	7787660.4298
1	560676.1678	7787651.2586
1	560668.2585	7787634.1628
1	560666.1006	7787622.1636
1	560661.2668	7787613.4146
1	560655.7083	7787606.3783
1	560651.1745	7787591.6792
1	560657.9864	7787580.2593
1	560675.3905	7787564.5726
1	560687.5921	7787567.7758
1	560696.2747	7787571.7885
1	560702.4256	7787574.7716
1	560706.2538	7787584.7698
1	560712.0562	7787599.2708
1	560719.2913	7787623.4513
1	560722.4135	7787636.7412

Wetland	X	Y
2	561460.1940	7787276.5297
2	561451.5074	7787280.6436
2	561442.2156	7787297.6182
2	561437.2258	7787309.7346
2	561431.6331	7787321.7900
2	561437.4060	7787337.0911
2	561441.2683	7787343.1703
2	561439.0856	7787348.1655
2	561443.0467	7787353.7829
2	561447.6032	7787354.3028
2	561454.2019	7787353.6765
2	561460.8841	7787350.2197
2	561465.0740	7787354.5641
2	561464.9230	7787359.1498
2	561466.2973	7787366.6246
2	561462.6958	7787373.1825
2	561452.9001	7787379.4829
2	561445.4501	7787378.3166
2	561437.7556	7787372.5748
2	561425.2391	7787375.8980
2	561421.7822	7787380.6980
2	561418.5144	7787386.3934
2	561412.2671	7787383.0192
2	561420.7015	7787370.5984
2	561418.8083	7787366.2312
2	561403.6573	7787352.6195
2	561414.4219	7787332.5379
2	561400.9140	7787321.8800
2	561390.0946	7787303.9744
2	561389.7904	7787268.5487
2	561387.4644	7787249.3482
2	561397.5030	7787232.4154
2	561411.9957	7787235.0873
2	561433.0768	7787240.0363
2	561457.0792	7787228.1084
2	561469.6552	7787235.3920
2	561470.2274	7787238.8817

Wetland	X	Y
3	561301.6921	7787176.8606
3	561306.3916	7787169.0444
3	561308.4434	7787163.7548
3	561311.2819	7787153.2363
3	561314.9684	7787140.9364
3	561317.3248	7787134.0082
3	561325.2518	7787128.1518
3	561330.9100	7787129.7218
3	561339.0267	7787125.0245
3	561348.2441	7787126.6523
3	561357.1761	7787126.5047
3	561358.5224	7787118.7783
3	561358.1918	7787110.5422
3	561364.8500	7787109.0420
3	561367.3511	7787116.7760
3	561363.7319	7787099.5868
3	561357.2604	7787105.8940
3	561350.1585	7787103.7854
3	561336.4344	7787103.3599
3	561331.5610	7787107.3275
3	561329.2670	7787115.5116
3	561324.9954	7787122.1409
3	561318.0701	7787125.5337
3	561309.5456	7787125.4575
3	561304.1901	7787129.0093
3	561299.3021	7787128.9446
3	561296.3911	7787134.8602
3	561302.3427	7787135.8661
3	561295.8319	7787141.5900
3	561287.1780	7787147.8921
3	561279.7363	7787152.0239
3	561286.5585	7787158.3152
3	561291.8510	7787164.0888
3	561286.7684	7787167.6491
3	561288.8069	7787176.5901
3	561295.2337	7787183.5008

Wetland	X	Y
4	561338.2977	7787196.7794
4	561339.6904	7787193.5237
4	561340.8807	7787187.4011
4	561348.7264	7787180.6218
4	561356.2807	7787181.6524
4	561360.3022	7787184.1961
4	561362.9038	7787192.5408
4	561367.9283	7787200.3456
4	561374.1050	7787204.7158
4	561370.4415	7787204.9761
4	561367.3624	7787206.9819
4	561368.1518	7787209.8408
4	561372.5931	7787212.9728
4	561370.3970	7787217.6619
4	561370.3221	7787224.9591
4	561358.9142	7787234.9585
4	561350.0069	7787240.8172
4	561341.0434	7787248.1521
4	561338.4395	7787243.5479
4	561338.9066	7787236.7893
4	561336.4324	7787229.9849
4	561328.5460	7787225.8841
4	561324.6268	7787223.1195
4	561332.8355	7787216.3831
4	561334.5433	7787210.0574
4	561333.5174	7787203.3831

