Rio Bravo Conservation and Management Area Updated Management Plan 2022-2026

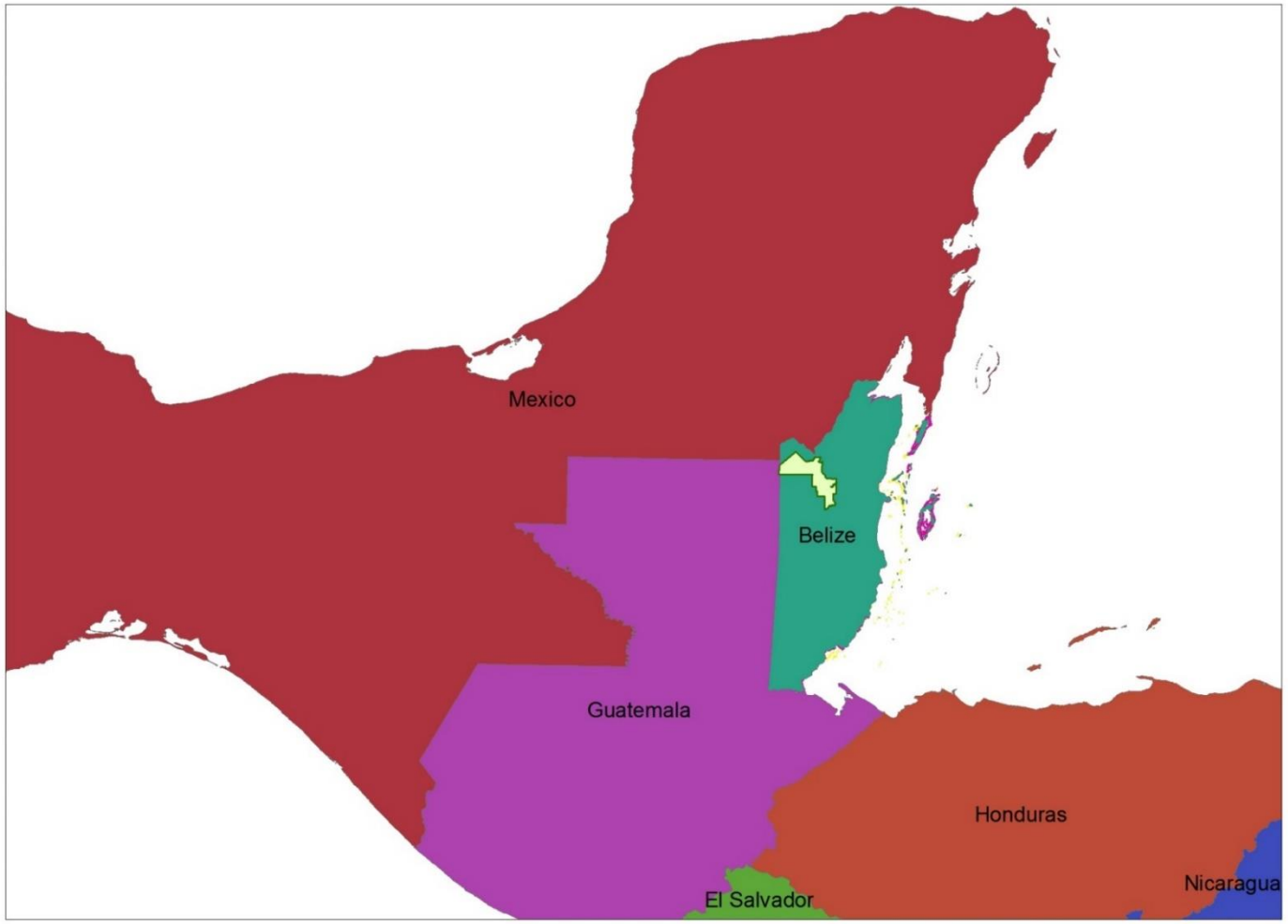
Protected Area Data Sheet		
Date	July 2021	
Name of Protected Area	Rio Bravo Conservation and Management Area	
Location of Protected Area	Orange Walk District, north-western Belize	
Date of establishment	1989	
Size of Protected Area	Acres: 254,000 (Hectares: 102,790)	
Land Tenure	Private Freehold	
Management Authority	Programme for Belize	
Affiliations / Partnerships with other organizations	Government of Belize (under formal Memorandum of Understanding)	
Number of Staff	Permanent:17	Temporary: 20
Annual Budget (Bz$) for management of protected area	c. BZ$ 2.7 million (This is the average for 2022-2026)	
Designation (Belize or IUCN category, World Heritage Site, RAMSAR etc.)	Private Protected Area – IUCN Category VI	
Reasons for Designation	Conservation of important forest area threatened with fragmentation and clearance	
Brief Details of Past Funding	Mix of donor agency, private donation and funding via international conservation organizations plus self-generated income	
Brief Details of Present Funding	As above	
Brief Details of Future Funding	Self-generated income prioritized, supplemented by donor/charitable support.	
List the four primary protected area objectives		
Develop and implement a public awareness strategy that focuses on the ecological importance and economic contributions of the RBCMA in order to make local communities and the general public understand the ecological and economic value of the RBCMA and its resources.		
Develop a resource mobilization strategy for the RBCMA by mid-2022 and implement thereafter in order to diversify the RBCMA's funding base and ensure the continuity and sustainability of its management programs.		
Strengthen the broad-leaved forest management program since the broad-leaved forest ecosystem is affected by the most threats compared to the other RBCMA ecosystems, including timber extraction, illegal logging, illegal agriculture, poaching of wildlife, uncontrolled burning, and road infrastructure and oil development.		
By the third quarter of 2021, develop a contingency plan for roads in order to adequately prepare in the event that GOB signs a contract for the construction of a highway through the RBCMA.		
List the top three most important threats to the protected area (and indicate why these were chosen)		

Uncontrolled/unmanaged fires (affecting the Yellow-headed Parrot and the Savannah)
Pesticides and fertilizers (affecting the Aquatic Ecosystem and its associated target species)
Road and oil development, which appears to affect the Broad-leaved Lowland Forest and the Jaguar.
List the top critical management actions
Develop and implement a community education and outreach campaign to develop appreciation for flora and fauna.
Maintain and continually improve resource protection and enforcement within the RBCMA.
Conduct an assessment of pesticide and fertilizer use within the RBCMA/NR Lagoon zone of influence.
Develop and implement a tourism recovery strategy for the RBCMA.
Conduct a threats and viability assessment of the corridor through which the proposed highway would pass.

Name/s of assessors and people consulted: Osmany Salas and Ki'ila Salas in consultation with Edilberto Romero (PfB Executive Director), Ramon Pacheco (Manager, Administration and Planning), other senior PfB administrative and field staff.

Contact details: The Executive Director, Programme for Belize, Belize City.

Location Map
Rio Bravo Conservation & Management Area



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EXECUTIVE SUMMARY

Established in 1988, the Rio Bravo Conservation and Management Area (RBCMA) is one of the largest protected areas in Belize, covering over hundred and two thousand seven hundred and ninety (102,790) hectares in the north-western section of Belize. It is owned by Programme for Belize (PfB), a non-governmental organization, and managed based on the UNESCO Man and the Biosphere Reserve principle – to conserve its biodiversity and archaeological heritage, while demonstrating sustainable use of its forest resources and contributing to the local and national economy. The RBCMA management regime corresponds to IUCN protected area category VI and complements that of the adjoining Maya Biosphere Reserve located in Guatemala.

This management plan covers the period 2022-2026 and is the seventh plan for the RBCMA. It was developed in consultation with PfB's administrative and technical field staff and provides the basis and direction for the future management of the protected area.

The plan examines the current situation and past experiences, and sets out a systematic approach for management actions over the coming five years, adopting the outline for terrestrial protected areas developed under the National Protected Areas Policy and System Plan (NPAPSP). This management plan forms part of many planning documents, supplemented by more detailed sectoral plans and implemented through annual work-plans developed by the programme managers.

The following statement forms the core of the RBCMA Management Goal for the next five years:

"The RBCMA is a model private protected area that maintains its biological integrity, regionally significant cultural and landscape features, and fosters a sense of civic appreciation, while providing a sustainable flow of ecological goods and services, and economic benefits to its stakeholders."

Following the NPAPSP outline for terrestrial protected areas, the RBCMA management plan is divided into 4 main sections: Section 1 provides the background and context of the protected area, and the purpose and scope of the management plan; and Section 2 gives the RBCMA's location, national and regional context, and includes its physical, biological, and cultural aspects. Sections three and four are the heart of the plan, comprising the conservation and management planning aspects, while providing for the other essential activities such as decision making, administration, resourcing, and operation of the RBCMA.

At the heart of the plan are three ecosystem-level conservation targets that have been identified for the RBCMA, namely Savannah, Broad-leaved Lowland Forest, and Aquatic Ecosystem, and

three species-level conservation targets that can be considered nested targets, namely, as the Yellow-headed Parrot, Central American River Turtle (Hicatee)/Bay Snook, and the Jaguar. The RBCMA is of very high conservation importance and past management has succeeded in keeping its conservation targets in overall good condition. The overarching objective for this new management planning period is thus to also maintain the conservation targets in this good state.

Based on the conservation target viability assessment, some of the more highly ranked threats appear to affect more than one of the conservation targets. These include uncontrolled unmanaged fires (affecting the Yellow-headed Parrot and the Savannah) and pesticides and fertilizers (affecting the Aquatic Ecosystem and its associated target species). Road and oil development are other highly ranked threats, which appears to affect the Broad-leaved Lowland Forest and the Jaguar. Other higher ranked threats affecting only one conservation target include invasive species. The lower ranked (medium and low) threats also appear to affect more than one of the conservation targets or a single conservation target and include: unregulated fishing, illegal logging, illegal agriculture, killing of Jaguars, oil development, poaching of wildlife, uncontrolled burning, and felling of nest trees.

The goal of the RBCMA is to manage threats to the conservation targets through a range of programmes designed to maintain the conservation targets in a “good” to “very good” state. From the assessment, most of the threats are ranked low or medium.

Threats to RBCMA conservation targets will be combatted through four overarching management strategies:

1. Stakeholder Outreach, Education and Advocacy
2. Ecosystems Protection and Management
3. Research and Monitoring
4. Institutional Strengthening and Management

Each of these management strategies has its associated strategic objectives and tactical objectives/actions for guiding the strategies and monitor management implementation. The strategic objectives are as follows:

- By 2026, strengthen the relationship between PfB and the RBCMA’s neighboring communities that traditionally depended on the area for subsistence in order to generate community support for the achievement of the conservation objectives of the RBCMA;
- Develop and implement a public awareness strategy that focuses on the ecological importance and economic contributions of the RBCMA in order to make local communities

and the general public understand the ecological and economic value of the RBCMA and its resources;

- Develop and implement an environmental education strategy for the RBCMA in order to build knowledge, skills, and experience that would foster appreciation for nature and protected areas among the buffer communities;

- Foster an understanding among policy makers and community leaders about the importance of maintaining the RBCMA's natural resources in order to ensure that enabling policies are in place and applied for the protection and effective management of the natural resources of the RBCMA.

- By mid-2022, institute a strengthened and expanded resource protection and enforcement program at the RBCMA in order to deter and eliminate encroachments and illegal incursions into the protected area;

- Strengthen the fire management program by the end of 2022 guided by the National Fire Management Strategy in order to which have the potential to affect the population structure and composition of native species, particularly Caribbean Pine;

- Strengthen the savannah protection program in order to reduce the poaching of Yellow-headed Parrots and other wildlife that is threatening this ecosystem within the RBCMA;

- Strengthen the broad-leaved forest management program since the broad-leaved forest ecosystem is affected by the most threats compared to the other RBCMA ecosystems, including timber extraction, illegal logging, illegal agriculture, poaching of wildlife, uncontrolled burning, and road infrastructure and oil development;

- Strengthen the management and protection of the aquatic ecosystem within the RBCMA in order to respond to the increasing threats of pollution (pesticides and fertilizers) and invasive species that could affect the population of Central American River Turtles (Hicatees) and cichlids;

- By 2026, develop and implement a water conservation program in order to optimize the ability of the RBCMA hydrological systems to catch and store water.

- By 2024, develop and strengthen a research and monitoring program for the RBCMA in order to integrate science-based decision-making for adaptive management of the RBCMA; and

- Strengthen and maintain a monitoring, reporting and verification (MRV) system for the RBCMA to maintain Forest Stewardship Council (FSC) certification of the RBCMA's timber harvesting operation.
- Develop a resource mobilization strategy for the RBCMA by mid-2022 and implement thereafter in order to diversify the RBCMA's funding base and ensure the continuity and sustainability of its management programs;
- Improve the branding and marketing of the RBCMA in order to generate greater support for the RBCMA and its management programs;
- Manage and enhance the human resources of the RBCMA in order to optimize employee performance in service of the RBCMA's conservation objectives;
- Strengthen staff recruitment and retention for the RBCMA in order to ensure that RBCMA has sufficient staff for effective management and biodiversity conservation;
- Develop and/or strengthen the equipment procurement system for the RBCMA in order to ensure adequate administration infrastructure and planning; and
- Conduct annual review of management activities in order to ensure compliance with the management plan and make adjustments as necessary (adaptive management).
- By the third quarter of 2021, develop a contingency plan for roads in order to adequately prepare in the event that GOB signs a contract for the construction of a highway through the RBCMA;
- By 2022, develop a contingency plan for oil in order to adequately prepare in the event of a commercial oil find within or adjacent to the RBCMA.

ACKNOWLEDGEMENTS

Special appreciation goes to the staff members of Programme for Belize and, in particular, the Executive Director, Edilberto Romero, for supporting our work throughout the management planning process.

Thank you also to the Ramon Pacheco for providing us with supporting documentation and the maps that were needed for the management plan, as well as sharing his extensive knowledge pertaining to the RBCMA's operations.

We extend our appreciation to the management staff of the RBCMA who contributed some of their valuable time to share their ideas, views, concerns and aspirations pertaining to the management of the RBCMA. Your dynamic participation at the various meetings was invaluable to the planning effort, and resulted in the updating of the RBCMA management plan for the next five years and beyond.

This management plan was funded under the Selva Maya Natural Resources Protection Project's (KfW/IUCN), Activity: Updating of the Management Plan for the Rio Bravo Conservation and Management Area, Sub-activity 1.3.1: To strengthen the effective management of resources in the protected Areas.

ACRONYMS

APM	Administration & Planning Manager
asl	Above sea level
ATNP	Aguas Turbias National Park
BEC	Belize Estate and Produce
CAP	Conservation Action Planning
CEOO	Community Education and Outreach Officer
Cm	Centimeter
CONAP	Comision Nacional de Areas Protegidas
CPA	Country Poverty Assessment
Dbh	Diameter-breast-height
ED	Executive Director
ERA	Eco-regional Assessment
EU	European Union
FD	Finance Director
GDP	Gross Domestic Product
GPS	Global positioning system
ICR	Indirect Cost Rate
IUCN	World Conservation Union
METT	Monitoring Effectiveness Tracking Tool
MOU	Memorandum of Understanding
NGO	Non-governmental organization
OPM	Office of the Prime Minister
p.a.	Per annum
PfB	Programme for Belize
RANP	Rio Azul National Park
RBCAP	Rio Bravo Climate Action Project
RBCMA	Rio Bravo Conservation and Management Area

RDEG	Rancho Dolores Environmental and Development Group
REDD	Reducing Emissions from Deforestation and Forest Degradation
SCWS	Spanish Creek Wildlife Sanctuary
TC	Technical Coordinator
TDU	Tourism Development Unit
VCS	Verified Carbon Standard
YHP	Yellow-Headed Parrot

1. INTRODUCTION

1.1 BACKGROUND AND CONTEXT

The Rio Bravo Conservation and Management Area (RBCMA) was established in 1989 as a private reserve to conserve forested land in north-western Belize threatened with fragmentation and clearance following the break-up of the Belize Estate and Produce (BEC) holdings in the area. It now covers 254,000 acres (102,790 hectares), secured through a series of transactions involving the original BEC property which also includes Yalbac, Gallon Jug and parts of the New Hope area.

The RBCMA is owned and managed by Programme for Belize (PfB), a local NGO, under the terms of a formal Memorandum of Understanding with the Government of Belize. The management regime is based on ecosystem protection and sustainable use of forest resources, therefore corresponding to an IUCN category VI protected area. The area is also an important component of the Belize National Protected Area System and a natural cross-border extension of the Maya Biosphere Reserve in Guatemala.

1.2 PURPOSE AND SCOPE OF PLAN

The primary purpose of the management plan is to set out the strategic framework for site management over the five year period from 2022-2026. This is the seventh plan for the RBCMA, the antecedents being an initial establishment of management principles in 1990, a provisional plan for their application in 1992, and full plans in 1995, 2000, 2006 and 2015. Like the previous management plan, the methodology used for this planning cycle also follows that adopted for general use in the national protected areas system (Wildtracks 2005).

The management plan is a guiding document, setting out the main directions for RBCMA management over the planning period while retaining operational flexibility in implementation. It is therefore part of a suite of documents with operations detailed in:

- Sectoral plans for the larger, more complex, programmes
- Annual plans developed by the programme managers and tailored to meet terms of individual funding agreements as well as meeting organizational needs

Adaptive management takes place at this level, with the overall management plan assuring continuity of purpose and coherence between strategies. It is based on the founding principles of RBCMA management – to preserve biodiversity and archaeological heritage while producing sufficient return from sustainable resource use to pay for its perpetual care and to participate in the economic development of the surrounding area.

The management plan also serves two subsidiary but extremely important functions as:

- A reference document summarizing information on the ecological and socio-economic context within which management strategies are developed;
- An aid to fund-raising, assuring supporters (funding agencies, donors, partners) that their input forms part of a coherent development agenda and facilitating identification of the most strategic areas for assistance.

2. CURRENT STATUS

2.1 LOCATION

The Rio Bravo Conservation Area (RBCMA or Rio Bravo) covers 254,000 acres (102,790 hectares) in the Orange Walk District of north-western Belize, centered on coordinates 17°45'N 88°50'W. It is therefore one of the largest protected areas in the country, covering 4.4% of Belize's total land area and approximately 21.2% of the Orange Walk District To the south and west, the RBCMA shares property boundaries with the Belize Maya Forest, formerly known as Yalbac/Laguna Seca, and Gallon Jug. The Blue Creek Mennonite Community borders the RBCMA to the north and San Felipe and New Hope area borders RBCMA to the east. The RBCMA lies along the international frontier, linking directly onto the Rio Azul National Park in Guatemala, as well as protected areas in Belize, namely Aguas Turbias National Park (which also adjoins the international frontier with Quintana Roo, Mexico), Spanish Creek Wildlife Sanctuary, and the Belize Maya Forest.

2.2 REGIONAL CONTEXT

The area is part of a trans-boundary complex of protected areas including the Calakmul and Maya Biosphere Reserves (in Mexico and Guatemala, respectively) and lies within the Selva Maya (Maya Forest) bloc extending over 4 million acres (1.5 million hectares) (Figure 1), the largest remaining forested area in Central America. The core zones (including the Rio Azul National Park) of the Maya Biosphere Reserve are designated World Heritage Sites on combined cultural and natural criteria. The RBCMA shares these qualities. Management as a functional extension of the Maya/Calakmul complex is reinforced by management zoning on the Biosphere Reserve model.

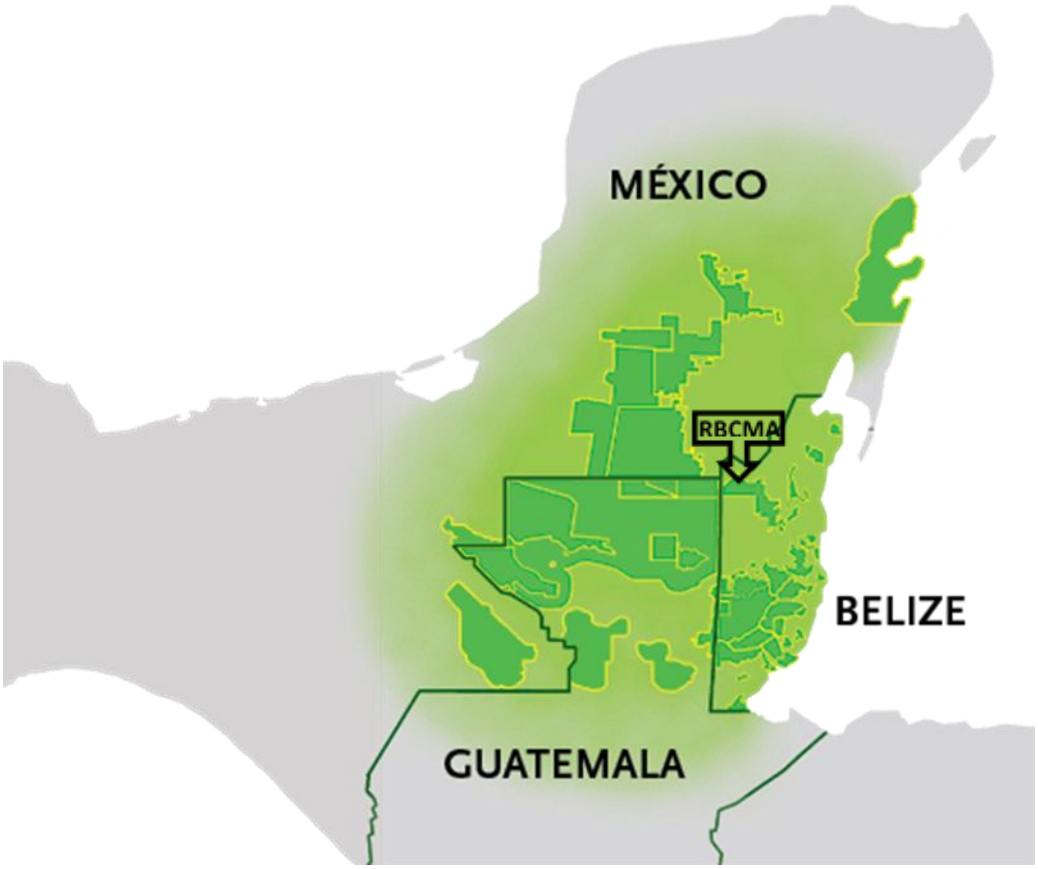

Figure 1: The Selva Maya

The area is therefore not only important in itself but also in maintaining trans-boundary biological connectivity. Its qualities on a regional scale are therefore recognized in the Ecoregional Assessment (ERA) for the Peten-Vera Cruz area (further strengthened by the presence of the lowland pine savannahs as a characteristic but restricted ecosystem on a regional level) and the site is integral to the Mesoamerican Biological Corridor. Conservation management on the RBCMA thus forms part of a tri-national conservation strategy, formalized under international agreement. As a key site in the National Protected Area System, the RBCMA also plays an important role in meeting national commitments related to the Convention on Biological Diversity.

2.3 NATIONAL CONTEXT

2.3.1 LEGAL AND POLICY FRAMEWORK

The Rio Bravo is a private protected area, secured through a series of land purchases, and land donations between 1989 and 1998. It is owned and managed by Programme for Belize (PfB), established in 1988 for this specific purpose and operating under the terms of a formal Memorandum of Understanding (MoU) with the Government of Belize. In effect the PfB is a private body with a public trust, dedicated to holding the land in perpetuity to conserve national heritage and contribute, through sustainable management of the area, to the economic development of northern Belize. In return, the government waives land taxes. The terms of the MoU define a management regime designed to ensure long-term protection and maintenance of biological diversity while at the same time providing a sustainable flow of natural products and services, corresponding to an IUCN category VI managed resource area. The management approach is, however, very conservative with about 60% of the area under full protection.

The RBCMA is a very important element within the National Protected Area System Plan (see Section 2.3.3). It has also been consciously designed to maximize its importance in maintaining biological connectivity at a landscape level. This not only maintains the linkage with the Petén but extends it into north-central Belize as a"bridge-head" to maintain corridor linkages across the northern coastal plain, into the lower Belize River Valley, and down the New and Hondo Rivers. It therefore plays a role in the Mesoamerican Biological Corridor Programme at a national as well as regional level. The MoU specifically states that the management regime must further national policy towards protected areas and proper resource use.

2.3.2 LAND TENURE

PfB holds unencumbered title to the land and there are no other rights or claims to the use of resources on the property. The terms of the MoU govern its use – land held in trust must be managed for biodiversity conservation and sustainable use of natural resources but with wide scope of action to achieve those ends. If PfB is for any reason unable to continue in that duty, its successor must follow the same objectives, so assuring permanence of management regime.

2.3.3 EVALUATION OF PROTECTED AREA

The Rio Bravo is one of the highest-scoring sites within the National Protected Area System, with a Management Effectiveness score of 78.1% (Wildtracks, 2019). Table 1 provides some of the scores for the RBCMA outcome indicators[1].

Table 1: RBCMA – The Status of Protected Areas Scores[2]

Outcomes	Max score	Site score	Comment
Status of Ecosystems	4	2	Fair: Ecosystem extent and condition / species populations will decline if there is no human intervention
Status of Biodiversity	4	2	Fair – biodiversity values are fairly intact Includes Central American river turtle (hicatee) (*Dermatemys mawii*) and Yellow headed parrot (*Amazona oratrix*) as species at high risk of decline.
Status of Ecosystem Services	4	4	Very Good - significant improvement over the last 5 year Protects a significant part of the headwaters of the New and Hondo river systems.
Status of agricultural & cultural values	4	4	Very Good.
Extractive Protected Areas	4	4	Extensive core zone maintaining viable populations in characteristic communities

The principal features conferring high value (and developed further in later sections) include:

- Key role in biological connectivity at a regional level;
- Size: The evaluation gives a maximum score to any area above 2000 acres in extent. The RBCMA is over 150 times that size, conferring special importance by conserving ecosystem processes operating at a landscape scale. This is further enhanced by being part of a single forested bloc including the neighbouring Yalbac, Gallon Jug, Aguas Turbias National Park and Colby property;

[1] Wildtracks. (2019). The Status of Protected Areas. The Forest Department.
[2] Ibid.

- Special habitats: 16 major habitats are recognized in the area. Of these, the RBCMA contributes over 90% of the national protected area coverage of four types (Table 2). It also makes a significant contribution in conserving extensive tracts of a further three that are poorly represented (i.e., > 25% shortfall on target coverage) and another one that is under-represented (i.e. >10% shortfall on target coverage) in the national system;
- An important wildlife refugium, serving as a source area for the surrounding region. This is essentially a function of size, allowing the area to support viable populations, characteristic of the region. Many of these species are of conservation concern and under pressure elsewhere, with the area acting as a source of replenishment;
- Although the flat to rolling terrain over much of the area is not particularly scenic, the sheer extent of good-quality natural habitat is exceptional while the New River Lagoon – the largest inland water-body in the country – is outstanding. The area also contains an array of archaeological sites including La Milpa, one of the largest Maya sites of the Classic period;
- A large proportion of the headwaters of the New River lies within the eastern Rio Bravo and a substantial area of those of the Hondo (Rio Azul, Rio Bravo, Booth's River) lies in the west. The area can therefore be assumed to provide significant environmental services in protecting these watersheds.

Table 2: Contribution of the RBCMA to ecosystem coverage in the National PA System[3]

Ecosystem	National area	Total area protected	RBCMA area	% Target coverage	% off target	RBCMA contribution to national protected coverage
Tropical evergreen seasonal broadleaf lowland forest over limestone – 1A2a(1) (b)K	84181	20649	174	40	-15	Minor contribution
Tropical evergreen seasonal broadleaf forest over calcareous soils – central eastern variant - 1A2a(1)(b)K - CE	147368	18229	10928	40	-28	Important contribution – 60% of total protected area of poorly represented type
Tropical evergreen seasonal broadleaf forest over calcareous soils – central western variant - 1A2a(1)(b)K - CW	133983	63914	63164	50	-2	Very important contribution – only area with significant representation
Tropical evergreen seasonal broadleaf forest over calcareous soils – Tehuantepec-Petén variant - 1A2a(1)(b)K - TP	337577	89538	82877	50	-23	Very important contribution – 93% coverage of under-represented type
Tropical evergreen seasonal broadleaf lowland forest on poor or sandy soil – 1A2a(1)(b)S	65910	20544	319	50	-19	Small contribution
Tropical evergreen seasonal broad-leaved alluvial forest – 1A2f (2)(a)	34485	6825	6825	50	-30	Very important contribution – only area with representation of poorly represented type
Tropical evergreen seasonal broadleaf swamp forest – high variant – 1A2.g.(1)(a)-T	305539	27977	16414	40	-31	Important contribution – 58% of total protected area of poorly represented type.
Caribbean mangrove scrub: freshwater mangrove scrub – 1A5A(1) b	28112	14736	2678	50	+2	Most inland representation
Evergreen lowland broad-leaved shrubland dominated by leguminous shrubs – IIIA1b(a) LE	78295	37644	35444	40	+8	Very important contribution – 95% of national protected coverage, giving good protected status.
Evergreen lowland broad-leaved shrubland – Miconia variant – IIIA1b(a) MI	51470	7203	3463	30	-16	Useful contribution – 47% of protected coverage of under-represented type
Broadleaved lowland disturbed shrubland – IIIB1b(a)2	45651	10622	519	20	+3	Anthropogenic, largely reverting to high forest.

[3] Areas in acres – derived from Meerman, 2005

Deciduous lowland riparian shrubland of the plains – IIIB1b(f)P	11122	2543	6	40	-17	Contributes – patches mostly too small to map.
Open water (lake) – SA1b(4)(b)	15909	3830	63	60	-36	Minor contribution by smaller lagoons (NB New River Lagoon technically not part of RBCMA)
Short-grass savannah with scattered needle-leaf trees – VA2a(1)(2)	218739	41718	15548	40	-21	Useful contribution – 37% of coverage. Areas reverting under management to closed pine forest, also under-represented in national PA system.
Short-grass savannah with shrubs – VA2b(2)	251561	66103	7520	20	+6	Contributes.
Tropical lowland tall herbaceous swamp – VII B 4	92947	27069	11794	30	-1	Useful contribution – 44% of total protected coverage.

2.3.4 SOCIO-ECONOMIC CONTEXT

This section outlines the socio-economic context in which the protected area operates, both at local and national levels. Economic and social factors are assessed to highlight the actual and potential bearing they may have on the integrity and management of the RBCMA.

2.3.4.1 NATIONAL ECONOMY AND REGIONAL CONTEXT

Overall, Belize is a small open economy that is supported primarily by natural resources with major sectors being agriculture (citrus, sugar, bananas, fisheries), manufacturing (including petroleum) and tourism (tertiary sector). This dependence on rich but fragile terrestrial and marine ecosystems underscores the importance of sound environmental management and ensuring sustainable development priorities. Over the last 30 years the economy has been slowly shifting over from "traditional" commodity exports to service exports mainly through tourism and petroleum exports . A historical review since Independence shows that Belize's economic growth has been driven mainly by fiscal stimulus which shows up in regular boom and bust cycles linked with booms in public spending, credit to the private sector, and deterioration in the current account. Belize's current GDP for 2020 is estimated at BZ$2.4397 billion, a decrease of 13.5% from 2019 due to the losses in the tourism sector as a result of the Covid-19 pandemic.

Though physically located within the northern district of Orange Walk, the RBCMA is located within the complex interactions of important national sectors of the economy identified. As can be expected, the national economic sectors and context is reflected in those sectors that have a direct bearing on the RBCMA. These sectors specifically include a) agriculture, b) forestry, c) tourism, and d) petroleum. Of these four, the agriculture sector poses the most significant set of challenges to the RBCMA especially in terms of landscape connectivity, habitat perseveration and maintenance of biodiversity in the buffer areas. The least significant is petroleum, which for the most part is currently focused only on exploratory activities. This of course could change quickly if and when there is a discovery that is deemed commercially viable.

There is significant agricultural production in the region where the RBCMA is located and, in several instances, productive lands directly abutt the protected area. The agriculture production is driven mainly by intensive agro-pastoral holdings by members of the Mennonite communities of Blue Creek, Shipyard, Indian Creek and Spanish Lookout. Agricultural products and commodities produced in the area include mainly grains, vegetables and livestock. Other agricultural activities include sugar cane farming in the south end of the sugar cane belt of northern Belize.

Forestry activities, mainly timber extraction, are other important economic features of the area. These activities are mainly undertaken by adjacent landholdings who own large acreage of lands which they manage in line with sustainable forest management approaches. As noted elsewhere, the RBCMA indeed was once part of a large timber operation. There is a portion of the protected area where timber is being sustainably harvested by PfB under certification by the Forest Stewardship Council (FSC). The timber harvested is sold to local sawmill operators and manufacturers of furniture and other wood products.

There is also a growing tourism sector in the region. Tourism remains one of the main engines of growth in the Belizean economy and the principal source of foreign exchange for the country. Locally, the nearby archeological site of Lamanai brings in hundreds of mainly foreign tourists annually to the area. In the south of the RBCMA, several Belize River Valley Communities have established a community-based protected area called the Community Baboon Sanctuary which attracts many visitors, locals and foreigners alike. Within the RBCMA itself, PfB has established the La Milpa Lodge which also attracts foreign visitors keen on enjoying a nature-based experience. A private eco-resort, namely Chan Chich Lodge located in Gallon Jug, also draws private guests to the area. In July of 2016, Ayinha Adventures Ltd started operations out of Lemonal Village. Their main business is to transfer cruise ship tourists from the Fort Street Tourism Village to Lemonal where they board tour boats to the Lamanai Archaeological site. While the tourism sector in the area is relatively small compared to other areas of the country, the full potential of the area is yet to be fully realized.

An emerging sector is the petroleum sector which saw commercial production of oil starting in 2006 with Belize Natural Energy Ltd. (BNE) making the first commercial find in Spanish Lookout, Cayo District. A significant portion of the RBCMA is currently licensed for exploration to Maranco Belize Ltd. and the remaining portion to the Blue Creek Exploration Ltd (now the New World Oil and Gas Ltd). There have been several exploratory tests conducted but to date no commercial find has been identified. Nonetheless, in the event that a commercial discovery is made, it will have both direct and indirect impact on the RBMCA and its management. To date exploration activities have been limited to seismic surveys conducted in 2009-2010. Seismic testing must be accompanied by environmental impact assessments for approval. No drilling has been conducted.

2.3.4.2 LOCAL COMMUNITY LIVELIHOODS

Aside from some of the northern Mestizo communities being involved in sugar cane production at a commercial scale, the 38 member New River Farmer's Cooperative based in San Carlos cultivates some 1,500 acres of land to produce 500,000 pounds of onions, 450,000 pounds of

potatoes, 200,000 pounds of carrots, 200,000 pounds of watermelon, 210,000 pounds of cabbage, 180,000 ears of corn, 54,000 pounds of tomato, and 30,000 pounds of hot peppers yearly. Cattle production in the area of August Pine Ridge and San Felipe is also on the rise. Aside from land cultivation for agriculture, communities especially in the southern area exhibit considerably more dependence on forest resources both inside and outside of the RBCMA.

The Belize River Valley communities gain income primarily from working in a wide variety of jobs in Belize City. Job seeking has prompted many to move out of the communities thereby stagnating population growth and depressing economic growth in the Belize River Valley. Another important source of household income for many residents in the southern region is remittances from relatives abroad, especially from the United States of America.

2.3.4.3 HUMAN SETTLEMENTS & ADJACENT LANDS

There are several local communities, private landholdings and even other protected areas that are adjacent to the RBCMA (Table 3). In the north there are five Mestizo (Figure 2) and three Mennonite communities (Figure 3), whilst in the south there are eight Creole communities from the Belize River Valley (Figure 4). Currently, these villages have an estimated combined population of over 16,800 persons made up of approximately 2,800 households[4]. As can be inferred from Table 3, southern Creole communities have lower population densities as compared to other communities in the area.

Since the 2010 country census, the communities have seen varied changes in population size. The villages of San Felipe, August Pine Ridge and Trinidad have shown rapid growth in population, Indian Church has grown at slower rates, whilst San Carlos has remained relatively constant. The Belize River Valley communities have experienced slight decreases in population size or have remainded constant largely due to younger generations seeking employment and more modern lifestyles in Belize City. The community of Flowers Bank has reported a recent return of residents citing the increase in crime in Belize City as the main influencing factor. Shipyard experienced an outflow of 1,000 residents who relocated to Neuland in the Corozal District but nonetheless its population has increased to approximately 4,000[5]. The population of Blue Creek remains stable at 400 to 500 largely due to residents having dual citizenship and several migrate to Mexico and Canada while Indian Creek reports a current population of approximately 800.

[4] Estimates were obtained from Village Councils as they have recently conducted population and household counts as part of an exercise for the Elections and Boundaries Department.
[5] Another amount left Shipyard and relocated somewhere in Peru.

Table 3: Human Settlements Adjacent to the RBCMA[6]

Village	District	No. of Households (2021 est.)	Population (2021 est.)
Northern Communities			
August Pine Ridge	Orange Walk	400 (≈551)	1,794 (≈3,523)
Indian Church	Orange Walk	66 (≈75)	267 (≈500)
San Carlos	Orange Walk	29 (≈30)	138 (≈128)
San Felipe	Orange Walk	332 (≈450)	1,499 (≈4,300)
Trinidad	Orange Walk	145 (≈260)	570 (≈1,300)
	Sub-total	***972 (≈1370)***	***4,268 (≈9,751)***
Mennonite Communities			
Blue Creek	Orange Walk	111	407 (≈500)
Indian Creek	Orange Walk	(≈150)	(≈800)
Shipyard	Orange Walk	621	3,345 (≈4,000)
	Sub-total	***732 (≈900)***	***3,752 (≈5,300)***
Southern Communities			
Bermudian Landing	Belize	43	183
Double Head Cabbage	Belize	102	406
Flowers Bank,	Belize	31 (≈46)	121 (≈153)
Isabella Bank	Belize	37 (≈40)	143 (≈115)
Lemonal	Belize	41	169 (≈200)
Rancho Dolores	Belize	48 (≈40)	217 (≈250)
St. Paul's Bank	Belize	37 (≈50)	153 (≈149)
Willows Bank	Belize	46 (≈64)	185 (≈250)
	Sub-total	***385 (≈425)***	***1577***
TOTAL		**2,089 (≈2,700)**	**9,597 (≈16,800)**

[6] Source: Statistical Institute of Belize, 2010

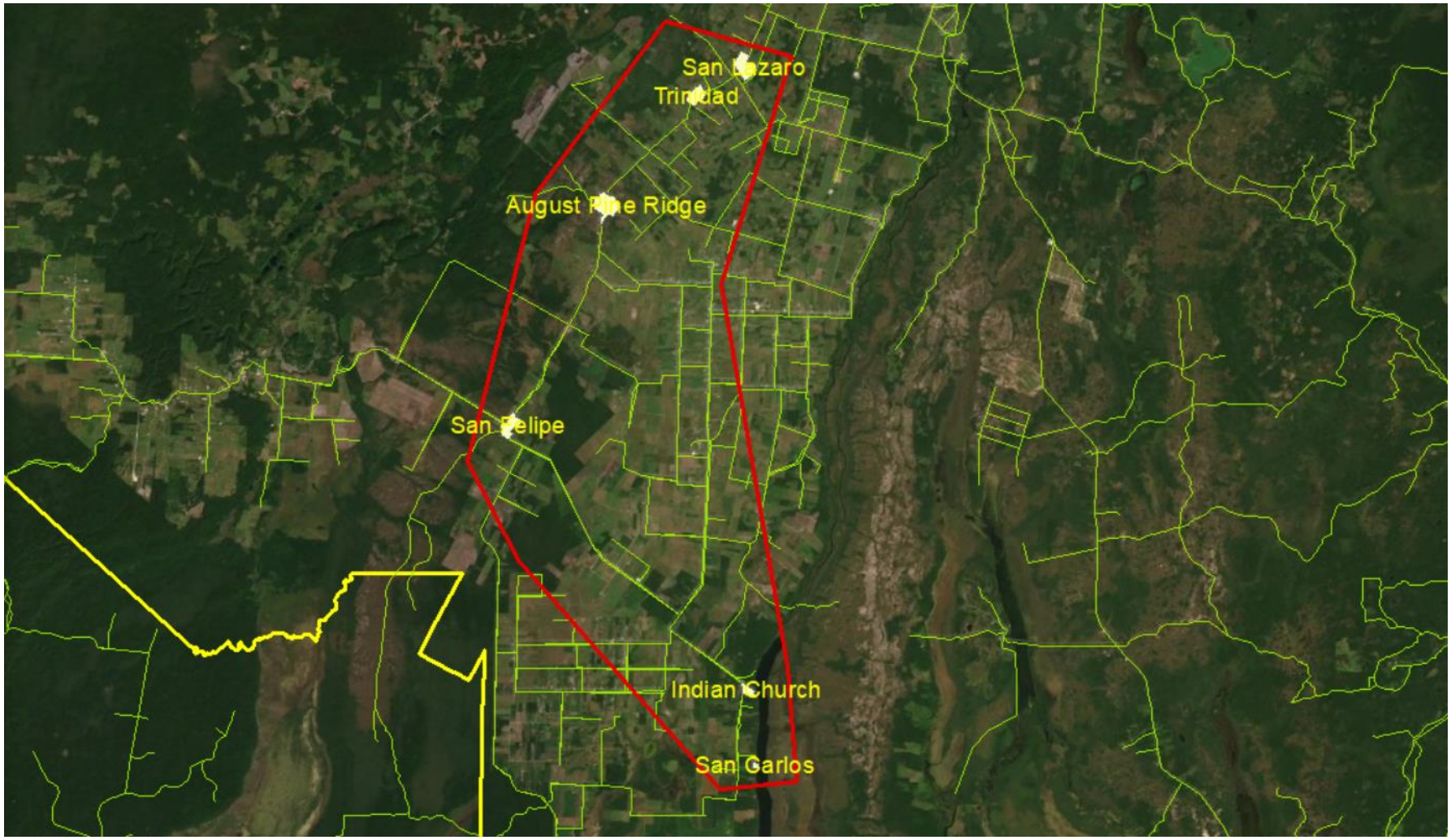

Figure 2: RBCMA Buffer Communities (Mestizo villages)

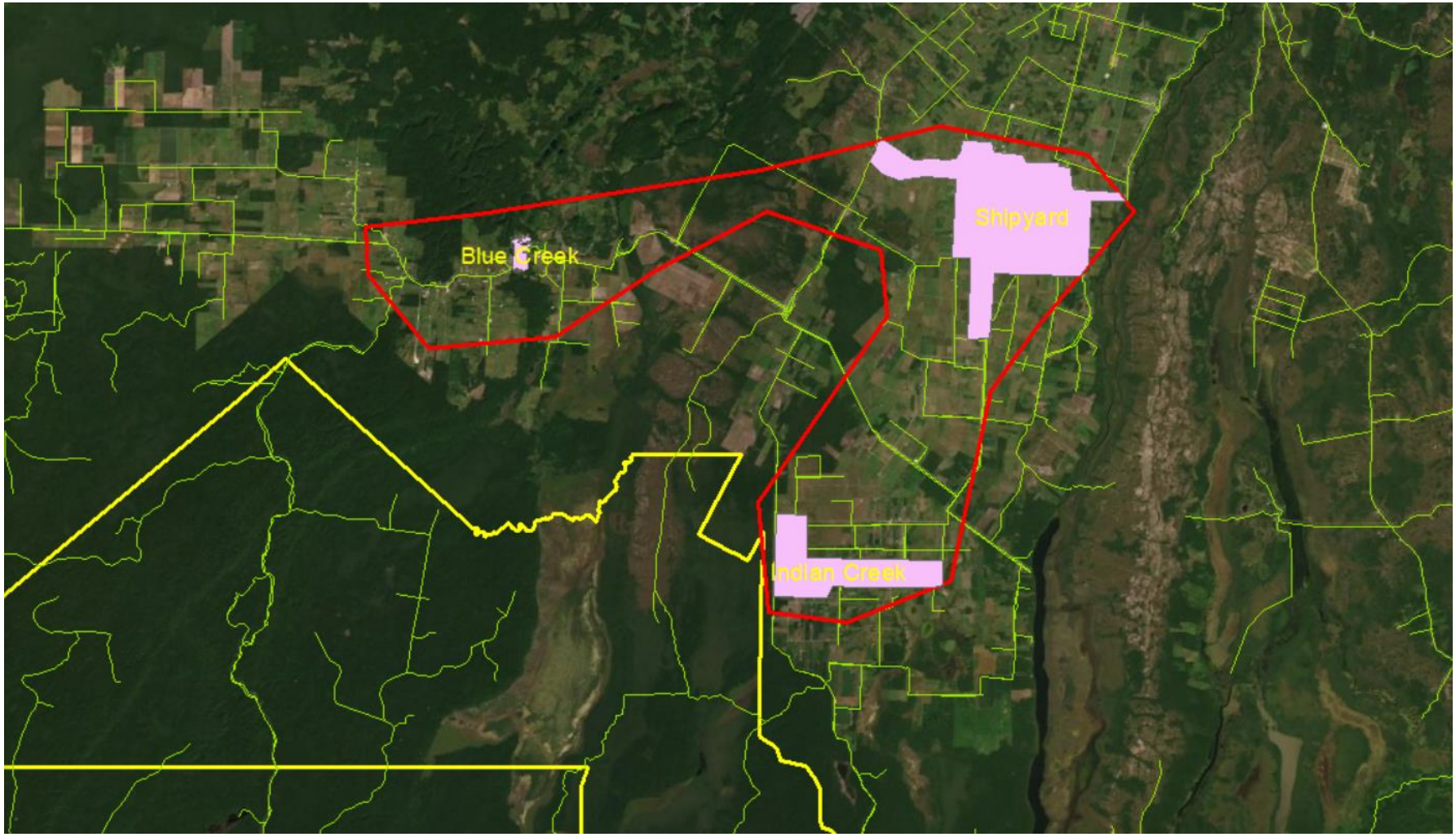

Figure 3: RBCMA Buffer Communities (Mennonite villages)

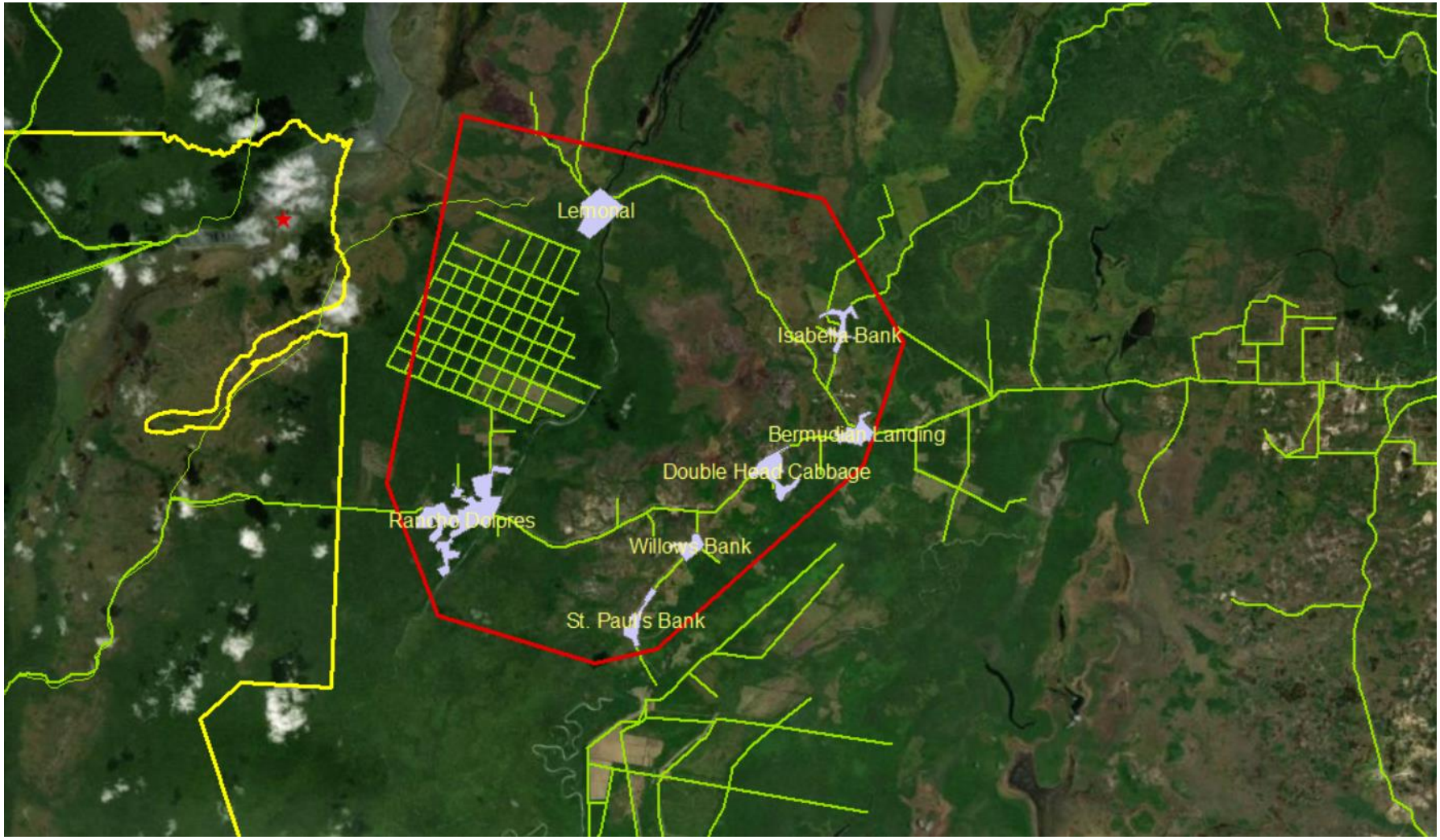

Figure 4: RBCMA Buffer Communities (Belize River Valley villages)

In addition to the rural communities, there are several protected areas that are adjacent to or in the vicinity of the RBCMA. These include the a) Aguas Turbias National Park (ATNP), a statutory protected area under the management authority of the Forest Department, b) Rio Azul National Park (RANP), a cross-border protected area under CONAP, the Guatemalan national park authority, and the c) Spanish Creek Wildlife Sanctuary (SCWS) managed by the Rancho Dolores Environmental and Development Group (RDEG), a community-based organization. There is shared and common interest between PfB and all three entities in the good management of their respective protected areas. PfB has assisted in developing a management plan for the ATNP and attempts to cover the area under its protection programme. It also assisted the Rancho Dolores group in establishing the Spanish Creek Wildlife Sanctuary and cooperates with CONAP on regional issues. In 2021, The Nature Conservancy (TNC) acquired 236,000 acres of land formerly known as Laguna Seca, which includes Yalbac and a portion of Gallon Jug, and designated it for protection. The newly named Belize Maya Forest is contiguous with the southwest portion of the RBCMA (Figure 5).