Wetland	X	Y
5	561693.1235	7787254.2715
5	561687.3111	7787254.6790
5	561680.3905	7787259.4057
5	561677.6411	7787258.2638
5	561675.9252	7787252.1051
5	561671.3952	7787249.3052
5	561667.8066	7787242.5365
5	561661.0105	7787239.1107
5	561657.4896	7787242.5152
5	561652.7338	7787243.8029
5	561653.5771	7787239.4189
5	561661.9592	7787233.6826
5	561667.3659	7787227.5311
5	561678.3146	7787220.9790
5	561686.6380	7787218.7500
5	561696.2759	7787216.2234
5	561700.8912	7787219.6568
5	561710.3768	7787221.9705
5	561717.6867	7787216.1047
5	561725.3861	7787208.3440
5	561731.3260	7787203.4901
5	561739.6925	7787190.4984
5	561744.9013	7787180.6070
5	561755.0252	7787174.3036
5	561758.6029	7787163.2589
5	561762.5993	7787154.0731
5	561775.4964	7787151.5397
5	561783.5659	7787152.6302
5	561784.8590	7787162.7335
5	561778.1185	7787175.7031
5	561770.2137	7787180.4773
5	561765.8136	7787187.5549
5	561767.6093	7787197.0134
5	561763.6676	7787212.2786
5	561766.7884	7787225.9211
5	561758.2417	7787234.8316
5	561750.5044	7787240.6890
5	561745.3704	7787240.9165
5	561742.4775	7787248.0579
5	561734.9610	7787249.2760
5	561728.4474	7787252.6077
5	561720.5581	7787253.5020
5	561713.4780	7787251.3306
5	561701.5164	7787254.3304

Wetland	X	Y
6	561727.6829	7787323.6153
6	561737.4970	7787318.8005
6	561743.1194	7787313.5256
6	561747.8502	7787311.4145
6	561753.2259	7787303.3020
6	561759.9701	7787305.8465
6	561760.3661	7787314.8708
6	561762.5187	7787325.2115
6	561758.4036	7787333.6696
6	561758.6446	7787340.2280
6	561770.0260	7787347.3396
6	561769.1984	7787358.2692
6	561762.4617	7787371.4317
6	561764.8912	7787380.6133
6	561761.7668	7787388.3391
6	561757.0177	7787393.6677
6	561756.4448	7787399.8264
6	561749.4457	7787404.9399
6	561743.3344	7787413.6982
6	561733.0114	7787422.3062
6	561722.0475	7787424.2109
6	561710.1061	7787415.7129
6	561697.0717	7787403.4414
6	561690.8868	7787398.2333
6	561687.7394	7787386.5881
6	561678.1812	7787385.5630
6	561671.5867	7787377.5606
6	561675.1122	7787370.5906
6	561685.0424	7787372.6020
6	561692.7582	7787366.5254
6	561694.0465	7787354.2030
6	561700.7774	7787343.6106
6	561701.1421	7787332.4278
6	561692.5613	7787321.8238
6	561699.5440	7787312.5415
6	561705.4287	7787308.8795
6	561714.4579	7787311.6057
6	561722.1109	7787321.3384