There are also several adjacent large private land-holdings that retain extensive forested lands in mixed systems that include combinations of extractive use (primarily timber), tourism and agriculture. These properties include: a) the Colby property, b) Gallon Jug, c) Spanish Lookout Community property, and d) the New River Enterprises (NRE) 'enclave.' In 2011, Gallon Jug sold 100,000 acres of its property to Yalbac and kept 30,000 acres of its original holdings. Yalbac on the other hand had sold some of its property to Spanish Lookout Mennonites of which 18,000 acres are adjacent to the southern tip of the RBCMA. The entire Yalbac property is now part of the Belize Maya Forest managed by the Belize Maya Forest Trust.

Both the adjacent private properties and protected areas play a very important role in ensuring landscape connectivity and changes in land use could have repercussions on the viability of the area, notably for species with wide ranges at low density such as jaguars. The PfB maintains a close business relationship with New River Enterprises (NRE) for timber supply and has purchased substantial tracts of land from them such as the NRE enclave near Governor Creek. Relationships with other land owners are neutral, mainly concerning practical arrangements (such as road maintenance) between neighboring properties. It should be noted, however, that the owners of Gallon Jug played a key role in the establishment of the RBCMA and facilitated the first land acquisition.

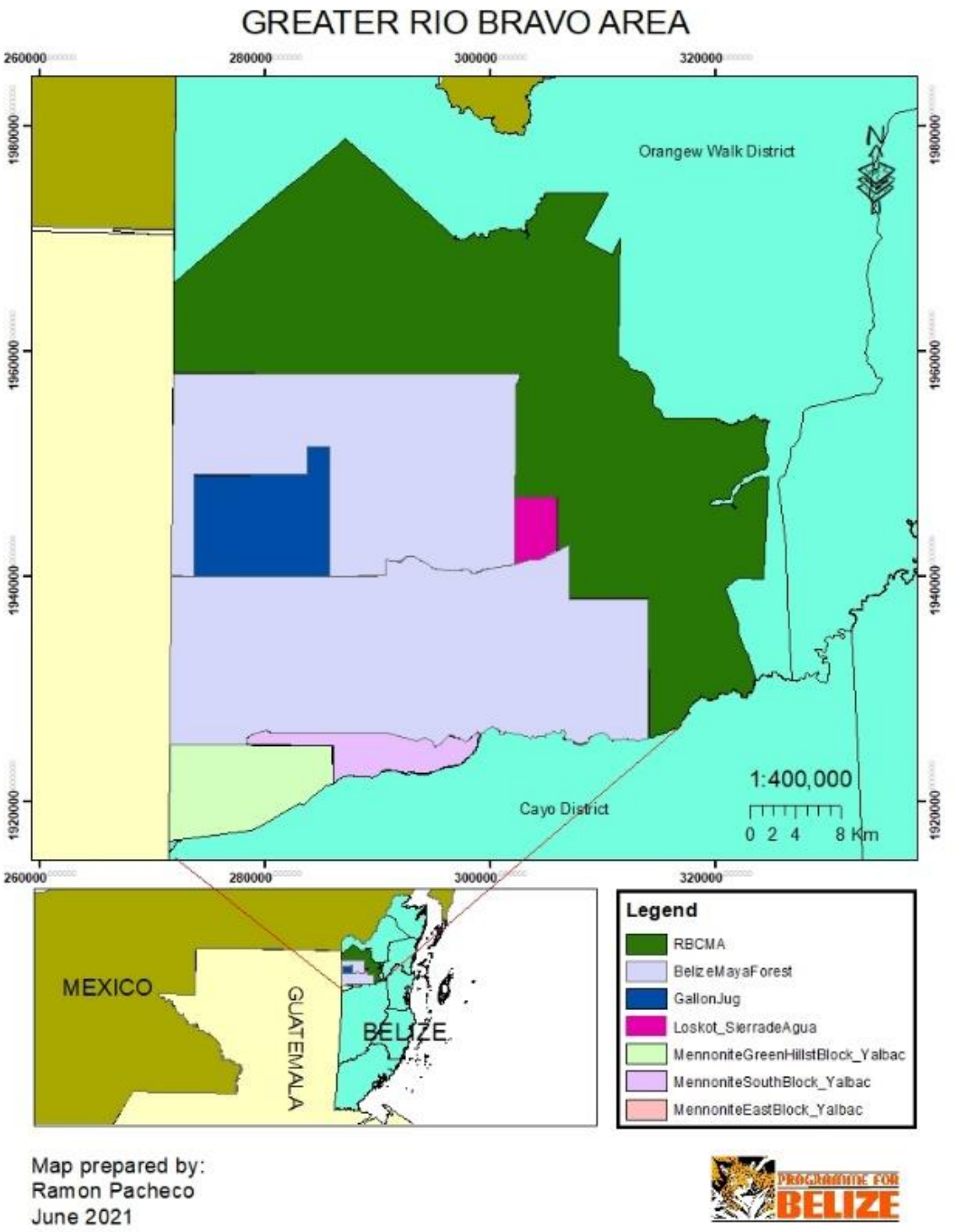

Figure 5: Greater Rio Bravo large landholdings

2.3.4.4 SOCIAL DEVELOPMENT

All communities that are adjacent to the RBCMA are all officially recognized as rural settlements. While the population of the country is divided almost equally between urban and rural areas, the rural areas generally lag in social, economic and infrastructural development. The country poverty rate for 2020 shows that 41% of the national population falls below the official poverty line. Rural Belizeans are almost twice as likely to be poor as compared to urban Belizeans. Poverty is most pronounced among agricultural workers including small scale and subsistence farmers and people with unskilled jobs as they are more likely to be poor or indigent. The buffer communities of the RBCMA to varying degrees meet this social characterization.

While demonstrating considerable interaction and dependence on the natural resources, several rural communities in the Belize District including those in the southern region of the RBCMA can be considered peri-urban extensions of an urban center as many residents commute to work mainly in Belize City. This additional layer of the social fabric has affected growth in the area as residents depend on amenities, services and markets available to them a short distance away. This limits the need to invest locally within their communities.

Nonetheless, all communities that are adjacent to the RBCMA have access to important social services such as primary education and health services. In the 2013, the Ministry of Education amalgamated the primary schools of the Belize River Valley to make better use of resources and staff. The Belize Rural High School in Double Head Cabbage serves the area but students also seek secondary education in Belize City. The Mestizo communities have their own primary schools and secondary education is accessed at the Belize High School of Agriculture, located between San Lazaro and Trinidad, as well as several high schools in Orange Walk Town. Youth in the buffer communities are increasingly accessing tertiary education in junior colleges and universities across the country of Belize. Health services are either available within the community or within a maximum of one hour travel time. In June 2017, a new health clinic was constructed in Double Head Cabbage by the US Embassy “Beyond the Horizon” program and handed over to the Ministry of Health for the residents of the Belize River Valley to access primary healthcare. There is increased access to telecommunication services. Access to potable running water remains a challenge mainly for southern River Valley communities. A current government project underway should address this situation very soon. Rural communities in the area enjoy a high level of citizen security with a low crime rate.

2.3.4.5 CULTURE AND ENVIRONMENTAL VALUES

The forest and its uses continue to form a fundamental aspect of the culture of Creole communities in the south having lived in the area for a very long time. Their historical relationship

with the forest sector (mainly Mahogany extraction) in the area extends back for over a hundred years. While there is no longer the level of extraction that once was, the communities remain dependent on the forest and forest resources as a part of their livelihood's strategies. Their cultural identity is tied to their relationship with the natural environment. Communities continue to use it as a source of food, materials for local construction and health and wellness. Northern Mestizo communities on the other hand lament the significant loss of forest cover and biodiversity in the Orange Walk district over the last 30 years. All their lands have been parceled and privatized to community members who use them for sugar cane production or cattle which invariably leads to deforestation. In the Belize River Valley, having all their community lands privatized and mostly deforested means that the trend of dependency on the forests for food continues to decrease. This is largely due to movement of people out of the communities and a trend towards modernization. A handful of residents, however, still rely on hunting for food and income.

Meanwhile, Mennonite communities generally see the land mainly as an input in the agricultural production process as they are heavily engaged in large scale industrial agriculture. They are of the view that protected areas should be concentrated on hilly and mountainous areas while open areas and flat land should be made available for farming. Their pattern of land use has contributed to deforestation in the general area of the RBCMA. They are fully dependent on farming rather than on the forest resources. While they do benefit from ecosystem goods and services from the RBCMA, for e.g. the Booths River and the Rio Bravo River provide most of the water used in large scale rice cultivation in Blue Creek, the connection between the protected area and their productive activities seem to be under-appreciated. Cultural values and religious beliefs among the Mennonites pose a challenge to conveying the importance of ecosystem services. The Mennonite religion is characterized by a separation between religion and the world. They remain tightly bound to their communities and strongly resist external influences. Those that have chosen to lead lives outside of their doctrines have been deemed as outcasts within their own communities. Their traditional large scale agriculture methods would be in contravention of modern environmentally-friendly practices.

2.3.4.6 STAKEHOLDERS OF RBCMA

In assessing the ecological services and benefits of and the socio-economic relationships with the RBCMA the following key stakeholders were identified and classified according to organizational interests and characteristics.

- **Government of Belize**

The large number of government ministries and agencies that have an interest in the RBCMA makes the Government of Belize a significant stakeholder of the protected area. This is due to the unique relationship that Programme for Belize has with the government in terms of the ownership and management of the RBCMA and characteristic of the RBMCA itself as a protected area of national significance. The RBCMA is entrusted to PfB for management with certain rights and privileges in the interest of ecological conservation and the society. There are several important Ministries that sit directly on the Board of the PfB in addition to other key departments such as the Forest Department having a direct regulatory and oversight role in relation to the protected area and forest management. The Forest Department for example is responsible both for terrestrial protected areas and for timber resources and therefore has a substantial interest in the management of the most important private reserve in the country and the only area with a forest management regime recognized through certification to meet highest international standards. The interest of the Ministry of Finance lies in the extent of the area placed in protective management and in the waiver of land taxes under the MoU. Representatives of both government bodies therefore have seats with full voting rights on the Board of Directors.

The management of the RBCMA is meant to contribute to national policy in natural resource management. Certain changes have occurred in the Belize's legislation that impacts the management of protected areas. In 2015, the National Protected Areas System Act was amended to allow for the declaration of private protected areas. The RBCMA is recognized through an agreement, the Programme for Belize Conservation Trust, with the Government of Belize through the Ministry of Finance. The regulations for private protected areas have not been defined under the National Protected Areas System (NPAS) Act hence the RBCMA continues to operate under the original trust agreement with the Government of Belize. This agreement was recently reinstated with the Government of Belize on August 17, 2020 and confirmed on September 24, 2020. The Forest Act legislation has significantly increased the penalties for illegal logging. This works in favor of PfB as it serves as a more effective deterrent to illegal logging activities in the RBCMA. The Non-Governmental Organization (NGO) Act has also been amended to increase the penalties for non-compliance by NGOs.

Beyond the conservation consideration, the RBCMA has been assigned as an oil prospecting block to petroleum companies. This is an extremely important consideration for the management of the RBCMA given that all terrestrial protected areas are being licensed for oil exploration. The Government of Belize has had a history of support to the RBCMA however its current oil exploration policy in protected areas may be incongruent with the vision of the RBCMA. This is a key issue that will need serious attention and dialogue in to resolve this.

- **Partners and Donors**

While funders in general are important to the continued management of the RBCMA, the partners and donors being considered here are longstanding partners who have invested heavily in establishing the RBCMA including the purchasing of land. The Rio Bravo Climate Action Project (RBCAP) has continuous support from The Nature Conservancy and donors who now have vested interests in the carbon sequestration project and its related rights and privileges to the carbon offsets. The land on which the RBCAP is being implemented is part and parcel of the RBCMA and as such these stakeholders have an interest in the overall management of the RBCMA. Additionally, PfB receives donor funds from the US Government, The Wildlife Conservation Society (WCS), and the Protected Areas Conservation Trust. PfB has formed a short-term partnership with Wildlife Biologist, Charles Britt, who engages in Yellow-headed Parrot research within the RBCMA.

- **Adjacent Property Owners**

There are several large private land-holdings adjacent to the RBCMA that effectively act as buffers and allow for there to be a large contiguous area that has no significant permanent human settlements. There are some areas of the private landholdings that are under use and cultivation. In general these properties have or potentially have significant level of influence over the RBCMA mainly through on-going protection and control of access to the area. These are positive for the most part as they help to safeguard ecosystems across the region. While the land owners do not have significant interests in the RBCMA itself future land use regimes instituted on these adjacent properties can have negative repercussions on the RBCMA. As noted elsewhere, a newcomer to the area is the Spanish Lookout Mennonite community that has purchased 18,000 acres of land from Yalbac as well as other lands adjacent to the RBCMA. The Mennonites' use of this land could have long term effects on the integrity of the RBCMA.

The Spanish Creek Wildlife Sanctuary (SCWS) continues to collaborate with the RBCMA in the form of ranger training, fire warden training, and general conservation efforts. Even though it is across an international border, the Rio Azul National Park in Guatemala managed by CONAP is an important connection to the RBCMA as it is held as a conservation area with World Heritage and Biosphere Reserve core zone status. This park is the main point of connectivity between RBCMA and the greater Peten Department of Guatemala both of which are complementary to each other in terms of biodiversity conservation.

- **Industry/Business Interests**

The two main categories of private sector enterprises that have a direct interest in the RBMCA are the timber-related enterprises and petroleum companies. PfB operates a sustainable forestry program under which timber is harvested and sold. Local timber product manufacturers benefit directly from raw timber extracted from the RBCMA which are then processed into furniture. The

two largest timber merchants/manufacturers in Orange Walk and one of the largest in Shipyard, with a combined workforce of over 100 employees, benefit from timber harvested at the RBCMA. Currently, 80% of harvested timber is sold the Herman Peters (Shipyard) for processing into lumber and 20% to Landy's & Sons (Orange Walk Town). Herman Peters also exports some Mahogany and other hardwoods. It is also becoming an important source of supply (primarily through timber recuperated through branches, etc.) to the small furniture workshops operating out of the Indian Creek and Shipyard Mennonite Communities. The sustainable forestry program is certified by Nature Economy and People Connected (NEPCon) under the Forestry Stewardship Council's principles and criteria and as such the RBCMA is an important stakeholder as it relates to timber extraction for business purposes. For the past 3 years, NEPCon, through its regional office in Guatemala, has replaced Rainforest Alliance as the certifying body.

Logging activities which include felling, debranching, and haulage are contracted to Frank Krahn from Blue Creek. This logging operation creates seasonal employment for 18 to 21 persons from San Felipe, Blue Creek and Trinidad. Employment is also created at the Herman Peters Sawmill in Shipyard which employs 14 Mennonites, and 14 Mestizos who mostly come from Guinea Grass. In the past years PfB has contracted Mennonites from Indian Creek to create and maintain fire lines and open roads. More importantly, however, the RBCMA is now the largest and most regular source of high-quality hardwood timber in northern Belize with a model sustainable timber harvesting programme. Overall the timber volumes are fairly low but, in a general situation of dwindling resources, the reliability of supply is a key issue.

The interests of two petroleum companies with exploration licenses covering significant portions of the RBMCA are obviously in subsurface hydrocarbons. While the licensees are currently active in the area, there is yet to be a commercially viable find. This threat to the integrity of the RBCMA as a conservation area is an ongoing and persistent one. A commercial oil find would transform the use and management of the RBCMA.

PfB independently operates two eco-tourism facilities at La Milpa and Hill Bank within the RBCMA and it is run as an income generating arm by providing tourism services. This operation generates significant financial resources that it warrants classification under the business interest category. It nonetheless contributes to the sector at a national level and provides about 12 extra full-time jobs. Unfortunately, the Covid-19 pandemic has led to the PfB to releasing 20 of its full time and temporary staff from their tourism department and at the main office. A few tourism staff were transferred to other departments. The tourism program is currently closed but PfB hopes to have it revitalized by 2022 hence regenerating the lost employment. Nonetheless, the facilities at Hillbank and La Milpa are being maintained to prevent them from falling into disrepair.

- **Local Communities**

Interactions with local communities are quite complex. Given that the RBCMA has historically been privately held, it has never really been used and occupied by local communities as compared to other protected areas in Belize. In recent focus group meetings, the Belize River Valley communities expressed a high-medium level of dependency on the RBCMA compared to medium-low levels by the Mestizo communities. The communities are aware of and support PfB's conservation goals and activities in the RBCMA.

The land itself is not at issue but there is a long tradition of unauthorized use of various forms – hunting, extraction of secondary forest products (poles, thatch), occasional timber theft, and illicit clearance often linked to marijuana cultivation, prior to the land being established as a protected area. Local communities that are adjacent to and interact directly with the area such as Lemonal, Rancho Dolores and San Felipe have always been aware of this and as such there is limited interaction between them and the RBCMA. Nonetheless, being adjacent to the area still means that there is some degree of engagement and this occurs mostly through limited employment and illicit extraction activities within the protected area such as the sourcing of timber, non-timber materials and game hunting for commercial and subsistence purposes. Commercial fishing is also a traditional extractive activity in the Lemonal community, extending to the New River Lagoon and the lower reaches of Irish Creek. In the short-term an increase in hunting activities is expected due to loss of income related to the Covid-19 pandemic.

PfB also tries to recruit staff from these communities especially in the Belize River Valley, which are economically depressed. PfB has also provided economic assistance to the communities in the form of scholarships to attend high school and assistance to local schools. In an effort to improve livelihoods PfB engaged in a project to electrify the community of San Carlos with solar panels. Twenty five, 25, individual households received solar units. Subsequently, some have expanded their system by adding solar panels and batteries thereby enabling them to use appliances such as washing machines. PfB installed a 20 KWH solar system at the San Carlos Government School and continues to provide maintenance support.

Given this reality, local communities exhibit a high dependence on subsistence agriculture and limited employment opportunities. Other communities in the area include Mennonite communities who are generally commercial farmers. While they do not necessarily encroach on the RBCMA there is much concern for agricultural run-offs from their activities that may negatively affect the protected area. The communities in the area also benefit indirectly from the ecosystem services such as clean air and freshwater provided by the RBCMA. Recent interviews with community leaders suggest that this benefit is recognized. There is also a high level of appreciation of the contribution of the RBCMA in reducing the impacts of climate change. Being

a historically private protected area, the stake or interests of local communities in its management is currently very limited.

Though the outlook is for continued cordial relationship with PfB, local community leaders have expressed concern on the reduced level of presence by PfB in the communities. PfB's presence can be improved via more community meetings, more community activities, support for education, radio and television, social media, and signage in the area. Signage can include regulations about the RBCMA, hunting seasons, protected species, and populations of communities coupled with the PfB logo.

- **Educational Institutions**

There are several local schools and international universities who organize trips to La Milpa Lodge and Hillbank Field Station and generally benefit from its information function. These educational institutions use the area mainly for its educational, scientific and research benefit. US based universities come to the RBCMA, to conduct biodiversity and archeological research. Some of these relationships are longstanding and need to be considered in overall management of the protected area. Additionally, PfB has organized programs such as field visits for children from the community, training for teachers and community leaders, and the Harpy Eagle release project. Unfortunately, the safety measures applied due to the Covid-19 pandemic have interrupted educational programs at the RBCMA and in the communities.

2.3.4.7 ANALYSIS OF STAKEHOLDERS' INTEREST AND INFLUENCE ON THE RBCMA

- **High Influence/High Interest Stakeholders**

Based on results of the assessment of key stakeholders it can be inferred that majority of the stakeholders of the RBCMA fall in the medium to high interest/influence category. This is especially true for stakeholders with extractive and economic interests in the RBCMA. Incidentally, the petroleum interests and the responsible government agency, namely the Geology and Petroleum Department are high in this category. In line with the economic characteristics of this group, the timber extraction and tourism activities of the PfB itself fall in this category as well. This is complemented by those private sector and international partner organizations that participate directly in the extraction and processing of sustainable timber and carbon sequestration represented mainly by The Nature Conservancy and the Rio Bravo Climate Action Project (RBCAP) donors. As expected, the Government of Belize is an important stakeholder and is represented by a subset of government of regulatory agencies including the Department of the Environment and the Forest Department who have a direct interest in the management of the RBCMA. As is usually the case with high interest/high influence stakeholders, it is important for PfB to monitor and manage these stakeholders very closely.

- **High Influence/Low Interest Stakeholders**

Stakeholders with high influence but low interest are mainly nearby Mennonite communities of Blue Creek, Indian Creek, Shipyard and Spanish Lookout as well as CONAP who manages the Rio Azul National Park. This category of stakeholder also includes private adjacent properties. Their categorization as high influence stakeholders has mainly to do with the potential impact they present to the ecological integrity of the RBCMA through landscape connectivity. The Rio Azul National Park acts as a buffer while the Mennonite communities though maintaining their farming activities on their private lands poses risks to the RBCMA through agricultural run-offs and the pushing of the agriculture frontier towards it increasing the likelihood of it becoming an "island" within the overall landscape. Spanish Lookout Mennonites had recently acquired a combined 28,000 acres of land from Gallon Jug and Yalbac; those have been cleared for agriculture. This puts these lands adjacent to the RBCMA and has created a threat of escaped fires in the dry season. PfB has sensitized them of this issue and the Spanish Lookout leaders usually inform of when they will do burning. This allows PfB rangers to appraise any possible threat and ensure that proper safeguards are in place. In 2019, a fire incident occurred when a Spanish Lookout farmer failed to inform of his intent to burn and consequently 68 acres of the RBCMA forest were burnt. Apart from the fire threat there is the threat of agrochemicals runoff into streams that feed into the New River. It is important for PfB to maintain good relationships with these stakeholders in order to enhance the positive benefits of their presence and minimize potential negative impacts wherever they appear. PfB will need to monitor and attempt to influence the activities on the adjacent lands in terms of land use and management regimes that are being pursued and implemented there. Nonetheless, PfB should keep up its efforts to communicate with Mennonite community leaders and find creative ways to get the message of the importance of ecosystems to their residents.

- **High Interest/Low Influence Stakeholders**

Local communities adjacent to the RBCMA can be considered to be a part of this group of stakeholders even though they can at times presents a moderate degree of influence on the RBCMA especially through illicit activities. Local communities see the natural resources abundant in the RBCMA as a source of livelihoods. The management measures in place currently limit their ability to access and utilize those resources. Their capacity to challenge and influence the management measures are limited and as such they are likely to continue to resort to illicit means to access the resources. Given this dynamic it should be expected that they will continue to put pressure on the resources within the protected area.

Considering the size and location of the RBCMA, it is unsurprising that sixty significant archeological sites from the Mayan civilization have been documented within the area. The Institute of Archeology (IOA) is primarily responsible for the excavation and management of

these sites. The current activities of the IOA have been limited. Although the IOA is officially the custodian of these important national patrimony, PfB monitors these sites regularly and informs the IOA of any signs of illegal activities or unauthorized disturbances. Consequently, IOA does not exert much influence over the overall management of the RBCMA. The Office of the Prime Minister and the Ministry of Finance also falls within this category given the government's continuous support for the RBCMA. The Office of the Prime Minister (OPM) is the main signatory to the custodial agreement with PfB, and officially supported the carbon sequestration project; however it maintains a hands-off approach leaving the management of the protected area up to PfB. This low level of influence however could change very quickly given the level of power the State wields through its various agencies that engages directly with the PfB. Other stakeholders that fall in this category include educational institutions that utilize the area for their interest but do not have significant influence. It is important for PfB to continuously communicate with local communities to make them aware of the management measures in place. It should also engage other stakeholders in this group by regularly updating on activities in the RBCMA related to their interests especially its government partners.

- **Low Interest/Low Influence Stakeholders**

The Aguas Turbias National Park (ATNP) owned by GOB falls within this category. While an officially declared protected area, the ATNP has no effective management. It does provide some level of connectivity between the RBCMA and the Calakmul buffer zone towards Mexico. Enhancing the management of the ATNP or its de-reservation would have significant effect on the RBCMA given its proximity. This however is not the case at this time. Nonetheless, it is important for PfB to monitor the activities in these protected areas but this exercise should not require any significant expenditure of resources and efforts. The Belize Tourism Board similarly has an interest in the ecotourism activities at La Milpa given its oversight role in the industry. This however does not necessarily translate into significant influence or interest in the overall management of the RBCMA given its own sectoral mandate.

2.4 PHYSICAL ENVIRONMENT OF MANAGEMENT AREA

2.4.1 CLIMATE

Weather data provided by the Belize National Meteorological Service (Figures 6, 7 and 8) is collected at La Milpa Field Station on the north-western RBCMA. Overall, the area experiences a sub-tropical moist climate with marked wet and dry seasons, dominated by weather systems moving through the Gulf of Mexico and western Caribbean. Temperatures are fairly constant across inland northern Belize, averaging 27°C (81°F), but rainfall increases from north-west to south-east. Mean annual rainfall at La Milpa over the period 1995-2005 was 1,239 mm (49"), and

for the period 2006-2014 was 1,505 mm (59”), suggesting a slightly wetter trend over the past decade. The 2015-2017 and 2019 rainfall records show a mean annual rainfall at La Milpa of 598.1 mm (23.5’’). This significant decrease of mean annual rainfall compared to the 2006-2014 records may be a result of the missing data for several months throughout within 2015-2017 and 2019. There was also no rainfall data for 2018 and 2020.

There are two main seasons:

- The wet season
    - The wet season is bimodal, normally beginning in late May to early June and rapidly increasing to a peak in late June-July, moderating and then peaking again in October before tailing off through November. Average temperatures are fairly high at approximately 28°C (82°F), though falling from October.

- The dry season can be subdivided into two phases
    - The cool dry season, from November to February, is a transitional period during which the rainfall declines and the land dries out, usually by December. It is also characterized by a succession of cold fronts, starting in the late wet season but occurring most frequently from December to January. These are the coolest months, with average temperatures ranging between 23 and 24°C (73-75°F). Temperatures below 12°C (54°F) have been recorded at La Milpa Field Station in all months between November and April. Extremes of 9°C (48°F) have been noted at La Milpa, though the record low (7.5 °C, 45°F) is from Tower Hill on March 12, 1996.

    - The warm dry season is from March to May; March and April are the driest months and temperatures rise during this period, peaking in May. The highest temperature recorded to date is 40.5°C (105°F) from Tower Hill on 26 April, 2003.

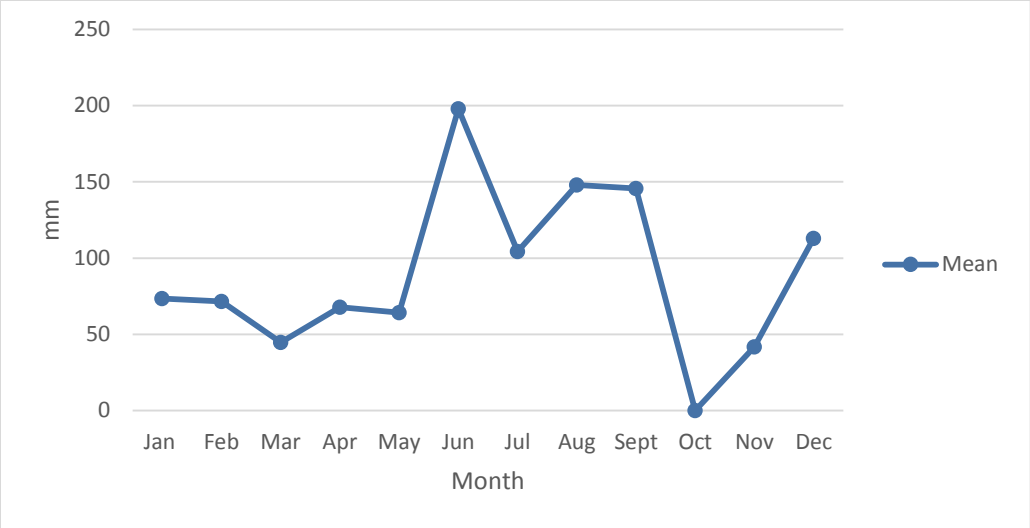

Figure 6: Mean Annual Rainfall – La Milpa (2015-2020)[7]

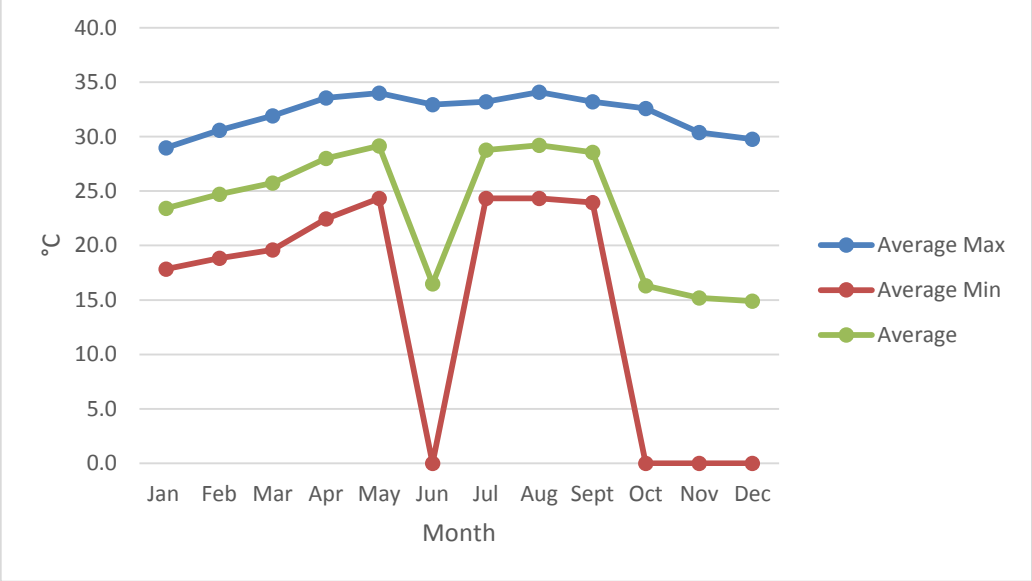

Figure 7: Average Temperature (°C) – La Milpa (2015-2020)[8]

[7] Note: There was no information on rainfall for October, and there was no information on average min temperature for June and October. Additionally, there was missing information for several months within 2015-2020.

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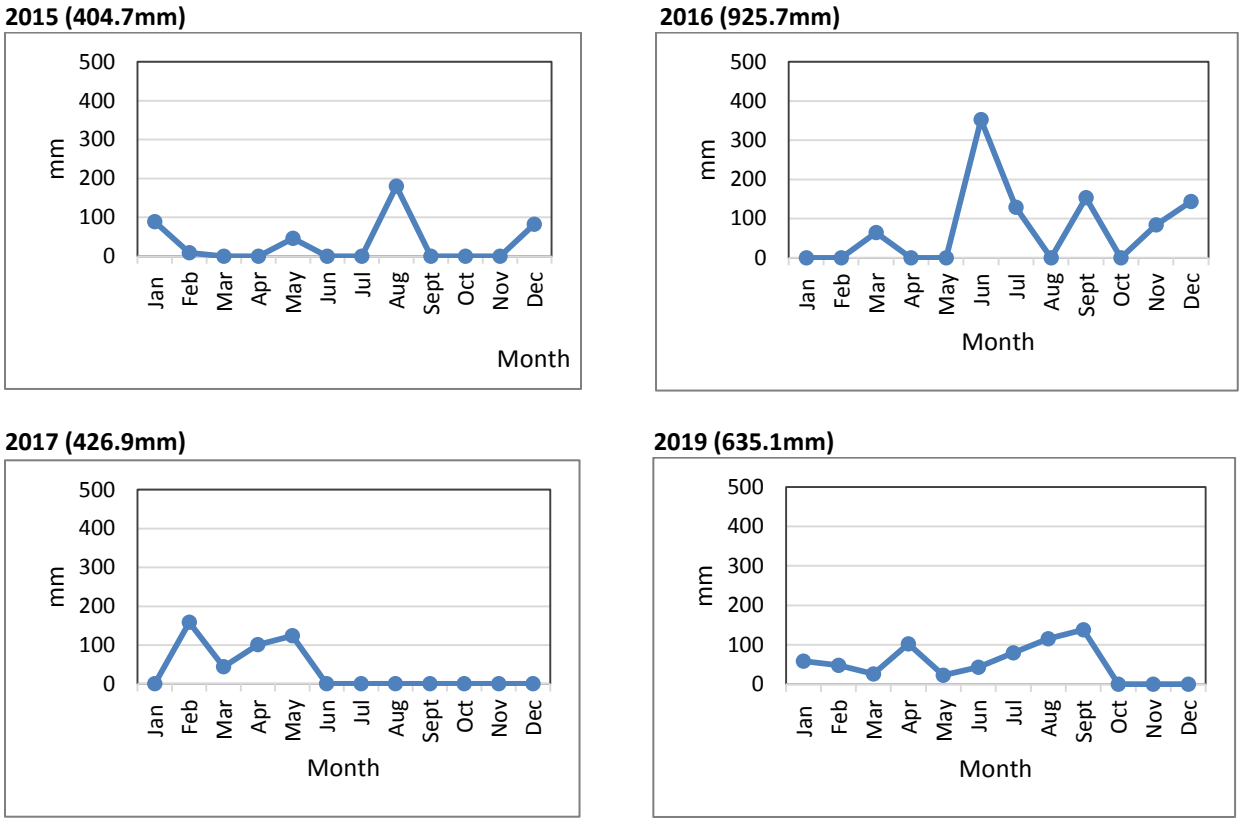

Figure 8: Annual rainfall patterns at La Milpa (2015-2019)[9]

The rainfall patterns are based on long-term averages but annual variability in timing, total rainfall and rainfall distribution is a marked characteristic. The annual rainfall is strongly influenced by short periods of heavy rain from low-pressure systems and the pattern reflects their passage. Over the past six years (2015-2020) annual rainfall at La Milpa has varied between 404.7 mm and 925.7 mm (16" and 36" respectively) while rainfall peaks can be early, late, heavy, moderate, or failing totally. This unpredictability has an important bearing on operational management.

A general water deficit prevails through the warm dry season and exceptional drought periods occur every few years, usually associated with an exceptionally pronounced dry season rather than an exceptionally dry year. The pine savannahs burn regularly, as do the herbaceous swamps in areas accessible to hunters. Fire risk in broad-leaved forest is usually low but becomes significant in drought years. Some fires are set by people, whether by accident or design, though natural outbreaks due to lightning strikes are also possible, both on pine savannah and in broad-

[9] Note: Information was missing for the entire year of 2018 and 2020.

leaf forest. The most recent extensive broadleaf forest fires occurred in 1995 in the West Botes area on the eastern RBCMA and there are reports of similar outbreaks in the past. For 2020 alone, the FIRMS fire alert system detected 1,965 fires within the RBCMA, affecting 1,691 hectares of forest. The affected areas include 412 hectares of broadleaf forest, 27 hectares of mangrove, 1,131 hectares of savanna, and 121 hectares of herbaceous swamps.

Periodic storms are a natural feature of the region. Most incoming storms lose force on land, but since records began in the late 19th century, three storms have gained hurricane force within 30 km of the RBCMA. Similar to Hurricane Richard of 2010, Hurricane Earl of 2016 mostly impacted the southern portion of the RBCMA (Figure 9). However, Hurricane Earl had a much greater impact, with 50% or more damage estimated at 37,699 hectares within the RBCMA. Within the broadleaf production forest, approximately 19,769 hectares were 50% or more damaged. Six years before, Hurricane Earl damaged only 18,000 hectares of forest.

Over the years, several tropical storms and hurricanes that threatened and have caused damage to the RBCMA. In 1892, a hurricane passed directly through the south-eastern region of the RBCMA and the forested land of the adjoining Yalbac (now known as the Belize Maya Forest) and Gallon Jug properties, and the eye of the 1942 hurricane passed over Shipyard and Blue Creek, immediately to the north of the RBCMA. The centers of tropical storms have traversed the RBCMA area in 1916 and 1931, while others have passed within 45 km of the RBCMA boundaries in 1889, 1898, 1921, 1924, 1931 (the second of the year), 1932 and 1945. These tropical storms and hurricanes have all impacted the forest while more distant storms have caused localized damage. After a hurricane, debris and snags are usually left in its wake, increasing the risk of extensive forest fires. Forest fires following a hurricane are common and create further forest damage.

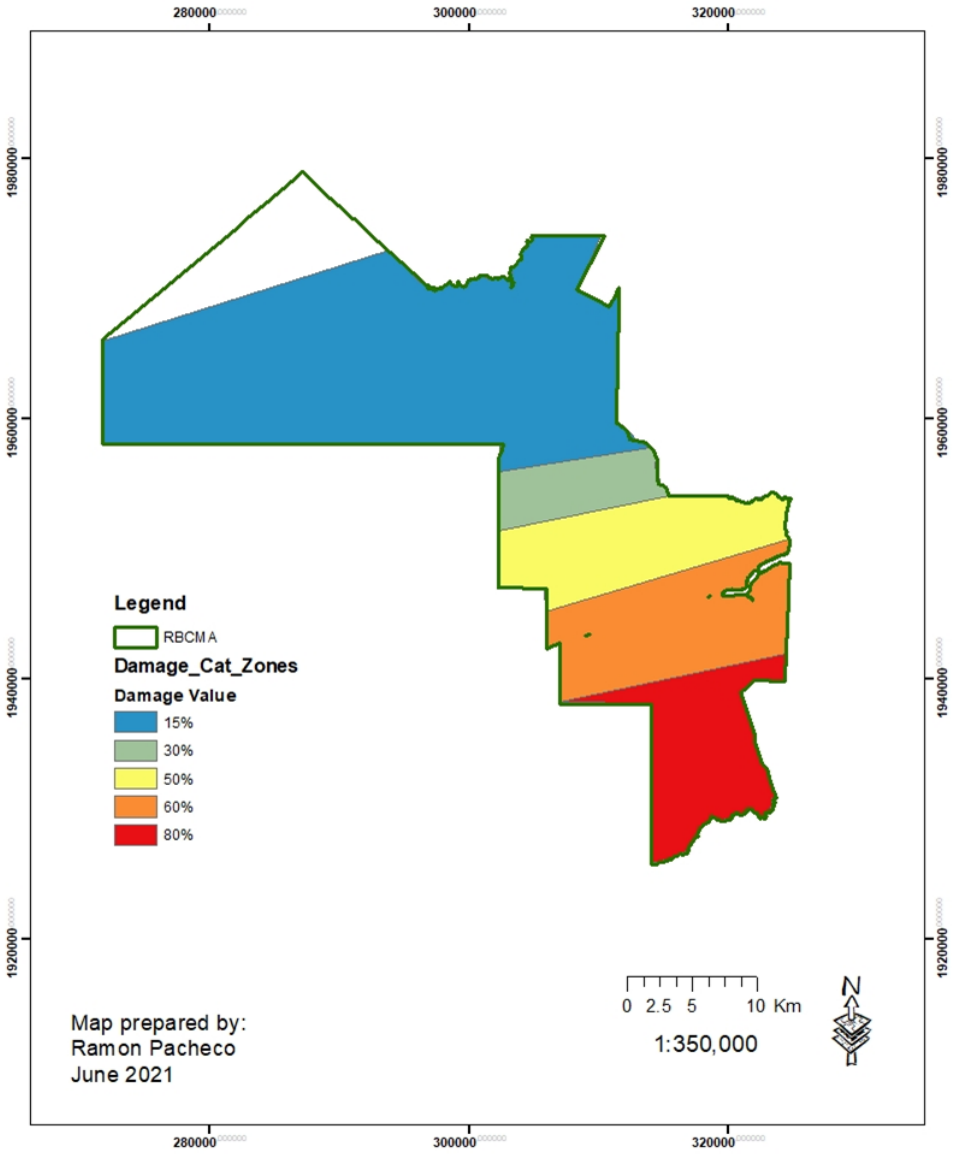

Figure 9: RBCMA Hurricane Earl Impact Zone 2016

2.4.2 GEOLOGY AND SOILS

Detailed land assessments have been undertaken in the area (King et al, 1992). The methodology combines climate, topography, geology and soils to identify land regions, systems and sub-units for planning purposes at a medium (1: 100,000) scale (Figure 10 and Figure 11). These, along with the vegetation studies that complement them, are derived from:

- Landsat (30 m resolution) and SPOT (10 m resolution) satellite imagery (regularly updated in successive surveys, most recently to 2014)

- Radar imagery (Shuttle and SeaSat for land systems, Aerial Synthetic Aperture Sidescan Radar or AIRSAT for ecosystems)
- Aerial photography (1969-70 at 1:48,000, 1972 at 1:39,000, 1988 at 1:42,000)
- Topographical maps at 1:50,000 scale
- Extensive ground survey

Special attention has been given to the soils (Baillie et al, 1993), using a local classification system correlated with international systems.

Generally speaking, the entire area forms part of the Yucatan Platform and is underlain by massive beds of limestone. Faulting on a NE-SW alignment has created a series of blocks that are slipping downwards to the east, resulting in a series of escarpments across the landscape – Lalucha, Rio Bravo, Booth's River and New River within the RBCMA with the sequence continuing eastwards to the outer cayes. The Booth's River escarpment divides the RBCMA between two land regions each with a number of land systems, briefly described below and in more detail in Figure 10 and Figure 11.