Wetland	X	Y
7	561075.7420	7787722.8199
7	561061.2200	7787741.2855
7	561037.9121	7787765.3105
7	561015.6019	7787785.0751
7	560997.0875	7787787.7990
7	560981.1920	7787772.1489
7	560971.9475	7787766.4370
7	560963.3624	7787781.9011
7	560956.8248	7787801.0169
7	560944.7752	7787817.3909
7	560940.5899	7787830.9261
7	560928.4064	7787849.0916
7	560925.1966	7787865.5843
7	560913.9323	7787879.0084
7	560912.3057	7787887.0726
7	560908.0390	7787887.3246
7	560897.7983	7787878.1543
7	560884.8403	7787877.9199
7	560888.8555	7787859.2925
7	560898.1325	7787839.5068
7	560905.0231	7787827.3331
7	560904.0374	7787822.7133
7	560897.3284	7787827.5161
7	560897.3157	7787821.4445
7	560899.5672	7787810.5947
7	560908.0497	7787816.6500
7	560909.0597	7787804.4798
7	560909.6414	7787788.3723
7	560906.8507	7787778.1320
7	560916.2970	7787766.3749
7	560920.8503	7787753.7392
7	560912.0479	7787740.5818
7	560901.0563	7787739.0017
7	560890.7033	7787733.7383
7	560896.1339	7787723.6987
7	560899.5392	7787713.9459
7	560917.6205	7787717.5534
7	560928.5275	7787711.9166
7	560943.4728	7787716.7410
7	560953.8013	7787716.3896
7	560959.1940	7787716.2916
7	560981.5242	7787729.6314
7	560988.7024	7787722.0890
7	561002.8414	7787715.7011
7	560997.6043	7787704.2197
7	561002.7634	7787685.4592
7	561011.7931	7787672.4234
7	561022.8919	7787645.0830

Wetland	X	Y
7	561011.0408	7787641.2834
7	560998.7174	7787645.1393
7	560986.9557	7787644.3513
7	560976.8097	7787646.7536
7	560975.9186	7787636.1307
7	560968.2270	7787635.0204
7	560962.6869	7787618.8960
7	560965.6694	7787618.0140
7	560967.1271	7787626.5998
7	560974.3650	7787630.3246
7	560984.5559	7787622.9899
7	560990.6781	7787613.9019
7	560996.5934	7787604.1107
7	561003.5765	7787598.2008
7	561014.1177	7787604.0599
7	561019.9034	7787615.5792
7	561030.8237	7787607.1092
7	561039.6589	7787604.9775
7	561045.8715	7787622.0304
7	561036.0904	7787638.8409
7	561040.5901	7787647.9612
7	561058.4502	7787639.0618
7	561053.0171	7787627.9213
7	561044.1339	7787597.1411
7	561040.6853	7787589.4731
7	561050.8361	7787579.2294
7	561060.8782	7787575.0446
7	561067.4065	7787581.1531
7	561063.6136	7787595.9467
7	561058.7774	7787605.3732
7	561067.4037	7787611.9717
7	561083.3307	7787608.5408
7	561110.9050	7787609.5979
7	561121.6568	7787595.1170
7	561133.4333	7787590.8579
7	561145.9027	7787580.9544
7	561145.8734	7787567.5888
7	561149.2887	7787553.8760
7	561153.9586	7787541.9499
7	561172.1057	7787544.7283
7	561185.5482	7787550.9662
7	561199.0895	7787558.5552
7	561186.4594	7787584.6311
7	561162.7878	7787612.8162
7	561137.9308	7787645.0944
7	561121.0803	7787664.5159
7	561091.9649	7787703.0467

Wetland	X	Y
8	560907.5569	7787896.9105
8	560888.6883	7787900.6473
8	560878.4313	7787900.1126
8	560872.6697	7787893.8714
8	560870.6652	7787889.5195
8	560863.1526	7787900.1229
8	560861.9525	7787906.2589
8	560858.4044	7787910.3837
8	560863.8463	7787913.3071
8	560873.6329	7787913.2462
8	560870.1028	7787929.4599
8	560869.1697	7787938.1268
8	560878.4873	7787941.9816
8	560882.7107	7787950.6866
8	560889.0106	7787937.2996
8	560894.9863	7787928.4448
8	560900.2226	7787914.3256