- The *Bravo Hills* – the upland (20-300 m above sea level) region west of the Booth's River, underlain by hard limestone
    - *Gallon Jug Plain with Hills* – the most extensive system
    - *Neustadt Plain* – limited to the extreme north-west, with less hilly terrain and soils tending to acidity
    - *Neustadt Swamps* – also limited to the north-west, consisting of broad shallow depressions created by solution of underlying limestone. Again, the soils tend to acidity
- The *Northern Coastal Plain* – the lowland (0-20 m asl) region east of Booth's River, mainly underlain by softer limestone and covered with leached Pleistocene alluvia over extensive areas. The land systems can be divided into three basic types:
    - *Broad-leaf forest areas* – typically over limestone with neutral to alkaline clay soils
        - *Hill Bank Plain* – the most extensive system in the south-eastern RBCMA, typically of level land over hard limestone
        - *Shipyard Plain* – similar to Hill Bank Plain, extending to the north and even more level. The main difference is in soil type – red Chucluum as against (here) dark Yalbac sub-series

- *Lower Belize Valley Floodplain*. Limited to the extreme south-eastern RBCMA and extending into the Belize River Valley land region. This is an upper river terrace system, seasonally swampy with alluvial soil
- *Beaver Dam Plain*. An alluvial system, only represented on the banks of Labouring Creek
- *Lazaro Plain*. The main sugar-producing land system of northern Belize, just reaching the extreme north-eastern RBCMA. Typically level, over soft limestone with dark sandy to loamy soil

- *Pine savannah areas* – forming over leached Pleistocene alluvia, with nutrient-poor acid soils

  - *San Felipe Plain* – typically transitionary, with thin acid ancient alluvial deposits over the underlying limestone. Vegetation ranges from mixed pine-oak woodland to true pine savannah formations. It also includes alluvial areas with slightly enriched soils and stunted broad-leaf patches and galleries

  - *August Pine Plain*. The typical pine savannah system, gently undulating and developing on deep deposits of leached Pleistocene alluvia with poor drainage
  - *Crooked Tree Plain*. Similar to August Pine Plain but with rather higher relief and deep sandy soils, often carrying dense stands of Pine *Pinus caribaea*

- *Swamps* – permanently waterlogged with organic mud over sand or clay

  - *Sibal Swamps* – used for all freshwater swamps

  - *Corozal Saline Swamp* – used for all saline swamps in northern Belize, usually recognized by presence of mangroves (NB – RBCMA inland mangroves appear to be maintained by mineral salts in ground water)

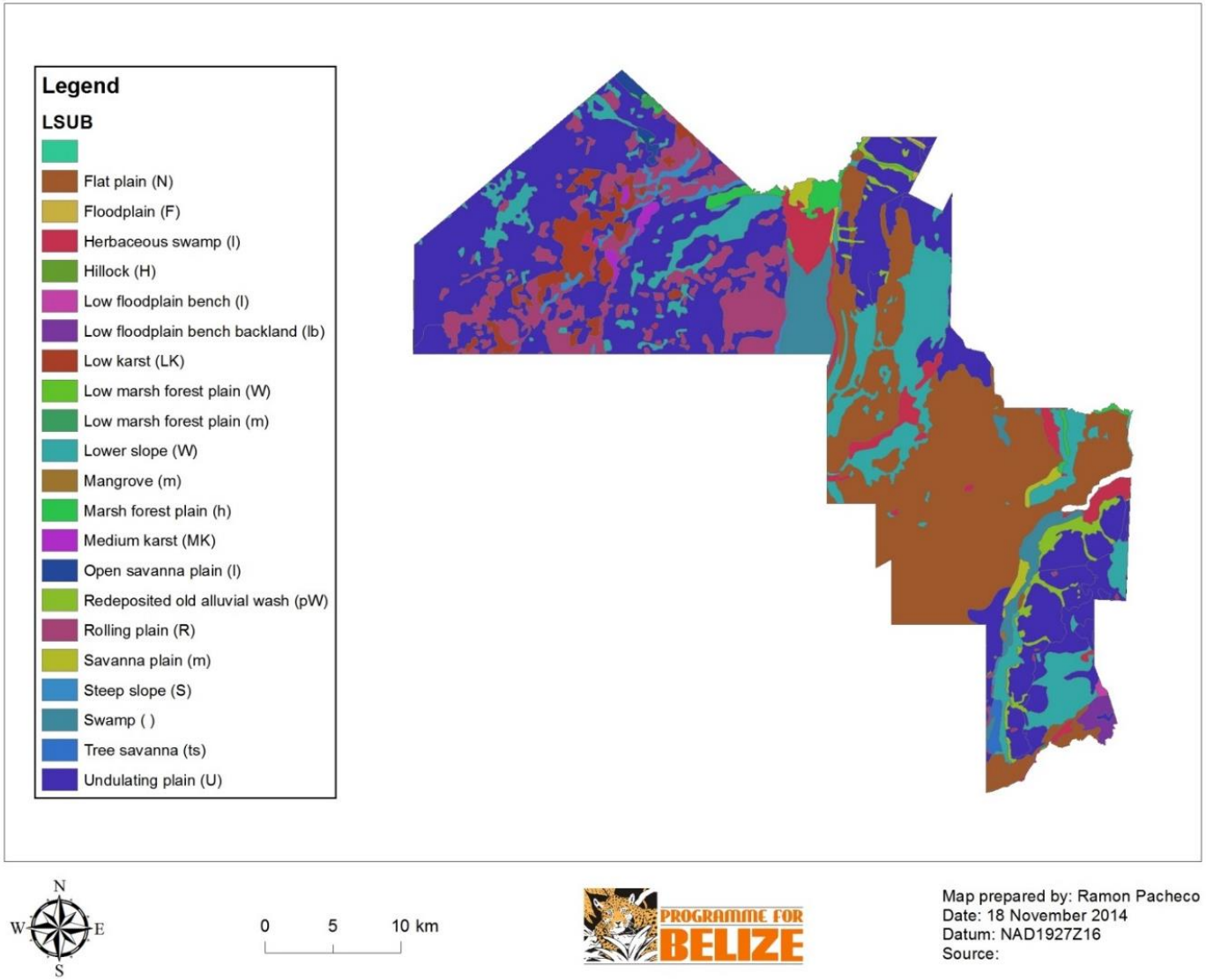

Figure 10: RBCMA land systems

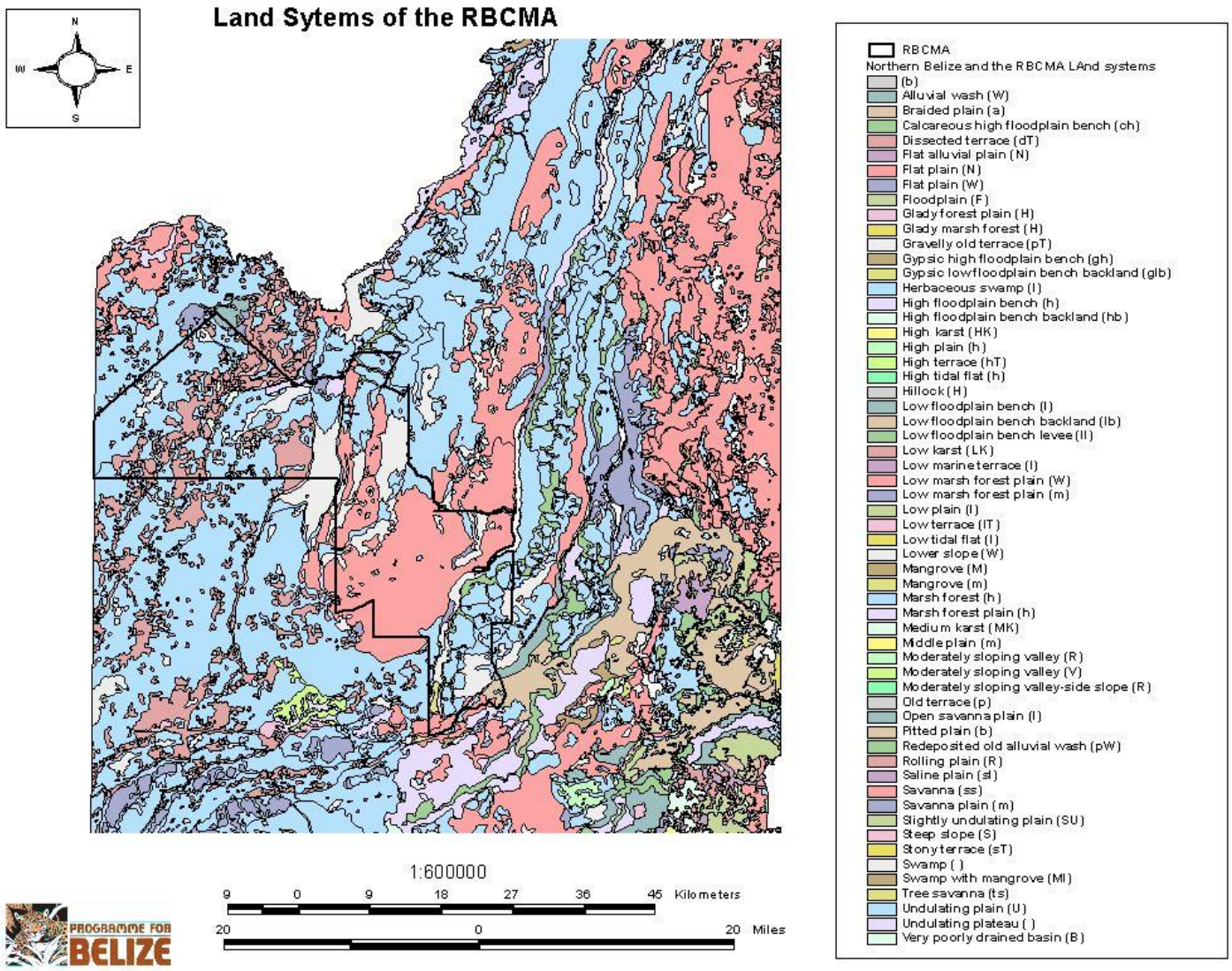

Figure 11: RBCMA detailed land systems

2.4.3 HYDROLOGY

Parts of three watersheds lie within the RBCMA (Figure 12):

- About 60% of the RBCMA lies in the Rio Hondo watershed, including the mid-reaches of Booth's River and the Rio Bravo and the headwaters of Blue Creek/Rio Azul. The latter flows westwards before turning back through Guatemala and Mexico to form the Rio Hondo, the international frontier. The entire Rio Hondo basin spans the Belize-Mexico border, of which 18% lies within Belize and only 4% on the RBCMA. The RBCMA covers a significant part (22%) of the Rio Hondo basin that lies within Belize.
- The remaining 40% of the RBCMA lies in the New River basin, representing 21% of the entire system including most of the upper reaches of its main tributaries. The RBCMA also covers both banks of the southern third of the New River Lagoon, the largest inland water body in the country.
- The extreme south-eastern boundary of the RBCMA runs onto Labouring Creek, which is part of the Belize River system but represents an insignificant part of the total.

All these systems have common characteristics:

- All the headwaters and smaller marshes are seasonal. Lack of water during the dry season is a serious constraint over wide areas, particularly in the limestone uplands. Historically this was relieved by maintaining aguadas, more recently supplemented by bore-holes. The lower reaches are permanent, fed by surface run-off often supplemented by springs along the base of the escarpments that guide their flow.
- Uplift towards the coast, perhaps caused by tilting of the fault blocks across the coastal plain (King et al, 1992), has ponded back all the rivers at some point on the courses. This has created extensive swamps on the lower Rio Bravo (the Booth's River marshes) and on Irish Creek. Along the deeper fault of the New River Escarpment, it has formed the New River Lagoon.
- There are substantial seasonal differences in water levels. The main streams can rise several meters in the wet season and all low-lying ground is subject to widespread seasonal flooding. At these times the different systems may become connected. During the dry season the soils of these same seasonally flooded areas become hard and deeply cracked.

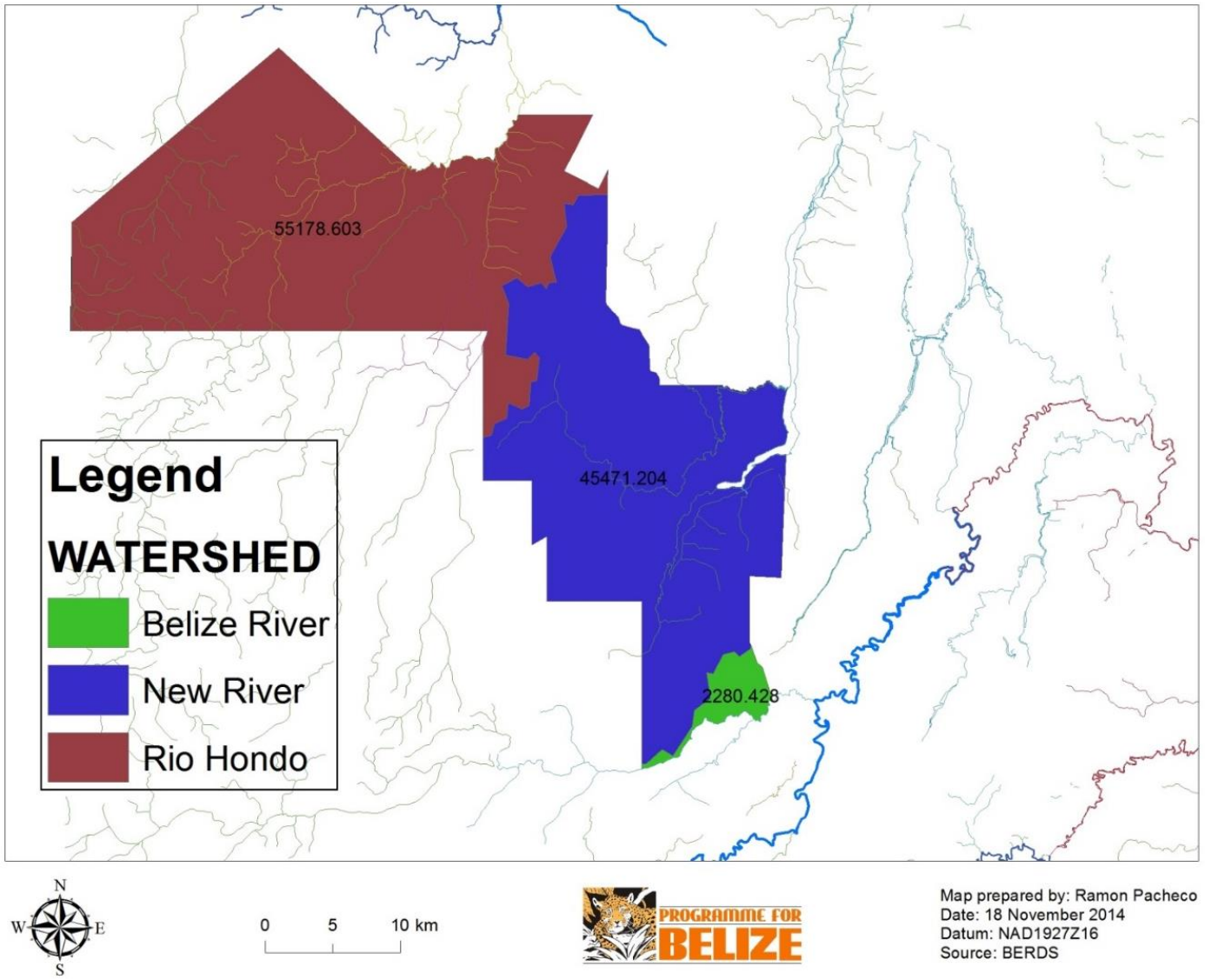

Figure 12: RBCMA watersheds

2.5 BIODIVERSITY OF MANAGEMENT AREA

2.5.1 ECOSYSTEMS

Belizean ecosystems have been described and mapped in a series of exercises over the past 50 years. The most recent work (Meerman & Sabido, 2001) classifies and maps the vegetation under a scheme applied across Central America (Figure 13 and Figure 14). It also incorporates previous work including Brokaw 1998 (in Mallory et al, 1998), the most recent and most detailed habitat characterization and mapping specific to the RBCMA. In turn, Brokaw incorporates a vegetation map specific to the Rancho Dolores Savannah. The ecosystems are briefly described here and in more detail in Figure 14. Their contribution to the national protected area system is given in Table 2 above.

Natural ecosystems on limestone areas

- *Tropical evergreen seasonal broadleaf forest over calcareous soils: Tehuantepec-Peten variant* – the main high broad-leaf forest type of the western RBCMA. Brokaw distinguishes:
  - *Upland dry forest* – on upper slopes and ridges
  - *Upland mesic forest* – on lower slopes and in valleys
  - *Upland forest with oak* – limited to the extreme north-west, on more acid Jolja soils
  - *Transition forest* – forests tending towards high swamp forest, on poorly-drained level land
  - *Cohune forest* – forest patches dominated by cohune palm *Attalea cohune*
- *Tropical evergreen seasonal broadleaf forest over calcareous soils: central-western variant* – The main high broad-leaf forest type on the eastern RBCMA. Brokaw classes this forest as *upland mesic* but also distinguishes:
  - *Upland mesic forest – swamp forest mosaic* for areas where gradations between the mesic and swamp forest are too fine to map
- *Tropical evergreen seasonal broadleaf forest over calcareous soils: central-eastern* variant – Limited to the extreme south-eastern RBCMA. Brokaw lumps this with the other upland mesic forests of the eastern RBCMA

- *Tropical evergreen seasonal broadleaf lowland swamp forest: tall variant* – forests subject to seasonal flooding. Brokaw classes them as transitional forest on the western RBCMA but assigns them to a variety of vegetation types on the east
- *Tropical evergreen seasonal broadleaf lowland swamp forest: low variant* – widespread throughout the RBCMA as small patches too small to map and so assigned to a variety of vegetation types of seasonally flooded areas
- *Evergreen lowland broadleaf shrubland dominated by leguminous shrubs* - called *bajo forest* or *bajo thicket* by Brokaw
- *Tropical evergreen seasonal broadleaf forest over lime-rich alluvium* – used for the forests along the Rio Bravo. Many patches along rivers actually correspond to *tropical evergreen seasonal broadleaf alluvial forest* but are not mapped as such (again corrected in Meerman 2005)

  Brokaw distinguishes:

  - *Riparian forest*
  - *Swamp forest,* specifically for the area at the head of the Booth's River marshes

- ***Pine savannah formations***
  - *Evergreen lowland broadleaf shrubland: Miconia variant* – used for a range of brushy mixed forest types transitional with the pine savannahs. Some areas qualify as *tropical evergreen seasonal broadleaf forest on poor or sandy soils* but are not mapped as such (though corrected in Meerman 2005)

    Brokaw also distinguishes:

    - *Hammock forest* for patches of broadleaved woodland within pine savannah
    - *Gallery forests for narrow lines of broadleaved woodland along drainage lines*
    - *Booth's River Forest*, specifically for broadleaved woodland patches on the San Felipe savannah
  - *Short-grass savannah with shrubs* - the open savannahs with variable cover of broad-leaved shrubs

- *Short-grass savannah with scattered needle-leaved trees* – the open savannahs with scattered pine. Some of the pine stands are sufficiently well developed to qualify as *tropical evergreen seasonal needle-leaf dense forest* but are not mapped as such

  Brokaw lumps both short-grass savannah types as 'savannah' but does recognize two further sub-types:

  - *Orchard savannah* – swampy savannah with shrubs and small scattered trees
  - *Palmetto savannah* – restricted to the north-west, on acid Jolja soil and thus entirely different in origin to the other savannah formations

- ***Wetland and aquatic ecosystems***

  - *Tropical lowland tall herbaceous swamp* – used for all extensive swamps and actually also including areas of *tropical lowland reed-swamp*. Brokaw distinguishes the two (as *tall* and *short grass marsh*). *Eleocharis marsh* occurs on the savannah but is not mapped by Meerman and Sabido and Brokaw also distinguishes *levee forest* for the low gallery woodlands and thickets occurring along stream-banks in the marshes
  - *Freshwater mangrove scrub* – mapped on the Booth's River marshes though patches occur on other rivers, especially on Ramgoat Creek where they are associated with *marl flats* (distinguished by Brokaw)

  The national ecosystems also include aquatic communities, distinguishing *rooted floating-leaved* and *underwater communities in freshwater lakes* and *rooted underwater communities in flowing water.* All three occur on the RBCMA.

- ***Disturbed habitats***

  - *Broad-leaved lowland disturbed shrubland* - re-growth (generally now well advanced) of areas cleared in the 1980s. Brokaw calls it *second growth forest* and uses *upland forest-wamil mosaic* where the old fields are numerous

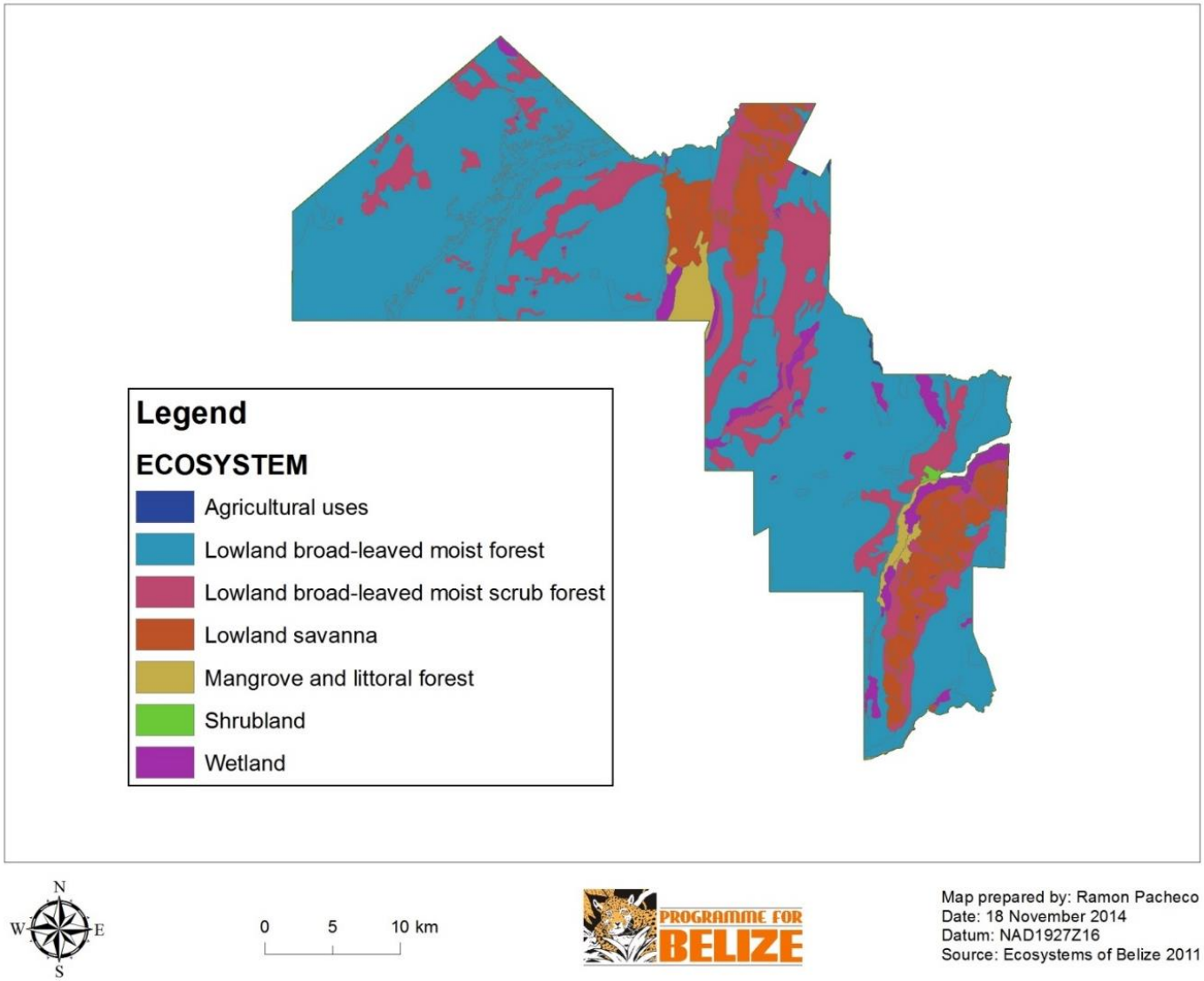

Figure 13: RBCMA broad ecosystems

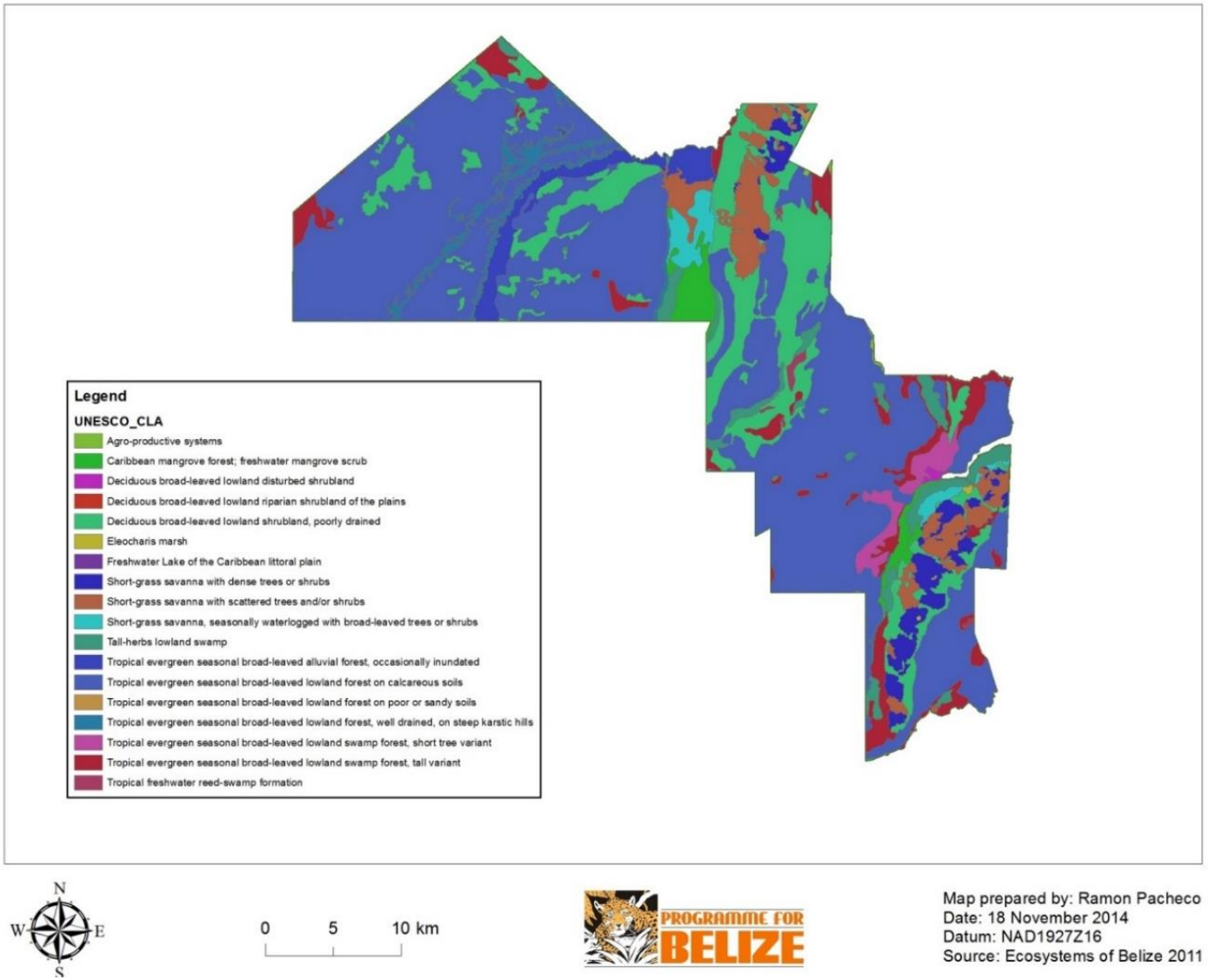

Figure 14: RBCMA ecosystems (UNESCO classification)

2.5.2 FLORA

Long-term research programmes on the RBCMA ecosystems mean that the flora, and especially the woody flora, is relatively well known with some 745 species recorded to date (Appendix 1). Diversity is average for a tropical system (50-60 woody species/ha in mesic forest) and the outstanding feature is that the area contains extensive tracts of land with complete and characteristic communities in fully functioning ecosystems. These include species characteristic of both the Peten and to the dryer moist forests of the Yucatan, which are closer to the northern region of RBCMA. The pine savannah ecosystems are noteworthy as a rare vegetation type at the regional level (occurring in the Belizean coastal plains and the Mosquitia region of Honduras/Nicaragua), with a number of species known only from Belize. Several species are listed as being of conservation concern at national or international level (Wildtracks, 2005), often occurring as common species within their communities (Appendix 2).

2.5.3 FAUNA

The fauna (Appendices 3-6) has also been well-studied with research and survey projects covering all the major groups. In general terms diversity is high (e.g., 79 mammals, over 350 bird species), including foraging and breeding habitat for a range of species of conservation concern (Appendix 2). As with the flora, the most important characteristic is that they occur in fully functioning communities characteristic of the area, most clearly demonstrated by the diversity and relative commonness of top predators (such as large cats and birds of prey). The RBCMA was the site of a Harpy Eagle Restoration Program, where 15 captive harpy eagles (*Harpia harpyja*), were released into the wild with the intention that they would mate with other wild harpy eagles to produce offspring. The goal of the program is to establish a viable population of harpy eagles in the Maya Biosphere Reserve. The Harpy Eagle is a globally threatened species and is highly dependent on extensive areas of unbroken forest.

2.5.4 Past and Present Research

The RBCMA is well-suited as a base for research and both field stations at Hill Bank and La Milpa host several visiting research and survey projects each year. As a result the ecological characteristics and dynamics of the area are perhaps the best known in the country. The most important multi-year efforts undertaken in partnership with international institutions and underlying present management programmes include:

- *Avifaunal surveys (from 1989):* These were undertaken in partnership with Manomet Observatory for the Conservation Sciences and later with The Nature Conservancy, starting with an emphasis on nearctic migrants and expanding to include the distribution

and status of the avifauna. Subsequent studies have concentrated on species of special conservation concern, notably the Yellow-headed Parrot. Programme for Belize has also implemented Yellow-Headed Parrot Recovery Program to protect the species from poachers. The Harpy Eagle Restoration Program (in partnership with the Peregrine Fund and Belize Zoo) was relocated from Las Cuevas Research Station to RBCMA in 2004. The most recent avian study was in 2017, from a graduate student from the University of Oklahoma that studied neotropical migrants passerines and their habitat selection patterns between breeding and wintering grounds.

- *Archaeological Programme (from 1992):* Longest running research project, with archaeologists from the University of Texas and Boston University working in and around the La Milpa site. Currently, only the University of Texas is conducting archaeological research.

- *Broad-leaved forest ecological dynamics (from 1989):* Studies began in partnership with Manomet Observatory and were expanded in partnership with Duke University and the UK-funded Forest Management and Planning Project to create permanent sample plots. They have included detailed vegetation mapping; forest phenology; monitoring and experimentation on recruitment, growth, and mortality, specifically for mahogany; and logging impacts on biodiversity indicator groups. Additionally, in 2015, Dr. Nicholas Brokaw from the University of Puerto Rico began his research on tree species composition, which were first inventoried in 1991.

- *Carbon sequestration (from 1995):* These studies are linked to the Carbon Sequestration Pilot Project and undertaken with The Nature Conservancy and Winrock International. The programme includes assessment and monitoring of biomass in different vegetation types, tracking of land use trends in north-west Belize and development of techniques for biomass assessment at different scales.

- *Pine savannah management (from 2001):* Initiated by studies on savannah vegetation and ecology with the Royal Botanical Gardens (Edinburgh) and continued in conjunction with The Nature Conservancy Fire Management Programme and the Carbon Sequestration Programme.

- *The Freshwater Programme (from 2004):* Monitoring of water quality indicators in the New River Lagoon and its tributaries, in conjunction with The Nature Conservancy.

- *Survey of Hawk-Eagles in Belize (2008):* Spearheaded by the Belize Raptor Research Institute, the project hoped to generate needed baseline data and natural history information on the three hawk-eagle species.

- *Pilot monitoring project for bats (2010):* This project's main goal was to determine the efficacy of using acoustic monitoring stations with bats as targets for PfB Smart Wood program. Secondarily this provided an opportunity to conduct a brief survey of the habitats in and around the Hillbank Field Station to fill in species distributions.

- *Assessment of Savanna Ecosystems (2010):* Belize Botanic Gardens collected seed from the savanna ecosystem as part of an effort to recreate a savanna habitat at the Belize Botanic Gardens to educate the public on savanna systems and use as an interpretive savanna trail.

- *Microclimate research (2011):* Students from the University of Oklahoma studied microclimate in tropical forests as a mechanism for avian extirpation.

- *Ocellated Turkey (2011):* Compare the mating system of the Ocellated Turkey with that of the relatively well-studied North American Wild Turkey, in conjunction with the University of Mississippi.

- *Jaguar research (2013):* A continuation of long-term jaguar monitoring via remotely-triggered, infrared camera traps in Belize, in conjunction with Virginia Tech.

- *Bees and Wasps research (2016)*: Research conducted on the diversity and behaviour of solitary bees and wasps with a focus on orchid bees by a professor from Montana State University.

- *Herps/tarantula burrow/scent lure research (2019*-2020): Students of a tropical ecology course from Canisius College studied the new camera trapping technique for herpetofauna, the occupancy of tarantula burrows, and the effect of scent lure on incidental capture of prey species on camera traps set for carnivores.

2.6 CULTURAL AND SOCIO-ECONOMIC VALUES OF MANAGEMENT AREA

2.6.1 COMMUNITY AND STAKEHOLDER USE

The RBCMA has a long history of extractive use. English place-names and marked camps on early maps suggest that the logwood-cutting industry penetrated up the New River as far as the lagoon by the late 18th century. Further west the area remained under the control of Maya groups (hence the name Rio Bravo) but was parceled out as mahogany works by the early 19th century. These holdings were first consolidated under local companies and then amalgamated into the main mahogany forest of the Belize Estate and Produce Company during the second half of the century. This enterprise dominated the economy of British Honduras throughout the colonial period, based on 'state of the art' timber operations. Hill Bank acted as the main base and the

point from which mahogany logs were rafted down-river to Chetumal Bay and then Belize City. Gallon Jug was established later as operations penetrated deeper into the hinterland, connected to Hill Bank by a railway. The area thus holds an important place in the colonial history of Belize both economically and as the site of the last armed conflicts with the Maya – who raided Hill Bank and Indian Church and confronted colonial forces at Cedar Crossing before settling in the Yalbac Hills in the 1860s.

The chicle-tapping industry rivaled mahogany in importance from the late 19th century to the mid-20th, continuing into the 1990s. The entire area was given out in annual concessions and all sapodilla *Manilkara zapote* trees of any size show signs of being tapped once to several times. The chicleros effectively explored the forest in advance of the logging operations, which reached the last unexploited stands in the mid-1950s. Throughout this period the RBCMA was undoubtedly a busy place with a substantial population of forest workers mostly recruited from the Belize River Valley villages. The disturbance created by the logging operations was compounded by establishment of fields (provision grounds) for food, widespread hunting, cutting of firewood for the steam engines, lopping of tree forage (mainly red breadnut *Brosimum alicastrum*) for mules and the trampling effect of the mule- and ox-trains used for transport.

The Belize Estate and Produce Company became moribund in the 1980s, removing the principal source of employment in the area. Logging under annual contracts with minimal oversight continued but the area was effectively neglected. During this period many small clearings were made for agriculture, including marijuana cultivation. This was brought under control in the early 1990s and the last of the settlers around the North Gate left as late as 1994. The present forest reflects this history and present stakeholder use is based on this legacy.

The ownership and management of the land and the RBCMA is not in question. The main point of conflict is where management measures collide with a long tradition of uncontrolled and illicit use. These activities include:

- *Hunting* - This is based on subsistence hunting for domestic consumption with a strong recreational element and partial commercialization. It is also strongly rooted in the rural tradition and widely accepted as a legitimate activity. The RBCMA is one of the better protected areas in the country but hunting remains a persistent problem on the eastern boundary, in the San Felipe area and along the Gallon Jug road. The poaching of Yellow-headed Parrots on the savannahs for sale by locals has seen decrease due to greater acceptance of legislation that bans such practice. Catching of Central American river turtles and iguana has been reported to be on the rise in the Belize River Valley.
- *Timber theft* – This takes two forms. In the first, legitimate timber operations operating in concessions on the edge of the Rio Bravo habitually take the opportunity to cross the

boundary line. This has occurred on southern Duck Ridge, on the north-western property line, and in the south-east in the Rancho Dolores area, but is readily detectable and halted. The second consists of organized illegal raids where a number of trees are swiftly felled and transported out. This is more difficult to control as the timber is cut and moved over to adjacent private properties and then moved out of the area under the cover of darkness. Typically it is a problem on Irish Creek and along the eastern boundary. This type of illicit resource use also extends to sabal thatch and fence-posts cutting

- *Marijuana cultivation* – Even though the hey-day of marijuana cultivation is long over it remains a recurrent problem in the Cacao area on the northern RBCMA despite repeated raids by national security personnel working with PfB rangers. Other areas on the eastern RBCMA have seen similar illicit activity whenever surveillance is relaxed. In the past two years no evidence of marijuana cultivation has been seen within the RBCMA. Given the time required, approximately 4 months, for a Marijuana plantation to mature for harvest, aerial patrols are conducted quarterly to monitor illicit activities. National Security personnel accompany the aerial patrols and subsequently destroy any identified fields. Interestingly, in 2010, a seismic line was used to infiltrate the heart of the RBCMA to establish a plantation.

- *Human trafficking on the international frontier* – This was a serious issue in the early 1990s. While it currently appears not to be a major problem communities reported during consultation meetings that such activities occur from time to time. While old logging roads have closed over, the surge in agricultural activities in the region have open new points of access. Nonetheless, PfB maintains communications with its cross border counterparts on the human trafficking issue. Furthermore, the presence of the Maya Biosphere core protected serves as a buffer against the transboundary movement of people.

- *Fishing* – The New River Lagoon supports a significant *freshwater fishery* both recreational and for local subsistence. Even though the lagoon is not part of the RBCMA freshwater bodies either extend or originates from within the protected area. The use of gillnets in the rivers and lagoons deplete fish stocks to levels that those who use fishing lines have decreased catches. The presence of outsiders using gillnet increases in the dry season when water levels are low.

- *Riverbank erosion* – An increase in riverbank erosion has been reported in the Belize River Valley communities. Locals have attributed this phenomenon to clearing of land for agriculture and livestock purposes.

- *New agriculture development* – It has been reported that significant acres of land have been cleared in the area of Lemonal and replaced with sour sop trees. This is a reduction of habitats and corridors through which wildlife traverse.

- *Escaped fires* – A few years ago, escaped farm fires from Spanish Lookout resulted in the burning of 68 hectares of broadleaf forest in the Marimba Area of the RBCMA. PfB has contracted Wilhelm Harder to reopen firelines in 2019 and 2020 and Herman Schmitt was contracted to do this in 2021. Fire line maintenance will continue to be a part of PfB's fire management prevention strategy.

Illegal threats from within the buffer communities can be attributed to level of knowledge of the laws governing the RBCMA. Focus group discussion with community leaders indicated that overall 50% to 75% of the population in the area respects the management policies of the RBCMA. This is further influenced by the proximity of the buffer community to the RBCMA.

2.6.2 ARCHAEOLOGICAL SITES

Being within the Mesoamerican region, the RBCMA carries a rich Mayan archaeological heritage. The La Milpa archaeological site is one of the largest in Belize and another 60 sites have been identified along with evidence of agricultural areas, water management systems and tool-making at an industrial scale. Two archaeological programs have been carried out under the aegis of the Institute of Archaeology during the past 15 years – Boston University and University of Texas. A trail system has been established for La Milpa and guided visits form part of the tourism offerings for the RBCMA. PfB actively helps to prevent the looting (last detected and halted on the RBCMA in 1992) of these sites by making it a part of the protection program. Some consolidation work has been carried out at the La Milpa site but it has been determined that the most appropriate (and practical) approach is to leave the sites largely unexposed in their forested context.

2.6.3 TOURISM AND RECREATION USE

Tourism within the RBCMA is directed and led by PfB's Tourism Development Unit (TDU) based in Belize City. The La Milpa Lodge is primarily a tourist facility for student courses and mid-range visitors. Hill Bank is more orientated towards research and management activity but also hosts student courses and is promoting mid-range visitors. The La Milpa Lodge is the most developed of the two sites in terms of amenities provided. Both sites however offer full board and lodging in cabanas and dormitories, have resident naturalist-guides on staff and have well-developed trail networks. Tourism and tourism-related activity is one of the principal sources of self-generated income for PfB, with the other major income stream coming in from sustainable timber harvesting operations. 'High-end' tourism schemes based on Warree Camp (on the Rio

Bravo) and Punta Gorda (on New River Lagoon) have failed to come to fruition but remain an option if suitable partners are identified. For this management plan PfB does not intend to move forward on these two options. The focus will remain on Hillbank and La Milpa for tourism. Arrangements for visits to the RBCMA are made through the Belize City Office. The stations rarely see walk-ins and this mostly has to do with the remote location. When these occur they are not refused so long as circumstances make it possible to accommodate them. There is some local visitation, especially to La Milpa, but this is generally on an ad hoc basis

Tourism is a very competitive sector and therefore more can be done to develop the product. Overall tourism activities have become stagnant and have not been generating sufficient revenue to further reinvest in developing the product and destination. Marketing can be improved in both in terms of communication and budget. In the past, international conservation organizations like The Nature Conservancy promoted La Milpa but this is no longer the case. Competition from regional countries offering similar products has also increased. There is a need for a clearer plan for the development of tourism. More can be done for Hill Bank for instance as it has eco-cultural potential. Road condition however is currently in a poor state and so access and transportation needs to be improved. Nonetheless, land use during the colonial period has not yet been explored for heritage tourism purposes but the physical evidence at Hill Bank, when taken with documentary records and oral history of living residents holds the potential to give valuable experience to both local and foreign visitors. The main effort, however, is currently directed towards optimizing use of existing facilities. Recent renovations have been carried out at the Hill Bank Field Station with a new restaurant, sidewalks and a private cabaña. The tourism sites will have to adapt both in protocols and physically to meet the safety standards for the Covid-19 pandemic. The focus will be initially with La Milpa Lodge due to feasibility and less conflict with other programs. PfB had previously estimated a cost of $30,000 for the necessary upgrades to meet safety standards, however, this may run up to $80,000 depending on the extent of the upgrades.

2.6.4 OTHER ECONOMIC USE

The terms of the Memorandum of Understanding (MOU) with the Government of Belize reflect the aim of recreating a modern version of the working forest of the BEC days, conserving biodiversity while contributing to the local economy. This is therefore a key management objective in itself as well as a conservation strategy that can help to displace illegal and unauthorized activities. Other economic activities of the RBCMA include ongoing timber harvesting and carbon sequestration.

2.6.4.1 TIMBER AND BIOMASS

- *Hardwood timber*. After tourism, the sustainable timber harvesting program has been the second largest gross revenue earner on the RBCMA, making an important contribution to management costs. The regime, which was developed through two EU-funded projects and in association with the World Land Trust and the UK-funded Forest Planning and Management Program (FPMP) is certified by the Forest Stewardship Council, through NEPCon, and has a strong science base including impact assessment and monitoring. It also places heavy emphasis on retaining the regenerative capacity of the forest. The basic system, which is set out in full in the forest management sectoral plan, is fully operational and producing 700,000 to 800,000 Doyle bdft of timber per annum. Mahogany represents between 18 and 30% of total volume and is the main economic driver of the operation. Including a range of other hardwoods, the operation is currently worth BZ$1,000,000 p.a. Future prospects are good. The present annual coupe is 750 ha p.a. to 1,000 ha p.a. (but this may need to be revised based on new information). The improving quality of the standing resource through natural growth and the potential for harvesting of additional species and marketing under ''green' labeling can enhance the success of the sustainable timber harvesting program.

- *Carbon Sequestration*. The Rio Bravo Climate Action Project (RBCAP) started in 1996 (the Original Project) and expanded in 1997 (the Expansion project). It consists of two contiguous avoided deforestation projects in northwest Belize totaling just over 15,000 hectares. The main objectives of the 40-year initiative were to protect biodiversity sub-tropical forest threatened by industrial agriculture, while at the same time reducing the amount of carbon dioxide going into the atmosphere. The projects received a total of US$5.82 million in funding by Wisconsin Electric Power Company (now WE Energies), Duke Power, Detroit Edison (now DTE Energy), PacifiCorp, Utilitree Carbon Company, Suncor Energy Inc. and Canadian Occidental Petroleum Ltd. (now Nexen Inc) and Programme for Belize. In exchange, these financial participants received the rights to any carbon credits generated from the properties. In 2000, a new agreement was drafted that consolidated the management and financial accounting for the two projects, as well as created a joint board to oversee activities. In 2012, the Original Project successfully underwent verification to the Verified Carbon Standard (VCS), resulting in the creation of 1,660,260 carbon credits that could be sold on the voluntary market to help raise funds for a project endowment. Donations of carbon credits by financial partners have generated an endowment fund of $2.65 million as of June 2020. The fund helps to finance the protection and management of the RBCMA and contribute to its financial sustainability.

2.6.4.2 NON-TIMBER FOREST PRODUCTS (NTFPS)

A range of other "sustainable use" approaches have been explored within the RBCMA. These include the following:

- *Seeds, fruits and conserves*: Allspice was formerly commercialized but is now essentially defunct as an industry, at least in Belize. Cohune oil is used in small quantities but obtaining it is labor intensive. Generally speaking, collecting the raw materials poses problems in natural habitat and prospective income is low for considerable effort expended. The best results come from species easily obtained around villages and developed as small-scale activities through outreach programs. PfB has successfully promoted handicraft production for the tourist trade, with a local entrepreneur now running a self-supporting workshop at August Pine Ridge using a range of gourds, seeds, palm nuts (including cohune), tie-tie and other items. Promotion of conserves using local fruits at Isabella Bank produced good product, undermined by insufficient attention to marketing and distribution. Attempts to stimulate honey production at Lemonal were unsuccessful for a variety of reasons (social, managerial and economic)

- *Chicle*: The chicle industry is historically important but is now virtually non-existent. Sapodilla (the source of chicle latex) is one of the commonest trees on the western RBCMA but fairly uncommon in the east where it is replaced by chicle macho, producing the inferior crown gum. A full program was developed by PfB in the early 1990s including research into impacts (low if slashing is careful), sustainable harvesting (seven year rotation optimal) and a monitoring protocol. It also reached an experimental production stage using a team of local chicleros, producing about 1 ton of raw material exported to Florida where it was turned into finished product and marketed for several years. The major problems at the time were lack of capacity for field management by PfB (the most serious difficulty, since addressed), inadequate access to a specialized market and high costs relative to identical material from Mexico and Guatemala

- *Sabal palm thatch*: The issues surrounding sustainable production of sabal thatch have been investigated, essentially involving a rotation of 5 years for a given stand, limiting extraction to young trees with accessible crowns and leaving the growing point with at least one (preferably two) good leaves untouched. There is substantial demand for sabal thatch, especially for tourist facilities, which is usually met from more accessible sources in the country. Sabal is, however, patchily common throughout the RBCMA, is used by PfB for its own buildings and is occasionally extracted without authorization. It definitely has promise as a subsidiary income stream

- *Xate and houseplants*: Xate (*Chamaedorea spp*) leaf is commercialized in the Peten and heavily exploited to the point of local depletion. It is not, however, very common in the

RBCMA except in rocky areas and then not in the most sought-for species. The potential for houseplants, orchids, etc. was investigated in detail through the EU-funded micropropagation project and its associated nursery. Although the production techniques were mastered, the technology and running costs were too expensive for the value of the material produced – especially from Hill Bank. Furthermore, the most promising line – orchids – was hindered by the bureaucracy involved in export despite being raised and shipped in sealed sterile containers.

PfB has done technical background work on these ideas however the economic feasibility is yet to be determined and as such they remain as possibilities for alternative livelihoods.

2.6.4.3 'NON-TRADITIONAL' ECONOMIC FUNCTIONS

- *Existence value*: The RBCMA continues to attract significant grant support from private foundations and donors including the statutory funding agency, the Protected Areas Conservation Trust (PACT). The management of the area was indeed totally dependent on such support initially and it still plays a crucial role in bridging the gap between self-generated income and annual budgets. Even if self-sufficiency is achieved it will always be a useful addition and in economic terms represents the willingness of civil society and government, at an international and local level, to contribute to the continued existence of biodiversity. An average revenue of about BZ$800,000 per annum has been maintained from this source over the past 15 years all of which is expended in the local economy.

- *Provision of environmental goods and services*: The carbon sequestration pilot project mentioned above is one means of capturing payment for an environmental service. The RBCMA also serves other, though yet un-quantified, environmental functions supporting the economic and social life of northern Belize. The RBCMA is a key link in the northern biological corridor and supports plant and wildlife species. It provides key environmental goods and services for buffer communities and the country of Belize on a whole, including food, fiber and freshwater. It further provides support services such as carbon sequestration, soil formation and stabilization, climate regulation and water catchment/storage ability. It also provides cultural services such as scenic beauty and tourism values. Water is an important resource from the RBCMA as it feeds into the New River Lagoon and supplies the communities downstream. Additionally, it supplies water for rice farming in Blue Creek. This is an environmental service that may be explored. These services may not be revenue-generating currently but their contribution should be assessed and certainly recognized by all stakeholders.

2.6.5 EDUCATION USE

As noted, student courses are an important element of the tourism program at the RBCMA, catering primarily to North American schools at the secondary and tertiary level. These account for both the majority of visitors and a substantial proportion of revenue generated. They are arranged around set curricula, usually combining the marine as well as the terrestrial environment. Visits by local schools and community groups are also arranged though in a less systematic manner. Local schools often lack the funding to cover transportation expenses to get to the RBCMA. Lastly, both La Milpa Lodge and Hill Bank Field Station are used to host workshops and training courses in conservation management. Activities involving youth from the buffer communities have included the summer camps, the Harpy Eagle program, and participation in school fairs. The promotion of this particular service can be further enhanced.

3. ANALYSIS OF CONSERVATION TARGETS AND THREATS

The conservation planning follows the Conservation Action Planning (CAP) process developed by The Nature Conservancy and adopted by the National Protected Areas Policy and System Plan.

3.1 CONSERVATION TARGETS

3.1.1 IDENTIFICATION OF CONSERVATION TARGETS

Six conservation targets have been identified for the RBCMA:

1. Savannah
2. Broad-leaved Lowland Forest
3. Aquatic Ecosystem
4. Yellow-headed Parrot
5. Aquatic Ecosystem Target Species (i.e., Central American River Turtle (Hicatee)/Bay Snook)
6. Jaguar

Each of these conservation targets is governed by fundamentally differing ecological processes, experience different types of threat and thus require different strategies. These conservation targets also capture all of the biodiversity and ecological processes within the protected area and conserving these six conservation targets will ultimately ensure the conservation of all the biodiversity and ecological processes within the RBCMA.

3.1.2 ASSESSMENT OF CONSERVATION TARGET VIABILITY

The viability assessment indicates that:

- The Savannah is in overall good health, despite having a fair fire regime and Caribbean Pine population structure and composition. Their greatest advantage is that they are extensive and still with good landscape connectivity. Fire is a natural ecological process on this conservation target but is over-frequent, affecting population structure and composition of native species, particularly the Caribbean Pine. These impacts can be addressed through management.
- The Broad-leaved Lowland Forest is in good health. It is extensive, with fair connectivity at the landscape level, and basic ecological processes are intact. Structure and species

composition are mostly modified by past and present timber extraction, illegal logging, illegal agriculture, uncontrolled burning, and road and oil development but impacts overall are moderate, leaving the natural communities in functional condition.

- The health of the Aquatic Ecosystem is currently fair. The upper reaches of some streams are beyond the RBCMA boundary, and the presence of some barriers (BOD, contamination, gill nets, etc.) may have compromised downstream connectivity. The population structure and composition of some fish species may also have been impacted as a result of tilapia and armored fish introduction and proliferation.

- The Yellow-headed Parrot population is currently fairly healthy. This species is highly dependent on the overall good health of the pine savannah ecosystem. Nesting success is moderately impacted by poaching, frequent and uncontrolled fires, and loss of suitable nesting pine trees. Management can help to address these impacts to this endangered species.

- The two targeted aquatic ecosystem species are Hicatee amd Bay Snook.

    - The Hicatee population is believed to be currently healthy, despite its dependence on a currently fairly healthy aquatic ecosystem. Species population size is impacted to a low extent by poaching, illegal and unregulated fishing, and contamination of habitat. Management can help to address these impacts to this endangered species.

    - The current Bay Snook population size and age structure appear to be in good health. Like the Hicatee, this species is also currently dependent on a fairly healthy aquatic ecosystem, and is being moderately impacted by poaching, illegal and unregulated fishing, and contamination of habitat. Management can help to address these impacts.

- The Jaguar population is believed to be in a healthy state. Poaching of its prey species and killing of problem animals appear to be currently to a low extent. Adequate and healthy habitat appears to be currently available for this fairly wide-ranging species of international concern.

3.2 THREATS TO BIODIVERSITY

The assessment indicates that all six conservation targets are subject to a number of threats, some of which are shared with other conservation targets and some that are specific.

- The Savannah is the most threatened of the conservation targets for the RBCMA, with uncontrolled/unmanaged fires and illegal logging being its most important threats. Poaching of wildlife (illegal hunting) is also a threat of particular consideration although the extent of its occurrence is medium.

- The Broad-leaved Lowland Forest conservation target is affected by the largest number of threats, including timber extraction, illegal logging, illegal agriculture, poaching of wildlife, uncontrolled burning, and road infrastructure and oil development. All of these threats are considered medium or low at the moment, with the exception of road and oil development that are high.

- The Aquatic Ecosystem is among the most threatened of the conservation targets presently, with invasive species being the most prominent threats (high rank). Unregulated fishing and pollution (pesticides and fertilizers) are also threats of particular consideration although the extent of their occurrence are currently medium and low, respectively.

- The Yellow-headed Parrot is also among the most threatened of the species-level conservation targets presently, being threatened mainly by felling of nest trees. Poaching and uncontrolled/unmanaged fires are also notable threast, although these are currently ranked low.

- The Jaguar is also among the most threatened of the species-level conservation targets. It is currently highly threatened by planned road infrastructural development. Poaching of prey species and killing of problem jaguars, and potential oil development are also notable threats, but these are currently considered low.

- The Hicatee and Bay Snooks are the least threatened of thespecies-level conservation targets. Current threats to these species are low and include poaching, and pollution from pesticides and fertilizers, which are considered medium and low, respectively.

Some of the more highly ranked threats appear to affect more than one of the conservation targets. These include uncontrolled unmanaged fires (affecting the Yellow-headed Parrot and the Savannah) and pesticides and fertilizers (affecting the Aquatic Ecosystem and its associated target species). Road and oil development are other highly ranked threats, which appears to affect the Broad-leaved Lowland Forest and the Jaguar. Other higher ranked threats affecting only one conservation target include invasive species. The lower ranked (medium and low) threats also appear to affect more than one of the conservation targets or a single conservation target and include: unregulated fishing, illegal logging, illegal agriculture, killing of Jaguars, oil development, poaching of wildlife, uncontrolled burning, and felling of nest trees.

The goal of the RBCMA is to manage threats to the conservation targets through a range of programmes designed to maintain the conservation targets in a "good" to "very good" state. From the assessment, most of the threats are ranked low or medium.

However, one of them (road infrastructure development – acting on the broad-leaved lowland forest and jaguar conservation targets) is ranked "very high". Two other threats (illegal logging and felling of nest trees) are ranked "high". These act on the savannah and broad-leaved lowland forest conservation targets, and the Yellow-headed Parrot conservation target, respectively. These are the three threats that are to be classified as critical threats requiring priority management intervention. Threats that rank "medium" and "low" will, fortunately, require less management intervention but nevertheless are conservation issues that should be tackled.

3.3 STRATEGIES TO REDUCE THREATS

Each conservation target is subject to one or more threats and some threats affect more than one conservation target. Furthermore, the proximate source of threat is usually propelled, or at least facilitated, by one or more factors acting indirectly. Strategies must address both, acting on direct sources to gain immediate relief and on indirect sources to alleviate the condition over the long term. The following general strategies will be employed to reduce threats to the RBCMA conservation targets:

- Institutional strengthening
    - To obtain proper work equipment, resource mobilization, and training of staff to be proactive and reactive to illegal activities
- Protection of ecosystems
    - Involving boundary demarcation, surveillance through aerial and ground patrols, and legal action when appropriate
- Managed resource use
    - To enhance the relevance of the area for the local economy and augment its reputation as a key site through delivery of concrete benefits, giving the basis for a constituency of support for the area. This also acts as a form of passive protection by occupying the ground and visibly demonstrating an active presence
- Outreach, education and advocacy

- To engage with neighbouring land owners and communities to gain support for RBCMA management and protection of the protected area, and to preserve the RBCMA resources to maintain biological connectivity in the wider landscape

- Research and monitoring
    - To obtain and disseminate information on the area, reinforcing awareness of its importance, and to monitor the success of management actions

3.4 MONITORING SUCCESS OF CONSERVATION STRATEGIES

The conservation strategies in place to reduce the threats to the conservation targets should be monitored continuously throughout the management period. The status of the conservation targets will provide management with a clear indication whether the conservation strategies are working or not. The RBCMA research and monitoring programme (section 4.7.3) provides a list of monitoring actions and activities. These actions and activities can then be tabulated and analyzed based on a "measures of success" scale to determine their success.

3.5 PLANNING FOR CLIMATE CHANGE

Belize is considered to be highly vulnerable to the impacts of Climate Change related impacts such as increased intensity of storms. Protected Areas play a critical role in the maintenance of ecosystem services and will become even more important as climate change impacts increase in the future. When developing management plans it is important to understand and integrate climate change adaptation into protected areas planning. The management strategies identified should help to ensure that the protected area continues to mitigate the predicted impacts of climate change. The methodology for identifying the Climate Change related management strategies is based on the ***Guidelines for Integrating Climate Change Adaptation Strategies into Management Plans*** (Wildtracks, 2012) which is an addendum to Management Plan Framework developed under the National Protected Areas Policy and System Plan (NPAPSP, 2005).

A Climate Change Analysis was conducted to look at how climate change can impact the RBCMA and what can be done as adaptation strategies.

<u>Situation Analysis</u>

To achieve conservation, the impacts of climate change must be mitigated. This can be achieved through an understanding of the changes that will come about at the national and site level as a result of these climate change elements, and identifying conditions that may lead to solutions. The potential climate change impacts for Belize that could impact the RBCMA are described in Table 4.

Table 4: Predicted climate change impacts for Belize and RBCMA

Predicted Climate Change Impacts	Current Status	25 - 50 years	100 years
Increased frequency of Storms	Increased storms from 1999 onwards, with annual fluctuations. More storms during La Niña, fewer El Niño[10]. Stronger storms >Cat 4/5.	Further increase in storms and storm frequency (GFDL, 2021) leading to Increased damage and loss to infrastructure and management capacities.	Further increase in storms and storm frequency (GFDL, 2021).
Decreased Precipitation	Mean annual rainfall over Belize has decreased at an average rate of 3.1mm per month per decade since 1960 (Richardson 2009, CCCCC 2014).	Predicted ecological shifts up the altitudinal gradient of the Maya Mountains Massif alter forest cover, and the catchment functionality important for maintaining rivers in dry season in the south of Belize and providing nutrients to the reef environment.	Predicted decrease in precipitation of 9% by 2099 (IPCC, 2007), attributed to El Niño with significant fluctuations.
Change in precipitation frequency and intensity	Rainfall patterns becoming more unpredictable (Richardson, 2009; UNDP/NCSP, 2011; CCCCC, 2014).	Droughts and floods becoming more frequent resulting in vegetation failure, inundation, landslides. Ultimately leading to ecological shifts.	
Increased Air Temperature	Mean annual temperature has increased in Belize by 0.45°C since 1960, an average rate of 0.10°C per decade. Average number of 'hot' days per year in Belize (days exceeding 10% of current average temperature) has increased by 18.3% between 1960 and 2003 (UNDP-NCSP, 2011).	Predicted mean annual temperature increase is 3.5° by 2099 (UNDP, 2009). Resulting in an increase of wildfires.	Predicted mean annual temperature increase is 3.5° by 2099 (UNDP, 2009).
Increased wild fires	Large scale fires following hurricanes in 2010 and 2016. Large scale drought related fires in 2020.	Large scale shifts in ecosystems with many forests transitioning to savannas.	

[10] El Niño is associated with dry conditions and La Niña with wet conditions (Karmalkar, et al., 2011).

3.5.1 PRIORITY CLIMATE CHANGE ADAPTATION PLANNING TARGETS

A series of Focal Targets on which to base Climate Change Adaptation planning were identified to ensure that the financial and human resource investments for adaptation strategies are prioritized for maximum effectiveness. The four Focal Targets include:

1. Conservation Targets identified during Conservation Action Planning Workshop.
2. Ecosystem Services provided by the Protected Area (PA).
3. Socio-economic Activities dependent on the natural resources of the PA.
4. Stakeholder Communities (Community Resource Users) of the PA.

The key questions asked to determine the Priority Focal Targets were:

- Which of the Conservation Targets identified during Conservation Planning would be most affected by climate change?
- What key ecosystem services provided by the protected area will be significantly impacted by climate change?
- Which community resource users would be most affected by climate change impacts on the protected area?
- How vulnerable / resilient are those communities?
- What socio-economic activities dependent on the natural resources of the protected area will be most affected by climate change?

3.5.1.1 PRIORITY CLIMATE CHANGE CONSERVATION TARGETS

Of the six conservation targets identified during the conservation planning session, three of these were selected as priority conservation targets that would be most affected by climate change, namely, broad-leaved lowland forest, savannah, and the aquatic ecosystem(5) (Table 5). These were confirmed based on the updating of a prioritization process that was originally conducted in 2014/15. This process used a rating (on a scale of 1 to 4) of the impacts of the relevant predicted climate change elements for Belize (Table 6). As the RBCMA is located away from the coast, sea temperature rise was looked at in terms of water bodies for the aquatic ecosystem existing within the protected area, and given a score of 2. An increase in intensity of storms on the aquatic ecosystem was given a score of 3, as it is believed that these will contribute to agrochemical contamination, prolonged flooding, and the introduction of exotic species. The sea level rise impact on the Hicatee was given a score of 3, as Hicatee nests would more than likely be submerged and eggs may not hatch.

Table 5: Climate change threat matrix for prioritizing conservation targets

	Predicted Climate Change Elements	Broad-leaved Lowland Forest	Savannah	Aquatic Ecosystem	Jaguar	Yellow-headed Parrot	Hicatee	Bay Snook
1	Increased Air Temperature	3	4	2	2.5	2.5	2	1
2	Decreased Precipitation	2.5	3	2	2	2.5	2	3
3	Increased Intensity of Storms	4	3	3	3	3	2	1
4	Sea Level Rise	1	2	3	1	1	3	1
5	Sea Temperature Rise	1	1	2	1	1	1	2
	Average Score	2.3	2.6	2.4	1.9	2	2	1.6
		Selected	Selected	Selected				

Table 6: Ratings for prioritization of conservation targets

RATING		DESCRIPTION
Very High	4	The climate change element is (or is predicted to be) the major contributing factor to the reduced viability, or possible local extinction, of the target over the majority of its extent within the project area over the next 50 years, and cannot be reversed.
High	3	The climate change element is (or is predicted to be) a significant contributing factor to the reduced viability of the target over a significant part of its extent within the project area over the next 50 years, but can be reversed at high cost or over a long time period.
Medium	2	The climate change element is (or is predicted to be) a moderate contributing factor to the reduced viability of the target over part of its extent within the project area over the next 50 years, and can be reversed at moderate cost.
Low	1	The climate change element is (or is predicted to be) a minor contributing factor to the reduced viability of the target in localized areas within the project area over the next 50 years, and will reverse naturally or at limited cost.

3.5.1.2 KEY ECOSYSTEM SERVICES

The RBCMA is a key link in the northern biological corridor and supports fifteen (15) threatened and endangered species such as the Jaguar, Yellow-headed Parrot and Central American River Turtle (Hicatee). It is critical for providing key ecosystem services for buffer communities and the country of Belize on a whole, including food, fiber and freshwater; cultural services such as scenic beauty and tourism values; support services such as biodiversity, biomass, carbon sequestration, soil formation and stabilization; climate regulation and water catchment/storage ability and

water protection; and is a gene bank for medicine, agriculture, and forestry. In addition, the RBCMA's rich ecosystems also play a vital role in buffering communities against storms and hurricanes by reducing potential physical damage to houses and other infrastructure during storm events, and in filtering out sediments and agrochemicals from unsustainable development and agricultural practices.

Two priority ecosystem services considered to be at greatest risk from climate change were selected. These are:

- Climate regulation; and
- Water catchment/storage ability and protection.

Table 7 summarizes the predicted climate change impacts to these ecosystem services.

Table 7: Predicted climate change impacts to RBCMA ecosystem services

Conservation Target	Climate regulation	Species recruitment	Habitat support	Climate Change Impact
Broad-leaved forest	Absorb greenhouse gases, regulate water flows.	Maintenance of biodiversity; Flora recruitment to help with soil stability and retention	Provide migrating plant and animal species routes to resilient habitats.	Changes in the density and species composition of the forests due to wildfire and edge effects from road development.
Savannah	Absorb greenhouse gases, regulate water flows.	Maintenance of biodiversity	Protect and provide habitat for the Yellow-headed Parrot.	Changes in the density and species composition of the forests due to wildfire.
Aquatic ecosystems	Regulate water flows.	Maintenance of biodiversity	Protect and provide habitat for the Bay Snook and Central American River Turtle.	Changes in precipitation and runoff modify the amount and quality of habitat for aquatic organisms, and indirectly influence ecosystem productivity and diversity.

3.5.1.3 PRIORITY STAKEHOLDER COMMUNITIES

Priority stakeholder communities were selected from those identified in the RBCMA stakeholder analysis. They were chosen based on their significant dependence on the natural resources and ecosystem services of the protected area, and lowest capacity for adaptation. Then they were analyzed and prioritized based on three (3) vulnerability factors:

1. Exposure: The extent to which a community comes into contact with climate events or specific climate impacts.
2. Sensitivity: The degree to which a community is negatively affected by changes in climate.
3. Adaptive Capacity: The potential or capability of a community to adjust to impacts of changing climate, and to minimize, cope with and recover from the consequences of changes.

Lemonal, Rancho Dolores and San Carlos were chosen as priority stakeholder communities for the RBCMA climate change planning. Of these communities, Lemonal and Rancho Dolores were thought to be the most vulnerable – being the most exposed and sensitive to climate change, and having a low potential or capability to adjust to and recover from impacts due to their perceived lower economies.[11]

3.5.1.4 KEY SOCIO-ECONOMIC ACTIVITIES

The stakeholder analysis and community consultations revealed that the RBCMA communities are are somewhat dependent on the natural resources of the protected area. Socio-economic activities such as fishing, hunting, extraction of non-timber forest products, logging, cash crop and sugarcane production, cattle rearing, and land-based tourism contribute to the local and national economy.

Small-scale farming (vegetables, grains, and small livestock including pig, poultry and sheep) were selected as the key socio-economic activity based on its dependence on the natural resources of the protected area and that will be most affected by climate change. Changes in temperature, amount of carbon dioxide, and the frequency and intensity of extreme weather could have significant impacts on crop yields. Heat stresses can increase the vulnerability of farm animals to disease, reduce fertility, and reduce milk production. Droughts may reduce the amount of quality forage available to grazing farm animals, and changes in crop production due to drought could also become a problem for animals that rely on grain. Climate change may also increase the

[11] In November 2020, there was severe flooding in the Belize River Valley area brought about by the outer bands of Hurricane Eta. There was extensive damage to crops and property, and many residents had to be evacuated. Lemonal and Rancho Dolores were the first communities to be affected (Source: News 5).

prevalence of parasites and diseases that affect farm animals, and increases in carbon dioxide may increase the productivity of pastures, but may also decrease their quality and nutritional benefits.

3.5.1.5 DEVELOPING ADAPTATION STRATEGIES

General adaptation strategies were identified for integration into the RBCMA management programmes (Table 8). The strategies aim to reduce anthropogenic threats which may exacerbate the impacts of climate change.

Table 8: Strategies for climate change focal targets

Objective	Strategy	Priority Threat
By 2026 strengthen the relationship between PfB and the RBCMA's neighboring communities that traditionally depended on the area for subsistence	Establish alternative livelihood projects in the key RBCMA buffer communities (i.e., Lemonal, Rancho Dolores and San Carlos)	Changes in species composition (flora and fauna) Warmer/drier micro-climates (which affects habitats & species) Reduced ability to catch and store water Decreased food production capacity Damage to infrastructure caused by flooding (access to markets) Increased production input costs (irrigation, pesticides, herbicides, etc.)
	Design projects and seek funding to create alternative livelihood opportunities for communities	
	Explore, develop and implement a game meat farming pilot project (e.g., gibnut, white-tailed deer)	
	Explore, develop and implement viable and sustainable harvesting of NTFPs as a pilot project (e.g., popta seeds - palmetto)	
	Conduct regular assessments of the economic benefits of RBCMA to communities	
	Support the provision of access to training and funding opportunities in agricultural best practices	
	Implement capacity building training programs on best farming practices	
	Establish partnership with agriculture research institutions to assist in providing better crop varieties, increase yields and reduce cost (farming methods)	
	Promote water conservation	
	Create linkages to micro-financing, agro-processing, and marketing opportunities	
	Develop entrepreneurship through partnership with BELTRAIDE, etc.	
	Develop and institute a disaster relief plan Lemonal, Rancho Dolores, and San Carlos by 2026	
	Provide disaster relief assistance	
Develop and institute a fire management program by the end of 2023 guided by the National Fire Management Strategy	Conduct training sessions on burning techniques and other fire management systems	Increased frequency and intensity of fires Warmer/drier micro-climates (which affects habitats & species)
	Institute fire response protocol commensurate with the level of threat	
	Implement prescribed burns of pine savannah on a maintained schedule (rangers and forestry staff)	
	Maintain adequate equipment for fire management (tractor, swatters, fire gauges, etc.)	

	Establish and train a community fire brigade (rapid response team) that will act as a support in RBCMA and the communities	
By 2023, develop and implement a water quality monitoring program	Conduct water quality testing in the New River watershed	Changes in water quality (saltwater intrusion and nutrient loading)
	Conduct studies to determine levels and methods of agrochemicals use in neighboring farms	Changes in species composition (flora and fauna)
	Implement education programs for best farming practices	Reduced ability to catch and store water
	Lobby GOB for increased and sustained monitoring of pesticides and fertilizer use within the New River watershed	Damage to infrastructure caused by flooding (access to markets)
By 2026, develop and implement a water conservation program	Maintain adequate protection efforts to prevent deforestation	Changes in water quality (saltwater intrusion and nutrient loading)
	Establish partnership with local authorities	
	Institute an education program on watershed management and protection	Reduced ability to catch and store water
	Monitor forest cover change around the RBCMA	Damage to infrastructure caused by flooding (access to markets)
	Work with land holders for forest connectivity	
By 2024, develop and institute a research and monitoring program for the RBCMA	Facilitate research into population structure and composition of key wildlife species, in particular the Mahogany, Jaguar, Yellow-headed Parrot, Central American River Turtle, and cichlids.	Increased frequency and intensity of fires Changes in species composition (flora and fauna) Warmer/drier micro-climates (which affects habitats & species) Reduced ability to catch and store water Decreased food production capacity Increased production input costs (irrigation, pesticides, herbicides, etc.)

4. MANAGEMENT PLANNING

4.1 MANAGEMENT AND ORGANIZATIONAL BACKGROUND

The PfB is one of the leading conservation NGOs acting on a regional as well as national scale. The PfB mission is:

"to conserve the biodiversity and promote the sustainable development of Belize through the proper management of the RBCMA and other lands entrusted to it."

Management is now in its thirty-first year and has run through six planning cycles in that time. The annual operating budget is c. BZ$ 2.7 million and the organization maintains a head-office in Belize City in addition to two field stations at La Milpa and Hill Bank. The administrative structure (as of March 2021) is set up as follows (Figure 15):

- The Board of Directors including the Executive Director, responsible for day-to-day management.
- An accounts department headed by the Financial Controller with line management of the Senior Accounts Clerk and Accounts Clerks.
- Manager of Administration and Planning, a key post with line management responsibility for all operations with the exception of tourism. This includes:
    - La Milpa Ecolodge and Research Station, including the station manager, with a tour guide, catering and maintenance staff;
    - Hill Bank Field station, also including the station manager, a naturalist/guide, catering and maintenance staff
    - The rangers, including a Head Ranger, an Assistant Head Ranger, five Rangers and six Temporary Rangers.
    - The Tourism Manager is responsible for the overall mamagement and marketing of the Tourism Programme including a Tourism Analyst and a Tourism Officer.
- Technical Coordinator, managing the forest management program with line management responsibility for the Staff Forester, the Assistant Forester, Field Ecologist and the other forestry staff.

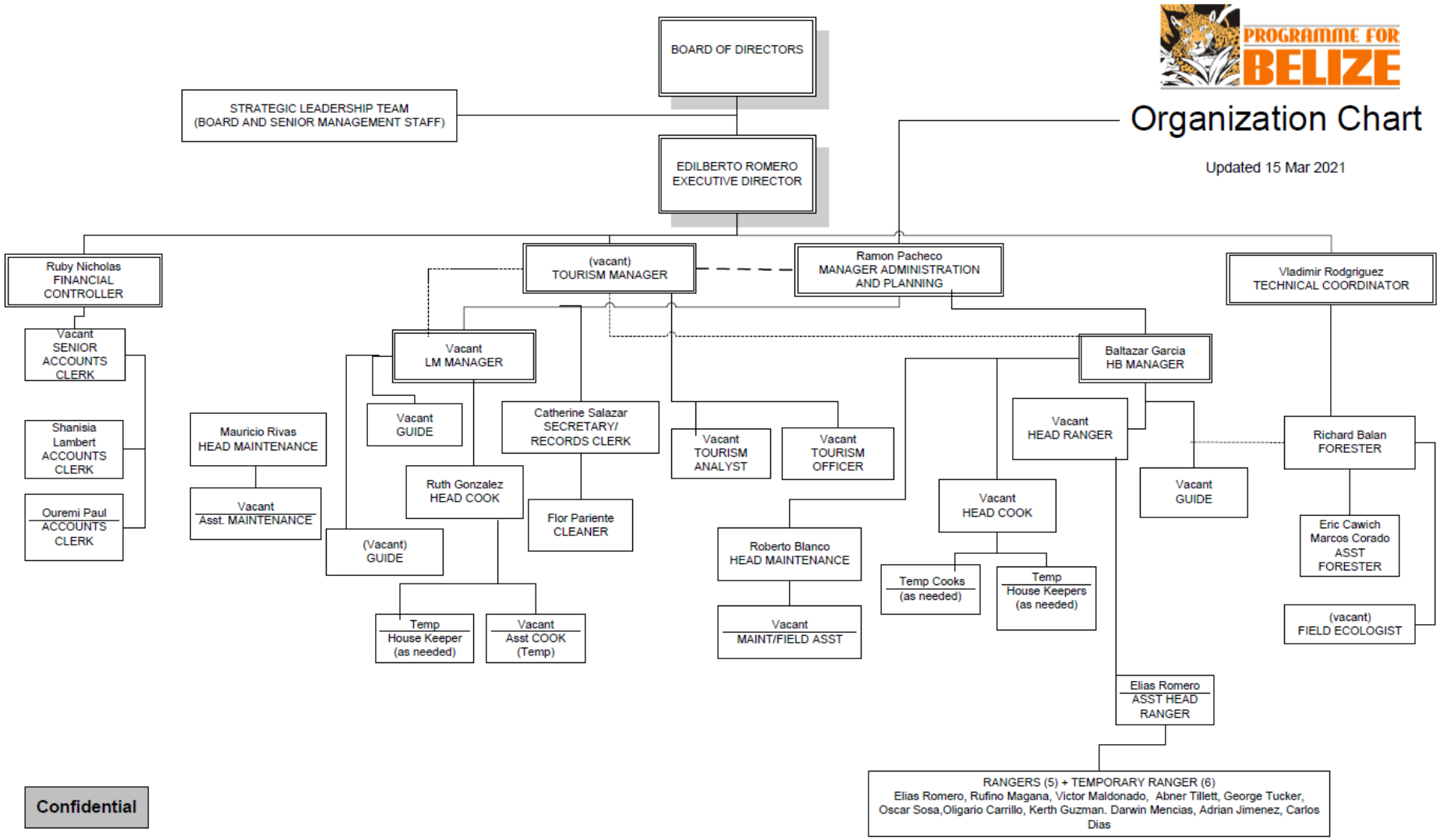

Figure 15: Programme for Belize Organization Chart

These posts are supplemented by temporary and short-term contract staff to cover specific tasks in the annual work cycle. Skill levels and qualifications are high and the organizational culture encourages career development, facilitating opportunities for further training and education often followed by re-hiring in a more senior position.

Recognized constraints, however, consist of a heavy multi-tasking workload falling on senior management staff and difficulties in covering the full range of work programs with available field staff. This has been compounded by the staffing shortage due to pandemic-related funding shortfalls. Furthermore, there is a consistent shortfall of BZ$200,000 to 300,000 between the operating budget and reliable income streams. This tends to be covered by grant-funding but is nonetheless debilitating, with constant uncertainty regarding overall funding and more particularly for cash flow. Grant-funding is normally for specific projects and reliance on this support to secure basic operating costs from the administrative overhead tends to pull PfB off its own priority areas. Sustained multi-year financial planning is difficult and re-investment in maintenance and replacement of capital items (buildings and other infrastructure, transport) tend to suffer, hindering day-to-day operations and eventually undermining on-ground management effectiveness and quality.

4.2 REVIEW OF PREVIOUS MANAGEMENT

The most recent self-assessment (2021) conducted for the RBCMA indicates that overall management effectiveness still remains at good (Appendix 7), despite notable weaknesses inresearch, education and awareness, engagement with local communities, and monitoring and evaluation. Notable imporvmenets have occurred in the area of law enforcement. The method used for the self-assessment is adopted from procedures set out by the World Bank and is a rapid assessment that utilizes a scorecard questionnaire that includes the six elements of management (context, planning, inputs, process, outputs and outcomes). The method provides a mechanism to identify needs, constraints and priority actions, and for monitoring progress towards more effective management of protected areas over time.

A review of the management success of implementation of the programmes set out in the 2015-2019 management plan (Appendix 8) shows that while all of the objectives have been met with some overall level of progress, many of the strategic actions were not undertaken, particularly in the area of Stakeholder Outreach, Education and Advocacy. Most of the progress was made in the Ecosystems Protection and Management area.

Success of implementation of some management programmes were hindered primarily by management constraints such as availability of field personnel, project financing, and reallocation of funds to other priority areas. The results of the conservation target viability assessment indicate, however, that the RBCMA conservation targets are in overall good health –

implying that management and conservation actions over the past management planning period continue to be adequate.

4.3 MANAGEMENT GOAL

The management goal of the RBCMA is as follows:

"The RBCMA is a model private protected area that maintains its biological integrity, regionally significant cultural and landscape features, and fosters a sense of civic appreciation, while providing a sustainable flow of ecological goods and services, and economic benefits to its stakeholders."

Meeting this goal will also meet the overall conservation purpose of maintaining RBCMA's ecosystems in good condition.

4.4 MANAGEMENT CONSTRAINTS AND LIMITATIONS

4.4.1 REVENUE GENERATION

PfB is always under-funded in relation to general administration (recurrent expenses), which in turn impacts the tourism and timber harvesting programs. Many of the grants do not include a portion for general administration, which tends to be 10-18% ICR. The NGO characteristic of PfB constrains the profitability of the tourism program, since the organization cannot approach tourism as a "for profit" business venture. Consequently, a tourism marketing budget is in place but is under-funded, which results in limited tourism marketing of the La Milpa Ecolodge and Research Station and the Hill Bank Field Station. This is compounded by the fact that travel and tourism have been negatively impacted by the Covid-19 pandemic as many countries placed a ban on international travel and nations went into lockdowns domestically. Travel and tourism is arguably one of the hardest hit sectors as a result of the pandemic. For Belize, the effects have been severe given the heavy reliance on tourism as a main economic driver.

A tourism marketing and development plan is not in place, and therefore PfB was not to capitalize (pre-Covid) on the opportunity to certify its tourism program (e.g., through Green Globe). While the Tourism Program has continued to be in based at the Belize City office, there have been tourism personnel limitations in the field in relation to the number of available naturalist guides.

While there has investment in infrastructure and equipment at Hill Bank Field Station, the facilities at La Milpa Ecolodge have started to deteriorate and now require upgrading. The passenger bus remains in a sub-standard condition having been in operations for many years; there is a need to modernize the tourism unit transportation vehicle. The road access to Hill Bank

continues to be in a deplorable state for many years. The proposed improvement of the road through the RBCMA will improve the access to Hill Bank, which could be a boon for the tourism program at this field station.

Coupled with these constraints and limitations to the tourism program, as well as increased competition in the sector, tourism visits to the RBCMA continued to remain low and to operate well below its potential. As has been mentioned, the Covid-19 pandemic effectively halted all visits to Belize in 2020. There has been a notable increase in tourism arrivals to Belize in 2021, but it is expected that visitor numbers will not get back to pre-Covid numbers until 2022. These trends will have a direct bearing on tourism visits to RBCMA.

In terms of the timber harvesting program, forestry staff have been unable to gather stock-taking data two to three years in advance to prepare for the rainy season and reduce health risks to staff. This is due to limited staff, infrastructure and equipment. Forest management certification (Forest Stewardship Council/Rainforest Alliance), however, has been maintained, albeit for the overall encompassing management of the RBCMA. The maintenance of the certification has been a challenge because it comes with a significant cost but does not guarantee a higher price for the timber. Certification has been mostly to demonstrate that PfB's timber harvesting is being carried in a sustainable manner.

4.4.2 CONSERVATION PROGRAMS

The major focus of RBCMA work is conservation. However, the field staff have been severely constrained in carrying out their protection work due to shortages of personnel and equipment (vehicles and communications). Over the past ten years, there have been numerous instances when transportation has not been available for patrols due to disrepair. The deteriorating condition of the roads and bridges within the RBCMA has contributed to the disrepair of the PfB vehicles. Even when transportation is available, there may be only one vehicle at the disposal of the Rangers at any given time to patrol a huge geographic area. According to the RBCMA staff, illegal logging and hunting remain a challenge within the protected area.

Neighboring resource users are aware of PfB's personnel and equipment limitations, and seem to know when to encroach into the protected area without much fear of being caught. The challenge is compounded by the fact that help from the relevant authorities (Forest Department, and the Police Department) is rarely guaranteed due to transportation and other resource limitations of those agencies.

At the time of the preparation of this management plan, there were twelve active Rangers. The previous management plan had set a target of 23 Rangers by 2019. There continues to be a dire

need to not only recruit additional Rangers, but to also conduct a review of the performance of the current Ranger force. There are capacity building needs among the RBCMA field staff – e.g., special constable designation and training, cross-training, and training in established protocols and chain-of-command.

4.4.3 CROSS-CUTTING PROGRAMS

The previous management plan included a significant focus on community education and outreach; however, a budget was not allocated for such. Consequently, PfB and RBCMA staff had insufficient contact with the communities surrounding the protected area. The community consultations held as part of the development of the new management plan determined that in general, there are some people from the adjacent communities that depend on the RBCMA resources (timber and non-timber) to generate financial income, physical assets and food. This, of course, is done through illicit means. While local community members extract various forest materials and hunt and fish in the area, the most damaging activity seems to be the illegal extraction of timber resources. There appears to be limited understanding of the RBCMA's purpose and national significance in terms of biodiversity conservation. Community members were aware about the protected area's location (being the historical BEC lands) but an understanding of why it is there and what happens in the protected area is not well understood. The current limited presence of PfB within the communities does little to change this situation. As the communities grow in population and forest resources diminish in village lands, the pressure on the RBCMA is likely to increase. The communities will increase their stake in the RBMCA but it will be for the short term gratification of needs rather than for the long term benefits of conservation.

Scientific research continues to be mostly an opportunistic and/or indirect activity and has not been programmatic except for timber-related research and archaeological research. The RBCMA has therefore not benefitted from strategic scientific data (with the exception of timber-related monitoring) to inform its management decision-making and adaptive management.

There continues to be some critical constraints in administration and planning. Management information and decisions does not filter down to all the PfB departments, thereby hindering the involvement of staff in planning of budgets and work plans. This lack of communication has resulted in inadequate programmatic integration across all departments; cross-fertilization of programs has been missing. The use of information technology at the organization has not been up to par and needs to be improved.

Another critical gap has been the staff compensation framework. Annual compensation increments to account for cost of living increases are not assured.

4.5 MANAGEMENT ZONES

Approximately 65 percent of RBCMA is managed as a strict preserve for the protection of biodiversity and natural habitats representing the core protected area (Figure 16). Only non-extractive activities and non-destructive tourism can be conducted in this core area. The remainder of the protected area is managed as the buffer to the core area where PfB experiments and develops sustainable economic land uses that leave the forest and its environmental values intact.

Any economic activity must meet the following criteria:

1. The activity must not have a significant negative impact on the biodiversity and environmental services of the forest; and
2. The activity must be economically feasible so that it can generate revenue for the protection and management of the RBCMA.

The major zonation categories include:

- Protection Zone (the Core Area)
- Sustainable Timber Harvest Zone
- Savannah Management Zone
- Tourism Zone

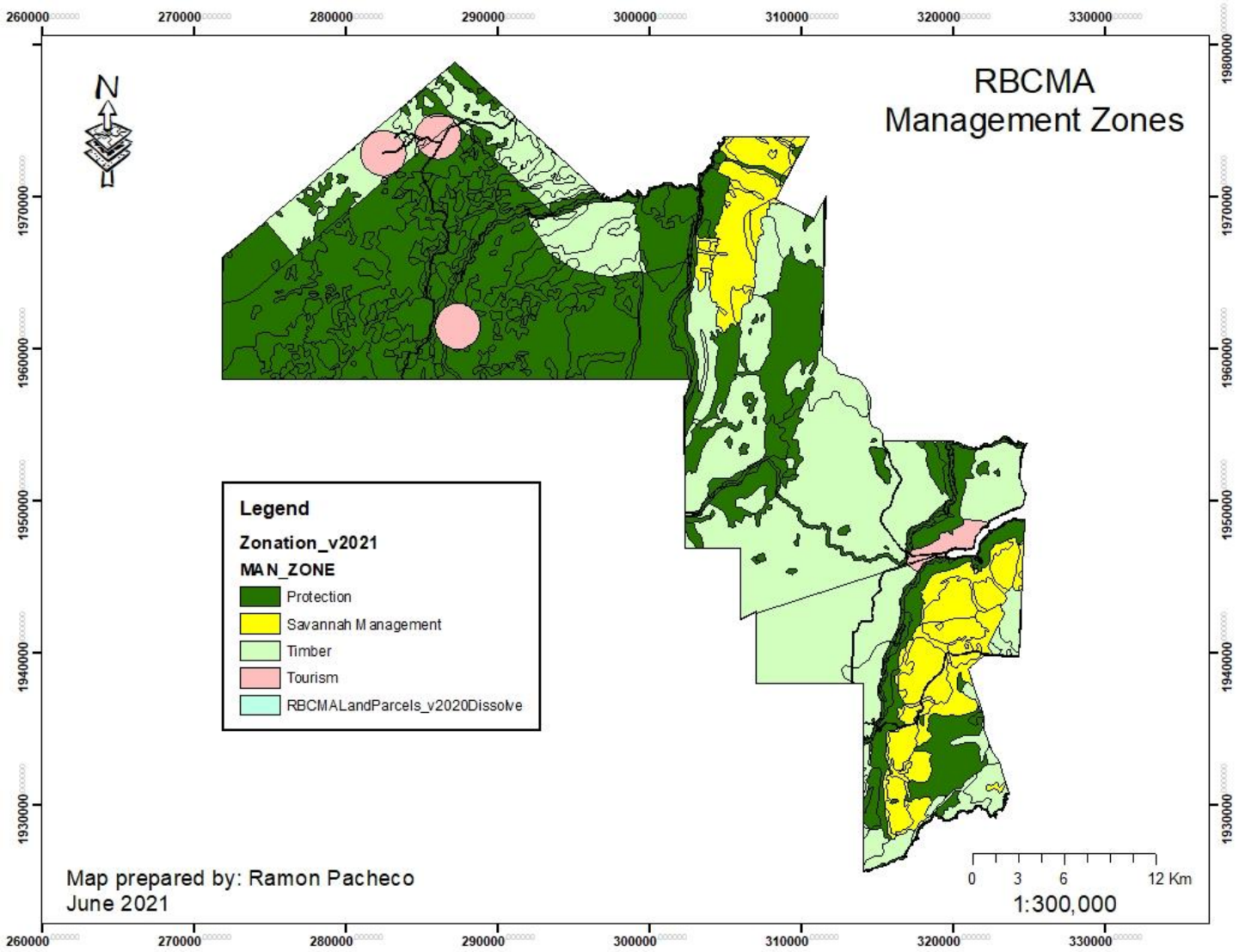

Figure 16: RBCMA management zones

4.5.1 PROTECTION ZONE

This is an extensive area managed on national park precepts and comprising:

- The entire RBCMA west of the Rio Bravo escarpment excepting the buffer zone on the northern property boundary;

- All lands (ecosystems and land facets) recommended by King, et. al, (1992) for conservation due to environmental constraints. These constraints are usually due to slope (primarily in sub-karst areas) and, more extensively, to soil wetness;

- Corridors 250 meters wide along major water bodies (i.e., permanent rivers and lagoons). This serves the same purpose and is more generous than the 30 meter buffer used as a national standard.

The result is to create a large protected zone extending throughout the RBCMA and connected along the main streams. It covers a large area of high (upland) forest and all the wetlands, swamp forests and thickets on the area. Permitted activities include:

- Protective patrolling;

- Biological and archaeological survey and monitoring;

- Non-manipulative research, primarily observational but permitting collection for identification purposes using selective techniques;

- Low impact tourism and educational visits.

In reality most of these activities will be localized, leaving much of the area as a wilderness where ecological processes are undisturbed. It connects to and shares its management regime with the Rio Azul and Aguas Turbias National Parks.

4.5.2 SUSTAINABLE TIMBER HARVEST ZONE

This zone combines the original “secondary forest products” and “experimental timber extraction” zones. It represents the production forest area within the RBCMA, covering all the taller broad-leaved forest formations on level to moderately sloping ground with firm calcareous soils:

- To the east of Booth’s River (comprising the original experimental forestry area);

- On the north-western RBCMA boundary to a depth of 3 km, excepting the La Milpa EcoLodge and Research Center and Archaeological Site (zoned for tourism), the immediate frontier area (zoned for protection to complement Rio Azul and Aguas Turbias National Park management regimes) and the area between the Rio Bravo and Booth's River marshes (where extended to 5 km). The provisional "secondary forest products" zone along the south-western boundary (i.e. against the Gallon Jug boundary) is now included in the protection zone as a "safe" boundary under current management.

The zone has the effect of creating a broad buffer around the protected core. Its extension is justified on the basis of increased confidence that well-managed timber operations are compatible with biodiversity conservation values and can be effectively managed by PfB. It also pushes an active management presence into recognized "hot-spots" of illicit activity. Spot-zones are used to conserve specific features at a finer scale. These are identified during compartment stock survey and applied during annual operations. Spot-zoning guidelines (Wilson, 2006) provide for:

- A standard 50 meter buffer:
    - On both sides of all-weather roads. This is primarily for aesthetic reasons but also minimize the potential fuel load from off-cuts and limbs alongside the road where fire risk is greatest;
    - Around sites of exceptional importance to biodiversity (nesting trees, exceptional but localized plant associations, etc.).

- A buffer area with boundaries set by the Staff Forester according to local conditions to exclude:
    - Areas within the high forest unsuitable for heavy machinery. These will usually consist of drainage lines and small bajo and swamp forest patches within the high forest. Slope may also be local constraint on the escarpments and broken terrain of the western Rio Bravo, where a protective spot zone should be established wherever steepness exceeds 20^{o};
    - Archaeological sites with distinct structures that could be damaged during operations.

Management programmes include all those applied to the protection forest plus:

- Research, demonstration and experimental programmes involving habitat manipulations (patch cuts, liberation thinning, etc.) in defined study plots;

- Extraction of timber and non-timber forest products following sustainable management guidelines established by PfB and subject to certification.

4.5.3 SAVANNAH MANAGEMENT ZONE

For zoning purposes the pine savannahs can be defined as those areas where fire is a key part of the system, both for management and as an ecological process. They correspond to the Puletan soil areas covered by the short-grass savannah vegetation types carrying shrubby and pine/oak formations. They also include the transitional woodlands on the savannah fringe.

Savannah management is aimed at:

- Conserving their outstanding qualities for biodiversity conservation;
- Rehabilitating pine stands as a potential resource that can act as the basis for:
    - A management regime with wider application across northern Belize (i.e. analogous to the development of the broadleaf forest regime);
    - Revenue generation for conservation management by PfB;
    - Kyoto-compliant carbon sequestration through restoration of tree cover.

Capacity to control and manage fire is critical to savannah management and assists management of broadleaf forest and herbaceous swamp.

4.5.4 TOURISM ZONES

Visitor levels are not high in any part of the RBCMA but areas in the vicinity of the field stations have been in regular use (at least pre-Covid). The zones include an area extending to 3 km around both field stations, with a network of maintained interpretative trails. On the western RBCMA it also includes an area with a 3 km radius centered on the La Milpa Archaeological site, which also has an interpretative trail system, and on the Dos Hombres Archaeological site. At Hill Bank the tourism zone is extended to cover the areas used for water-based activities, separated from the production forest by the 100 meter buffers and including:

- The southern end of the lagoon (i.e. the section surrounded by the RBCMA);
- Ramgoat Creek southward to the marl flats;
- Irish Creek, from its mouth to the old Belize Timber saw-mill.