Wetland	X	Y
9	561512.5845	7786655.1037
9	561510.3395	7786647.8881
9	561518.9029	7786644.3181
9	561531.7072	7786650.0020
9	561537.3450	7786655.2207
9	561540.9355	7786662.4170
9	561540.2348	7786670.7701
9	561533.8241	7786686.3483
9	561535.9293	7786704.1832
9	561539.0489	7786716.8707
9	561539.1162	7786724.2552
9	561527.9814	7786729.5162
9	561517.7595	7786745.1055
9	561510.8800	7786753.4514
9	561506.1853	7786748.1327
9	561502.0490	7786754.7926
9	561498.3191	7786763.0305
9	561491.9483	7786764.2066
9	561491.1954	7786756.8767
9	561502.0076	7786743.6886
9	561500.3754	7786737.1307
9	561500.1767	7786726.8868
9	561504.9931	7786714.4622
9	561506.8529	7786706.2595
9	561508.2204	7786693.5393
9	561511.3381	7786674.6456
9	561510.5422	7786663.4242

Wetland	X	Y
10	561210.1483	7787562.4111
10	561213.0279	7787552.2666
10	561222.0966	7787545.4740
10	561229.2197	7787539.8137
10	561241.6153	7787539.9212
10	561253.4119	7787544.3870
10	561292.3997	7787544.2733
10	561307.9895	7787549.2935
10	561322.7575	7787545.5365
10	561339.4137	7787542.7135
10	561355.8115	7787546.2992
10	561361.6720	7787530.4871
10	561364.4178	7787508.6108
10	561364.6491	7787500.1754
10	561379.3454	7787508.4982
10	561397.7661	7787512.8020
10	561409.3128	7787519.8523
10	561432.6095	7787507.1251
10	561429.9224	7787497.2736
10	561465.2858	7787451.1953
10	561484.3087	7787466.4805
10	561439.7337	7787531.5719
10	561435.4763	7787554.7621
10	561473.2577	7787575.6580
10	561526.4745	7787538.4702
10	561546.6761	7787553.5616
10	561565.6869	7787558.6185
10	561574.8212	7787591.4230
10	561548.7347	7787613.8984
10	561564.9907	7787618.7325
10	561581.9440	7787648.8669
10	561603.1487	7787668.3990
10	561614.3685	7787686.6977
10	561640.8287	7787681.2674
10	561656.5531	7787703.3786
10	561638.1580	7787724.5753
10	561620.3572	7787749.3202
10	561637.7950	7787739.6986
10	561631.0597	7787762.2571
10	561627.8835	7787773.1351
10	561603.7554	7787754.0301
10	561593.0279	7787733.2975
10	561576.7599	7787717.4381
10	561525.6532	7787752.3028
10	561483.1024	7787759.1685
10	561471.4996	7787742.4033
10	561452.5964	7787722.2916
10	561452.2497	7787697.8288

Wetland	X	Y
10	561463.5842	7787688.5019
10	561489.8993	7787681.8357
10	561491.6700	7787669.9030
10	561506.7202	7787649.3869
10	561509.6979	7787622.8253
10	561524.6641	7787615.0220
10	561525.0770	7787598.1719
10	561503.9227	7787596.7082
10	561473.2354	7787610.9263
10	561455.1742	7787615.3006
10	561460.3186	7787623.4912
10	561458.0911	7787644.1639
10	561433.8475	7787663.8283
10	561414.6362	7787658.8902
10	561404.6178	7787677.3751
10	561419.1637	7787685.9440
10	561418.8465	7787703.8061
10	561403.9971	7787728.0290
10	561383.3207	7787731.2012
10	561361.7104	7787748.0038
10	561354.3150	7787751.0295
10	561346.7722	7787739.7404
10	561336.6327	7787714.7410
10	561339.4236	7787703.4583
10	561356.3509	7787704.7431
10	561371.4227	7787704.7656
10	561351.1226	7787691.5841
10	561327.1684	7787682.4074
10	561323.0929	7787675.9979
10	561330.3965	7787660.9195
10	561327.9360	7787648.3694
10	561329.8637	7787626.6437
10	561338.0110	7787614.8654
10	561344.9239	7787608.7174
10	561329.6720	7787608.6091
10	561325.9189	7787590.6228
10	561313.6092	7787604.7763
10	561324.4894	7787616.0558
10	561320.2143	7787620.9250
10	561308.4157	7787619.9501
10	561288.9594	7787609.1350
10	561278.0792	7787594.4779
10	561246.7876	7787583.5435
10	561227.4597	7787578.2531