Tourism takes priority in these zones, which are managed to maximize visit quality and educational value. The La Milpa Archaeological site is a special case in that it integrates tourism with archaeological survey and research. Similar zones may be created in future wherever archaeological sites are developed for visitation. On the RBCMA this consists of retaining the sites in their forested setting, using trails, guides and literature for interpretation. Leaving them unrestored except for minor consolidation is the most practical way of protecting them for the future.

4.6 LIMITS OF ACCEPTABLE CHANGE/CARRYING CAPACITY

Visitor use or public resource use at RBCMA is compatible with and directly related to the following management objective: "To boost the tourism development programme so that it can generate at least $1.5 million in gross revenue to re-invest in RBCMA management (e.g., operating cost of the administration and conservation programmes)". To achieve this objective, RBCMA management must ensure that it also focuses on concurrently achieving the other management objectives.

In order to better protect the RBCMA from human activities, the acceptable kinds of resource, social conditions and managerial conditions must be understood. Management actions that can be tracked and traced can then be prescribed to protect or achieve those conditions and allow for stability over time.

Limits of acceptable change, then, are basically the amount of change within the protected area that is considered acceptable as a result of human use. Any amount of human activity will have an impact on the protected area and therefore management should be based on constant monitoring of the site as well as the objectives established for it. It is advisable that within the limits of acceptable change framework, a visitor limit should be established.

A visitor capacity study for the RBCMA should be developed via a separate study as new or more information becomes available in post-Covid times. This visitor carrying capacity study should be carried out as part of a comprehensive Visitor Management Plan for the protected area.

The carrying capacity study should be carried out through a collaborative planning process that includes the following:

- Conduct an assessment of the various activities that occur within the RBCMA to determine the level of use;
- Conduct a survey of the activities with a view to determining projections for unsustainable activity levels;

- Make recommendations for public resource use capacity indicators to be considered by the protected area manager;
- Present findings from the assessment and survey to develop sound recommendations for the various tourism and recreation activities carried out at the RBCMA;
- Develop guidelines for the various activities carried out at the protected area; and
- Literature review of any existing studies, reports and other documents that will provide information and aid in the development of the Visitor Management Plan.

Exceeding or not meeting limits of acceptable change for any component of the site may not necessarily indicate that there has been a change in the protected area's ecosystem components, processes, benefits and services. However, when a limit of acceptable change is not met or has been exceeded this may require investigation to determine whether there has indeed been a change in the RBCMA's ecological character.

4.7 MANAGEMENT STRATEGIES AND OBJECTIVES

Four management strategies have been envisioned for the 2021-2026 management period:

1. Stakeholder Outreach, Education and Advocacy
2. Ecosystems Protection and Management
3. Research and Monitoring
4. Institutional Strengthening and Management

These four strategies are mutually-supporting, and each has its own set of strategic objectives and tactical objectives/actions that are used to guide the programmes and monitor management implementation. Their background and rationale are summarized here.

4.7.1 STAKEHOLDER OUTREACH, EDUCATION AND ADVOCACY

Programme for Belize's RBCMA outreach and awareness activities involving local communities has been minimal and, hence, a Stakeholder Outreach, Education and Advocacy Strategy is needed. The objectives of this strategy are as follows:

- By 2026, strengthen the relationship between PfB and the RBCMA's neighboring communities that traditionally depended on the area for subsistence in order to generate community support for the achievement of the conservation objectives of the RBCMA;
- Develop and implement a public awareness strategy that focuses on the ecological importance and economic contributions of the RBCMA in order to make local

communities and the general public understand the ecological and economic value of the RBCMA and its resources;

- Develop and implement an environmental education strategy for the RBCMA in order to build knowledge, skills, and experience that would foster appreciation for nature and protected areas among the buffer communities;
- Foster an understanding among policy makers and community leaders about the importance of maintaining the RBCMA's natural resources in order to ensure that enabling policies are in place and applied for the protection and effective management of the natural resources of the RBCMA.

4.7.2 ECOSYSTEMS PROTECTION AND MANAGEMENT

This strategy aims to improve and maintain the ecological integrity of the RBCMA through effective protected areas management.

The following six key programmes form the main elements of the Ecosystems Protection and Management Strategy for the next five years: 1) Resource Protection and Enforcement, 2) Fire Management, 3) Savannah Management, 4) Broad-Leaved Forest Management, 5) Aquatic Ecosystem Management, and 6) Contingency Plans for Oil and Roads.

The ecosystems protection and management strategy will focus on achieving the following objectives:

- By mid-2022, institute a strengthened and expanded resource protection and enforcement program at the RBCMA in order to deter and eliminate encroachments and illegal incursions into the protected area;
- Strengthen the fire management program by the end of 2022 guided by the National Fire Management Strategy in order to which have the potential to affect the population structure and composition of native species, particularly Caribbean Pine;
- Strengthen the savannah protection program in order to reduce the poaching of Yellow-headed Parrots and other wildlife that is threatening this ecosystem within the RBCMA;
- Strengthen the broad-leaved forest management program since the broad-leaved forest ecosystem is affected by the most threats compared to the other RBCMA ecosystems, including timber extraction, illegal logging, illegal agriculture, poaching of wildlife, uncontrolled burning, and road infrastructure and oil development;
- Strengthen the management and protection of the aquatic ecosystem within the RBCMA in order to respond to the increasing threats of pollution (pesticides and fertilizers) and invasive species that could affect the population of Central American River Turtles (Hicatees) and cichlids;

- By 2026, develop and implement a water conservation program in order to optimize the ability of the RBCMA hydrological systems to catch and store water.

4.7.3 RESEARCH AND MONITORING

Programme for Belize encourages research in the RBCMA especially if it is going to develop information to assist the management of the reserve and is compatible with the management regime. However, RBCMA research activities have been mostly opportunistic and indirect, or occasionally may be built into a particular donor-aided project. PfB recognizes the importance and necessity of research and thus envisions developing an effective research and monitoring programme, and that can also be cross-cutting with the other RBCMA management programmes. Currently, adequate research facilities do not exist at the RBCMA, and PfB's support and field assistance to researchers might be limited due to budgetary constraints. PfB offers a discounted rate to researchers who want to conduct research within the RBCMA, and this should be maintained

The objectives of the research and monitoring strategy are thereore as follows:

- By 2024, develop and strengthen a research and monitoring program for the RBCMA in order to integrate science-based decision-making for adaptive management of the RBCMA; and

- Strengthen and maintain a monitoring, reporting and verification (MRV) system for the RBCMA in order to Rainforest Alliance (FCS) certification of the RBCMA's timber harvesting operation.

Achieving the first objective would include conducting feasibility studies on the production of NTFP goods and services; developing and implementing standardized biodiversity monitoring protocols in liaison with other national, regional and international initiatives; developing and implementing a fish survey monitoring programme; promoting the field stations as central bases for research activities in the RBCMA; facilitating research into population structure and composition of key wildlife species, in particular the Mahogany, Jaguar, Yellow-headed Parrot, Central American River Turtle, and cichlids; and developing and implementing a microclimate change monitoring plan for RBCMA target habitats.

There is also the need to strengthen and maintain a monitoring, reporting and verification (MRV) system to maintain Rainforest Alliance Forest Stewardship Council (FSC) certification of the RBCMA's timber harvesting operation. Ideally, this would be done through monitoring of High Conservation Value Forests (HCVFs) and development of a database and format for monitoring and reporting activities.

4.7.4 INSTITUTIONAL STRENGTHENING AND MANAGEMENT

This strategy has to do with enhancing and improving the RBCMA's organizational structure and processes, improving executive decision-making, as well as building a strong support structure to enable the work at the protected area to be effectively and efficiently carried out.

The following five key programmes form the main elements of this Institutional Strengthening and Management Strategy for the next five years: 1) Resource Mobilization Strategy, 2) Marketing, 3) Human Resources, 4) Equipment Procurement, and 5) Review of Management Performance.

The objectives of this strategy are as follows:

- Develop a resource mobilization strategy for the RBCMA by mid-2022 and implement thereafter in order to diversify the RBCMA's funding base and ensure the continuity and sustainability of its management programs;

- Improve the branding and marketing of the RBCMA in order to generate greater support for the RBCMA and its management programs;

- Manage and enhance the human resources of the RBCMA in order to optimize employee performance in service of the RBCMA's conservation objectives;

- Strengthen staff recruitment and retention for the RBCMA in order to ensure that RBCMA has sufficient staff for effective management and biodiversity conservation;

- Develop and/or strengthen the equipment procurement system for the RBCMA in order to ensure adequate administration infrastructure and planning; and

- Conduct annual review of management activities in order to ensure compliance with the management plan and make adjustments as necessary (adaptive management).

4.7.5 CONTINGENCY PLANS FOR OIL AND ROADS

Contingency plans for oil and roads are more pronounced in the current management cycle due to GOB's announced intention to build (upgrade) a highway connecting Orange Walk (San Felipe) and Cayo (Spanish Lookout) through the RBCMA. The proposed highway would be routed through the RBCMA's Sustainable Timber Harvesting Zone (Figure 17). The contingency plan is also necessary should there be significant oil finds within or adjacent to the protected area. The objective of this strategy as as follows:

- By the third quarter of 2021, develop a contingency plan for roads in order to adequately prepare in the event that GOB signs a contract for the construction of a highway through the RBCMA;

- By 2022, develop a contingency plan for oil in order to adequately prepare in the event of a commercial oil find within or adjacent to the RBCMA.

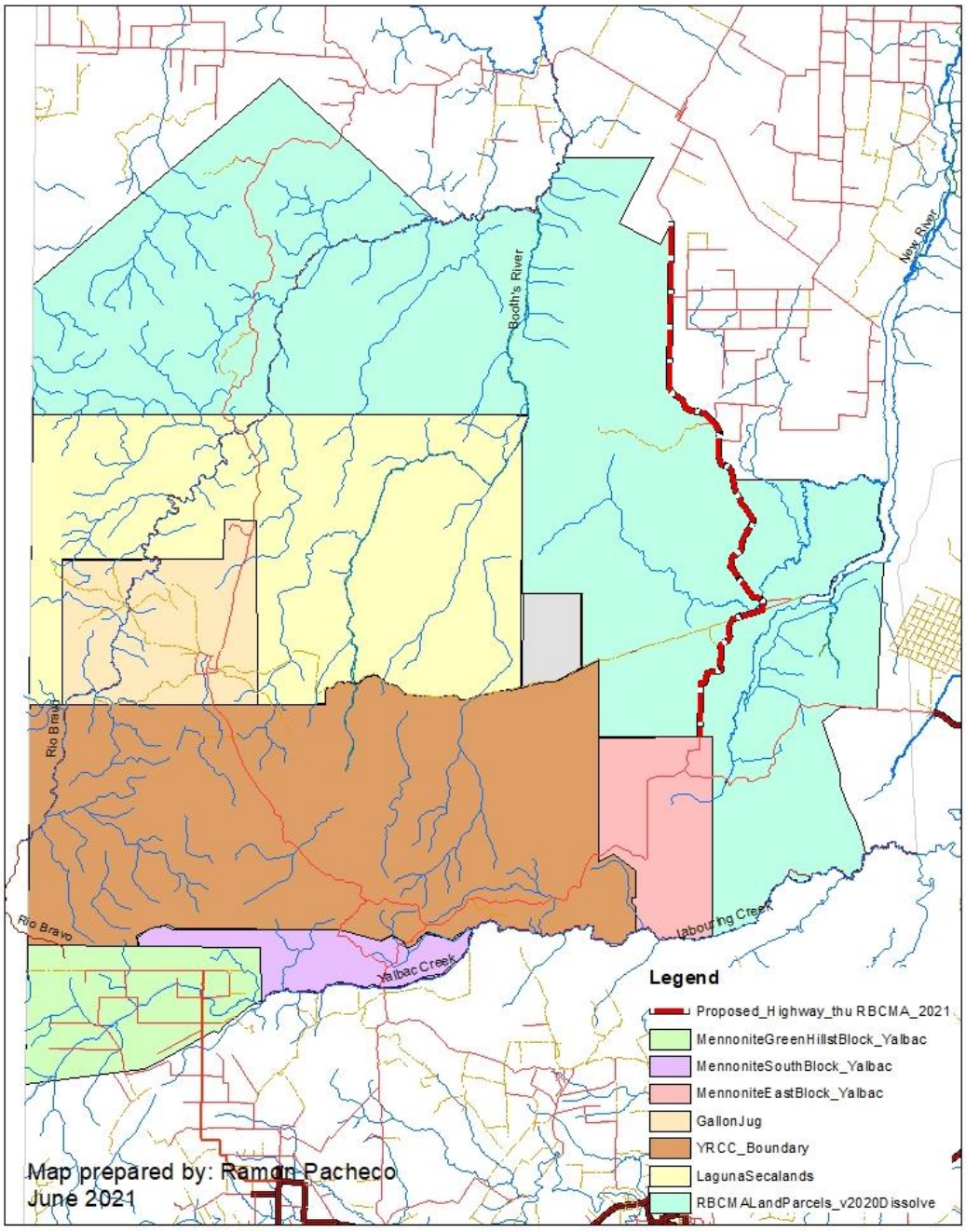

Figure 17: Proposed Highway through the RBCMA

Ideally the contingency plans would address the opening up/disturbance of new habitats due to road construction and usage, seismic survey lines, other oil exploration activities, chance of fires due to increased human presence, potential reduction of the areas tourism potential as a result of loss or displacement of charismatic wildlife species, and potential contamination of surface and groundwater supplies as a result of oil spills or fracking activities.

Two petroleum companies (Maranco Belize Ltd. and Blue Creek Exploration Ltd.) have been granted exploration license covering extensive portions of the RBCMA, and while there is yet to be a commercial oil find by any one of these companies, a find of commercial quantity would impact the viability of this protected area greatly.

Oil exploration in the RBCMA core area (the strict preservation zone that is comprised of 65% of the protected area, and where only non-extractive activities and non-destructive tourism can be conducted) can create significant negative impacts, particularly from seismic surveys and roads, increased illegal activities, degradation and disruption of ecosystem services, and loss of potential revenue for PfB and local communities due to impacts to ecotourism services. Significant impacts can also be caused to the buffer zone area (where PfB allows experiments and develops sustainable economic land uses that leave the forest and its environmental values intact) if the two basic criteria for economic activities in the RBCMA are not met: 1) It must not create significant negative impact on the biodiversity and environmental services of the forest; and 2) It must be economically viable.

Seismic surveys can create transect lines through RBCMA ecosystems that can have lasting impacts on habitats and biodiversity long after the surveys are completed. In addition, mistakes made by un-attentive survey crews could result in wider than necessary transect lines and more unnecessary clearing of habitats.

The threat from road construction and usage is also clearly defined. Road construction activities will bring about an increase in road traffic through the RBCMA, increasing impacts to biodiversity, and creating garbage pollution. This may result in added expense to the PfB which would have to monitor work crews, control access to the area, and provide other logistical support.

Having an open access to new areas of the RBCMA may also encourage illegal activities. Seismic lines can provide conduits for illegal hunting, poaching, and illegal logging. Using seismic lines, illegal loggers and marijuana growers would be able to penetrate further inside the RBCMA to extract logs and cultivate marijuana. Illegal logging can also reduce the designated tree stocks used for sequestering carbon. These impacts may go beyond the duration of the oil exploration activities, and apart from straining the field protection staff, can also significantly increase PfB's monitoring and protection expenses.

Un-natural fires is also a big threat to the RBCMA, and the risk of fires increases with seismic surveys opening new areas, coupled with increased vehicle usage and the presence of more individuals.

Three watersheds drain the RBCMA, namely the Belize River, New River and Rio Hondo watersheds. These drainage systems supply surface and groundwater for RBCMA buffer communities for recreational, agricultural, and domestic use. Oil exploration and production activities (including accidental spills, fracking activities, etc.) could potentially contaminate and degrade these natural systems.

Oil exploration and production could also negatively impact RBCMA charismatic wildlife species. As a result, eco-tourism related activities such as bird-watching and nature tours could potentially decrease, resulting in a loss of revenue for the PfB's management programmes.

Oil exploration and development ideally should not be allowed in the Rio Bravo Conservation and Management Area, especially in the core area managed as a strict preserve. Consideration for oil exploration should only be given for the buffer area if it can be proven that it will not have a significant impact on protected areas, and the additional cost for monitoring, protection and personnel for at least three years beyond the actual exploration is covered by the oil exploration company, and Programme for Belize is compensated for the losses it may incur in road damage, tourism and in carbon sequestration.

Ideally, the PfB envisions developing contingency plans for oil and roads, to include:

- What is acceptable and what is not acceptable regarging oil exploration and road development within the different zones of the RBCMA;
- Directing what special features should be included in new roads that may be constructed;
- Implementing the monitoring plan for seismic lines;
- Working with government and the seismic company to ensure they respect the management regime of the RBCMA and cover the additional management and protection expenses imposed in the RBCMA; and
- Developing a plan for dealing with oil exploration and determining the additional costs (including additional rangers, vehicles, and equipment needed) to minimize the impact of oil exploration.

4.8 MANAGEMENT ACTIONS AND TIMELINE

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
A. STRATEGY: STAKEHOLDER OUTREACH, EDUCATION AND ADVOCACY							
Objective #1: By 2026, strengthen the relationship between PfB and the RBCMA's neighboring communities that traditionally depended on the area for subsistence							
Rationale: To generate community support for the achievement of the conservation objectives of the RBCMA							
1. Establish alternative livelihood projects in the key RBCMA buffer communities (i.e., Lemonal and San Carlos)	Administration & Planning Manager (APM) with support from: Station Managers, Agriculture Department, Forest Department						
a) Design projects and seek funding to create alternative livelihood opportunities for communities							
b) Explore the potential of a viable and sustainable harvesting of NTFPs as a pilot project (e.g., popta seeds) – feasibility study							
2. Conduct regular assessments of the economic benefits of RBCMA to communities	Consultant						
3. Support the provision of access to training and funding opportunities in agricultural best practices	APM with support from: Technical Coordinator (TC)						
a) Implement capacity building training programs on best farming practices							
b) Establish partnership with agriculture research institutions to assist in providing better crop varieties, increase yields and reduce cost (farming methods)							
c) Promote water conservation							
4. Create linkages to micro-financing, agro-processing, and marketing opportunities	APM with support from TC						
5. Develop entrepreneurship development through partnership with BELTRAIDE, etc.	APM with support from TC						
6. Develop and institute a disaster relief plan for Lemonal and San Carlos by 2023	APM with support from TC and Rangers						

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
a) Develop and institute a disaster relief plan for Lemonal and San Carlos							
<u>Objective #2</u>: Develop and implement a public awareness strategy that focuses on the ecological importance and economic contributions of the RBCMA							
<u>Rationale</u>: To make local communities and the general public understand the ecological and economic value of the RBCMA and its resources							
1. Expand the use social media platforms to bring awareness to the Yellow-headed Parrot programme and other conservation efforts within the RBCMA	APM with support of the Tourism Development Unit (TDU)						
2. Highlight the tourism benefits and potential of the RBCMA, as well as the potential for NTFPs and alternative livelihood initiatives for communities that surround the RBCMA	APM with support of the TDU						
3. Expand the use of print and electronic media to highlight the RBCMA management challenges as well as the opportunities	APM						
<u>Objective #3</u>: Develop and implement an environmental education strategy for the RBCMA							
<u>Rationale</u>: To build knowledge, skills, and experience that would foster appreciation for nature and protected areas among the buffer communities							
1. Develop and implement a community education and outreach campaign to develop appreciation for flora and fauna	Community Education and Outreach Officer (CEOO) with support of Executive Director (ED) and STC						
a) Recruit a Community Education and Outreach Officer	ED with support from APM and FD						
b) Visit RBCMA community primary schools annually to make presentations	CEOO with support from Station Managers and Rangers						
c) Conduct at least one Community Open Day per year, with competitions, etc.	CEOO with support from Station Managers and Rangers						

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
d) Foster a sense of civic pride for the RBCMA through the promotion and support of tree planting, and so on	CEOO with support from Station Managers and Rangers						
2. Establish a volunteer program to support the various RBCMA programs (in partnership with UB's natural resources management program)	APM, UB						
3. Conduct one annual training for neighboring farmers on the proper use of pesticides and fertilizers to reduce chemical runoffs around the RBCMA	TC						
Objective #4: Foster an understanding among policy makers and community leaders about the importance of maintaining the RBCMA's natural resources							
Rationale: To ensure that enabling policies are in place and applied for the protection and effective management of the natural resources of the RBCMA							
1. Continue to lobby the government for the updating of legislation and regulations pertaining to the harvesting of and trade in endangered species (e.g., Mahogany)	ED with support from APM and TC						
2. Lobby the government for the formulation and enforcement of legislation and regulations pertaining to the use of sawmills	ED with support from APM and TC						
3. Continuously lobby for improved law enforcement and institution of higher penalties for trespassing, illegal logging, and poaching in private protected areas	ED with support from APM and TC						
B. STRATEGY: ECOSYSTEMS PROTECTION AND MANAGEMENT							
Objective #5: By mid-2022 and beyond, institute a strengthened and expanded resource protection and enforcement program at the RBCMA							
Rationale: To deter and eliminate encroachments and illegal incursions into the protected area							
1. Strengthen the Ranger protection and surveillance plan	TC with support from ED, APM and Finance Director (FD)						
a) Increase the number of rangers to an optimal size (year 1 = 13, year 3 = 16, and year 5/ongoing = 23)							
b) Increase (or at least maintain) the number of RBCMA patrols							
c) Conduct proper, regular scheduled protection patrols							

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
d) Ensure that the Ranger team are always properly equipped (by year 2)							
e) Provide adequate supervision and coordination of patrols (scheduling, implementation, monitoring, reporting)							
f) Collaborate with and coordinate Ranger support with the Belize Maya Forest.							
2. Install two ranger/conservation posts and a fire observation tower at strategic locations (San Felipe savannah, Lemonal area)	ED with support from APM and Finance Director FD						
3. Acquire new patrol vehicles and equipment as needed	ED with support from FD and PACT						
4. Continue to reinforce boundary demarcation through the use of proper signage	TC and Rangers						
5. Maintain access year-round of the San Felipe/Bergen road	ED with support from APM and TC						
6. Provide logistical support to the Forest Department when possible	ED with support from APM and TC						
7. Revisit policy on the use of firearms within the RBCMA, and address the risk/safety of Rangers	ED with support from APM, TC, FD and Board Of Directors						
<u>Objective #6</u>: Develop and institute a fire management program by the end of 2022 guided by the National Fire Management Strategy							
<u>Rationale</u>: To reduce the frequency of uncontrolled/unmanaged fires, which have the potential to affect the population structure and composition of native species, particularly the Caribbean Pine.							
1. Update the fire management plan (for the savannah and broad-leaved forests) by year 1 and implement fully by year 2 and beyond	TC with support from ED, APM and FD						
a) Maintain the fire management team with clear roles and chain of command							

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
b) Conduct annual training sessions on burning techniques and other fire management systems							
c) Maintain/continue prescribed burns of pine savannah on a maintained schedule (rangers and forestry staff) – 5 year cycle							
d) Document fires in RBCMA – size, location, impact/damage, etc., regardless of size/location							
e) Maintain the number of patrols in the hot spots to prevent and contain fires							
f) Conduct routine training of rangers, forestry personnel and community members							
g) Maintain adequate equipment for fire management (tractor, swatters, fire gauges, etc.)							
h) Conduct an annual review of fire-fighting equipment – acquire adequate fire-fighting equipment							
i) Education and awareness on fire management for communities, staff, and guests							
2. Establish and train a community fire brigade (rapid response team) that will act as a support in RBCMA and the communities	TC with support from ED, APM and FD						
3. Develop a hurricane response plan in the event of damage/impact from tropical storm winds	TC with support from ED, APM and FD						
<u>Objective #7</u>: Strengthen the savannah protection program							
<u>Rationale</u>: To reduce the poaching of Yellow-headed Parrots and other wildlife that is threatening this ecosystem within the RBCMA.							
1. Develop and implement a Yellow-headed Parrot (YHP) conservation program	TC with support from ED, APM and FD						
a) Develop and implement a media awareness campaign on the YHP and the RBCMA (including print and electronic media, as well as social media)	APM with support from TC and TDU						

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
b) Assign rangers seasonally for YHP protection (year 2 = 2, year 5 = 4)	TC and Rangers						
c) Schedule and implement regular patrols to the pine savannahs	TC and Rangers						
d) Improve monitoring of YHP nests/breeding success (February to June)	Rangers						
e) Evaluate the need for a community volunteer program for YHP monitoring	TC with support from APM and Rangers						
f) Develop a YHP adopt-a-parrot initiative (nesting site/parrot family)	TC with support from APM and Rangers						
g) Continue and expand partnerships with interested organizations, such as Defiance College and BBC	ED with support from APM and TC						
Objective #8: Strengthen the broad-leaved forest management program							
Rationale: The broad-leaved forest ecosystem is affected by the most threats compared to the other RBCMA ecosystems, including timber extraction, illegal logging, illegal agriculture, poaching of wildlife, uncontrolled burning, and road infrastructure and oil development.							
1. Maintain and continually improve resource protection and enforcement within the RBCMA	TC and Rangers						
2. Ensure adequate funding for fuel (patrols)	FD						
Objective #9: Strengthen the management and protection of the aquatic ecosystem within the RBCMA							
Rationale: To respond to the increasing threats of pollution (pesticides and fertilizers) and invasive species that could affect the population of Central American River Turtles (Hicatees) and cichlids.							
1. Conduct an assessment of pesticide and fertilizer use within the RBCMA/NR Lagoon zone of influence	Consultant(s)						
2. Collaborate with Fisheries Department to implement an invasive species education and outreach programme	TC with support from ED, APM and Station Managers; Fisheries Department						

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
3. By 2023, develop and implement a water quality monitoring program	TC with support from Station Managers, Rangers, Volunteers and Researchers; with support of universities, DOE, FNR, NRTF, Agriculture Department, DOE						
a) Continue conducting water quality testing in the New River watershed							
b) Develop an education strategy for best farming practices							
c) Lobby GOB for increased and sustained monitoring of pesticides and fertilizer use within the New River watershed							
d) Participate on the New River Task Force and support the development of the New River Watershed Management Plan	ED, APM, TC						
Objective #10: By 2026, develop and implement a water conservation program							
Rationale: To optimize the ability of the RBCMA hydrological systems to catch and store water.							
1. Maintain adequate protection efforts to prevent deforestation	TC, Forestry Staff and Rangers						
2. Develop and institute an education program on watershed management and protection	CEOO with support from TC and Station Managers						
3. COndict annual monitor of forest cover change around the RBCMA using satellite imagery	TC						
4. Continue to work with neighbouring landowners for forest connectivity	TC with support from ED and APM						
C. STRATEGY: RESEARCH AND MONITORING							
Objective #11: By 2024, develop and strengthen a research and monitoring program for the RBCMA							
Rationale: To integrate science-based decision-making for adaptive management of the RBCMA.							
1. Explore the potential of NTFP goods and services (via feasibility studies) based on the request of an interested party (and possibly financed by them)	Researchers with support from TC and Forestry Staff						

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
2. Maintain and expand standardized biodiversity monitoring protocols in liaison with other national, regional and international initiatives	TC with support from Consultants						
3. Conduct ecological and sociological assessments of fish stock status within the New River Lagoon and associated waterways (link to hicatee/turtle and bay snook)	TC with support from Rangers, Volunteers and Researchers						
4. Continue to promote the field stations as central bases for research activities in the RBCMA	APM with support from ED, FD, and TDU						
5. Continue and expand the facilitation of research into population structure and composition of key wildlife species, in particular Mahogany, Jaguar, Yellow-headed Parrot, Central American River Turtle, and cichlids.	TC with support from Forestry Staff, Rangers, Interns and Researchers						
6. Undertake an updated climate change analysis for RBCMA; develop a basic climate monitoring strategy.	ED, APM, TC with support from relevant staff; Consultant(s)						
Objective #12: Strengthen and maintain a monitoring, reporting and verification (MRV) system for the RBCMA							
Rationale: To maintain Rainforest Alliance (FCS) certification of the RBCMA's timber harvesting operation.							
1. Continue monitoring of High Conservation Value Forests	TC and Forestry Staff						
2. Develop a database and format for monitoring and reporting activities	TC						
D. STRATEGY: INSTITUTIONAL STRENGTHENING AND MANAGEMENT							
Objective #13: Develop a resource mobilization strategy for the RBCMA by mid-2022 and implement thereafter							
Rationale: To diversify the RBCMA's funding base and ensure the continuity and sustainability of its management programs.							
1. Develop and implement an updated financial sustainability and fundraising strategy for the RBCMA	ED with support from Consultants, FD, APM, TDU and Board						
2. Explore innovative financing mechanisms	ED with support from APM, TC and FD						
3. Identify and maintain donor agencies and cultivate/strengthen donor relations	ED with support from APM and FD						

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
4. Strengthen the implementation of the sustainable timber management program	TC with support from ED and FD						
5. Develop and implement a tourism recovery strategy for the RBCMA	APM with support from ED, FD and TDU						
a) Conduct research on the tourism potential of the RBCMA	APM and TDU						
b) Based on the results of the research, revise the RBCMA tourism development plan to adequately incorporate Hill Bank, marketing, etc	APM and TDU						
c) Explore the viability of rehabilitating portions of the La Milpa Archaeological Site	ED with support from APM and TDU						
d) Maintain the Hill Bank Field Station to showcase its colonial history and upgrade the La Milpa Ecolodge and Field Station	APM with support from ED, FD and TDU						
e) Explore the viability of developing a Creole Heritage Centre at St. Paul's Bank	APM with support from ED, FD and TDU; St. Paul's Bnak Village Council; NICH						
Objective #14: Improve the branding and marketing of the RBCMA							
Rationale: To generate greater support for the RBCMA and its management programs.							
1. Develop and implement a marketing strategy for the RBCMA	APM with support from ED, FD, and TDU						
2. Improve and maintain website for PfB and the RBCMA, linked to the websites of other protected area management and tourism agencies	APM with support from TDU						
3. Develop professional and attractive logos for RBCMA sites	APM with support from TDU						
Objective #15: Manage and enhance the human resources of the RBCMA							
Rationale: To optimize employee performance in service of the RBCMA's conservation objectives							
1. Conduct a comprehensive training needs assessment (identification of gaps) for effective management of the RBCMA	APM with support from FD						
2. Develop and implement a training program for RBCMA staff	APM and TC						

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
a) Train staff on the use and maintenance of equipment							
b) Train field staff on the pertinent Laws of Belize (e.g., the Wildlife Protection Act, EPA and regulations, Forests Act and regulations, etc.)							
c) Train rangers in protocols for patrols							
Objective #16: Strengthen staff recruitment and retention for the RBCMA							
Rationale: To ensure that RBCMA has sufficient staff for effective management and biodiversity conservation							
1. Prepare clear and detailed Terms of Reference (job descriptions) for all staff posts	APM with support from ED, FD and TC						
2. Develop and implement a Staff Recruitment Policy and Plan (including Succession Planning)	ED with support from APM and FD						
3. Develop and implement preferential hiring policy for employment from local communities	ED with support from APM and FD						
4. Review Compensation Framework including compensation philosophy and pay policy	ED with support from APM and FD						
5. Review and strengthen PfB's Administrative and Personnel Policy Manual	APM with support from TDU						
6. Strengthen performance evaluation framework for staff	APM with support from TDU						
Objective #17: Develop and/or strengthen the equipment procurement system for the RBCMA							
Rationale: To ensure adequate administration infrastructure and planning							
1. Develop and implement a five-year infrastructure development and equipment procurement plan	APM with support from ED, FD and TC						
Objective #18: Conduct annual review of management activities							
Rationale: To ensure compliance with the management plan and make adjustments as necessary (adaptive management)							
1. Conduct management effectiveness assessments on an annual basis (using the METT tool), for submission to the Forest Department	ED and APM						
2. Conduct "Measures of Success" monitoring	ED and APM						

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
3. Preparation and review of annual work plans	Senior Managers						
4. Review of management plan after 2.5 years and after 5 years	ED with support of all staff						
E. OIL AND ROADS CONTINGENCY PLAN							
Objective #19: By the third quarter of 2021, develop a contingency plan for roads.							
Rationale: To adequately prepare in the event that GOB signs a contract for the construction of a highway through the RBCMA.							
1. Develop a contingency plan for roads	APM and TC with support from ED; Consultant(s)						
a) Conduct a rapid ecological assessment of the corridor through which the proposed highway would pass	APM and TC with support from ED; Consultant(s)						
b) Conduct a threats and viability assessment of the corridor through which the proposed highway would pass	APM and TC with support from ED; Consultant(s)						
c) Prepare and present recommendations on how threats (i.e., impacts to biodiversity) could be ameliorated, mitigated or prevented	APM and TC with support from ED; Consultant(s)						
Objective #20: By 2022, develop a contingency plan for oil.							
Rationale: To adequately prepare in the event of a commercial oil find within or adjacent to the RBCMA.							
1. Develop a contingency plan for oil	APM and TC with support from ED; Consultant(s)						
a) Implement the monitoring plan for seismic lines	APM and TC with support from ED; Consultant(s)						
b) Work with GOB and the seismic company(ies) to adequately fund the monitoring plan	APM and TC with support from ED; Consultant(s)						

Management Actions	Responsibility	Year					
		2021	2022	2023	2024	2025	→
c) Develop a "needs" plan related to seismic lines (to include additional rangers, vehicles, and equipment).	APM and TC with support from ED; Consultant(s)						

4.9 MONITORING AND REVIEW

Monitoring and evaluation will operate at three levels:

- Managerial efficiency in implementing planned activities – i.e., are planned activities under each programme actually carried out?
- Overall effectiveness of the management regime as organized under the management plan – do these activities add up to a better managed site?
- Success of management strategies in addressing the current and potential negative impacts on the forest ecosystem – are the strategies properly targeted, with management improvement leading to improvement in management?

4.9.1 EVALUATING MANAGERIAL EFFICIENCY

The following coordination and monitoring process will serve as the mechanism for tracking progress of the Management Plan's implementation and ensuring compliance with assigned responsibilities within the Management Plan. The process includes the following steps:

- The Technical Coordinator and Station Managers shall collect monthly updated management objective summary/status reports (see Appendix 9) by compiling reports from RBCMA personnel.
- The Technical Coordinator and Station Managers ensure that all objectives have been accounted for.
- Monitoring of management plan implementation shall be included as a recurrent agenda item for RBCMA/PfB meetings; reporting of the results of such meetings can be done via the Technical Coordinator's and Station Managers' quarterly reports to the Manager of Administation and Planning.
- The Technical Coordinator and Station Managers make note of unfinished objectives (shortfalls), needs for readjustments of outcomes and target dates (reforecasts), meetings to be called, etc., on a bi-monthly basis. This is recorded using the Objectives, Responsibilities and Targets (ORT) form (see Appendix 10). Reporting can be done via the Technical Coordinator's and Station Managers' quarterly reports to the Manager of Administation and Planning.

4.9.2 MONITORING MANAGEMENT EFFECTIVENESS

The management plan is only a guiding document, setting out a framework for the different actions. Actual implementation is affected by a range of factors that cannot be foreseen up to five years ahead, notably funding availability and the need in practice to modify detailed actions to the terms of financing agreements while maintaining the overall policy thrust.

The principal working documents at this level are the annual plans covering the budget for the organization and for individual programmes. These are then supported by periodic reports, submitted to the Forest Department and usually also required by the funding agency concerned. The cross-check is the key monitoring mechanism for management efficiency, allowing timely remedial action as and when necessary.

The primary means of assessing overall managerial effectiveness is the Management Effectiveness Tracking Tool (METT) Self-Assessment Framework. This exercise should be repeated at the end of the first and third years of the lifetime of the plan, and again in the fifth in preparation for the subsequent plan.

The first assessment gives the opportunity for early revision/overhaul of programmes where necessary and the second is essentially a mid-term review, allowing re-orientation as required. The third assessment represents the final assessment of management performance over the planning period.

The METT Self-Assessment Framework reports progress on management effectiveness via a simple and rapid site assessment system.

The assessment focuses on six elements: context (assessment of importance, threats, and policy environment), planning (assessment of RBCMA design and planning), inputs (assessment of resources needed to carry out management), processes (assessment of the way in which management is conducted), outputs (assessment of the implementation of management programmes and actions; delivery of products and services); and outcomes (assessment of the outcomes and the extent to which they achieved objectives).

The METT Self-Assessment therefore provides an overview of progress in improving the effectiveness of management in the RBCMA, and helps to identify trends and patterns in the management of the RBCMA over time.

A METT Self-Assessment, guided by an Independent Facilitator, should be conducted at the end of the first and third years of the lifetime of the plan, and again in the fifth in preparation for the subsequent plan. See Appendix 11 for the METT Self-Assessment Framework.

4.9.3 MONITORING CONSERVATION SUCCESS

The Evaluation of Management Success (using the tool at Appendix 12) reviews the management actions set out in this Management Plan and assesses the degree to which the management actions have been implemented, to what effect, and what gaps remain. The methodology is set out for and adapted from the National Protected Area System Plan (2019) and is used to guide management actions for the upcoming period. The review should be conducted at the end of the management plan implementation period.

It is important to repeat that the extent of management success will in large part depend on the RBCMA management and staffing arrangements. As has been indicated, the RBCMA staff at its present capacity would not be able to implement all management actions and objectives.

4.10 FINANCING – INDICATIVE BUDGET

The budget figures presented here are only indicative, and reflect budgetary needs over the duration of this management plan (Table 9). Where budget figures are based on annual needs, this figure has been multiplied by the number of years (see Section 4.8 – Management Actions and Timeline) to reflect the management plan time periods. Furthermore, where a budgetary figure is shown as "-----", this suggests that salaries outlay covers the cost of the activity. Where the costs of projects (e.g., alternative livelihood initiatives) are not yet known, these are indicated as "Project Funding" meaning that the costs are to be determined.

To understand the projected budgetary outlays for the respective annual time periods, refer to Section 4.8 (Management Actions and Timeline).

It must be noted also that the indicative budget is specified as "non-staff" or "investments".

The non-staff budget refers to operations, training, materials and equipment, travel and per diem, and contracting and consulting fees.

The investment budget denotes budgetary requirements for capital investments in infrastructure, vehicles, major equipment, and so on.

Please refer to Section 4.10.1 for the summary of the non-staff and investments indicative budget.

Finally, the staff budget is shown separately (Section 4.10.2), and is based on the Administrative Structure presented in Section 4.1.

Table 9: Management Action - FInancing

Management Actions	**Indicative Budget**
A. STRATEGY: STAKEHOLDER OUTREACH, EDUCATION AND ADVOCACY	
Objective #1: By 2026, strengthen the relationship between PfB and the RBCMA's neighboring communities that traditionally depended on the area for subsistence	
1. Support alternative livelihood projects in the key RBCMA buffer communities (i.e., Lemonal and San Carlos)	----- (see Staff Salaries)
a) Design projects and seek funding to create alternative livelihood opportunities for communities	----- (see Staff Salaries)

Management Actions	Indicative Budget
b) Explore the potential of a viable and sustainable harvesting of NTFPs as a pilot project (e.g., popta seeds) – feasibility study	----- (see Staff Salaries) + Plus project funding
2. Conduct regular assessments of the economic benefits of RBCMA to communities	----- (see Staff Salaries)
3. Support the provision of access to training and funding opportunities in agricultural best practices	----- (see Staff Salaries)
a) Implement capacity building training programs on best farming practices	----- (see Staff Salaries) + Plus project funding
b) Establish partnership with agriculture research institutions to assist in providing better crop varieties, increase yields and reduce cost (farming methods)	----- (see Staff Salaries)
c) Promote water conservation	----- (see Staff Salaries)
4. Create linkages to micro-financing, agro-processing, and marketing opportunities	----- (see Staff Salaries)
5. Develop entrepreneurship development through partnership with BELTRAIDE, etc.	----- (see Staff Salaries)
6. Develop and institute a disaster relief plan for Lemonal and San Carlos by 2023	----- (see Staff Salaries)
a) Develop and institute a disaster relief plan for Lemonal and San Carlos	To be determined
<u>Objective #2</u>: Develop and implement a public awareness strategy that focuses on the ecological importance and economic contributions of the RBCMA	
1. Expand the use of social media platforms to bring awareness to the Yellow-headed Parrot programme and other conservation efforts within the RBCMA	----- (see Staff Salaries)
2. Highlight the tourism benefits and potential of the RBCMA, as well as the potential for NTFPs and alternative livelihood initiatives for communities that surround the RBCMA	----- (see Staff Salaries)

Management Actions	Indicative Budget
3. Expand the use of print and electronic media to highlight the RBCMA management challenges as well as the opportunities	----- (see Staff Salaries)
Objective #3: Develop and implement an environmental education strategy for the RBCMA	
1. Develop and implement a community education and outreach campaign to develop appreciation for flora and fauna	
a) Recruit a Community Education and Outreach Officer	----- (see Staff Salaries)
b) Visit RBCMA community primary schools annually to make presentations	$1,000 (annual X 5 = $5,000)
c) Conduct at least one Community Open Day per year, with competitions, etc.	$5,000 (annual X 5 = $25,000)
d) Foster a sense of civic pride for the RBCMA through the promotion and support of tree planting, and so on	Combined with 1 b)
2. Establish a volunteer program to support the various RBCMA programs (in partnership with UB's natural resources management program)	----- (see Staff Salaries)
3. Conduct one annual training for neighboring farmers on the proper use of pesticides and fertilizers to reduce chemical runoffs around the RBCMA	----- (see Staff Salaries)
Objective #4: Foster an understanding among policy makers and community leaders about the importance of maintaining the RBCMA's natural resources	
1. Continue to lobby the government for the updating of legislation and regulations pertaining to the harvesting of and trade in endangered species (e.g., Mahogany)	----- (see Staff Salaries)
2. Lobby the government for the formulation and enforcement of legislation and regulations pertaining to the use of sawmills	----- (see Staff Salaries)
3. Continuously lobby for improved law enforcement and institution of higher penalties for trespassing, illegal logging, and poaching in private protected areas	----- (see Staff Salaries)
B. STRATEGY: ECOSYSTEMS PROTECTION AND MANAGEMENT	
Objective #5: By mid-2022, institute a strengthened and expanded resource protection and enforcement program at the RBCMA	
1. Strengthen the Ranger protection and surveillance plan	
a) Increase the number of rangers to an optimal size (year 1 = 13, year 3 = 16, and year 5/ongoing = 23)	----- (see Staff Salaries)
b) Increase (or at least maintain) the number of RBCMA patrols	$20,000 (annual X 5 = $100,000)
c) Conduct proper, regular scheduled protection patrols	
d) Ensure that the Ranger team are always properly equipped (by year 2)	See 2 below
e) Provide adequate supervision and coordination of patrols (scheduling, implementation, monitoring, reporting)	----- (see Staff Salaries)

Management Actions	Indicative Budget
f) Collaborate with and coordinate Ranger support with the Belize Maya Forest.	----- (see Staff Salaries)
2. Install two ranger/conservation posts and a fire observation tower at strategic locations (San Felipe savannah, Lemonal area)	$100,000 (investment)
3. Acquire new patrol vehicles and equipment as needed	See Objective #17
4. Continue to reinforce boundary demarcation through the use of proper signage	$5,000 (annual X 4 = $20,000)
5. Maintain access year-round of the San Felipe/Bergen road	???
6. Provide logistical support to the Forest Department when possible	Covered in 1 b) and c)
7. Revisit policy on the use of firearms within the RBCMA, and address the risk/safety of Rangers	----- (see Staff Salaries)
Objective #6: Develop and institute a fire management program by the end of 2022 guided by the National Fire Management Strategy	
1. Update the fire management plan (for the savannah and broad-leaved forests) by year 1 and implement fully by year 2 and beyond	----- (see Staff Salaries)
a) Maintain the fire management team with clear roles and chain of command	----- (see Staff Salaries)
b) Conduct annual training sessions on burning techniques and other fire management systems	$1,000 (annual X 4 = $4,000)
c) Maintain/continue prescribed burns of pine savannah on a maintained schedule (rangers and forestry staff) – 5 year cycle	$1,000 (annual X 5 = $5,000)
d) Document fires in RBCMA – size, location, impact/damage, etc., regardless of size/location	----- (see Staff Salaries)
e) Maintain the number of patrols in the hot spots to prevent and contain fires	Covered elsewhere
f) Conduct routine training of rangers, forestry personnel and community members	$1,000 (annual X 4 = $4,000)
g) Maintain adequate equipment for fire management (tractor, swatters, fire gauges, etc.)	$5,000 (annual X 4 = $20,000)
h) Conduct an annual review of fire-fighting equipment – acquire adequate fire-fighting equipment	TBD
i) Education and awareness on fire management for communities, staff, and guests	$1,000 (annual X 4 = $4,000)
2. Establish and train a community fire brigade (rapid response team) that will act as a support in RBCMA and the communities	$1,000 (bi-annual X 3 = $3,000)
3. Develop a hurricane response plan in the event of damage/impact from tropical storm winds	----- (see Staff Salaries)
Objective #7: Strengthen the savannah protection program	

Management Actions	Indicative Budget
1. Develop and implement a Yellow-headed Parrot (YHP) conservation program	
a) Develop and implement a media awareness campaign on the YHP and the RBCMA (including print and electronic media, as well as social media)	$5,000 (annual X 4 = $20,000)
b) Assign rangers seasonally for YHP protection (year 2 = 2, year 5 = 4)	----- (see Staff Salaries)
c) Schedule and implement regular patrols to the pine savannahs	Covered elsewhere
d) Improve monitoring of YHP nests/breeding success (February to June)	----- (see Staff Salaries)
e) Evaluate the need for a community volunteer program for YHP monitoring	$5,000 (non-staff)
f) Develop a YHP adopt-a-parrot initiative (nesting site/parrot family)	$5,000 (non-staff)
g) Continue and expand partnerships with interested organizations, such as Defiance College and BBC	----- (see Staff Salaries)
Objective #8: Strengthen the broad-leaved forest management program	
1. Maintain and continually improve resource protection and enforcement within the RBCMA (see the resource protection and enforcement program)	Covered elsewhere
2. Ensure adequate funding for fuel (patrols)	----- (see Staff Salaries)
Objective #9: Strengthen the management and protection of the aquatic ecosystem within the RBCMA	
1. Conduct an assessment of pesticide and fertilizer use within the RBCMA/NR Lagoon zone of influence	$2,000 (annual X 4 = $8,000)
2. Collaborate with Fisheries Department to implement an invasive species education and outreach programme	$1,000 (annual X 3 = $3,000)
3. By 2023, develop and implement a water quality monitoring program	
a) Continue conducting water quality testing in the New River watershed	$1,000 (annual X 4 = $4,000)
b) Develop an education strategy for best farming practices	$1,000 (annual X 4 = $4,000)
c) Lobby GOB for increased and sustained monitoring of pesticides and fertilizer use within the New River watershed	Covered elsewhere
d) Participate on the New River Task Force and support the development of the New River Watershed Management Plan	----- (see Staff Salaries)
Objective #10: By 2026, develop and implement a water conservation program	
1. Maintain adequate protection efforts to prevent deforestation	Covered elsewhere
2. Develop and institute an education program on watershed management and protection	$1,000 (annual X 4 = $4,000)