Wetland	X	Y
11	561085.9026	7787875.1483
11	561081.1893	7787861.2351
11	561085.0667	7787851.8328
11	561081.3789	7787835.5406
11	561098.0654	7787840.4381
11	561106.0327	7787830.3274
11	561109.0360	7787815.5644
11	561121.0183	7787808.5385
11	561131.3300	7787797.7335
11	561146.8629	7787787.8112
11	561162.6405	7787771.6189
11	561175.2113	7787755.3672
11	561205.7297	7787734.4466
11	561218.6452	7787728.6008
11	561226.4185	7787722.5189
11	561231.2100	7787722.1677
11	561232.8730	7787740.6695
11	561216.8223	7787763.1529
11	561220.9436	7787769.0618
11	561229.3213	7787778.4182
11	561232.3621	7787791.5832
11	561221.8548	7787805.0947
11	561216.7690	7787821.2772
11	561202.0569	7787832.6323
11	561202.3350	7787844.2802
11	561201.9479	7787855.6318
11	561196.5939	7787870.6092
11	561187.9399	7787863.1065
11	561174.9790	7787867.3097
11	561148.5103	7787867.5626
11	561135.1359	7787868.7110
11	561119.9705	7787877.2089
11	561104.4120	7787886.7905
11	561091.4790	7787892.2372

Wetland	X	Y
---------	---	---

Wetland	X	Y
12	561266.3432	7788044.5074
12	561256.5450	7788026.9516
12	561235.5178	7787999.5922
12	561233.5361	7787988.8837
12	561223.2158	7787978.6060
12	561203.4989	7787970.7575
12	561185.6957	7787967.0521
12	561166.4189	7787974.6941
12	561155.5118	7787969.7957
12	561148.2030	7787962.2608
12	561135.1731	7787956.7820
12	561120.4270	7787956.0371
12	561107.0679	7787963.1743
12	561095.3030	7787968.3164
12	561089.7051	7787961.8798
12	561099.0730	7787952.3189
12	561111.4979	7787950.1506
12	561123.7541	7787941.7305
12	561096.5337	7787932.3991
12	561094.3522	7787937.7905
12	561100.1604	7787942.9334
12	561090.7640	7787947.0837
12	561076.9833	7787959.1728
12	561073.3233	7787965.2750
12	561063.3525	7787961.3895
12	561059.7778	7787952.0197
12	561058.1010	7787947.1068
12	561066.2539	7787939.4088
12	561068.1447	7787924.6335
12	561066.7136	7787907.6663
12	561061.1293	7787893.7503
12	561042.8533	7787900.9832
12	561028.1542	7787911.1646
12	561021.6977	7787919.8804
12	561014.9706	7787921.1561
12	561012.4170	7787933.7543
12	561011.5559	7787947.2618
12	561012.7189	7787962.6830
12	561012.5729	7787993.6510
12	560992.0713	7788014.2742
12	561012.7949	7788027.5122
12	561026.0855	7788014.2105
12	561013.5221	7787999.3497
12	561014.2693	7787981.8865
12	561023.7863	7787969.5309
12	561025.0303	7787945.3491
12	561028.7417	7787937.3356
12	561038.7709	7787941.5584