Management Actions	Indicative Budget
3. Conduct annual monitor of forest cover change around the RBCMA using satellite imagery	----- (see Staff Salaries)
4. Continue to work with neighbouring landowners for forest connectivity	----- (see Staff Salaries)
C. STRATEGY: RESEARCH AND MONITORING	
Objective #11: By 2024, develop and institute a research and monitoring program for the RBCMA	
1. Explore the potential of NTFP goods and services (via feasibility studies) based on the request of an interested party (and possibly financed by them)	$25,000 (Consultant X 2 = $50,000)
2. Maintain and expand standardized biodiversity monitoring protocols in liaison with other national, regional and international initiatives	----- (see Staff Salaries)
3. Conduct ecological and sociological assessments of fish stock status within the New River Lagoon and associated waterways (link to hicatee/turtle and bay snook)	$5,000 (annual X 3 = $15,000)
4. Continue to promote the field stations as central bases for research activities in the RBCMA	----- (see Staff Salaries)
5. Continue and expand the facilitation of research into population structure and composition of key wildlife species, in particular Mahogany, Jaguar, Yellow-headed Parrot, Central American River Turtle, and cichlids.	----- (see Staff Salaries)
6. Undertake an updated climate change analysis for RBCMA; develop a basic climate monitoring strategy.	$10,000 (annual X 3 = $30,000)
Objective #12: Develop and institute a monitoring, reporting and verification (MRV) system for the RBCMA	
1. Continue monitoring of High Conservation Value Forests	$5,000 (annual X 5 = $25,000)
2. Develop a database and format for monitoring and reporting activities	----- (see Staff Salaries)
D. STRATEGY: INSTITUTIONAL STRENGTHENING AND MANAGEMENT	
Objective #13: Develop a resource mobilization strategy for the RBCMA by mid-2022 and implement thereafter	
1. Develop and implement an updated financial sustainability and fundraising strategy for the RBCMA	----- (see Staff Salaries) + $25,000 (Consultant X 2 = $50,000)
2. Explore innovative financing mechanisms	----- (see Staff Salaries)
3. Identify and maintain donor agencies and cultivate/strengthen donor relations	----- (see Staff Salaries)

Management Actions	Indicative Budget
4. Strengthen the implementation of the sustainable timber management program	----- (see Staff Salaries) + $ (annual X $ = $)
5. Develop and implement a tourism recovery strategy for the RBCMA	
a) Conduct research on the tourism potential of the RBCMA	----- (see Staff Salaries) + $25,000 (Consultant X 2 = $50,000)
b) Based on the results of the research, revise the RBCMA tourism development plan to adequately incorporate Hill Bank, marketing, etc	
c) Explore the viability of rehabilitating portions of the La Milpa Archaeological Site	
d) Maintain the Hill Bank Field Station to showcase its colonial history and upgrade the La Milpa Ecolodge and Field Station	$150,000 (investment)
e) Explore the viability of developing a Creole Heritage Centre at St. Paul's Bank	Project funding
Objective #14: Improve the branding and marketing of the RBCMA	
1. Develop and implement a marketing strategy for the RBCMA	$40,000 (Consultant) + $10,000 (annual X 5 = $50,000)
2. Improve and maintain website for PfB and the RBCMA, linked to the websites of other protected area management and tourism agencies	
3. Develop professional and attractive logos for RBCMA sites	
Objective #15: Manage and enhance the human resources of the RBCMA	
1. Conduct a comprehensive training needs assessment (identification of gaps) for effective management of the RBCMA	----- (see Staff Salaries)
2. Develop and implement a training program for RBCMA staff	
a) Train staff on the use and maintenance of equipment	----- (see Staff Salaries)
b) Train field staff on the pertinent Laws of Belize (e.g., the Wildlife Protection Act, EPA and regulations, Forests Act and regulations, etc.)	----- (see Staff Salaries)
c) Train rangers in protocols for patrols	----- (see Staff Salaries)
Objective #16: Strengthen staff recruitment and retention for the RBCMA	
1. Prepare clear and detailed Terms of Reference (job descriptions) for all staff posts	----- (see Staff Salaries)
2. Develop and implement a Staff Recruitment Policy and Plan (including Succession Planning)	----- (see Staff Salaries)
3. Develop and implement preferential hiring policy for employment from local communities	----- (see Staff Salaries)

Management Actions	Indicative Budget
4. Review Compensation Framework including compensation philosophy and pay policy	----- (see Staff Salaries)
5. Review and strengthen PfB's Administrative and Personnel Policy Manual	----- (see Staff Salaries)
6. Strengthen performance evaluation framework for staff	----- (see Staff Salaries)
Objective #17: Develop and/or strengthen the equipment procurement system for the RBCMA	
1. Develop and implement a five-year infrastructure development and equipment procurement plan	
a) Procure equipment for patrols	$25,000 X 2 = $50,000 (investment)
b) Procure 4X4 vehicles and ATVs for protection patrols and outreach activities	$125,000 X 2 = $250,000 (investment)
c) Procure one heavy-duty tractor with trailer	$50,000 (investment)
d) Maintain large boat in a "sea-worthy" state at all times	TBD
Objective #18: Conduct annual review of management activities	
1. Conduct management effectiveness assessments on an annual basis (using the METT tool), for submission to the Forest Department	----- (see Staff Salaries)
2. Conduct "Measures of Success" monitoring	----- (see Staff Salaries)
3. Preparation and review of annual work plans	----- (see Staff Salaries)
4. Review of management plan after 5 years	$40,000 (Consultant)
OIL AND ROADS CONTINGENCY PLAN	
Objective #19: By the third quarter of 2021, develop a contingency plan for roads.	
1. Develop a contingency plan for roads	
a) Conduct a rapid ecological assessment of the corridor through which the proposed highway would pass	$30,000 (Consultant)
b) Conduct a threats and viability assessment of the corridor through which the proposed highway would pass	$20,000 (Consultant)
c) Prepare and present recommendations on how threats (i.e., impacts to biodiversity) could be ameliorated, mitigated or prevented	
Objective #20: By 2022, develop a contingency plan for oil.	
1. Develop a contingency plan for oil	
a) Implement the monitoring plan for seismic lines	----- (see Staff Salaries)
b) Work with GOB and the seismic company(ies) to adequately fund the monitoring plan	

Management Actions	Indicative Budget
c) Develop a "needs" plan related to seismic lines (to include additional rangers, vehicles, and equipment).	

4.10.1 INDICATIVE BUDGET – NON-STAFF & INVESTMENTS (SUMMARY)

Management Actions	Indicative Budget
A. STRATEGY: STAKEHOLDER OUTREACH, EDUCATION AND ADVOCACY	
Objective #1: By 2026, strengthen the relationship between PfB and the RBCMA's neighboring communities that traditionally depended on the area for subsistence	-----
Objective #2: Develop and implement a public awareness strategy that focuses on the ecological importance and economic contributions of the RBCMA	-----
Objective #3: Develop and implement an environmental education strategy for the RBCMA	$30,000 (non-staff)
Objective #4: Foster an understanding among policy makers and community leaders about the importance of maintaining the RBCMA's natural resources	-----
B. STRATEGY: ECOSYSTEMS PROTECTION AND MANAGEMENT	
Objective #5: By mid-2022, institute a strengthened and expanded resource protection and enforcement program at the RBCMA	$120,000 (non-staff) + $100,000 (investment)
Objective #6: Develop and institute a fire management program by the end of 2022 guided by the National Fire Management Strategy	$40,000 (non-staff) + $ (investment)
Objective #7: Strengthen the savannah protection program	$30,000 (non-staff)
Objective #8: Strengthen the broad-leaved forest management program	-----
Objective #9: Strengthen the management and protection of the aquatic ecosystem within the RBCMA	$19,000 (non-staff)
Objective #10: By 2026, develop and implement a water conservation program	$4,000 (non-staff)
C. STRATEGY: RESEARCH AND MONITORING	
Objective #11: By 2024, develop and institute a research and monitoring program for the RBCMA	$50,000 (Consultant) + $45,000 (non-staff)
Objective #12: Develop and institute a monitoring, reporting and verification (MRV) system for the RBCMA	$25,000 (non-staff)
D. STRATEGY: INSTITUTIONAL STRENGTHENING AND MANAGEMENT	
Objective #13: Develop a resource mobilization strategy for the RBCMA by mid-2022 and implement thereafter	$100,000 (Consultant) + $150,000 (investment)
Objective #14: Improve the branding and marketing of the RBCMA	$40,000 (Consultant)

Management Actions	Indicative Budget
	+ $50,000 (non-staff)
Objective #15: Manage and enhance the human resources of the RBCMA	-----
Objective #16: Strengthen staff recruitment and retention for the RBCMA	-----
Objective #17: Develop and/or strengthen the equipment procurement system for the RBCMA	$350,000 (investment)
Objective #18: Conduct annual review of management activities	$40,000 (Consultant)
Objective #19: By the third quarter of 2021, develop a contingency plan for roads.	$50,000 (Consultant)
Objective #20: By 2022, develop a contingency plan for oil.	-----

4.10.2 INDICATIVE BUDGET (STAFF SALARIES)

The indicative staff budget is shown below, and is based on the current Administrative Structure presented in Section 4.1. Annual figures are shown (Table 10).

Table 10: Indicative Budget (Staff Salaries)

Staff Post	Indicative Annual Budget (Gross Salaries)
Executive Director	
Administration and Planning Manager	
Technical Coordinator	
Financial Controller	
Tourism Manager (vacant)	
Senior Accounts Clerk	
Accounts Clerk (2)	
Community Education and Outreach Officer	
Tourism Analyst	
Tourism Officer	
Station Manager – La Milpa	
Station Manager – Hill Bank	
Secretary/Records Clerk	
Staff Forester	
Assistant Forester	
Head Ranger	
Assistant Head Ranger	
Rangers ($14,400 X 13) -- Year 1	
+ Rangers ($14,400 X 3) -- Year 3	
+ Rangers ($14,400 X 7) -- Year 5	

Field Naturalist (Tour Guide)	
Field Ecologist	
La Milpa Station Staff (catering & maintenance)	
Hill Bank Station Staff (catering & maintenance)	
GRAND TOTAL	**$**

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APPENDIX 1: RBCMA-ATNP SPECIES INVENTORY, PLANTS

The list is compiled from all available records of plants found to date on or around the Rio Bravo Conservation and Management Area. The taxonomy and nomenclature follows Balick et al 2000 (Balick) unless a more recent assessment has been posted on the web version of the Flora Mesoamericana (FM), in which case the FM takes precedence. Common names are standardised to assist in field work and stock surveys, favouring those in general use in north-western Belize.

The sources for inclusion in the list may be collections or sight records. Collections from the RBCMA with voucher specimens are given precedence. Where numerous specimens have been obtained only a representative selection is listed, although as many different collectors as possible are included. Sight records are only given if there is no voucher specimen or if the collecting locality is given as 'Orange Walk' (in which case the species is only listed if there are supporting sightings). The observers are noted by initials: B – Dr Nick Brokaw; RW - Roger Wilson; SS – 'stock survey', with identifications by Darrell Novello. All ATNP records are from the Rapid Ecological assessment (JM – Jan Meerman) unless noted otherwise. Important collections consist of: GoB – Forest Department herbarium; E – Royal Botanic Gardens, Edinburgh; B& S – Brokaw & Schulze, in Missouri Botanical Gardens; S&R – Standley & Record; W – Winzerling; BM – British Museum.

Family *Scientific name*	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
LYCOPODIOPHYTA					
Lycopodiaceae					
Lycopodiella caroliana (L.) Pic.Serm.		H		E	
POLYPODIOPHYTA					
Schizaeaceae					
Lygodium venustum Sw.	Wire Whiss	L		E	
Adiantaceae					
Acrostichum aureum L	Tiger Bush	H		E	
Adiantum tenerum Sw.	Black Stick		X (sp)	GoB 3219	
Adiantum villosum Sw.				GoB 3220	
Thelypteridaceae					
Thelypteris aff. ovata R.P.St.John		H		E	
Family					

Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Aspleniaceae					
Cyclopeltis semicordata (Sw.) J.Smith				GoB 3222	
Blechnaceae					
Blechnum serrulatum Rich.		H		E	
Salviniaceae					
Salvinia minima Baker		H	X	E.	
Hypolepidaceae					
Pteridium caudatum			X	SR (RW)	
PINOPHYTA					
Pinaceae					
Pinus caribaea Morelet	Caribean Pine	Tl		E.	
CYCADOPHYTA					
Cycadaceae					
Zamia polymorpha D.W. Stev., A. Moretti & L. Gaudio	Camotillo, Mata Raton	H	X	E	
MAGNOLIOPHYTA *MAGNOLIOPSIDA*					
Annonaceae					
Annona glabra L.	Bobwood, Cove Apple	Tm	X (sp)	E	
Annona muricata L.	Soursop	Tm		SR (RW)	
Annona primigenia Standl. & Steyerm.	Wild Custard Apple			GoB 3281	Vera Cruz – Peten
Annona reticulata L.	Custard Apple	Tm		SR (RW,Br.)	
Cymbopetalum mayanum Lundell	Guanabano	Tm		SR (Br)	Atlantic slope
Malmea depressa (Baill.) Fries	Lancewood, Wild Soursop	Ts	X	B&S 448 (as cf. dep.). W 332.E.	
Xylopia frutescens Aubl.	Polewood	Tl		GoB 540, GoB 3251	
Lauraceae					
Cassytha filiformis L.		Hl		SR (RW)	
Licaria campechiana (Standl.) Kosterm.		T		C.S. B. 31 (S&R).	
Licaria peckii (I.M.Johnst.) Kosterm.	Timbersweet	Tl	X (?)	B&S 129 (as cf.). W 23, 34b.	
Nectandra coriacea (Sw.) Griseb.	Laurel, Timbersweet	Ts		SR (Br.)	
Nectandra salicifolia (H.B.K) Nees	Timbersweet	Tm		E (as cf salic.)	
Piperaceae					
Peperomia obtusifolia (L.) A. Dietr.		Hep		SR (RW)	
Piper aduncum L.	Spanish Elder	Ts/S		SR (RW, Br.).	

Family *Scientific name*	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Piper amalago L.	Spanish Elder	S		SR(RW)	
Piper auritum H.B.K.	Cowfoot, Bullhoof	Ts/S		GoB 3230	
Piper jacquemontianum Kunth.		S.	X	B&S 23, 430.	
Piper marginatum Jacq.		S.		B&S 55	
Piper peltatum L.		H/S		SR (RW)	
Piper pseudofuligineum C. DC.		S.		B&S 56	
Piper psilorhachis C. DC.	Spanish Elder	S.	X	B&S 63	Atlantic slope
Piper yucatanense C. DC.		S.		B&S 22, 278.	
Aristolochaceae					
Aristolochia maxima Jacq.				GoB 511	
Nymphaeaceae					
Nymphaea ampla (Salisb.) DC.		Hm/Ha		E.	
Ceratophyllaceae					
Ceratophyllum muricatum			X	SR (RW) – sp.	
Menispermaceae					
Cissampelos pareira L.		L		E.	
Hyperbaena winzerlingii Standl.		Ts	X	B&S 193, E	Atlantic slope
Ulmaceae					
Ampelocera hottlei (Standl.) Standl.	Female Bullhoof	Tl		B&S 41, 264	
Trema micrantha (L.) Blume	Capulin, Wild Bay Cedar	Tm		B&S 96	
Moraceae					
Brosimum alicastrum Sw.	Ramon, Red Breadnut, Ox	Tl	X	B&S 40, 379.E.	
Castilla elastica Sesse	Wild Rubber	Tl		B&S 100	
Dorstenia contrajerva L.		H.		B&S 451	
Ficus americana Aubl.	Fig	He	X sp	B&S 384, W37	
Ficus insipida Willd.	Fig, Amate	Tl		B&S 356, BM/FD	
Ficus maxima Miller		Tl		B&S 33, 34, 214,455, 478. W 589.E.	
Ficus obtusifolia Kunth.				W 85	
Ficus ovalis (Liebm.) Miq.		T		E.	
Ficus cf pertusa L.f.		He/St		SR (Br.)	
Ficus cf. popenoi Standl.		He/St		SR (Br.)	
Maclura tinctoria (L.) D.Don. ex Steud.	Fustic	Tl		B&S 450	
Pseudolmedia glabrata (Liebm.) C.C.Berg	Cherry	T		W 40	
Pseudolmedia spuria (Sw.) Griseb.	Cherry	Tm	X	B&S 131	

Trophis racemosa (L.) Urb.	White Breadnut, White Ramon	Tm		B&S 385. E. GoB 3263	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Cecropiaceae					
Cecropia peltata L.	Trumpet, Guarumo	Tm	X	B&S 82, 370. E.	
Coussapoa oligocephala Donn. Sm.		He/Tl		B&S 210 (as C. sp.). W 192.	
Urticaceae					
Boehmeria cylindrica (L.) Sw.		H		E	
Laportea aestuans (L.) Chew	Nettle	H		SR (RW)	
Pilea microphylla (L.) Liebm.	Lace Plant	H		SR (RW)	
Urera baccifera (L.) Gaud.	Cow Itch	H/S		SR (RW, Br.)	
Myricaceae					
Myrica cerifera L.	Tea Bark, Tea Box	Ts		B&S 272. E.	
Fagaceae					
Quercus oleoides Schlect. & Cham.	Oak	Tl.		B&S 276. E.	
Phytolaccaceae					
Achatocarpus nigricans Triana		S		B&S 50, 351, 352	
Phytolacca rivinoides Kunth. & Brucht.		H		SR (RW)	
Rivina humilis L.	Bloodberry	H		B&S 86	
Nyctaginaceae					
Neea psychotrioides J.D.Smith		Ts		B&S 8, 150, 237, 279, 290. W 286.	
Pisonia aculeata L.		L.	X	SR (RW)	
Cactaceae					
Epiphyllum phyllanthus (L.) Haw. var strictum	Santa Rita	Hep		SR (RW)	
Rhipsalis baccifera (J.Miller) Stearn	Mistletoe Cactus	Hep		SR (RW)	
Selenicereus grandiflorus var. donkelaarii (Salm-Dyck) Bauer		Hep		SR (RW)	
Selenicereus testudo (Karw.) Buxbaum	Devil's Gut	Hep	X	SR (RW)	
Opuntia cochenillifera (L.) Mill.	Cochineal	S		SR (RW)	
Willmattea minutiflora Britt.& Rose		Hep		SR (RW)	Atlantic wet forest affinities
Amaranthaceae					
Iresine diffusa Willd.	Bloodleaf	H		GoB 3238	
Portulacaceae					
Portulaca pilosa L.		H		E	
Polygonaceae					

Coccoloba acapulcensis Standl.		Tm	X	W 36.	
Coccoloba barbadensis Jacq.	Wild Grape	T	X sp	E. B&S 172. W327.	
Coccoloba belizensis Standl.	Wild Grape, Uva	Tl		B&S 353. W 36.	
Coccoloba cozumelensis Hemsl.	Wild Grape	Tm.		B&S 163, 309, 449. E.	
Coccoloba diversifolia Jacq.		Ts		SR (RW)	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Coccoloba reflexiflora Standl.		Ts /S		B&S 394. E (as cf.)	Northern Atlantic slope
Gymnopodium floribundum Rolfe	Bastard Logwood	Ts/S	X	B&S 190, 280.	Northern Atlantic slope
Neomillspaughia paniculata (J.D.Smith) Blake		L.		B&S 83	At northern range limit
Polygonum punctatum Elliott		H		E	
Dilleniaceae					
Curatella americana L.	Yaha	Ts		E.	
Davilla kunthii A. St.Hil.	Chaparro	L.		PA720	
Doliocarpus dentatus (Aubl.) Standl.		L.	X	SR (RW)	
Tetracera volubilis L. subsp. mollis (Standl.) Kub.	Water Tie-Tie	L.		B&S 162, W 62., E.	
Ochnaceae					
Ouratea lucens (HBK) Engler	Laurel	Ts	X sp	B&S 261. E.	
Ouratea nitida (Sw.) Engler	Bastard Blossom Berries	Ts/S		B&S 114, 446. E.	
Sauvagesia erecta L. ssp. brownii (Blanchori)Sastre		H		E.	
Sauvagesia erecta L. ssp. erecta		H		E.	
Theaceae					
Ternstroemia tepezapote Schlecht. & Cham.	River Crabboo	Tl		B&S 434. W 27. E.	
Quiinaceae					
Quiina schippii Standl.	Pigeon Plum	Tl		SR (Br.)	At northern range limit
Clusiaceae					
Calophyllum brasiliense Cambess.	Santa Maria	Tl	X	B&S 294. W 9.E.	
Clusia lundellii Standl.		He	X	B&S 218	
Hypericum pratense Cham.& Schtdl.		H		E	
Vismia camparaguey Sprague & Riley	Old William, Yellow Sangre	Tm		E	
Tiliaceae					
Corchorus siliquosus L.		H		SR (RW)	
Luehea seemanni Triana & Planch.	Caulote	Tl	X	SR (Br.)	
Luehea speciosa Willd.	Caulote, Mountain Moho	Tl		B&S 65,220	
Muntingia calabura L.	Capulin	Ts	X	SR (RW)	
Trichospermum grewiifolium (A.Rich.) Kosterm.	Moho, Narrowleaf Moho, Capulin	Tl	X	SR (RW, Br.)	

Heliocarpus americanus L		T		?	
Sterculiaceae					
Byttneria aculeata Jacq.	Zarza Hueca	L	X	B&S 121	
Guazuma ulmifolia Lam.	Bay Cedar, Pixoy	Tm	X	B&S 462	
Helicteres guazumifolia H.B.K.		S		E.	
Melochia pyramidata L.		H		SR (RW)	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Melochia spicata (L.) Fryxell		H		E	
Theobroma cacao L	Cacao	Ts		SR (Br.)	Introduction
Waltheria indica L.		H		E.	
Bombacaceae					
Ceiba aesculifolia (HBK) Britt. & Baker f.		Tl		SR (Br.)	
Ceiba pentandra (L.) Gaertn.	Cotton, Ceiba	Tl	X	B&S 374, BM/FD	
Ochroma pyramidale (Lam.) Urb.	Polak, Balsa	Tl		SR (RW, Br.)	
Pachira aquatica Aubl.	Provision Bark, Provision Tree	Tl		B&S 476.E.	
Pseudobombax ellipticum (HBK) Dugand	Mapola	Tl	X	B&S 106.E.	
Quararibea sp.	Batidos	Tm		SR (Br.)	
Malvaceae					
Anoda cristata (L.) Schltdl.		H		SR (RW)	
Hampea trilobata Standl.	Moho	Tm	X	W 106. E.	
Hampea stipitata S.Wats	Moho	Tm		B&S 27	
Hibiscus costatus A. Rich.		S/L		E.	
Malachra alceifolia Jacq.	Wild Ochra, Malva	H		SR (RW)	
Malvaviscus arboreus Cav.		S	X	B&S 11	
Pavonia sp.		H		SR (RW)	
Sida acuta Burm.	Broom Weed, Wire Weed	H	X	SR (RW)	
Sida linifolia Cov.		H		E.	
Urena lobata L.	Wild Cotton, Caesar Weed	Hl/S		SR (RW)	
Droseraceae					
Drosera capillaris Poir.	Spider Plant	H		E.	
Flacourtiaceae					
				B&S 47, 348, 383, 469.	
Casearia corymbosa Kunth.	Paletillo	Tm		E.	
Casearia sp.		T		B&S 285	
Laetia thamnia L.		Tm	X	B&S 52, 66, 329. W 1. E.	

Pleuranthodendron lindenii (Turcz.) Sleumer		T		SR (Br.)	
Xylosma flexuosa (Kunth.) Hemsley		S	X sp	W 442. E.	
Zuelania guidonia (Sw.) Britton & Millsp.	Waterwood	Tl	X	B&S 120. W 174, 355.	
Bixaceae					
Bixa orellana L.	Annatto, Achiote	Ts		SR (RW).	
Cochlospermum vitifolium Willd. ex. Spreng.	Wild Cotton	Tm		E	
Lacistemataceae					
Lacistema aggregatum (Berg.)Rusby	Palo Mulatto	Tm		B&S 266	

Family *Scientific name*	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Violaceae					
Hybanthus calceolaria Schultze		H		E	
Orthion malpighiifolium (Standl.) Standl. & Steyerm.				SR (Br.)	
Rinorea guatemalensis (Wats.) Bart.	Wild Coffee, Cafecillo	Ts/Tm		B&S 104, 128, 282.	
Rinorea hummelii Sprague	Wild Coffee, Cafecillo	T		SR (Br.) S&R.	
Turneraceae					
Piriquetia cistoides (L.) Griseb.		H		E	
Turnera aromatica Arbo		S	X	B&S 212. E.	
Turnera diffusa Willd. ex Schult.	Damiana	S		E	
Turnera ulmifolia L.		H		E	
Passifloraceae					
Passiflora biflora			X		
Passiflora foetida L.		Hl	X	E.	
Passiflora mayarum			X		
Passiflora palmeri			X	SR (RW)	
Passiflora rovirosae Killip		Hl	X	B&S195	
Passiflora urbaniana Killip		Hl	X	E	Belize endemic
Caricaceae					
Carica papaya L.	Papaya	Tm		SR (RW, Br.)	
Jacaratia dolichaula	Wild Pawpaw	Tl		SR (Br.)	
Cucurbitaceae					
Cionosicyus macranthus (Pittier) C.Jeffrey				GoB 559	
Melothria pendula L.		L		SR (RW)	
Psiguria triphylla			X		
Sicydium tamnifolium (HBK) Cogn.		L		SR (RW)	
Capparaceae					

Cleome serrata Jacq.		H		SR (RW)	
Forchhammeria trifoliata Radlk.	Bastard Dogwood	Ts	X	SR (Br.)	
Sapotaceae					
Chrysophyllum mexicanum Brandege ex Standl.	Wild Star Apple	Tm	X	B&S 24, 269. W 387. E.	
Manilkara chicle (Pitt.) Gilly	Chicle Macho, Chiquebul	Tl		SR (Br, RW, SS)	
Manilkara zapota L. P. Royen	Sapodilla, Sapote	Tl	X	B&S 130. E.	
Pouteria amygdalina (Standl.) Baehni	Silion, Silly Young	Tl	X	B&S 42, 205, 252	
Pouteria belizensis			X		
Pouteria campechiana (HBK) Baehni	Mammee Ciruela	Tm	X	B&S 308, 381	
Pouteria durlandii (Standl.) Baehni	Mammee Cerera	Tm	X	B&S 126, 233. W 29, 270.	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Pouteria reticulata (Engler) Eyma	Zapotillo	Tl	X	B&S 305, 369. W 12, 75.	
Pouteria sapota (Jacq.) Moore & Stearn.	Mammee Apple, Zapote	Tl		B&S 101, 132, 360. PA721	
Sideroxylon foetidissimum Jacq subsp gaumeri (Pitt.) T.D.Penn	Cream Tree	Tl	X sp	SR (RW, SS)	Yucatec
Sideroxylon obtusifolium (Roem.& Schult.) Penn.		S		E	
Sideroxylon salicifolium (L.) Lam.	Chachiga, Mijico	Tl		SR (Br.)	
Ebenaceae					
Diospoyros bumelioides			X		
Diospyros yatesiana Standl.		T		B&S 85	Atlantic slope
Diospyros salicifolia Willd.				W 15, 78.	
Theophrastaceae					
Jacquinia macrocarpa Cav.	Knock-me-back	S	X	B&S 28, 366, 435. W 537. E.	
Myrsinaceae					
Ardisia compressa HBK	Male Blossom Berry, Grape	Ts	X	B&S 19, 113, 337, 431	Northern range limit
Myrsine sp.		S		SR (Br.)	
Parathesis cubana (A. DC.) Molinet & Maza		S	X	E.	
Connaraceae					
Connarus lambertii Britton		S		E	Northern range limit
Rourea glabra HBK.	Tie-tie	L		SR (RW)	
Chrysobalanaceae					
Chrysobalanus icaco L.	Coco Plum	Tm/S		B&S 112, 403. E.	
Hirtella americana L.	Pigeon Plum	Tl	X	B&S102,124. W2,95.GoB548.E	
Hirtella racemosa Lam.	Wild Pigeon Plum	T		E	

Licania platypus (Hemsl.) Fritsch	Monkey Apple	Tl		SR (RW, Br,SS)	
Fabaceae - Mimosoideae					
Acacia collinsii Saff.	Cockspur, Ant Thorn	Tm		B&S 43. E.	
Acacia cookii Safford		Tm	X sp	SR (Br)	
Acacia gentlei Standl.	Red Cockspur	Tm		SR (RW)	Vera Cruz-Peten
Acacia cornigera (L.) Willd.		Ts		SR (RW)	
Acacia dolichostachya Blake	Wild Tamarind, Black Tamarind	Tl		SR (RW, Br.) S&R.	
Acacia glomerosa Benth.	White Tamarind, Cantemo	Tl		B&S 123, 164. BM/FD. GoB 32	
Albizzia tomentosa (Micheli) Standl.	Wild Tamarind.	Tl		Record 27 (S&R, FoG).	Near southern range limit
Balizia leucocalyx (Britton & Rose) Barneby & Grimes	Wild Tamarind	T		C.S B. (S&R).	Atlantic slope
Calliandra belizensis (Britt. & Rose) Standl.		Ts/S		B&S 136,169,440.	Yucatec
Calliandra houstoniana (Miller) Standl.	Cabello de Angel	S		E.B&S 75..	
Calliandra tergemina (L.) Benth.		S		B&S 186, 191, 422, 444. E.	
Chloroleucon mangense (Jacq.) Britt.& Rose	Guabillo	Tl		BM/FD	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Cojoba arborea (L.) Britt. & Rose	Barba Jolote	Tl		B&S 216	
Cojoba graciliflora (S.F.Blake) Britt. & Rose	Turtle Bone, John Crow Bead	Ts		B&S 277. E. W68	
Desmanthus virgatus (L.) Willd.		H		SR (RW)	
Enterolobium cyclocarpum (Jacq.) Griseb.	Tubroos, Guanacaste	Tl		BM/FD. E.	
Havardia albicans (Kunth.) Britt&Rose		S		E	
Inga vera Willd.	Guamo, Bribri	Tm		B&S 460	
Inga sp.			X sp	SR (Br.).	
Lysiloma acapulcense (Kunth.) Benth.	Jesmo, John Crow Wood			W 624. BM/FD	
Lysiloma latisiliquum (L.) Benth.	Tsalam	Tl		E	
Mimosa albida Humb.& Bonpl. ex Willd.		S		E	
Mimosa asperata L.		S		E	
Mimosa bahamensis Benth.	Bastard Logwood	S	X	E	
Mimosa pellita Humb. & Bonpl. ex Willd. var pellita		S		SR (RW)	
Mimosa pudica L.	Sensitive Weed	H		E	
Mimosa somnians Humb.& Bonpl. ex Willd.		H		E	
Pithecellobium winzerlingii Britton & Rose	Red Fowl	Tm	X sp	C.S.B. 28 (S&R)	Vera Cruz-Peten
Pithecellobium lanceolatum (Humb. & Bonpl.) Benth	Red Fowl	Ts		H.W.W.1.2. W 565.E. B&S 458.	
Pithecellobium macrandrium Donn. Sm.	Pricklewood	T		H.W.W. (S&R). E.	Atlantic slope
Pithecellobium usumacintensis Lundell				W 68.	

Zapoteca formosa (Kunth.) H.Hearn		L		B&S 64	
Zygia peckii (Rob.) Britt. & Rose		Ts		B&S 289, GoB 554.	Atlantic slope
Zygia gigantifolia			X		
Fabacaeae: Caesalpinioideae					
Bauhinia divaricata L.	Cowfoot, Pata de Vaca	Ts	X	E	
Bauhinia herrerae (Britt. & Rose) Standl. & Steyerm.	Pata de Vaca	L	X	SR (RW)	
Bauhinia ungulata L.		S		E	
Caesalpinia gaumeri Greenm.	Warree Wood	Tl	X	SR (Br., RW)	Yucatec
Caesalpinia pulcherrima (L.) Sw.	Pride of Barbados	Ts		SR (RW)	
Caesalpinia yucatanensis Greenm. var yucatanensis	Bastard Billy Webb	Tm	X	W 148	Yucatec
Cassia grandis L.	Bookut, Stinking Toe	Tl		SR (RW, Br.)	
Chamaecrista diphylla (L.) Greene		H		SR (RW)	
Chamaecrista flexuosa (L.) Greene var. flexuosa		H		E.	
Chamaecrista hispidula (Vahl.) H.S.Irwin & Barneby		H		E.	
Chamaecrista nictitans (L.) Moench. var dissadena	Tamarandillo	H/S		SR (RW)	
Dialium guianense (Aubl.) Steud.	Ironwood	Tl		SR (Br., SS).	
Haematoxylon campechianum L.	Logwood	Tm		E.	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Schizolobium parahybum (Vell.) Blake	Quamwood	Tl		S&R.. BM/FD	
Senna papillosa (Britton & Rose) H.S.Irwin & Barneby	Frijol de Cabra	S		SR (RW)	
Senna pendula			X		
Senna peralteana (H.B.K.) H.S.Irwin & Barneby		S		SR (RW)	
Senna undulata (Benth.) H.S.Irwin & Barneby		S	X	E, GoB 525	
Senna uniflora (Mill.) H.S.Irwin & Barneby		H		E	
Tamarindus indica L.	Tamarind	Tm		SR (RW)	
Fabaceae: Papilionoideae					
Acosmium panamensis (Benth.) Yakoul.	Billy Webb	Tl		BM/FD	
Andira inermis HBK	Ballseed	Tl		E.	
Canavalia brasiliensis Mart. ex Benth.		Hl		SR (RW)	
Centrosema angustifolium (Kunth.) Benth.		H		E.	
Centrosema virginianum (L.) Benth.	Butterfly Pea	Hl		SR (RW)	
Clitoria guianensis (Aubl.) Benth.		H		E	
Crotalaria sagittalis L.		H		E	
Dalbergia glabra (Miller) Standl.	Logwood Brush	Ts/L		E	
Desmodium axillare (Sw.) DC.		H		SR (RW)	
Desmodium barbatum (L.) Benth.& Oerst.		H		E	

Desmodium incanum DC.		S		E	
Desmodium tortuosum (Sw.) DC.		H		SR (RW)	
Erythrina folkersii Kruk. & Mold.	Pita, Coral Tree, Tiger Tree	Ts		SR (Br.)	
Galactia striata (Jacq.) Urb.		Hl		E.	
Gliricidia sepium (Jacq.) Steud.	Madre de Cacao	Tm		B&S 144. W 530.E.	
Gliricidia maculata			X		
Lonchocarpus castilloi Standl.	Black cabbage bark, Machich	Tl	X	W 45.BM/FD	
Lonchocarpus guatemalensis Benth.	Dogwood	Tl	X	SR (Br.)	
Lonchocarpus luteomaculatus Pittier		T	X sp	E	
Lonchocarpus rugosus Benth.	Black Cabbage Bark	Tl	X	W 428.E.	
Lonchocarpus xuul Lundell				GoB 538	
Machaerium cirrhiferum Pittier		L		SR (RW)	
Machaerium seemanni Benth.		L		SR (RW)	
Machaerium sp. (cirrhiferum or falciformis)				W 396	
Myroxylon balsamum (L.) Harms	Balsam of Peru	Tl		SR (Br.)	
Ormosia sp.	Hormigo	Tl		SR (Br.)	
Pachyrhizus ferrugineus (Piper) Sorensen		L	X	SR (RW)	
Piscidia piscipula (L.) Sarg.	Jabin	Tl		SR (Nov.)	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Platymischium dimorphandrum Donn. Sm.	Granadillo	Tl		W 377.	
Pterocarpus officinalis Jacq.	Swamp Kaway	Tl		SR (Nov.)	
Pterocarpus rohrii Vahl.	Mountain Kaway	Tl		SR (RW, Br.)	
Rhynchosia americana (Mill.) Metz.		L		E.	
Rhynchosia minima (L.) DC.	Least Snoutbean	Hl		SR (RW)	
Stylosanthes guianensis (Aubl.) Sw.		H		E.	
Stylosanthes viscosa Sw.		H		E.	
Swartzia cubensis (Britt. & Rose) Standl.	Bastard/Northern Rosewood	Tl	X	W 43, 358. BM/FD.E. GoB 544	
Swartzia cf. robinaefolia Willd.				W 198.	
Vatairea lundellii (Standl.) Killip	Bitter Wood	Tl		SR (Br, SS)	
Zornia reticulata Sm		H		E.	
Proteaceae					
Roupala montana Aubl		Ts		B&S258x. E.	
Myrtaceae					
Calyptranthes bartlettii (Standl.)		Ts	X spp	SR (DN)	Belize endemic

Calyptranthes chytraculia (L.) Sw.		S/Ts		SR (Br.)	
Calyptranthes karlingii Standl.		S		SR (Br.)	Atlantic slope
Calyptranthes millspaughii Urb.	Walk-Naked, Indio Desnudo			W 505	Yucatec
Eucalyptus sp.	Eucalyptus	Tl		SR (RW, Br.)	
Eugenia axillaris (Sw.) Willd.		Ts	X spp	E. (as cf axil). GoB 27	
Eugenia buxifolia Lam.		Ts		E	
Eugenia capuli (Schltdl. & Cham.) O.Berg		Ts		SR (DN.)	Atlantic slope
Eugenia origanoides O.Berg.		Ts		E.	
Eugenia rhombea Krug.& Urb. ex Urb.		S		Br 215	
Eugenia winzerlingii Standl.		Ts		E.	Vera Cruz-Peten
Eugenia yucatanensis Standl.	Blossom Berry	T		C.S.B. 27 (S&R).	Yucatec
Myrciaria floribunda (Willd.) Berg.				SR (Br.)	
Pimenta dioica (L.) Merrill	Allspice	Tl	X	SR (RW, Br, DN)	
Psidium guajuva	Guava	Ts		SR(RW)	
Onagraceae					
Ludwigia peruviana (L.) H.Hara		H		SR (RW)	
Ludwigia octovalvis (Jacq.) Raven		H	X	E.	
Melastomaceae					
Clidemia capitellata (Bonpl.) Don.		S	X sp	SR (RW)	
Clidemia novemnervia Triana		S		E	Northern range limit
Clidemia octona (Bonpl.) L.O.Wms		S		B&S 62	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Clidemia sericea D.Don.		S		E	
Clidemia strigillosa (Sw.) DC.		S		SR (RW)	Northern range limit
Conostegia xalapensis (Bonpl.) Don.		S/Ts		SR (RW)	
Henrietta succosa (Aubl.) DC.		S		E	
Miconia albicans Triana		S		E.	
Miconia argentea (Sw) DC.	White Maya	Tm	X	B&S 323	
Miconia ciliata (Rich.) DC	Maya	S		E.	
Miconia impetiolaris (Sw.) D.Don.	Maya	Ts		SR (Br.)	
Miconia longifolia (Aubl.) DC.		T		B&S 209	
Miconia prasina (Sw.) DC.		S		E.	
Miconia cf schlimii Triana	Maya	Tm		SR (RW)	Northern range limit
Miconia cf serrulata (DC.) Naudin		Ts		SR (RW)	
Miconia stenostachya DC.	Pine Ridge Sirin	S		SR (RW)	
Mouriri myrtilloides subsp. parvifolia (Benth.) Morley	Jug, Half Crown	Tm		SR (RW, Br.)	