Wetland	X	Y
12	561040.3580	7787978.4738
12	561044.8456	7787994.1970
12	561060.9416	7788001.1230
12	561081.8206	7788000.0841
12	561101.8046	7788004.4244
12	561106.2686	7788017.8745
12	561113.0355	7788036.1887
12	561097.0578	7788038.2597
12	561085.0520	7788056.8401
12	561070.6715	7788073.9338
12	561078.8986	7788088.8040
12	561089.7945	7788097.7407
12	561106.0784	7788086.7720
12	561119.7676	7788077.3422
12	561128.6686	7788082.1834
12	561156.6535	7788066.8297
12	561159.2237	7788092.2824
12	561169.9597	7788098.9445
12	561173.3879	7788107.2482
12	561157.7034	7788126.2418
12	561154.6001	7788138.4186
12	561150.8217	7788154.2021
12	561145.4860	7788157.5176
12	561152.7061	7788161.7749
12	561166.3265	7788165.2103
12	561173.7076	7788181.3372
12	561178.4041	7788188.1678
12	561194.2274	7788190.3244
12	561186.0889	7788177.7377
12	561192.2962	7788152.4491
12	561199.0535	7788154.1858
12	561207.6080	7788139.2700
12	561195.6020	7788112.8037
12	561207.7665	7788099.5397
12	561226.9388	7788086.8084
12	561251.7623	7788063.3308

APPENDIX E

List of Vascular Plant Species Identified in Grand Baie Wetlands

Appendix E: List of Vascular Plant Species Identified in Grand Baie Wetlands

Family	Species	Common name	Origin	IUCN	GB_1	GB_2	GB_3	GB_4	GB_5	GB_6	GB_7	GB_8	GB_9	GB_10	GB_11	GB_12
Acanthaceae	<i>Asystasia gangetica</i> (L.) T. Anders. ssp. <i>gangetica</i>	Herbe pistache	Alien						x							x
Acanthaceae	<i>Thunbergia laevis</i> Nees	Liane toupie	Alien		x	x				x	x	x	x	x	x	x
Aizoaceae	<i>Sesuvium ayresii</i> Marais		Native	LC					x	x	x					
Amaranthaceae	<i>Alternanthera sessilis</i> (L.) DC.	Brede emballage	Alien				x						x			
Araceae	<i>Spirodela punctata</i> (G. F. W. Meyer) Thompson	Lentille d'eau	Native	DD	x											
Araceae	<i>Typhonodorum lindleyanum</i> Schott	Via	Alien				x									
Arecaceae	<i>Phoenix dactylifera</i> L.	Dattier	Alien									x				
Asclepiadaceae	<i>Cynanchum callialatum</i> Buch.- Ham. ex Wight et Arn.	Ipeca sauvage	Alien				x									
Asteraceae	<i>Bidens pilosa</i> L.	Herbe villebague	Alien					x			x					
Asteraceae	<i>Chromolaena odorata</i> (L.) R. M. King et H. Robinson		Alien						x							
Asteraceae	<i>Conyza sumatrensis</i> (Retz) E. H. Walker	Herbe gandia	Alien								x					
Asteraceae	<i>Eclipta prostrata</i> (L.) L.		Alien										x			
Asteraceae	cf. <i>Mikania micrantha</i> Kunth	Liane margoze	Alien												x	x
Asteraceae	<i>Parthenium hysterophorus</i> L.	Herbe blanche	Alien													x
Asteraceae	<i>Sonchus</i> sp. (juvenile plant)	Lastron	Alien										x			
Asteraceae	Unidentified ornamental species		Alien												x	
Asteraceae	<i>Vernonia cinerea</i> (L.) Less	Ayapana sauvage	Crypto-genic	LC					1 plant							
Boraginaceae	<i>Cordia curassavica</i> (Jacq.) Roem. et Schult.	Herbe condé	Alien						x		x					
Chenopodiaceae	<i>Chenopodium album</i> L.	Epinaud sauvage	Alien						x							
Cleomaceae	<i>Cleome viscosa</i> L.	Brede Caya	Alien				x									
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Crypto-genic	LC	x	x										
Convolvulaceae	<i>Cuscuta platyloba</i> Progel	Liane jaune	Alien		x									x		x
Convolvulaceae	<i>Ipomoea alba</i> L.	Liane marche de Vierge	Alien								x					
Convolvulaceae	<i>Ipomoea aquatica</i> (Forssk.)		Alien				x						x			x
Convolvulaceae	<i>Ipomoea batatas</i> (L.) Lam.	Patate douce, Sweet potato	Alien					x								
Convolvulaceae	<i>Ipomoea cairica</i> (L.) Sweet	Liane lastique, liane de sept ans	Alien		x									x	x	
Convolvulaceae	<i>Ipomoea obscura</i> (L.) Ker Gawl.		Alien		x			x		x					x	
Convolvulaceae	<i>Ipomoea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatran	Native	LC							x	x				x
Cyperaceae	<i>Cyperus ligularis</i> L.		Alien				x	x			x				x	x
Cyperaceae	<i>Cyperus stoloniferus</i> Retz.		Native	LC		x		x	x							
Cyperaceae	<i>Pycnus</i> cf. <i>polystacheus</i> (Rottb.) P. Beauv.		Native	LC	x	x					x			x		x
Cyperaceae	<i>Kyllinga polyphylla</i> Willd. ex Kunth		Native	DD	x		x								x	
Cyperaceae	<i>Fimbristylis ferruginea</i> (L.) Vahl		Native	LC					x	x					x	