Pterolepis stenophylla Gleason		H		E.	
Combretaceae					
Bucida buceras L.	Bullet Tree	Tl	X	B&S 118. W 489.E.	
Combretum fruticosum (Loefl.) Stuntz	Tie-tie, Curassow Comb	L		GoB 3294	
Combretum laxum Jacq.		L		B&S 241	
Conocarpus erectus L.	Buttonwood	Ts		SR (Br.)	
Terminalia amazonia (Gmel.) Exell.	Nargusta	Tl	X	B&S 293. W 74.BM/FD	Introduction
Terminalia catappa L.	Almond	Tl		SR (Br, RW)	
Rhizophoraceae					
Cassipourea guianensis Aubl.	Water Wood	Tm	X	B&S 156, 165 (as cf.). W 406. E.	
Rhizophora mangle L.	Red Mangrove	Tm		E.	
Olacaceae					
Schoepfia schreberi J.F.Gmel.		Ts		B&S 187, 188, 441	
Ximenia americana		Ts		Stewart	
Loranthaceae					
Phthirusa pyrifolia (HBK) Eichler		He-pa		E	
Psittacanthus pinicola Kuijt		He-pa		B&S 247	
Struthanthus cassythoides Millsp.		He-pa		SR (RW)	
Struthanthus orbicularis (Kunth.) Blume ex Schult.				E	
Viscaceae					
Phoradendron sp.		He-pa		B&S 117	

Family *Scientific name*	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Balanophoraceae					
Helosis cayennensis (Sw.) Spreng. var mexicana		H-pa		SR (RW)	
Celastraceae					
Crossopetalum gaumeri (Loes.) Lundell		S		B&S 29, 141, 15, 333. Stewart.	
Crossopetalum gentlei (Lundell) Lundell		S		E	Belize endemic
Semialarum mexicanum (Miers.) A.M.W. Mennaga		S		E	
Hippocrateaceae					
Hemiangium excelsum (HBK) A.C.Sm.		Tm		SR (Br.)	
Hippocratea sp.			X sp	Stewart	
Aquifoliaceae					
Ilex guianensis (Aubl.) Kuntze	Cassada, Bird Cherry	T		B&S 407, E.	
Dichapetalaceae					
Dichapetalum donnell-smithii Engler	Auselin	L/T		B&S 429	

Euphorbiaceae					
Adelia barbinervis Schlect. & Cham.	Wild Lime	Ts		B&S 468	
Alchornea latifolia Sw.	Fiddlewood	Tl		B&S 342	
Astrocasia tremula (Griseb.) Webster		Ts		B&S 363	
Bernardia interrupta (Schltdl.) Mull. Arg.	Waika Ribbon	T/S		SR (Br.)	Atlantic slope
Caperonia castaneaefolia (L.) A.St.Hil.		H		E	
Caperonia palustris (L.) St. Hil.		H	X	SR (RW)	
Chamaesyce hirta (L.) Millsp.		H		SR (RW)	
Chamaesyce hypericifolia (L.) Millsp.	Chicken Seed, Wild Pissabed	H		SR (RW)	
Cnidoscolus multilobus (Pax) I.M.Johnst.	Nettle, Picapica	Ts/H		SR (RW, ?Br.).	
Codiaeum variegatum (L.) Blume		S		SR (RW)	
Croton schiedeanus Schltdl.	Wild Cinnamon	Ts		SR (RW)	
Croton glandulosepalus Millsp.		Ts/S		SR (RW)	
Croton hirtus L'Herit.		H		E.	
Croton billbergianus Mull Arg subsp. pyramidalis		Ts/S	X	SR (RW, Br)	
Croton niveus Jacq.		Ts		B&S 273, 398, 399, 436. W267.	
Croton sp.		Ts/S		B&S 183, 334, 364.	
Dalechampia scandens L.		Hl		SR (RW)	
Dalechampia schippii Standl.		L	X	E.	Belize endemic
Drypetes brownii Standl.	Male Bullhoof	Tl	X	C.S.B.38 (S&R) GoB 474	
Drypetes lateriflora (Sw.) Krug. & Urb.		Tm		B&S 53, 157, 306, 317, 439.	
Euphorbia cyathophora Murr.	Redhead	H		SR (RW).	
Euphorbia pulcherrima Willd. ex. Klotzch.	Flor de Pascua	Ts/S		SR (RW)	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Gymnanthes lucida Sw.	False Lignum Vitae	Tm		B&S 134, 292. W 6.	
Jatropha curcas L.		Ts		B&S 109	
Jatropha gaumeri Greenm.			X	W 524, E.	Yucatec
Manihot esculenta Crantz.	Cassava	S		SR (RW)	
Margaritaria nobilis L.f.	Clawberry, Ramon Macho.	Tm	X	B&S 463, 477.	
Phyllanthus acuminatus Vahl.		S		E.	
Plukenetia penninervia Muell.-Arg.		L	X	SR (RW)	
Ricinus communis L.	Castor Oil	Ts/S		SR (RW)	
Sapium lateriflorum Hemsl.	Leche de Maria	Tl	X	SR (RW,Nov,Br)	
Sebastiana adenophora Pax & K.Hoffm.		T	X sp	E.	
Sebastiana confusa Lundell	White Poisonwood	Ts/Tm		W 40a	Greater Peten
Rhamnaceae					

Colubrina arborescens (Mill.) Sarg.		T		B&S 390	
Gouania polygama (Jacq.) Urb.		L.		B&S 122, 194.	
Krugiodendron ferreum (Vahl.) Urb.	Axemaster, Quebracho	Tl		B&S 479	
Ziziphus mauritiana Lam.	Governor's Plum.	Ts/Tm		SR (RW)	
Vitaceae					
Cissus gossypifolia Standl.		L	X	SR (RW)	
Cissus microcarpa Vahl		L		SR (RW)	
Cissus verticillata (L.) Nicolson & Jarvis		L		B&S 3	
Erythroxylaceae					
Erythroxylum guatemalense Lundell	Redwood	S	X	W 518. E. B&S 116.	
Erythroxylum rotundifolium Lunan		S	X	B&S 189, 421. E.	
Malphighiaceae					
Bunchosia sp.		T		SR (RW, Br.)	
Byrsonima bucidaefolia Standl.	Crabboo	T	X	SR (Br.)	
Byrsonima crassifolia (L.) DC.	Crabboo	Tm	X	E.	
Heteropteris brachiata (L.) DC	Sobach	L		GoB 3268	
Heteropteris laurifolia (L.) A.Juss.		S		E.	
Hiraea fagifolia (DC.) Juss.		L		SR (RW)	
Malpighia glabra L	Wild Crabboo	T	X	S&R, SR (RW)	
Stigmaphyllon ellipticum (Kunth.) A. Juss.		L		E.	
Tetrapteris arcana Morton				GoB 504	
Tetrapteris schiedeana Schlecht. & Cham.		L		SR (RW)	
Vochysiaceae					
Vochysia hondurensis Sprague	Yemeri	Tl		SR (RW, Br,DN)	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Polygalaceae					
Polygala longicaulis H.B.K		H		SR (RW)	
Polygala variabilis H.B.K.		H		E	
Polygala sp.		H		E	
Securidaca diversifolia (L.) Blake		L		SR (RW)	
Sapindaceae					
Allophyllus cominia (L.) Sw.	Cherry, Huesillo	Ts/Tm	X	B&S 17. E.	
Blomia prisca (Standl.) Lundell		Tl		B&S 99, 301, 316, 380.	Greater Peten
Cardiospermum grandiflorum Sw.		L		SR (RW)	
Cupania belizensis Standl.	Bastard Grande Betty	Tm	X	B&S 171, 321.	North Atlantic slope
Cupania rufescens Triana & Planche	White Grande Betty	Tm		W 296. E.	northern range limit

Exothea diphylla (Standl.) Lundell	Uayamcox	Tm		SR (Br.)	Yucatec
Exothea paniculata (Juss.) Radlk.		T		SR (Br.)	
Matayba apetala (Madfad.) Radlk.	Boyjob	Tl	X	B&S 320. W 55. E.	
Paullinia cururu L.		L		B&S 7	
Paullinia pinnata L.		L	X	E.	
Sapindus saponaria L.	Soap-seed Tree	Tl		SR (Br, RW)	
Serjanea adiantoides Radlk.		L		E	
Serjania atrolineata Sauvalle & C.Wright		L		SR (RW)	
Serjanea sp.		L.	X sp	E.	
Talisia oliviformis (Kunth.) Radlk.		T		B&S 174, 176	
Talisia floresii Standl.		T		B&S 219	
Thinouia tomocarpa Standl.		L		SR (RW)	Greater Peten
Thouinia paucidentata Radlk.		Tm		B&S 125	Yucatec
Urvillea ulmacea HBK		L		SR (RW)	
Burseraceae					
Bursera simarouba L	Red Gombolimbo	Tl	X	B&S 90, 365. BM/FD.E.	
Protium copal (Schlect. & Cham.) Engler	Copal	Tm	X	B&S 155, 265.E.	
Protium costaricense (Rose) Engler	Copal Macho	T		S&R	Northern range limit
Protium. cf multiramiflorum Lundell	Copal Colorado	Tm		SR (Br.).	Vera Cruz-Peten
Anacardiaceae					
Astronium graveolens Jacq.	Jobillo, Palo Mulatto	Tl		B&S 81	
Astronium fraxinifolium Schott. ex Spreng.				W 342, 360.	
Mangifera indica L.	Mango	Tm/Tl		W 46	Introduction
Metopium brownii (Jacq.) Urb.	Black Poisonwood, Chechem	Tl	X	B&S 295, W 50, GoB 35988	
Mosquitoxylum jamaicense Krug. & Urb.	Bastard Mahogany	Tl		B&S 158	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Spondias mombin L.	Hog Plum	Tl	X	BM/FD	
Spondias purpurea L.	May Plum	Tm		SR (RW)	
Spondias radlkoferi Donn. Sm.	Hog Plum	Tl		SR (Br.)	
Simaroubeaceae					
Simarouba glauca DC.	Negrito	Tl	X	W 21, 566. E. B&S 139	
Picramnia antidesma Sw.		Ts		B&S 146, 369	
Meliaceae					
Cedrela odorata L.	Cedar, Spanish Cedar	Tl	X	B&S 340.BM/FD	Vulnerable
Guarea glabra Vahl.	Cramantee	Tm		B&S 314, 354	

Guarea grandifolia DC.	Wild Ackee	Tl		SR (Br.)	
Melia azedarach L.	Paradise Tree	T		SR (Br.)	
Swietenia macrophylla King	Mahogany, Caoba	Tl	X	B&S 296, 345.BM/FD	Vulnerable
Trichilia havanensis Jacq.	Bastard Lime	Tm	X	B&S 234	
Trichilia minutiflora Standl.	Wild Lime	Tm	X	B&S 39	
Trichilia pallida Sw.	Carbon del Rio	Tm	X	B&S 44	
Rutaceae					
Amyris balsamifera L.		Tm		B&S 433	
Citrus sp.		Tm		SR (RW, Br.)	Introduction
Zanthoxylum caribaeum Lam.	Bastard Prickly Yellow	Tm		B&S 453	
Zanthoxylum ekmanni (Urb.) Alain	Prickly Yellow	Tl		SR (RW, Br.)	
Zanthoxylum juniperinum Poepp.	Black Prickly Yellow	Tm		B&S 341	Northern range limit
Zanthoxylum riedelianum Engl.	Prickly Yellow	T		S&R. W 219.	
Zanthoxylum microcarpum Griseb.	Alligator-toothed Prickly Yellow	T		S&R	
Oxalidaceae					
Oxalis frutescens L.		H		E.	
Araliaceae					
Dendropanax arboreus (L.) Decne & Planch.	White Gombolimbo	Tl	X	B&S 15, 137	
Oreopanax liebmannii Marchal	Yaxyulup	Ts		Winzerling (Yale 9889) (S&R).	
Oreopanax obtusifolius L.O.Williams		He		B&S 217	
Umbelliferae					
Centella asiatica (L.) Urban		H		E	
Loganiaceae					
Mitreola petiolata (J.F.Gmel.) Torr.& Gray		H		E.	
Polypremum procumbens L.		H		E.	
Spigelia anthelmia L.		H		SR (RW)	
Spigelia humboldtiana Cham. & Schlecht.		H		SR (RW)	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Strychnos panamensis Seeman.	Snake-Seed	L	X	B&S 37	
Gentianaceae					
Coutoubia spicata Aubl.		H	X	E.	
Lisianthus axillaris Hemsl.		S		B&S 111. E.	
Schultesia guianensis (Aubl.) Malme		H		E.	
Voyria sp.		H		B&S 262	
Apocynaceae					

Aspidosperma cruentum Woods	Red Mylady	Tl	X (sp)	SR (Br.)	
Aspidosperma megalocarpon Muell.-Arg.	White Mylady	Tl		W 30.E.	
Cameraria latifolia L.	Savanna White Poisonwood	Tm		B&S 332, E.	
Pentalinon andrieuxii (Mull.-Arg) Hanson & Wunderlin	Contrayerba	L		SR (RW)	
Plumeria obtusa (C.Wright) Woods	Zopilote	Tm	X	SR (Br.)	
Plumeria rubra L.	Frangipani	Tm		SR (Br.)	Introduction
Rauvolfia tetraphylla L.		S		E.	
Stemmadenia donnell-smithii (Rose ex J.D.Smith) Woodson	Cojoton	Tl		B&S 45	
Tabernaemontana alba Mill.	Cojon de Perro	Tm	X(sp)	W 379., E. B&S 35	
Tabernaemontana arborea Rose				GoB 3223	
Thevetia ahouai (L.) DC.	Cojon de Mico, Grandpa's Balls	Ts	X	E. GoB 534.	
Thevetia gaumeri Hemsl.	Good-Luck Seed	Ts		SR (RW)	
?Urechites sp.			X(sp)		
Asclepiadaceae					
Asclepias curassavica L.	Curacao Milkweed	H	X	B&S 68	
Matalea gentlei (Lundell & Standl.) Woodson		L		B&S 79, 238	Yucatec
Metastelma schlechttendalii Decne		L		SR (RW)	
Metastelma stenomeres (Standl. & Steryerm.) Stevens		Hl.		E.	Belizean endemic
Sarcostemma bilobum Hook. & Arn.		L		B&S 74	
Solanaceae					
Capsicum annuum L. var aviculare D'Arcy & Eshb.	Bird Pepper, Chile	S		SR (RW)	
Cestrum racemosum Ruiz & Pavon	Night Bloom	Tm		B&S 376	
Physalis gracilis Miers		H		SR (RW)	
Solandra grandiflora Swartz.	Cup of Gold	S		SR(RW)	Introduction
Solanum americanum Mill.	Common Nightshade	H		SR (RW)	
Solanum erianthum D.Don.	Tabaquillo	Ts		SR (RW)	
Solanum hirtum Vahl.	Shumpa	S		SR (RW)	
Solanum tampicense Dunal	Sosumba	H		SR (RW)	
Solanum nudum Kunth.		S	X	B&S 31	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Solanum rugosum Dunal.		Ts		SR (Br.)	northern range limit
Convolvulaceae					
Evolvulus sericeus Sw.	Zig-Zag Morning Glory	H		E	
Ipomoea alba L.	Morning Glory	Hl	X sp	SR (RW.)	

Ipomea crinicalyx Moore		Hl		SR (RW)	
Ipomoea hederifolia L.	Scarlet Creeper	H		SR (RW)	
Ipomea heterodoxa Standl. & Steyerm.		L		B&S 179	
Ipomea indica (Burm) Merill.	Morning Glory, Gloria de Manana	Hl		E	
Ipomea sagittata Lam.	Glades Morning Glory	Hl		E	
Ipomea sepacuitensis Donn. Sm.				GoB 542	
Ipomea cf. setosa Ker.		Hl		SR(RW)	
Ipomea tiliacea (Willd.) Choisy	Quilamul, Hebil, Campanola	Hl		SR (RW)	
Ipomea tuxtlensis House		L		B&S 18, E.	Atlantic slope
Jacquemontia pentantha (Jacq.) D.Don.		Hl		SR (RW)	
Merremia cissoides (Grisseb.) Hall. f.		Hl		SR (RW)	
Merremia umbellata (L.) Hall. f.		Hl		SR (RW)	
Merremia quinquefolia (L.) Hall. f.	White Cowslip	Hl		SR (RW)	
Menyanthaceae					
Nymphoides indica (L.) Kuntze		H		E.	
Hydrophyllaceae					
Hydrolea spinosa L.		H		SR (RW)	
Boraginaceae					
Bourreria mollis Standl.	Black Fiddlewood, Roble	T		C.S.B. (S&R). B&S 88	
Bourreria oxyphyllaria Standl.	Sacpah	Tl		SR (RW, Br., DN). S&R.	Atlantic slope
Cordia alliodora (R.& P.) Oken	Salmwood	Tl		SR (Br., RW,DN)	
Cordia curassavica (Jacq.) Roem. & Schult.		S		SR (RW)	
Cordia dodecandra DC.	Ziricote	Tm		SR (RW, DN)	Yucatec
Cordia sebestena L.	Ziricote	Tm		SR (Br, RW)	Planted, native at San Felipe?
Cordia spinescens L.		S		E.	
Cordia stellifera I.M.Johnston	Bastard Salmwood	T		GoB 30328. S&R	Atlantic slope
Heliotropium angiospermum Murr.		H		SR (RW)	
Heliotropum fruticosum L.		H		E.	
Tournefortia hirsutissima L.		L		SR (RW)	
Verbenaceae					
Aegiphila elata Sw.		S/L		SR (RW)	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Aegiphila monstrosa Moldenke	Vara Blanca	S/Ts		B&S 297, S&R.	
Callicarpa acuminata	Pukin			SR (Br.)	

Cornutia pyramidata L.		S		E	
Gmelina arborea Roxb.	Gmelina	Tl		SR (RW, Br.)	Introduction
Lantana camara L.	Wild Sage, Cinco Negritos	S		E	
Lippia nodiflora Cham.		H		E	
Lippia stoechadifolia (L.) HBK.)		H		E	
Petrea volubilis L.	Purple Wreath	L		SR (RW)	
Priva lappulacea (L.) Pers.		H		SR (RW)	
Rehdera penninervia Standl. ex Moldenke	Hinge Hinge	Tl		B&S 94, 228, 230	
Tectona grandis L.	Teak	Tl		SR (RW, Br.)	Introduction
Stachytarpheta cayennensis (L.Rich.) Vahl.	Wild Verbena	H	X	SR (RW)	
Stachytarpheta jamaicensis (L.) Vahl		H		E	
Stachytarpheta mineacea Moldenke		H/S	X	B&S 223	Greater Peten
Vitex gaumeri Greenm.	Fiddlewood, Yashnik	Tl	X	B&S 119. W 56, 83, 581.BM/FD.E.	
Lamiaceae					
Hyptis conferta Pohl ex Benth.		H		E	
Marsypianthes chamaedrys (Vahl.) Kuntze		H		E	
Teucrium vesicarium Miller	Verbena	H		SR (RW)	
Scrophulariaceae					
Agalinis harperi Pennell		H		E	
Angelonia ciliaris Robins.		H	X	E	
Anisantherina hispidula (Mart.) Pennell		H		E	
Bacopa lacertosa Standl.		H		SR (RW)	
Bacopa monnieri (L.) Pennell		H		E	
Buchnera pusilla Kunth.		H		E	
Russelia campechiana Standl.		HL		SR (RW)	
Russelia sarmentosa Jacq.		H		E	
Stemodia verticillata (Mill.) Hemsl.		H		SR (RW)	
Acanthaceae					
Aphelandra scabra R.Br.	Chacanal	S		B&S 2, 38, 92. E.	
Blechum pyramidatum (Lam.) Urb.		H		GoB 495	
Odontonema callistachyum (Schltdl&Cham.)Kuntze		S		E	
Ruellia nudiflora (Engel. & Gray) Urb.		H		SR (RW)	
Bignoniaceae					
Adenocalymma inundatum DC				GoB 556	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Amphitecna latifolia (Miller) Gentry	River Calabash	Ts/S	X	B&S 244	

Arrabidaea florida P. DC.		L		B&S 1	
Arrabidaea podopogon (DC) A. Gentry				GoB 535	
Crescentia cujete L.	Calabash	Ts		SR (RW, Br.)	
Parmentiera aculeata (HBK) Seem.	Cow Okra	Tm		SR (RW, Br.)	
Tabebuia guayacan (Seem.) Hemsl.	Yellow Mayflower	Tl		Brown 15. B&S 304, 331	
Tabebuia chrysantha (Jacq.) Nich.	Cortez	Tl		SR (RW, DN). C.S.B. (S&R).	
Tabebuia rosea (Bertol.) DC.	Mayflower	Tl	X(sp)	B&S 470 (as cf.) W 84, 558, 587.	
Tynanthus guatemalensis Donn. Sm.		L		SR (RW)	
Lentibulariaceae					
Utricularia adpressa St. Hil.		H		SR (RW)	
Utricularia foliosa L.		Ha		E.	
Utricularia simulans Pilg.		H		SR (RW)	
Campanulaceae					
Lobelia cardinalis L.		H		E.	
Rubiaceae					
Alibertia edulis (L.Rich.(A. Rich.)	Wild Guava	Ts		B&S 9. E.	
Alseis yucatanensis Standley	Wild Mammee	Tl	X	B&S 36	Atlantic slope
Amaioua corymbosa HBK		Tm		B&S 93. E.	
Appunia guatemalensis J.D.Smith		L		B&S 58	
Chiococca alba (L.) Hitch.		L/S		E.	
Chomelia protracta (Bart.) Standley		S		B&S 254. E.	
Coccocypselum guianense (Aubl.) K. Schum.		H		E	
Cosmocalyx spectabilis Standley		Tl		B&S 232, 330	Yucatec
Coutarea hexandra (Jacq.) K.Schum.		T		B&S 349, 371, 454, 456, 457.	
Diodia apiculata (Willd. ex Roem.&Schult) Schum.		H		E	
Diodia sarmentosa Sw.		H		SR (RW)	
Faramea occidentalis (L.) Rich.		Ts		B&S 251	
Geophila repens (L.) I.M. Johnston		H	X	B&S 4	
Guettarda combsii Urb.	Glassy Wood	Tl	X	B&S 97. W 20. E.	
Guettarda elliptica Sw.	Prickle Wood	T		B&S 406, 464	
Guettarda gaumeri Standl.		S		E.	Yucatec
Guattarda macrosperma J.D.Smith		T		B&S 5	
Hamelia patens Jacq.	Fire Bush	S		B&S 20, 25	
Machaonia acuminata Kunth.		S		E.	
Machaonia lindeniana Baill.		S		W 170. E.	
Family					

Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Morinda royoc L.		S		E.	
Morinda yucatanensis Greenm.		S		SR (RW)	Greater Peten
Palicourea triphylla DC.		S		E.	
Psychotria chiapensis Standley	Cassada, White Wood	T	X sp	B&S 287, 346, 355	
Psychotria costivenia Griseb.		S		B&S 12, 21, 59, 67, 70, 215, 283,	
Psychotria domingensis Jacq.		S		B&S 32	
Psychotria fruticetorum Standley		S		B&S 184, 255, 312, 313. E.	
Psychotria horizontalis Sw.		S		B&S 13, 475	
Psychotria officinalis Kuntze		S		E.	northern range limit
Psychotria pubescens Sw.		S		B&S 30. 71, 108, 239, 248, 275	
Psychotria nervosa Sw.		S		SR (RW)	
Psychotria tenuifolia Sw.		S		B&S 14	
Randia aculeata L.		S		B&S 89, 143, 185, 324, 445. E.	
Randia lundelliana Standl		S/L	X sp	E.	
Randia sp.		S		E.	
Richardia scabra L.		H		SR (RW)	
Simira salvadorensis (Standl.) Steyerm.	John Crow Redwood	Tl	X	B&S 196. W 151, 408.	
Spermacoce assurgens Ruiz & Pav.		H		SR (RW)	
Spermacoce verticillata L.		H	X ?	E.	
Compositae					
Acmella pilosa R.K.Jansen		H		SR (RW)	
Ageratum radicans B.L.Rob.		H		E	Belize endemic
Bidens pilosa L	Spanish Needle	H		SR (RW)	
Bidens squarrosa			X		
Calea jamaicense (L.) L.		H		E	
Clibadium arboreum Donn.Sm.		Ts		SR (Br.)	Atlantic slope
Chromolaena odorata (L.) King & Rob.	Crucito	S/L		SR (RW)	
Cosmos caudatus HBK.		H		SR (RW)	
Cyanthillium cinereum (L.) H. Rob.		H		SR (RW)	
Emilia fosbergii Nicolson		H		E	
Hebeclinum macrophyllum (L.) DC		H		SR (RW)	
Goldmanella sarmentosa Greenm.		H		SR (RW)	Greater Peten
Harleya oxylepis (Benth.) Blake		H		SR (RW)	
Koanophyllon albicaule (Sch.Bip.ex Klatt) King & Rob.	Old Woman's Walking Stick	Ts		SR (Br., RW)	
Lasianthaea fruticosa (L.) Becker		S	X	GoB 494	

Melanthera nivea (L.) Small	Spanish Needle	H		E	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Mikania micrantha Kunth		L		E	
Montanoa atriplicifolia (Pers.) Sch.Bip.		L		SR (RW)	
Neurolaena lobata (Sw.) R.Br.	Jack-ass Bitters	H		GoB 3226	
Parthenium hysterophorus L.		H		SR (RW)	
Perymenium gymnolomoides (Less.) DC.		S/L		SR (RW)	
Pluchea odorata (L.) Cass.		S		SR (RW)	
Pluchea foetida L.		H		E	
Spiracantha cornifolia HBK.		H		SR (RW)	
Sphagneticola trilobata (L.) Pruski		H		SR (RW)	
Vernonanthura patens (HBK) L.Robb.				GoB 512	
Wedelia acapulcensis Kunth.		H		E	
Zexmenia serrata La Llave		L		SR (RW)	
LILIOPSIDA					
Dioscoreaceae					
Dioscoria sp.	Wild Yam	L		SR (RW)	
Smilacaceae					
Smilax mollis H.& B.	Sarsaparilla	L		SR (RW)	
Smilax spinosa Miller		L		E	
Dracaenaceae					
Dracaena americana J.D.Smith	Candle Wood	Tm	X	B&S 138	
Hypoxidaceae					
Hypoxis decumbens L.	Star Grass	H		SR (RW)	
Amaryliidaceae					
Hymenocallis littoralis (Jacq.) Salisb.		H		E	
Iridaceae					
Cipura campanulata Ravenna		H		E	
Agavaceae					
Agave angustifolia			X		
Orchidaceae					
Bletia purpurea (Lam.) DC.		H		E	
Catasetum integerrimum			X		
Encyclia bractescens (Lindl.) Hoehne		He	X	SR (RW)	
Encyclia cochleata (L.) Lemee	Black Orchid	He		SR (RW)	

Epidendrum anceps Jacq.	Dingy Epidendrum			SR (RW)	
Epidendrum nocturnum			X		
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Epidendrum paniculatum			X		
Epidendrum rigidum Jacq.	Rigid Epidendrum	He	X	SR (RW)	
Epidendrum stamfordianum Batem.		He		SR (RW)	
Maxillaria rufescens			X		
Maxillaria tenuifolia Lindl.		He	X	SR (RW)	
Maxillaria variabilis			X		
Myrmecophila tibicinis (Batem. ex Lindl.) Rolfe	Canyo, Horn Orchid	He		SR (RW)	
Oeceoclades maculate			X		
Oncidium ascendens Lindl.	Onion Orchid	He	X	SR (RW)	
Oncidium sphacelatum			X		
Ornitocephalus gladiatus			X		
Pleurothallus ?cobanensis			X		
Pleurothallis grobyi Batem. ex Lindl.		He	X sp	SR (RW)	
Polystachya clavata Lindl.		He	X	SR (RW)	
Sacoila lanceolata (Aubl.) Garay		H		SR (RW)	
Spiranthes torta (Thunb.) Gray & H.R.Sweet		H		E	
Rhynchlaelia digbyana			X		
Trigonidium egertonianum Batem. ex Lindl.	Dragon's Mouth	He	X	SR (RW)	
Vanilla planifolia Andrews	Vanilla	L	X	SR (RW)	
Araceae					
Anthurium schlechtendalii Kunth.	Pheasant's Tail	He		SR (RW)	
Dieffenbachia seguine (Jacq.) Schott.	Dumb Cane	H		SR (RW)	Introduction
Montrichardia arborescens (L.) Schott.		Ha		SR (RW)	
Philodendron sp.		H		E.	
Pistia stratiotes L.	Water Lettuce	Ha		SR (RW)	
Syngonium angustatum Schott.		H	X(sp)	E.	
Syngonium podophyllum Schott.	Ochil	Le		SR (RW)	
Lemnaceae					
Lemna sp.			X		
Triuridaceae					
Sciaphila picta Miers		pa (sap)		SR (RW)	
Alismataceae					
Sagittaria lancifolia L.		Ha		E	

Najadaceae					
Najas wrightiana A. Br.		Ha		SR (RW)	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Bromeliaceae					
Aechmea magdalenae (Andre) Andre ex Baker	Silk Grass	H		SR (RW)	
Aechmaea tillandsioides var tillands. (Mart) Baker				GoB 3216	
Aechmea bracteata			X		
Ananas comosus (.) Merr.	Pineapple	H		SR (RW)	
Bromelia penguin			X		
Catopsis sp			X		
Tillandsia balbisiana Schult.f.		He	X	E.	
Tillandsia bulbosa Hook.		He	X	SR (RW)	
Tillandsia fasciculata			X		
Tillandsia festucoides Brong. ex Mez.		He	X	GoB 3247	
Tillandsia juncea (R.& P.) Poir.		He	X	SR (RW)	
Tillandsia streptophylla Scheidw.		He	X	SR (RW)	
Tillandsia usneoides L.	Spanish Moss	He		SR (RW)	
Pontederiaceae					
Pontederia cordata L. var cordata	Pickerel Weed	Ha		SR (RW)	
Typhaceae					
Typha domingensis Pers.		Ha		E.	
Heliconiaceae					
Heliconia latispatha Benth.		H		SR (RW)	
Heliconia rostrata Ruiz & Pavon.		H		SR (RW)	Introduction
Zingiberaceae					
Renealmia sp.		H		SR (RW)	
Costaceae					
Costus pulverulentus C. Presl.		H		SR (RW)	
Marantaceae					
Maranta arundinacea L.	Arrowroot	H		E.	
Maranta gibba Smith				GoB 3235	
Commelinaceae					
Tradescantia spathacea Sw.		H		SR (RW).	
Tripogandra grandiflora (J.D.Sm.) Woodson				GoB 3248	
Xyridaceae					

Xyris jupicai L.Rich.		H		E	
Cyperaceae					
Bulbostylis cf.barbata C.B.Clarke		H		E	
Bulbostylis cf. juncoides (Vahl.) Kukenth.		H		E	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Bulbostylis tenuifolia (Rudge) Macbr.		H		SR (RW)	
Cladium jamaicense Crantz.	Cutting Grass	H		E	
Cyperus cf. aggregatus Endl.		H		E	
Eleocharis interstincta R.Br.		H		E	
Eleocharis sp.		H		E (S304)	
Fuirena cf umbellata Rottb.		H		E	
Rhynchospora barbata (Vahl.) Kunth.		H		SR (RW)	
Rhynchospora contracta Nees) J.Raynal		H		SR (RW)	
Rynchospora holoschoenoides Vahl.		H		E	
Rhynchospora nervosa (Vahl.) Boeck. subsp. ciliata		H		SR (RW)	
Rynchospora sp.		H		E (S256)	
Scleria bracteata Cav.		H	X	E	
Scleria distans Poir.		H	X	E	
Gramineae					
Andropogon bicornis L.		H		E	
Andropogon glomeratus (Walt.) B.S.P.	Broom Sedge	H		SR (RW)	
Andropogon virginicus L.		H		E	
Dichanthelium acuminatum (Swartz) Goul & Clark		H		E	
Dichanthelium strigosum (Muhl.) Freekmann		H		E	
Digitaria cf cayoensis Swallen		H		E	
Digitaria sp.		H		E -B94	
Echinochloa colona (L.) Link		H		E	
Eragrostis elliottii S.Wats.		H		E	Greater Peten
Guadua spinosa (Swallen) McClure	Spiny Bamboo	Woody		SR (RW)	
Homolepis aturensis (Kunth.) Chase		H		E	
Ischaemum latifolium (Spreng.) Kunth.		H		E	
Lasiacis divaricata (L.) Hitchc.		Woody		SR (RW)	
Merostachys pauciflora Swallen		Woody		SR (RW)	
Mesosetum filifolium Hubb.		H		E	
Olyra latifolia L.		Woody		SR (RW)	
Panicum cyanescens Nees		H		E	

Panicum altum Hitch. & Chase		H		E	
Paspalum blodgetti Chapm.		H		SR (RW)	
Paspalum pulchellum Kunth.		H		E	
Paspalum serpentinum Hochst. ex Steud.		H		E	
Paspalum setaceum Michx.		H		E	
Family					
Scientific name	*Common name*	*Form*	*ATNP*	*Sources*	*Conservation status (range)*
Paspalum vaginatum Sw.		H		SR (RW)	
Rhipidocladum bartlettii			X		
Setaria parviflora (Poir.) Kerguelen		H		E	
Sorghastrum setosum Hitchcock		H		E	
Palmae					
Acoellorhaphe wrightii (H.Wendl.) Beccari	Palmetto, Pimenta	Tm	X	B&S 271. E.	
Acrocomia aculeata (Jacq.) Lodd. ex Mart.	Suppa Palm	Tl		SR (RW)	
Attalea cohune Mart.	Cohune	Tl		B&S 487x.	
Bactris major Jacq.	Porknoboy	Tm	X	SR (RW, Br.)	
Bactris mexicana Mart.	Porknoboy	Tm		B&S 180	Atlantic slope
Chamaedorea oblongata Mart.	Xate	Ts	X	SR (RW)	
Chamaedorea sp.	Xate	Ts		B&S 26, 80	
Cocos nucifera L.	Coconut	Tl		SR (Br., RW).	
Crysophila stauracantha (Heynh.) R.Evans	Give and Take	Tm	X	B&S 225, 226	Greater Peten
Desmoncus orthacanthos Mart.	Basket Tie-Tie	L	X	SR (RW)	
Gaussia maya (Cook) Quero & Reed		Tm	X	B&S 319. W 11. GoB 3249, 508	
Roystonea regia (Kunth.) O.F.Cook	Royal Palm	Tl		SR (RW, Br.)	
Sabal mauritiiformis (Karst.) Griseb. & H.Wendle	Botan, Sabal	Tl	X	B&S 486x. E.	

APPENDIX 2: SPECIES OF CONSERVATION CONCERN

Common name	Scientific name	Status	List	Status on RBCMA
Mammals				
Yucatan black howler monkey	Alouatta pigra	Endangered Trade controls	IUCN Red List CITES	Common throughout, high forest
Baird's Tapir	Tapirus bairdii	Endangered Trade controls	IUCN Red List CITES	Frequent, widespread
West Indian Manatee	Trichecus manatus	Vulnerable Trade controls	IUCN Red List CITES	Ranges into New River Lagoon
Elegant Myotis (bat)	Myotis elegans	Near-threatened	IUCN Red List	Recorded
Jaguar	Panthera onca	Near-threatened Trade controls	IUCN Red List CITES	Widespread, frequent to common
Puma	Panthera concolor	Near-threatened	IUCN Red List	Status uncertain, widespread and fairly frequent?
Great false vampire bat	Vampyra spectra	Near-threatened	IUCN Red List	Status uncertain, seen at La Milpa ruins
Neotropical river otter	Lutris longicaudis	Trade controls	CITES	Status uncertain, fairly frequent?
Jaguarundi	Herpailurus yaguarondi	Trade controls	CITES	Status uncertain, recorded
Ocelot	Leopardus pardalis	Trade controls	CITES	Status uncertain, frequent?
Margay	Leopardus wiedii	Trade controls	CITES	Status uncertain, frequent?
Birds				
Yellow-headed parrot	Amazona oratrix	Endangered Trade controls	IUCN Red List CITES	Common, RBCMA pine savannah is nationally important habitat
White-crowned pigeon	Columba leucocephala	Near-threatened	IUCN Red List	Rare, marginal range but recorded at Hill Bank

Olive-sided flycatcher	Contopus cooperi	Near-threatened	IUCN Red List	Regular passage migrant
Great curassow	Crax rubra	Near-threatened	IUCN Red List	Widespread, frequent
Harpy eagle	Harpya harpyia	Near-threatened Trade controls	IUCN Red List CITES	Re-introduced to western RBCMA
Black crake	Laterallus jamaicensis	Near-threatened	IUCN Red List	Status uncertain, rare or local
Black Catbird	Melanoptila glabirostris	Near-threatened	IUCN Red List	Local
Ocellated Turkey	Meleagris ocellata	Near-threatened	IUCN Red List	Widespread, locally common
Crested eagle	Morphnus guianensis	Near-threatened	IUCN Red List	Very uncommon
Golden-winged warbler	Vermivora chrysoptera	Near-threatened	IUCN Red List	Recorded, passage migrant on western RBCMA
Jabiru	Jabiru mycteria	Trade controls	CITES	Frequent on wetlands, breeder
Peregrine Falcon	Falco peregrinus	Trade controls	CITES	Uncommon winter visitor/transient
Reptiles				
Central American river turtle, Hiccattee	Dermatemys mawii	Endangered	IUCN Red List	Common, deeper rivers are important habitat
Mexican giant mud turtle	Staurotypus triporcatus	Near-threatened	IUCN Red List	Frequent to common in deeper water-bodies
Narrow-bridged musk turtle	Claudius angustatus	Near-threatened	IUCN Red List	Recorded, infrequently seen.
Morelet's Crocodile	Crocodylus morelettii	Near-threatened Trade controls	IUCN Red List CITES	Common, all water-bodies

Tabasco mud turtle	Kinosternon acutum	Near-threatened	IUCN Red List	Recorded, La Milpa.
Common slider	Trachemys scripta	Near-threatened	IUCN Red List	Regularly seen in water-bodies
Boa constrictor	Boa constrictor	Trade controls	CITES	Widespread, fairly common
Plants				
Pigeonplum, mosquito stick	Quiina schippii	Endangered	IUCN Red List	Frequent in high forest, eastern RBCMA
Fiddlewood	Vitex gaumeri	Endangered	IUCN Red List	One of commonest species, all forest types
Prickly Yellow	Zanthoxylum ekmanni	Endangered	IUCN Red List	Occurs (NB – sight records and stock surveys usually lump all prickly yellows, fairly common as a group)
Bastard prickly yellow	Zanthoxylum caribaeum	Endangered	IUCN Red List	Occurs, collected on western RBCMA
Black prickly yellow	Zanthoxylum juniperinum	Endangered	IUCN Red List	Occurs, collected on western RBCMA
Vara blanca	Aegiphila monstrosa	Endangered	IUCN Red List	Occurs, collected on western RBCMA
Cedar	Cedrela odorata	Vulnerable	IUCN Red List	Widespread, locally common to fairly common
Palm	Gaussia maya	Vulnerable	IUCN Red List	Frequent, western RBCMA
Silly Young	Pouteria amygdalina	Vulnerable	IUCN Red List	Frequent, mainly western RBCMA
Mahogany	Swietenia macrophylla	Vulnerable	IUCN Red List	Common, all forest types
White Mylady	Aspidosperma megalocarpon	Near-threatened	IUCN Red List	Frequent, all forest types but mainly western
Mata raton	Zamia polymorpha	Near-threatened	IUCN Red List	Fairly common

APPENDIX 3: RBCMA FISH SPECIES

Scientific Name	***International name***	***Creole name***	***Notes***
Cichlidae			
Cichlasoma aureus	Golden Cichlid		*Thorichthys* in DeRahm. Variable and out of range according toOut of range in lit but some 'C. meeki' specimens best ID'd here
			to literature but some specimens may fit here (French 2001).
Cichlasoma freidrichstahli		Mosmos	*Parapetenia* in DeRham.
Cichlasoma intermedium			Strong current
Cichlasoma maculicauda	Spotted Cichlid		
Cichlasoma meeki	Fire-mouth cichlid	Bluefish, Moko Jek	*Thorichthys* in DeRahm. V. common but variable. Confusable
			with *C. aureus.*
Cichlasoma octofasciatum	Jack Dempsey		
Cichlasoma robertsoni	False Fire-mouth Cichlid	Night and Day	*Amphilophus* in DeRham
Cichlasoma salvini	Yellow-belly cichlid	Pritty Fish, Green Gial	*Parapetenia* in DeRham.
Cichlasoma spilurum	Yellow-belly cichlid	Crana	*Archocentrus* in DeRham. Confusable with C. urophthalmus.
Cichlasoma synspilum	Red-head cichlid	Tuba, Mountain Tuba	V. variable. Omnivorous.
Cichlasoma urophthalmus	Mayan cichlid	Crana	Common, carnivorous. *Parapetenia* in DeRham.
Oreochromis nilotica	Tilapia	Tilapia	Introduced, potentially invasive
Petenia splendida		Bay snook	Common, with four colour variants – normal, white, black, red.
Gerreidae			
Eugerres plumieri			
Eleotridae			
Gobiomorus dormitor	Bigmouth Sleeper	Sleeper	
Atherinidae			
Atherinella sp.			As *Melaniris* sp in DeRham?
Poecilidae			NB: DeRham also notes Poecilia sp/spp at Whitewater Lagoon.
Belonesox belizanus	Pike killifish	Poopsy	Carnivorous
Gambusia luma	Sleek mosquitofish	Poopsy	
Gambusia sexradiata		Poopsy	
Heterandria bimaculata			
Phallichthys fairweatheri			

Poecilia ?nicaraguensis	Nicaraguan Gambusia		
Poecilia mexicana	Shortfin molly	Poopsy	
Poecilia ?orri	Mangrove Molly		
Xiphophorus helleri	Green Swordtail		
Xiphophorus maculatus	Southern Platyfish		
Cyprinodontidae			
Rivulus tenuis			
Ictaluridae			
Ictalurus furcatus	Blue Catfish	Bakra	
Ictaluridae sp.		Tiger Bakra	
Ariidae			
Ariopsis assimilis		Catfish	
Pimelodidae			
Rhamdia guatemalensis		Buttersea	
Rhamdia laticauda		Buttersea	
Characidae			
Astyanax aeneus	Banded Tetra	Billam, Sardine	Syn A. fasciatus mexicanus
Brycon ?guatemalensis			
Hyphessobrycon compressus		Billam	As H. milleri/obesus in DeRham. As Brycon sp. ?guatemalensis
			in French 2001.
Clupeidae			
Dorosoma petenense	Threadfin shad	Yellow-striped Billum	
Megalopidae			
Megalops atlanticus	Tarpon	Tarpon	
Synbranchidae			
Synbranchus marmoratus			
Anguillidae			
Anguila rostrata	American Eel	Conger Eel	

APPENDIX 4: RBCMA-ATNP SPECIES INVENTORY - MAMMALS

Base list consists of all species ranging into area according to Emmons & Feer 1997, Reid 1997. References are the earliest written record (published paper, research report) located. Sight records: RW – Roger Wilson; JM – John Masson.

Common name	Scientific name	RBCMA	ATNP	Notes
New World Opossums	Didelphimorpha			
American Opossums	*Didelphidae*			
Common Opossum	Didelphis marsupialis			
Virginia Opossum	Dideplhis virginiana	X		Jacobson et al, 1990
Grey Four-eyed Opossum	Philander opossum	X		Jacobson et al, 1990
Water Opossum	Chironectes minimus			
Mexican Mouse Opossum	Marmosa mexicana	X		Unidentified mouse opossum, Jacobson et al, 1990.
Central American Woolly Opossum	Caluromys derbianus			
Anteaters, Sloths and Armadillos	Xenarthra			
Anteaters	*Myrmecophagidae*			
Northern Tamandua	Tamandua mexicana	X		Jacobson et al, 1990
Silky Anteater	Cyclopes didactylus			
Armadillos	*Dasypodidae*			
Nine-banded Armadillo	Dasypus novemcinctus			
Insectivores	Insectivora			
Shrews	*Soricidae*			
Maya Small-eared Shrew	Cryptotis mayensis			Recorded, ref? (in small mammal trap).
Bats	Chiroptera			
Sac-winged Bats	*Emballonuridae*			
Proboscis Bat	Rhynchonycteris naso	X		Smith, 1994
Greater White-lined Bat	Saccopteryx bilineata	X		Smith, 1994
Lesser White-lined Bat	Saccopteryx leptura	X		Hill Bank, range extension?. Smith, 1994.
Shaggy Bat	Centronycteris maximiliani			
Lesser Dog-like Bat	Peropteryx macrotis			
Greater Dog-like Bat	Peropteryx kappleri			
Least Sac-winged Bat	Balantiopteryx io			
Northern Ghost Bat	Diclidurus albus			
Fishing and Bulldog Bats	*Noctilionidae*			
Greater Fishing Bat	Noctilio leporinus	X		Sight records, New River Lagoon. RW
Leaf-chinned Bats	*Mormoopidae*			

Ghost-faced bat	Mormoops megalophylla			
Common Moustached Bat	Pteronotus parnellii	X		Jacobson et al, 1990
Lesser Moustached Bat	Pteronotus personatus	X		Hill Bank, Smith 1994.
Davy's Naked-backed Bat	Pteronotus davyi	X		Smith, 1994
Leaf-nosed Bats	*Phyllostomidae*			
Common Big-eared Bat	Mycronycteris microtis			
Schmidt's Big-eared Bat	Micronycteris schmidtorum			
Orange-throated Bat	Micronycteris brachyorum			
Bartica Bat	Micronycteris daviesi	X		Hill Bank, range extension?. Smith, 1994.
Common Sword-nosed Bat	Lonchorhina aurita			
Long-legged Bat	Macrophyllum macrophyllum			
Stripe-headed Round-eared Bat	Tonatia saurophila			
Pygmy Round-eared Bat	Tonatia brasiliense			
Davis' Round-eared Bat	Tonatia evotis			
Golden Bat	Mimon bennettii			
Striped Hairy-nosed Bat	Mimon crenulatum	X		Hill Bank, Smith 1994.
Pale Spear-nosed Bat	Phyllostomus discolor			
Pale-faced Bat	Phylloderma stenops			
Fringe-lipped Bat	Trachops cirrhosus	X		Jacobson et al, 1990
Woolly False Vampire Bat	Chrotopterus auritus	X		Smith, 1994
Great False Vampire Bat	Vampyrum spectrum	X		Smith, n.d.
Common Long-tongued Bat	Glossophaga soricina	X		Jacobson et al, 1990
Brown Long-tongued Bat	Glossophaga commissarii	X		Hill Bank, Smith 1994.
Short-tailed Bats	*Carolliinae*			
Silky Short-tailed Bat	Carollia brevicaudata	X		Jacobson et al, 1990
Seba's Short-tailed Bat	Carollia perspicillata	X		Jacobson et al, 1990
Tailless Bats	*Stenodermatinae*			
Little Yellow-shouldered Bat	Sturnira lilium	X		Jacobson et al, 1990
Great Fruit-eating Bat	Artibeus lituratus	X		Jacobson et al, 1990
Intermediate Fruit-eating Bat	Artibeus intermedius	X		Jacobson et al, 1990
Jamaican Fruit-eating Bat	Artibeus jamaicensis	X		Jacobson et al, 1990
Toltec Fruit-eating Bat	Artibeus tolteca	X		Smith, 1994
Pygmy Fruit-eating Bat	Artibeus phaeotis	X		Jacobson et al, 1990
Thomas' Fruit-eating Bat	Artibeus watsoni			

Velvety Fruit-eating Bat	Enchisthenes hartii	X		Smith, 1994. Range extension?
Common Tent-making Bat	Uroderma bilobatum	X		Jacobson et al, 1990
Heller's Broad-nosed Bat	Platyrrhinus helleri	X		Jacobson et al, 1990
Great Stripe-faced Bat	Vampyrodes major	X		Hill Bank, range extension?. Smith, 1994.
Hairy Big-eyed bat	Chiroderma villosum	X		Smith, 1994
Little Yellow-eared Bat	Vampyressa pusilla	X		Jacobson et al, 1990
Wrinkle-faced Bat	Centurio senex	X		Jacobson et al, 1990
Vampire Bats	*Desmodontinae*			
Common Vampire Bat	Desmodus rotundus	X		Smith, 1994
Hairy-legged Vampire Bat	Diphylla ecaudata			
Funnel-eared Bats	*Natalidae*			
Mexican Funnel-eared Bat	Natalus stramineus	X		Smith, 1994
Plain-nosed Bats	*Vespertilionidae*			
Elegant Myotis	Myotis elegans	X		Smith, 1994
Hairy-legged Myotis	Myotis keaysi			
Argentine Brown Bat	Eptesicus furinalis	X		Smith, 1994
Central American Yellow Bat	Rhogeesa aeneus	X		Smith, 1994 (as R. tumida)
Western Red Bat	Lasiurus blossevillii	X		Jacobson et al, 1990
Northern Yellow Bat	Lasiuris intermedius			
Southern Yellow Bat	Lasiurus ega			
Free-tailed Bats	*Molossidae*			
Broad-eared Bat	Nyctinomops laticaudatus			
Black Bonnetted Bat	Eumops auripendulus			
Underwood's Bonnetted Bat	Eumops underwoodii			
Wagner's Bonnetted Bat	Eumops glaucinus			
Dwarf Bonnetted Bat	Eumops bonariensis	X		Smith, 1994
Black Mastiff Bat	Molossus ater			
Sinaloan Mastiff Bat	Molossus sinaloae			
Little Mastiff Bat	Molossus molossus			
Monkeys	Primates			
New World Monkeys	*Cebidae*			

Yucatan Black Howler	Alouatta pigra	X	X	Fragoso et al, 1990, REA
Central American Spider Monkey	Ateles geoffroyi	X	X	Fragoso et al, 1990. REA
Rodents	Rodentia			
Squirrels	*Sciuridae*			
Yucatan Squirrel	Sciurus yucatanensis	X		Sight record. East gate. RW.
Deppe's Squirrel	Sciurus deppei	X		Jacobson et al, 1990
Pocket Gophers	*Geomyidae*			
Hispid Pocket Gopher	Orthogeomys hispidus			
Pocket Mice	*Heteromyidae*			
Gaumer's Spiny Pocket Mouse	Heteromys gaumeri			
Forest Spiny Pocket Mouse	Heteromys desmarestianus	X		Jacobson et al, 1990
Rats and mice	*Muridae*			
Coues' Rice Rat	Oryzomys couesi	X		Jacobson et al, 1990
Rusty Rice Rat	Oryzomys rostratus			
Alfaro's Rice Rat	Oryzomys alfaroi			
Northern Pygmy Rice Rat	Oligoryzomys fulvescens			
Hispid Cotton Rat	Sigmodon hispidus	X		Jacobson et al, 1990
Northern climbing Rat	Tylomys nudicaudatus	X		Jacobson et al, 1990 (remains in scat)
Big-eared Climbing Rat	Ototylomys phyllotis	X		Jacobson et al, 1990
Vesper Rat	Nyctomys sumichrastii			
Yucatan Vesper Mouse	Otonyctomys hatti			
Slender Harvest Mouse	Reithrodontomys gracilis			
Roof Rat	Rattus rattus			
House Mouse	Mus musculus			
New World Porcupines	*Erethizontidae*			
Mexican Porcupine	Couendou mexicanus			
Agoutis	*Dasyproctidae*			
Central American Agouti	Dasyprocta punctata	X		Sight record, La Milpa. RW.
Pacas	*Agoutidae*			

Paca	Agouti paca	X		Jacobson et al, 1990
Carnivores	Carnivora			
Dogs and Foxes	*Canidae*			
Grey Fox	Urocyon cinereoargenteus	X		Jacobson et al, 1990
Raccoons and allies	*Procyonidae*			
Cacomistle	Bassariscus sumichrastii	?		Possible sight record, J.M.
Northern Raccoon	Procyon lotor	X	X	Jacobson et al, 1990
White-nosed Coati	Nasua narica	X	X	Jacobson et al, 1990
Kinkajou	Potos flavus	X		Jacobson et al, 1990
Weasels, skunks and allies	*Mustelidae*			
Long-tailed Weasel	Mustela frenata			
Greater Grison	Galictis vittata			
Tayra	Eira barbara	X		Jacobson et al, 1990
Spotted Skunk	Spilogale putorius			
Striped Hog-nosed Skunk	Conepatus semistriatus	X		Jacobson et al, 1990
Neotropical River Otter	Lutra longicaudis	X		Jacobson et al, 1990
Cats	*Felidae*			
Ocelot	Leopardus pardalis	X		Jacobson et al, 1990
Margay	Leopardus wiedii	X		Jacobson et al, 1990
Jaguarundi	Herpailurus yaguarondi	X		Jacobson et al, 1990
Puma	Puma concolor	X	X	Jacobson et al, 1990. REA
Jaguar	Panthera onca	X	X	Jacobson et al, 1990. A. Reimer, pers.comm.
Manatees and Dugongs	Sirenia			
Manatees	*Trichechidae*			
West Indian Manatee	Trichechus manatus	X		New River Lagoon
Odd-toed Ungulates	Perissodactyla			
Tapirs	*Tapiridae*			
Baird's Tapir	Tapirus bairdii	X		Fragoso et al, 1990
Even-toed Ungulates	Artiodactyla			

Peccaries	*Tayassuidae*			
Collared Peccary	Tayassu tajacu	X	X	Fragoso et al, 1990
White-lipped Peccary	Dicotyles pecari	X	X	Fragoso et al, 1990
Deer	*Cervidae*			
White-tailed Deer	Odocoileus virginianus	X	X	Fragoso et al, 1990. REA
Red Brocket Deer	Mazama americana	X		Fragoso et al, 1990
Yucatan Grey Brocket Deer	Mazama pandora			Newly described. Recorded from Campeche near N.W. Belize. Evidence for RBCMA inconclusive, Fragoso 1990.