Appendix E: List of Vascular Plant Species Identified in Grand Baie Wetlands

[illegible]

Appendix E: List of Vascular Plant Species Identified in Grand Baie Wetlands

Family	Species	Common name	Origin	IUCN	GB_1	GB_2	GB_3	GB_4	GB_5	GB_6	GB_7	GB_8	GB_9	GB_10	GB_11	GB_12
Ruppiaceae	<i>Ruppia maritima</i> L.		Native	DD			x		x	x						
Ruscaceae	<i>Dracaena concinna</i> Kunth		Native	EN								2 seed-lings				
Santalaceae	<i>Santalum album</i> L.	Sandalwood tree	Alien													x
Sapindaceae	<i>Cardiospermum halicacabum</i> L. var. <i>microcarpum</i> (Kunth.) Blume		Alien				x	x				x			x	x
Scrophulariaceae	<i>Capraria biflora</i> L.		Alien				x									
Solanaceae	<i>Solanum americanum</i> Mill.	Brede martin	Alien		x		x	x			x		x	x		
Solanaceae	<i>Solanum violaceum</i> Ortega	Bringelle marron	Alien										x			x
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Crypto-genic	LC	x	x	x	x	x	x	x	x	x	x	x	x
Verbenaceae	<i>Phyla nodiflora</i> (L.) Greene		Alien			x					x	x		x		
Verbenaceae	<i>Verbena officinalis</i> L.	Verveine	Alien				x									
Vitaceae	<i>Cissus rotundifolia</i> (Forssk.) Vahl	Liane de boeuf	Crypto-genic	LC					x				x			
					15	15	22	13	18	10	24	14	11	13	21	20

APPENDIX F

List of Fauna Identified During Grand Baie Wetlands Survey

Appendix F: List of Fauna Identified during Grand Baie Wetlands Survey

Species	Common name	Origin	IUCN	GB_1	GB_2	GB_3	GB_4	GB_5	GB_6	GB_7	GB_8	GB_9	GB_10	GB_11	GB_12
<i>Felis catus</i> (Linnaeus, 1758)	Cat	Alien					x								
<i>Lepus nigricollis</i> (Cuvier, 1823)	Hare	Alien						x	x			x			
<i>Canis familiaris</i> (Linnaeus, 1758)	Dog	Alien				x				x					
<i>Butorides striatus</i> (Linnaeus, 1758)	Green Heron, Gasse	Native	LC					x	x		x				
<i>Streptopelia picturata</i> (Temminck, 1813)	Turtle dove	Cryptogenic	LC									x		x	x
<i>Tringa nebularia</i> (Gunnerus, 1767)	Greenshank, Chevalier	Migratory	LC					x							
<i>Zosterops borbonicus mauritianus</i> (Gmelin, 1789)	Pic-pic	Native	LC	x											
<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien			x					x		x	x	x	x
<i>Streptopelia chinensis</i> (Scopolis, 1786)	Grosse tourterelle, Spotted Dove	Alien								x					x
<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien		x	x			x	x				x		x
<i>Serinus mozambicus</i> (S. Muller, 1776)	Serin, Yellow-fronted Canary	Alien		x					x			x			
<i>Coturnix coturnix africana</i> (Temminck & Schlegel, 1849)	Common quail, Caille	Alien											x	x	
<i>Foudia madagascariensis</i> (Linnaeus, 1766)	Madagascar red fody, Cardinal de Madagascar	Alien		x	x	x	x	x		x	x	x	x	x	x
<i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow, Moineau	Alien		x			x			x					
<i>Ploceus cucullatus</i> (Muller, 1776)	Serin, Yellow-fronted Canary	Alien			x					x			x		
<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Boulboul, Bulbul, Konde	Alien		x	x		x				x	x	x	x	x
<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, Poule d'eau	Alien		x			x	x		x		x	x		x
<i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien		x						x	x			x	x
<i>Phelsuma ornata</i> (Gray, 1825)		Endemic	LC	-	-	-	-	-	-	-	-	x	-	-	-
<i>Hemidactylus frenatus</i> (Schlegel, 1836)		Alien										x			
<i>Calotes versicolor</i> (Daudin, 1802)	Agamid	Alien				x	x	x			x				
<i>Phelsuma madagascariense</i> (Gray, 1831)		Alien								recent intro.					
<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien		x	x	x	x		x	x		x	x	x	x
<i>Bufo gutturalis</i> (Power, 1927)	Toad, Krapo	Alien		x								x	x		
<i>Gambusia affinis</i> (Baird & Girard, 1853)	Million	Alien			x				x				x	x	
<i>Danaus chrysippus</i> (Linnaeus, 1758)	African monarch	Native	LC							x		x	x	x	
<i>Borbo borbonica</i> (Boisduval, 1833)		Native	LC		x	x	x	x					x	x	x
<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC	x	x	x					x	x	x	x	x
<i>Zizula hylax</i> (Fabricius, 1775)		Native	LC							x					
<i>Phalantha phalantha</i> (Drury, 1773)	Common leopard	Native	LC				x			x				x	x
<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native	LC			x				x	x	x	x	x	
<i>Eurema floricola</i> (Boisduval, 1833)		Native	LC			x				x		x		x	

Appendix F: List of Fauna Identified during Grand Baie Wetlands Survey

Species	Common name	Origin	IUCN	GB_1	GB_2	GB_3	GB_4	GB_5	GB_6	GB_7	GB_8	GB_9	GB_10	GB_11	GB_12
<i>Henotesia narcissus narcissus</i> (Fabricius, 1798)		Native	LC									x			
<i>Melanitis leda</i> (Linnaeus, 1758)	Evening brown	Native	LC					x							
<i>Papilio demodocus</i> (Esper, 1798)		Alien				x				x		x	x	x	
<i>Gyraulus mauritanus</i> (Morelet, 1876)		Endemic?	LC							x	x			x	x
<i>Laemodonta bella</i> (Adams, 1854)		Native	LC							x					
<i>Maureneia poutirini</i> (Germain, 1918)		Endemic	LC									x			
<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC					x	x	x	x	x	x	x	x
<i>Quickia concisa</i> (Morelet, 1868)		Native	LC									x			
<i>Streptostele acicula</i> (Morelet, 1877)		Native	LC									x			
<i>Tropidophora fimbriata</i> (Lamarck, 1822)		Native	LC							x	x				
<i>Achatina fulica</i> (Bowdich, 1822)		Alien									dead	x			dead
<i>Bradybaena simularis</i> (Ferrusac, 1821)		Alien													
<i>Bulinus cernicus</i> (Morelet, 1867)		Alien								x					
<i>Euglandina rosea</i> (Ferrusac, 1818)		Alien										x			dead
<i>Lymnaea natalensis</i> Krauss, 1848		Alien									x			x	x
<i>Macrochlamys indica</i> (Pfeiffer, 1846)		Alien			x						x				x
<i>Physa acuta</i> (Draparnaud, 1805)		Alien		x						x	x		x	x	x
<i>Subulina octona</i> (Bruguère, 1792)		Alien										x			
<i>Subulina striatella</i> (Rang, 1831)		Alien									x	x			x