APPENDIX 5: RBCMA-ATNP BIRDS

Taxonomy and order standardised to Lee Jones, 2003. All ATNP records derived from the Rapid Environmental Assessment. Western RBCMA records derived from Mallory & Brokaw 1992. Eastern RBCMA records derived from Vallely & Whitman 1996. Further records derived from Mallory et al 1998, Lee Jones 2003 and sight records.

		ATNP	W. RBCMA	E. RBCMA				RBA	EXTRAS	Status
				F	Sc	PS	W			
Tinamidae										
Great Tinamou	Tinamus major	X	X	C	R			X		R
Little Tinamou	Crypturellus soui	X		R	C			X		R
Thicket Tinamou	Crypturellus cinnamomeus	X	X	F	F			X		R
Slaty-breasted Tinamou	Crypturellus boucardii		X	F	F			X		R
Podicipidae										
Least Grebe	Tachybaptus dominicus	X	X				V	X		R
Pied-billed Grebe	Podilymbus podiceps						R	X		R+W
Pelecanidae										
American White Pelican	Pelecanus erythrorhynchos								Blue Crk, Lee Jones 2003	V
Brown Pelican	Pelecanus occidentalis		X				V	X		R
Phalacrocoracidae										
Neotropic Cormorant	Phalacrocorax brasilianus		X				C	X		R
Double-crested Cormorant	Phalacrocorax auritus								New River, Lee Jones 2003	V
Anhingidae										
Anhinga	Anhinga anhinga		X				R	X		R
Fregatidae										
Magnificent Frigatebird	Fregata magnificens		X				V	X		R
Ardeidae										
Pinnated Bittern	Botaurus pinnatus		X							R
American Bittern	Botaurus lentiginosus		X				V	X		W
Least Bittern	Ixobrychus exilis		X				R	X		R+W
Bare-throated Tiger-heron	Tigrisoma mexicanum		X	R			R	X		R
Great Blue Heron	Ardea herodias		X				R	X		R+W
Great Egret	Egretta alba		X				C	X		R+W
Snowy Egret	Egretta thula		X				C	X		R+W
Little Blue Heron	Egretta caerulea		X				C	X		W
Tricolored Heron	Egretta tricolor		X				F	X		R+W
Cattle Egret	Bubulcus ibis		X					X		R
Green Heron	Butorides virescens		X					X		R+W
Agami Heron	Agamia agami		X					X		R
Black-crowned Night-heron	Nycticorax nycticorax							X		R+W
Yellow-crowned Night-heron	Nyctanassa violacea		X					X		R+W
Boat-billed Heron	Cochlearius cochlearius		X					X		R
Threskiornithidae										
White Ibis	Eudocimus albus		X				V	X		W
Roseate Spoonbill	Platalea ajaja		X							W
Ciconiidae										

Jabiru	Jabiru mycteria		X	R		R	U	X		V
Wood Stork	Mycteria americana	X	X				R	X		R
Cathartidae										
Black Vulture	Coragyps atratus	X	X	C	C			X		R
Turkey Vulture	Cathartes aura	X	X	C	C			X		W+R
Lesser Yellow-headed Vulture	Cathartes burrovianus		X			U	U	X		R
King Vulture	Sarcorhamphus papa		X	U				X		R
Anatidae										
Black-bellied Whistling Duck	Dendrocygna autumnalis		X				U	X		R
Fulvous Whistling Duck	Dendrocygna bicolor									R
Snow Goose	Chen caerulescens								Tres Leguas, Lee Jones 2003	V
Muscovy Duck	Cairina moschata		X				R	X		R
Blue-winged Teal	Anas discors		X					X		W
American Wigeon	Anas americana								Blue Creek, Lee Jones 2003	W
Cinnamon Teal	Anas cyanoptera								Blue Creek, Lee Jones 2003	W
Northern Shoveller	Anas clypeata								RW, Blue Creek	W
Northern pintail	Anas acuta							X	RW, Blue Creek	W
Lesser Scaup	Aythya affinis							X		W
Accipitridae										
Osprey	Pandion haliaetus		X				V	X		W+R
Grey-headed Kite	Leptodon cayanensis		X	R	R			X		R
Hook-billed Kite	Chndrohierax uncinatus		X	R	R			X		R
Swallow-tailed Kite	Elanoides forficatus		X	R	R	R		X		S
White-tailed Kite	Elanus leucurus		X		C			X		R
Snail Kite	Rostrhamus sociabilis		X				C	X		R
Double-toothed Kite	Harpagus bidentatus		X	U	U			X		R
Plumbeous Kite	Ictinia plumbea		X	U	U			X		S
Black-collared Hawk	Busarellus nigricollis		X				R	X		R
Bicolored Hawk	Accipiter bicolor		X					X		R
Crane Hawk	Geranospiza caerulescens		X	U	U			X		R
White Hawk	Leucopternis albicollis		X	U				X		R
Common Black Hawk	Buteogallus anthracinus	X	X	U	U	R		X		R
Great Black Hawk	Buteogallus urubitinga		X					X		R
Solitary Eagle	Harpyhaliaetus solitarius		X(?)							R
Grey Hawk	Asturina nitida		X	C	C	C		X		R
Roadside Hawk	Buteo magnirostris	X	X	U	C	C		X		R
Short-tailed Hawk	Buteo brachyurus		X	C	C			X		W
White-tailed Hawk	Buteo albicaudatus		X		R	R		X		R
Red-tailed Hawk	Buteo jamaicensis								RW 92-94, also Lee Jones	R+W
Crested Eagle	Morphnus guianensis		X					X		R

Harpy Eagle	Harpia harpyja		X						Re-introduction, 2005.	R
Black-and-white Hawk-eagle	Spizastur melanoleucus		X					X		R
Black Hawk Eagle	Spizaetus tyrranus		X	R	R			X		R
Ornate Hawk Eagle	Spizaetus ornatus	X	X	U				X		R
Falconidae										
Barred Forest-falcon	Micrastur ruficollis	X	X	U				X		R
Collared Forest-falcon	Micrastur semitorquatus	X	X	U	U			X		R
Laughing Falcon	Herpetotheres cachinnans		X	F	F			X		R
American Kestrel	Falco sparverius		X		R	R		X		R+W
Merlin	Falco columbarius		X							W
Aplomado Falcon	Falco femoralis				R	U		X		R
Bat Falcon	Falco rufigularis	X	X	R	C	U		X		R
Peregrine Falcon	Falco peregrinus		X		R	R	V	X		W
Cracidae										
Plain Chachalaca	Ortalis vetula	X	X	U	C			X		R
Crested Guan	Penelope purpurascens	X	X	U				X		R
Great Curassow	Crax rubra	X	X	U				X		R
Phasianidae										
Ocellated Turkey	Meleagris ocellata	X	X		V			X		R
Odontophoridae										
Black-throated Bobwhite	Calinus nigrogularis		X			U		X		R
Spotted Wood-quail	Odontophorus guttatus		X	V				X		R
Singing Quail	Dactylortyx thoracicus		X							R
Rallidae										
Ruddy Crake	Laterallus ruber	X	X		C		C	X		R
Gray-breasted Crake	Laterallus exilis								Gall. Jug, Lee Jones 2003	R
Black Crake	Laterallus jamaicensis							X		R+W
Grey-necked Woodrail	Aramides cajanea		X	U	C		C	X		R
Uniform Crake	Amaurolimnus concolor		X	R	R			X		R
Sora	Porzana carolina						V	X		W
Yellow-breasted Crake	Porzana flaviventer						V		Also RW, New River Lagoon	R
Spotted Rail	Pardirallus maculatus							X		R
Purple Gallinule	Porphyrio martinica								RW, Blue Creek	R+W
Common Moorhen	Gallinula chloropus		X							W
American Coot	Fulica americana		X					X		W
Heliornithidae										
Sungrebe	Heliornis fulica		X	U				X		R
Aramidae										
Limpkin	Aramus guarauna		X				C	X		R
Charadriidae										

American Golden Plover	Pluvialis dominica						V	X	Also RW, Blue Creek	Trans
Semipalmated Plover	Charadrius semipalmatus		X							W
Killdeer	Charadrius vociferus						R			W
Recurvirostridae										
Black-necked Stilt	Himantopus mexicanus		X				V	X		Trans
Jacanidae										
Northern Jacana	Jacana spinosa		X				C	X		R
Scolopacidae										
Greater Yellowlegs	Tringa melanoleuca		X				R	X		W
Lesser Yellowlegs	Tringa flavipes						U	X		W
Solitary Sandpiper	Tringa solitaria		X				U	X		W
Willet	Catoptrophorus semipalmatus						R	X		W
Spotted Sandpiper	Actitis macularia		X				U	X		W
Upland Sandpiper	Bartramia longicauda								RW 93, Tres Leguas	Trans
Hudsonian Godwit	Limosa haemastica								RW, Blue Creek	Trans
Least Sandpiper	Calidris minutilla		X							W
White-rumped Sandpiper	Calidris fuscicollis		X							W
Pectoral Sandpiper	Calidris melanotus						V	X		Trans
Stilt Sandpiper	Calidris himantopus									Trans
Short-billed Dowitcher	Limnodromus griseus									Trans
Long-billed Dowitcher	Limnodromus scolopaceus									Trans
Wilson's Snipe	Gallinago delicata		X							W
Laridae										
Laughing Gull	Larus atricilla		X							V
Bonaparte's Gull	Larus philadelphia								Hill Bank, Lee Jones 2003	V
Herring Gull	Larus argentatus							X		V
Royal Tern	Sterna maxima		X							V
Sooty Tern	Sterna fuscata		X							V
Black Skimmer	Rynchops niger								Hill Bank, Lee Jones 2003	V
Columbidae										
Pale-vented Pigeon	Columba cayennensis	X	X	C	C			X		R
Scaled Pigeon	Columba speciosa		X	C	C			X		R
White-crowned Pigeon	Columba leucocephala								Hill Bank, Lee Jones 2003	V
Red-billed Pigeon	Columba flavirostris	X	X	C	C			X		R
Short-billed Pigeon	Columba nigrirostris		X	C				X		R
White-winged Dove	Zenaida asiatica								RW 92-94	LM
Mourning Dove	Zenaida macroura		X		V			X		W
Common Ground-dove	Columbina passerina		X							R
Plain-breasted Ground-dove	Columbina minuta		X			U		X		R
Ruddy Ground-dove	Columbina talpacoti	X	X		U			X		R

Blue Ground-dove	Claravis pretiosa		X	F	C			X		R
White-tipped Dove	Leptoptila verrauxi	X	X		F	U		X		R
Grey-fronted Dove	Leptoptila rufaxilla		X	C				X		R
Grey-chested Dove	Leptoptila cassinii		X							R
Ruddy Quail-dove	Geotrygon montana		X	C						R
Psittacidae										
Olive-throated Parakeet	Aratinga nana	X	X	C	C			X		R
Brown-hooded Parrot	Pionopsitta haematotis	X	X	C	U			X		R
White-crowned Parrot	Pionus senilis		X	C	C			X		R
White-fronted Parrot	Amazona albifrons	X	X	C	C			X		R
Yellow-lored Parrot	Amazona xantholora	X			R	U		X		R
Red-lored Parrot	Amazona autumnalis	X	X	C	C			X		R
Mealy Parrot	Amazona farinosa	X	X	U				X		R
Yellow-headed Parrot	Amazona oratrix			U	U	U		X		R
Cuculidae										
Yellow-billed Cuckoo	Coccyzus americanus		X							Trans
Squirrel Cuckoo	Piaya cayana	X	X	C	C			X		R
Striped Cuckoo	Tapera naevia		X		U			X		R
Pheasant Cuckoo	Dromococcyx phasianellus		X	V				X		R
Groove-billed Ani	Crotophaga sulcirostris		X		U			X		R
Tytonidae										
Barn Owl	Tyto alba		X		V			X		R
Strigidae										
Vermiculated Screech-owl	Otus guatemalae	X	X	C				X		R
Spectacled Owl	Pulsatrix perspicillata		X							R
Central American Pygmy Owl	Glaucidium griseiceps		X	R				X		R
Ferruginous Pygmy Owl	Glaucidium brasilianum		X					X		R
Mottled Owl	Ciccaba virgata	X	X	C	U			X		R
Black-and-White Owl	Ciccaba nigrolineata	X	X	U				X		R
Stygian Owl	Asio stygius							X		W
Caprimulgidae										
Lesser Nighthawk	Chordeiles acutipennis		X		R			X		W
Common Nighthawk	Chordeiles minor		X					X		Trans
Common Pauraque	Nyctidromus albicollis	X	X	C?	C			X		R
Yucatan Poorwill	Nyctiphrynus yucatanicus		X	V	V			X		R
Yucatan Nightjar	Caprimulgus badius		X	V	V			X		W
Nyctibiidae										
Northern Potoo	Nyctibius jamaicensis		X							R
Apodidae										
White-collared Swift	Streptoprocne zonaris		X	V	V			X		R

Vaux's Swift	Chaetura vauxi		X	U	U			X		R
Lesser Swallow-tailed Swift	Panyptila cayennensis		X	F	F			X		R
Trochilidae										
Long-tailed Hermit	Phaethornis superciliosus	X	X	U				X		R
Stripe-throated Hermit	Phaethornis striigularis	X	X	C				X		R
Scaly-breasted Hummingbird	Phaeochroa cuvierii		X	R				X		R
Wedge-tailed Sabrewing	Campylopterus curvipennis	X	X	U				X		R
White-necked Jacobin	Florisuga mellivora		X	R	U			X		R
Brown Violet-ear	Colibri delphini				R			X		R
Green-breasted Mango	Anthracocorax prevostii		X		U			X		R
Canivet's Emerald	Chlorostilbon canivetii	X	X		R			X		R
White-bellied Emerald	Amazilia candida		X	C	U			X		R
Azure-crowned Hummingbird	Amazilia cyanocephala		X	R	R			X		R
Rufous-tailed Hummingbird	Amazilia tzacatl	X	X	C	C	C		X		R
Buff-bellied Hummingbird	Amazilia yucatanensis					R		X		R
Purple-crowned Fairy	Heliothryx barroti		X	R	R			X		R
Sparkling-tailed Hummingbird	Tilmatura dupontii								Prob. Tres Leg. Lee Jones	LM
Ruby-throated Hummingbird	Archilochus colubris		X					X		W
Trogonidae										
Black-headed Trogon	Trogon melanocephalus	X	X	C	C			X		R
Violaceous Trogon	Trogon violaceus	X	X	C	C			X		R
Collared Trogon	Trogon collaris		X	F				X		R
Slaty-tailed Trogon	Trogon massena		X	C				X		R
Momotidae										
Tody Motmot	Hylomanes momotula		X	R				X		R
Blue-crowned Motmot	Momotus momota	X	X	U				X		R
Alcedinidae										
Ringed Kingfisher	Ceryle torquata		X		R		C	X		R
Belted Kingfisher	Ceryle alcyon		X				R	X		W
Amazon Kingfisher	Chloroceryle amazona		X	R			C	X		R
Green Kingfisher	Chloroceryle americana		X	U			U	X		R
Pygmy Kingfisher	Chloroceryle aenea	X	X	U			U	X		R
Bucconidae										
White-necked Puffbird	Notharchus macrorhynchus		X	R	R			X		R
White-whiskered Puffbird	Malacoptila panamensis		X	U				X		R
Galbulidae										
Rufous-tailed Jacamar	Galbula ruficauda	X	X	U				X		R
Ramphastidae										
Emerald Toucanet	Aulacorhynchus prasinus		X					X		R
Collared Aricari	Pteroglossus torquatus	X	X	C	U			X		R

Keel-billed Toucan	Ramphastos sulfuratus	X	X	C	C			X		R
Picidae										
Acorn Woodpecker	Melanerpes formicivorus		X			C		X		R
Black-cheeked Woodpecker	Melanerpes pucherani		X	C				X		R
Yucatan Woodpecker	Melanerpes pygmaeus		X					X		R
Golden-fronted Woodpecker	Melanerpes aurifrons	X	X		U			X		R
Yellow-bellied Sapsucker	Sphyrapicus varius		X	R				X		W
Ladder-backed Woodpecker	Picoides scalaris					U		X		R
Smoky-brown Woodpecker	Veniliornis fumigatus		X	U	R			X		R
Golden-olive Woodpecker	Piculus rubiginosus	X	X	U	U			X		R
Chestnut-colored Woodpecker	Celeus castaneus	X	X	U	R			X		R
Lineated Woodpecker	Dryocopus lineatus	X	X	U	C			X		R
Pale-billed Woodpecker	Campephilus guatemalensis	X	X	C				X		R
Furnariidae										
Rufous-breasted Spinetail	Synallaxis erythrothorax		X	R	C			X		R
Buff-throated Foliage-gleaner	Automolus ochrolaemus	X	X	R				X		R
Plain Xenops	Xenops minutus		X	C	U			X		R
Scaly-throated Leaftosser	Scelurus guatemalensis	X	X	U				X		R
Dendrocolaptidae										
Tawny-winged Woodcreeper	Dendrocincla anabatina	X	X	C	U			X		R
Ruddy Woodcreeper	Dendrocincla homochroa	X	X	C				X		R
Olivaceous Woodcreeper	Sittasomus griseicapillus	X	X	C	R			X		R
Wedge-billed Woodcreeper	Glyphorynchus spirurus	X	X	R				X		R
Strong-billed Woodcreeper	Xiphocolaptes promeropirhynchus	X	X	V				X		R
Northern Barred Woodcreeper	Dendrocolaptes sanctithomae	X	X	U				X		R
Ivory-billed Woodcreeper	Xiphorhynchus flavigaster	X	X	C	R			X		R
Streak-headed Woodcreeper	Lepidocolaptes souleyetii		X	V		R		X		R
Thamnophilidae										
Great Antshrike	Taraba major		X		V			X		R
Barred Antshrike	Thamnophilus doliatus	X	X	R	C			X		R
Plain Antvireo	Dysithamnus mentalis	X	X	V				X		R
Dot-winged Antwren	Microrhopias quixensis	X	X	C	R			X		R
Dusky Antbird	Cercomacra tyrannina		X	U	R			X		R
Black-faced Ant-thrush	Formicarius analis	X	X	C	U			X		R
Tyrannidae										
Yellow-bellied Tyrannulet	Ornithion semiflavum	X	X	C				X		R
Northern Beardless Tyrannulet	Camptostoma imberbe		X		U	U		X		R
Greenish Elaenia	Myiopagis viridicata	X	X	C	U			X		R
Yellow-bellied Elaenia	Elaenia flavogaster		X	R	C	U?		X		R

Ochre-bellied Flycatcher	Mionectes oleaginus	X	X	C	U			X		R
Sepia-capped Flycatcher	Leptopogon amaurocephalus		X	R				X		R
Paltry Tyrannulet	Zimmerius vilissimus		X							R
Northern Bentbill	Oncostoma cinereigulare	X	X	C	C			X		R
Slate-headed Tody-flycatcher	Poecilotriccus sylvia		X		R			X		R
Common Tody-flycatcher	Todirostrum cinereum		X		U	U		X		R
Eye-ringed Flatbill	Rhynchocyclus brevirostris		X	C				X		R
Yellow-olive Flycatcher	Tolmomyias sulphurescens	X	X	C	C			X		R
Stub-tailed Spadebill	Platyrinchus cancrominus	X	X	C				X		R
Royal Flycatcher	Onychorhynchus coronatus	X	X	R	U			X		R
Ruddy-tailed Flycatcher	Terenotriccus erythrurus		X	R				X		R
Sulphur-rumped Flycatcher	Myiobius sulphureipygius	X	X	U				X		R
Olive-sided Flycatcher	Contopus cooperi		X					X		Trans
Eastern Peewee	Contopus virens		X	U	U			X		Trans
Tropical Peewee	Contopus cinereus	X	X		U	U		X		R
Yellow-bellied Flycatcher	Empidonax flaviventris	X	X	C				X		W
Acadian Flycatcher	Empidonax virescens		X	V				X		Trans
White-throated Flycatcher	Empidonax albigularis		X					X		W
Least Flycatcher	Empidonax minimus		X		C			X		W
Vermilion Flycatcher	Pyrocephalus rubinus		X		U	C		X		R
Bright-rumped Attila	Attila spadiceus	X	X		C	U		X		R
Rufous Mourner	Rhyptipterna holerythera		X	U				X		R
Yucatan Flycatcher	Myiarchus yucatanensis		X	R	U			X		R
Dusky-capped Flycatcher	Myiarchus tuberculifer	X	X	C	C			X		R
Great Crested Flycatcher	Myiarchus crinitus		X	C	F			X		W
Brown-crested Flycatcher	Myiarchus tyrranulus	X	X	U	U			X		R
Great Kiskadee	Pitangus sulphuratus	X	X	R	C	F		X		R
Boat-billed Flycatcher	Megarynchus pitangua	X	X	U	U			X		R
Social Flycatcher	Myiozetetes similis	X	X	F	C	C		X		R
Streaked Flycatcher	Myiodynastes maculatus		X	U	U			X		S
Sulphur-bellied Flycatcher	Myiodynastes luteiventris		X		U			X		S
Piratic Flycatcher	Legatus leucophaius		X		R			X		S
Tropical Kingbird	Tyrannus melancholicus	X	X		C	C		X		R
Couch's Kingbird	Tyrannus couchii		X		U	U		X		R
Cassin's Kingbird	Tyrranus vociferans								Gall. Jug, Lee Jones 2003	W
Eastern Kingbird	Tyrannus tyrannus		X		R			X		Trans
Grey Kingbird	Tyrannus dominicensis								La Milpa, Lee Jones 2003	W
Fork-tailed Flycatcher	Tyrannus savana		X		R	C	U	X		R
Incertae Sedis										
Thrush-like Schiffornis	Schiffornis turdinus	X	X	C				X		R

Rufous Piha	Lipaugus unirufus		X	R				X		R
Speckled Mourner	Laniocera rufescens		X	U				X		R
Cinnamon Becard	Pachyramphus cinnamomeus	X		V				X		R
Grey-collared Becard	Pachyramphus major	X		R	V			X		R
Rose-throated Becard	Pachyramphus aglaiae	X		R	R			X		R
Masked Tityra	Tityra semifasciata	X		U				X		R
Black-crowned Tityra	Tityra inquisitor			V				X		R
Cotingidae										
Lovely Cotinga	Cotinga amabilis		X					X		R
Pipridae										
White-collared Manakin	Manacus candei	X	X		U			X		R
Red-capped Manakin	Pipra mentalis	X	X	C	U			X		R
Vireonidae										
White-eyed Vireo	Vireo griseus	X	X	R	U			X		W
Mangrove Vireo	Vireo pallens	X	X	R	C			X		R
Yellow-throated Vireo	Vireo flavifrons		X	R				X		W
Philadelphia Vireo	Vireo philadelphicus		X							W
Red-eyed Vireo	Vireo olivaceus		X	C	C			X		Trans
Yellow-green Vireo	Vireo flavoviridis		X	U	C			X		S
Yucatan Vireo	Vireo magister		X							R
Tawny-crowned Greenlet	Hylophilus ochraceiceps	X	X	C				X		R
Lesser Greenlet	Hylophilus decurtatus	X	X	C	U			X		R
Green Shrike-vireo	Vireolanius pulchellus		X	C				X		R
Rufous-browed Peppershrike	Cyclarhis gujanensis	X	X		R	U		X		R
Corvidae										
Green Jay	Cyanocorax yncas	X	X	R	R			X		R
Brown Jay	Cyanocorax morio	X	X	C	C	C		X		R
Yucatan Jay	Cyanocorax yucatanicus	X	X					X		R
Hirundinidae										
Purple Martin	Progne subis		X		C			X		Trans
Grey-breasted Martin	Progne chalybea		X		C		C	X		R
Tree Swallow	Tachycineta bicolor		X		U		U	X		W
Mangrove Swallow	Tachycineta albilinea		X		C		C	X		R
Northern Rough-winged Swallow	Stelgidopteryx serripennis		X		U	R	U	X		W
Ridgway's Rough-winged Swallow	Stelgidopteryx (serripenis) ridgwayi								RW, 2005. La Milpa	R
Bank Swallow	Riparia riparia				R			X		Trans
Cave Swallow	Petrochelidon fulva								Blue Creek, Lee Jones 2003	W
Barn Swallow	Hirundo rustica		X		U		U	X		W
Troglodytidae										
Band-backed Wren	Campylorhynchus zonatus								Lamanai, Lee Jones 2003	R

Spot-breasted Wren	Thryothorus maculipectus	X	X	C	C			X		R
White-browed Wren	Thryothorus ludovicianus (albinucha)		X					X		R
Plain Wren	Thryothorus modestus		X							R
Southern House Wren	Troglodytes aedon		X		U			X		R
White-bellied Wren	Uropsila leucogastra	X	X	C	U			X		R
White-breasted Wood-wren	Henicorhina leucosticta	X	X	C				X		R
Nightingale Wren	Microcerculus philomela		X							R
Sylviidae										
Long-billed Gnatwren	Ramphocaenus melanurus	X	X	C				X		R
Blue-grey Gnatcatcher	Polioptera caerulea	X			U	C		X		W
Tropical Gnatcatcher	Polioptera plumbea	X	X	C				X		R
Turdidae										
Veery	Catharus fuscescens		X					X		Trans
Grey-cheeked Thrush	Catharus minimus		X					X		Trans
Swainson's Thrush	Catharus ustulatus		X	R				X		W
Wood Thrush	Catharus mustelinus	X	X	C				X		W
Clay-colored Robin	Turdus grayi	X	X	R	U			X		R
White-throated Robin	Turdus assimilis		X	R				X		R
American Robin	Turdus migratorius								Hill Bank, Lee Jones 2003	V
Mimidae										
Grey Catbird	Dumutella carolinensis	X	X	C	C	C		X		W
Black Catbird	Melanoptila glabirostris								Gall. Jug, Lee Jones 2003	R
Tropical Mockingbird	Mimus gilvus		X		C			X		R
Bombycillidae										
Cedar Waxwing	Bombycilla cedrorum							X		W
Parulinae										
Blue-winged Warbler	Vermivora pinus		X	R	R			X		Trans
Golden-winged Warbler	Vermivora chrysoptera		X					X		W
Lawrence's Warbler	V. pinus x V. chrysoptera								Lamanai, Lee Jones 2003	W
Tennessee Warbler	Vermivora penegrina		X	R	R			X		W
Northern Parula	Parula americana		X	U	U			X		W
Yellow Warbler	Dendroica petechia aestiva		X		U	U		X		W
Chestnut-sided Warbler	Dendroica pensylvanica		X	C	C	C		X		W
Magnolia Warbler	Dendroica magnolia	X	X	C	C	C		X		W
Black-throated Blue Warbler	Dendroica caerulescens		X							W
Yellow-rumped (Myrtle) Warbler	Dendroica coronata coronata		X			V		X		W
Black-throated Green Warbler	Dendroica virens		X	C	U			X		W
Blackburnian Warbler	Dendroica fusca		X	V				X		Trans
Yellow-throated Warbler	Dendroica dominica		X	R	U			X		W
Grace's Warbler	Dendroica graciae					C		X		R

Palm Warbler	Dendroics palmarum							X		W
Bay-breasted Warbler	Dendroica castanea		X	U				X		Trans
Blackpoll Warbler	Dendroica striata		X							W
Black-and-White Warbler	Mniotilta varia	X	X	C	U			X		W
American Redstart	Setophaga ruticilla	X	X	C	C			X		W
Prothonotary Warbler	Protonotaria citrea		X	V				X		Trans
Worm-eating Warbler	Helmitheros vermivorus		X	U				X		W
Swainson's Warbler	Helmitheros swainsonii		X	V	V			X		W
Ovenbird	Seiurus aurocapilla	X	X	U	C			X		W
Northern Waterthrush	Seiurus noveboracensis	X	X	U	U			X		W
Louisiana Waterthrush	Seiurus motacilla		X	C	R			X		W
Kentucky Warbler	Oporornis formosus	X	X	C				X		W
Mourning Warbler	Oporornis philadelphia		X							Trans
Common Yellowthroat	Geothlypis trichas	X	X		C	C	C	X		W
Grey-crowned Yellowthroat	Geothlypis poliocephala		X		C	C		X		R
Hooded Warbler	Wilsonia citrina	X	X	C	C			X		W
Wilson's Warbler	Wilsonia pusilla		X					X		W
Golden-crowned Warbler	Basileuterus culucivorus	X	X	R				X		R
Yellow-breasted Chat	Icteria virens	X	X		U	U		X		W
Grey-throated Chat	Granatellus sallaei	X	X	U				X		R
Coerebinae										
Bananaquit	Coereba flaveola		X					X		R
Thraupidae										
Grey-headed Tanager	Eucometis penicillata	X	X	U				X		R
Black-throated Shrike-tanager	Lanio aurantius	X	X	C				X		R
Red-crowned Ant-tanager	Habia rubica	X	X	C				X		R
Red-throated Ant-tanager	Habia fuscicauda	X	X	C	U			X		R
Rose-throated Tanager	Piranga roseogularis	X	X	R	R			X		R
Hepatic Tanager	Piranga flava		X			C		X		R
Summer Tanager	Piranga rubra	X	X	F	C			X		W
Scarlet Tanager	Piranga olivacea				R			X		Trans
Western Tanager	Piranga ludoviciana		X							W
White-winged Tanager	Spermagra leucoptera							X		R
Blue-grey Tanager	Thraupis episcopus		X		U			X		R
Yellow-winged Tanager	Thraupis abbas		X	R	U			X		R
Scrub Euphonia	Euphonia affinis	X	X	V	R			X		R
Yellow-throated Euphonia	Euphonia hirundinacea	X	X	C	C			X		R
Olive-backed Euphonia	Euphonia gouldii	X	X	C	R			X		R
Golden-hooded Tanager	Tangara larvata		X	R	R			X		R
Green Honeycreeper	Chlorophanes spiza		X					X		R

Red-legged Honeycreeper	Cyanerpes cyaneus	X	X	C	U			X		R
Emberizidae										
Blue-black Grassquit	Volatinia jacarina		X		U	U				R
Slate-colored Seedeater	Sporophila schistacea									R
Variable Seedeater	Sporophila aurita		X		U	U				R
White-collared Seedeater	Sporophila torqueola	X	X	R	C	C				R
Thick-billed Seedfinch	Oryzoborus funereus	X	X		U	U				R
Blue Seedeater	Amaurospia concolor								Hill Bank, Lee Jones 2003	R
Yellow-faced Grassquit	Tiaris olicavea								Gall. Jug, Lee Jones 2003	R
Grassland Yellow-finch	Tiaris olivacea								Blue Creek, Lee Jones 2003	R
Orange-billed Sparrow	Arremon aurantiirostris								Lamanai, Lee Jones 2003	R
Olive Sparrow	Arremonops rufivirgatus				C	C				R
Green-backed Sparrow	Arremonops chloronotus	X	X	C	C					R
Botteri's Sparrow	Aimophila botterii				U	U				R
Chipping Sparrow	Spizella passerina		X		U	U				R
Grasshopper Sparrow	Ammodramus savannarum					U				V
Cardinalidae										
Greyish Saltator	Saltator coerulescens		X		V			X		R
Buff-throated Saltator	Saltator maximus	X	X					X		R
Black-headed Saltator	Saltator atriceps	X	X	C	C			X		R
Black-faced Grosbeak	Carythraustes poliogaster	X	X	C				X		R
Northern Cardinal	Cardinalis cardinalis		X		U			X		R
Rose-breasted Grosbeak	Pheucticus ludovicianus		X		V			X		W
Blue-black Grosbeak	Cyanocompsa cyanoides	X	X	C	C			X		R
Blue Bunting	Cyanocompsa parellina		X	U	U			X		R
Blue Grosbeak	Passerina caerulea		X		U	U		X		W
Indigo Bunting	Passerina cyanea		X	R	C	C		X		W
Dickcissel	Spiza americana		X		U			X		Trans
Icteridae										
Red-winged Blackbird	Agelaius phoeniceus		X		V		U	X		R
Eastern Meadowlark	Sturnella magna				V	U		X		R
Melodious Blackbird	Dives dives	X	X		C			X		R
Great-tailed Grackle	Quiscalus mexicanus		X		C		R	X		R
Bronzed Cowbird	Molothrus aeneus		X							R
Brown-headed Cowbird	Molthrus ater								Gall. Jug, Lee Jones 2003	W
Giant Cowbird	Molothrus oryzivora		X							R
Black-cowled Oriole	Icterus dominicensis	X	X	C	U			X		R
Orchard Oriole	Icterus spurius		X	U	C			X		W
Hooded Oriole	Icterus cucullatus		X		U					R
Yellow-backed Oriole	Icteris chrysater		X			U		X		R

Yellow-tailed Oriole	Icterus mesomelas			U	U	U		X		R
Altamira Oriole	Icterus gularis				R			X		R
Baltimore Oriole	Icterus galbula		X	C	C	C		X		W
Yellow-billed Cacique	Amblycercus holosericeus	X	X	R	F			X		R
Montezuma Oropendula	Psarocolius montezuma	X	X	C	C			X		R
Fringillidae										
Red Crossbill	Loxia curvirostra					V		X		R
Lesser Goldfinch	Carduelis psaltria								RW, San Felipe	R

APPENDIX 6: RBCMA-ATNP HERPETOFAUNA

Base-list includes all species in Stafford & Meyer 2000 with ranges in north-western Belize. All ATNP records are from the REA (Meerman et al, 2003). Other records are derived from Stafford & Meyer 2000, Meyer 1994, Meyer 1995, Platt & Rainwater 1998.

		ATNP	RBCMA	Notes
Amphibia				
Caudata				
	Bolitoglossa mexicana			
Anura				
Marine Toad	Bufo marinus		X	
Gulf Coast toad	Bufo valliceps		X	
Lowland Rainfrog	Eleutherodactylus rhodopsis			Recorded from Gallon Jug (only known Belizean site)
Central American Rainfrog	Eleutherodactylus rugulosus			Recorded from Gallon Jug
White-lipped Frog	Leptodactylus labialis		X	
Black-backed Frog	Leptodactylus melanonotus		X	
Tungara Frog	Physolaemus pustulosus	X	X	Restricted to NW in Belize
Gulf Chirping Frog	Syrrhophus leprus		X	
Elegant Narrowmouth Frog	Gastrophryne elegans			Known in Belize from 4 localities only
Sheep Frog	Hypopachus variolosus		X	
Red-eyed Treefrog	Agalychnis callidryas		X	
Variegated Treefrog	Hyla ebraccata	X	X	
Red-footed Treefrog	Hyla loquax		X	
Yellow Treefrog	Hyla microcephala		X	
Cricket Treefrog	Hyla picta		X	
Pepper Treefrog	Phrynohyas venulosa		X	
Stauffer's Treefrog	Scinax staufferi		X	
Mexican Treefrog	Smilisca baudinii		X	
Casquehead Treefrog	Triprion petasatus		X	
Rio Grande Leopard Frog	Rana berlandierii	X	X	
Rainforest Frog	Rana vaillantiii		X	
Mexican Burrowing Frog	Rhinophrynus dorsalis		X	
Reptilia				
Crocodilia (Crocodiles)				
Crocodylidae				
Morelet's Crocodile	Crocodylus moreletii		X	
Testudines (Turtles)				
Dermatydidae				
Central American River Turtle	Dermatemys mawii		X	Polisar 1990
Kinosternidae				

Narrow-bridged Musk Turtle	Claudius angustatus		X	Polisar 1990
Tabasco Mud Turtle	Kinosternon acutum		X	Sight record, La Milpa
White-lipped Mud Turtle	Kinosternon leucostomum		X	Sight record, La Milpa
Scorpion Mud Turtle	Kinosternon scorpioides	X	X	Sight record, Rancho savannah
Mexican Giant Mud Turtle	Staurotypus triporcatus		X	Polisar 1990
Emydidae				
Furrowed Wood Turtle	Rhinoclemmys areolata		X	Polisar 1990
Slider	Trachemys scripta		X	Polisar 1990
Squamata - Sauria (Lizards)				
Eublepharidae				
Yucatan Banded Gecko	Coleonyx elegans		X	
Gekkonidae				
Yellow-bellied Leaf-toed Gecko	Phyllodactylus tuberculosus			More coastal
Dwarf Gecko	Sphaerodactylus glaucus			Recorded on Gallon Jug
Spotted Gecko	Sphaerodactylus millepunctatus			
Turnip-tailed Gecko	Thecadactylus rapicaudata			Recorded from Lamanai
Corytophanidae				
Striped Basilisk	Basiliscus vittatus		X	
Smooth-headed Helmeted Basilisk	Corytophanes cristatus		X	Sight record
Hernandez's Helmeted Basilisk	Corytophanes hernandezii			Recorded on Gallon Jug
Eastern Casque-headed Iguana	Laemanctus longipes			Recorded on Gallon Jug
Serrated Casque-headed Iguana	Laemanctus serratus			More northern
Iguanidae				
Black Iguana	Ctenosaura similis		X	
Green Iguana	Iguana iguana		X	
Phrynosomatidae				
Yellow-spotted Spiny Lizard	Sceloporus chrysostictus			Recorded from Lamanai
Polychrotidae				
Central American Green Anole	Norops biporcatus		X	
Big-headed Anole	Norops capito		X	
Ghost Anole	Norops lemurinus		X	
Lichen Anole	Norops pentaprion			Recorded from Cayo, probably throughout.
Smooth Anole	Norops rodriguezii			Recorded from Orange Walk Town
Brown Anole	Norops sagrei			More coastal. Reaches Gold Button.
Silky Anole	Norops sericeus			Recorded from Guinea Grass
Greater Scaly Anole	Norops tropidonotus		X	

Lesser Scaly Anole	Norops uniformis	X		First north Belizean record (REA)
Scincidae				
Schwartze's Skink	Eumeces schwartzei		X	
Central American Mabuya	Mabuya unimarginata		X	
Brown Forest Skink	Sphenomorphus cherriei		X	
Gymnophthalmidae				
Golden-spectacled Lizard	Gymnophthalmus speciosus			Recorded from Carmelita
Teiidae				
Rainbow Ameiva	Ameiva undulata		X	Sight record
Yucatan Whiptail	Cnemidophorus angusticeps			More coastal
Maslin's Racerunner	Cnemidophorus maslinii			Recorded from Guinea Grass
Squamata - Serpentes (Snakes)				
Typhlopidae				
Yucatan Blindsnake	Typhlops microstomus			Recorded from Altun ha
Leptotyphlopidae				
Black Blindsnake	Leptotyphlops goudotii			Recorded from Corozal
Boidae				
Mexican Boa	Boa constrictor	X	X	Sight record
Colubridae				
Middle American Earth Snake	Adelphicos quadrivirgatus			Recorded from Gallon Jug
Mexican Snake eater	Clelia scytalina		X	Sight Record (Clelia sp)
Two-spotted Snake	Coniophanes bipunctatus		X	Sight Record
Yellow-bellied Snake	Coniophanes fissidens			Probably occurs in Orange Walk District
Black-striped Snake	Coniophanes imperialis			Recorded from Gallon Jug
Faded Black-striped Snake	Coniophanes schmidti			Recorded from Lamanai (Platt & Rainwater)
Many-lined Snake	Conophis lineatus			Possibly in northern Orange Walk District
Snail-eating Thirst Snake	Dipsas brevifacies			
Lizard Eater	Dryadophis melanolomus			Recorded from Orange Walk Town
Black-tailed Indigo Snake	Drymarchon corais		X	
Speckled Racer	Drymobius margaritiferus		X	
Tropical Rat Snake	Elaphe flavirufa			Recorded from Orange Walk Town
Blotched Hook-nosed Snake	Ficimia publia			Recorded from Gallon Jug
Blunt-headed Tree Snake	Imantodes cenchoa			Recorded from Gallon Jug
Tropical Kingsnake	Lampropeltis triangulum		X	
Rain Forest Cat-eyed Snake	Leptodeira frenata		X	
Central merican Cat-eyed Snake	Leptodeira septentrionalis			Recorded from Gallon Jug

Green Parrot Snake	Leptophis ahaetulla			Recorded from Gallon Jug
Mexican Parrot Snake	Leptophis mexicanus		X	Sight record
Tropical Whipsnake	Masticophis mentovarius		X	Sight record
Red Coffee Snake	Ninia sebae			Recorded from Gallon Jug
Neotropical Vine Snake	Oxybelis aeneus		X	
Green Vine Snake	Oxybelis fulgidus		X	Sight record
Puffing Snake	Pseustes poecilonatus			Recorded from Gallon Jug
Shovel-toothed Snake	Scaphiodontophis annulatus			Recorded from Orange Walk
Green Rat Snake	Senticolis triaspis			
Cloudy Snail Sucker	Sibon nebulata			Recorded from Gallon Jug
Pygmy Snail Sucker	Sibon sanniola			Recorded from Gallon Jug
Terrestrial Snail Sucker	Sibon sartorii		X	
Tiger Ratsnake	Spilotes pullatus		X	
Blood Snake	Stenorrhina freminvillii			Recorded from Orange Walk District
Yucatan White-lipped Snake	Symphimus mayae		X	
Yucatan Centipede Snake	Tantilla cuniculator			Recorded from Orange Walk Town
Yucatan Dwarf Short-tailed Snake	Tantilla canula			Recorded from Lamanai
Checkered Garter Snake	Thamnophis marcianus			Recorded from Lamanai
Gulf Coast Ribbon Snake	Thamnophis proximus			Recorded from Orange Walk Town
False Coral Snake	Urotheca elapoides			More southern
False Fer-de-Lance	Xenodon rabdocephalus			Recorded from Gallon Jug
Elapidae				
Variable Coral Snake	Micrurus diastemata			Recorded from Orange Walk Town
Central American Coral Snake	Micrurus nigrocinctus			Recorded from Gallon Jug
Viperidae				
Tropical Moccasin	Agkistrodon bilineatus			Recorded from Orange Walk town
Eyelash Palm Pitviper	Bothriechis schlegelii			Recorded from Gallon Jug
Fer-de-lance	Bothrops asper		X	
Yucatan Rattlesnake	Crotalus durissimus	X	X	Sight records

APPENDIX 7: SELF-ASSESSMENT OF MANAGEMENT EFFECTIVENESS

Issue	Criteria	Score		Comments	Next Steps
1. Legal status Does the protected area have legal status (or in the case of private reserves is covered by a covenant or similar)? *Context*	The protected area is not gazetted/covenanted	0		There is a Trust Agreement (in perpetuity) approved by the National Assembly. Tax exemption expires in 2018 and terms of the agreement can be negotiated then.	The Trust Agreement has been reiterated; Land tax exemption has been extended for 50 years (as of 18 June 2018).
	There is agreement that the protected area should be gazetted/covenanted but the process has not yet begun	1			
	The protected area is in the process of being gazetted/covenanted but the process is still incomplete (includes sites designated under international conventions, such as Ramsar, or local/traditional law such as community conserved areas, which do not yet have national legal status or covenant)	2			
	The protected area has been formally gazetted/covenanted	3	**3**		
2. Protected area regulations Are appropriate regulations in place to control land use and activities (e.g. hunting)? *Planning*	There are no regulations for controlling land use and activities in the protected area	0		Regulations for seismic activities and road development do not exist.	
	Some regulations for controlling land use and activities in the protected area exist but these are major weaknesses	1			
	Regulations for controlling land use and activities in the protected area exist but there are some weaknesses or gaps	2	**2**		
	Regulations for controlling inappropriate land use and activities in the protected area exist and provide an excellent basis for management	3			
3. Law enforcement Can staff (i.e. those with responsibility for managing the site) enforce protected area rules well enough? *Input*	The staff have no effective capacity/resources to enforce protected area legislation and regulations	0		Managing 3 Ranger Gates, provide support to YHP Rangers, assist the Foresters with log shipments, etc. SMART system is in user for patrols (can now compare and analyze data);	Continue joint patrols with the security forces, and coordinate law enforcement data.
	There are major deficiencies in staff capacity/resources to enforce protected area legislation and regulations (e.g., lack of skills, no patrol budget, lack of institutional support)	1			
	The staff have acceptable capacity/resources to enforce protected area legislation and regulations but some deficiencies remain	2	**2**		
	The staff have excellent capacity/resources to enforce protected area legislation and regulations	3			
	No firm objectives have been agreed for the protected area	0			

Issue	Criteria	Score		Comments	Next Steps
4. Protected area objectives Is management undertaken according to agreed objectives? *Planning*	The protected area has agreed objectives, but is not managed according to these objectives	1		There was a Community Outreach Officer for some time but left to further studies; There needs to be improvement in the socio-economic betterment of RBCMA stakeholders (communities). This is as a result of financial constraints to implement programs.	Fundraising for COO; Identify opportunities for livelihood programs/project jointly with the communities (e.g., employment opportunities, and scholarships)
	The protected area has agreed objectives, but is only partially managed according to these objectives	2	**2**		
	The protected area has agreed objectives and is managed to meet these objectives	3			
5. Protected area design Is the protected area the right size and shape to protect species, habitats, ecological processes and water catchments of key conservation concern? *Planning*	Inadequacies in protected area design mean achieving the major objectives of the protected area is very difficult	0		Opportunities for landscape-level management with the BMF	
	Inadequacies in protected area design mean that achievement of major objectives is difficult but some mitigating actions are being taken (e.g. agreements with adjacent land owners for wildlife corridors or introduction of appropriate catchment management)	1			
	Protected area design is not significantly constraining achievement of objectives, but could be improved (e.g. with respect to larger scale ecological processes)	2			
	Protected area design helps achievement of objectives; it is appropriate for species and habitat conservation; and maintains ecological processes such as surface and groundwater flows at a catchment scale, natural disturbance patterns, etc.	3	**3**		
6. Protected area boundary demarcation Is the boundary known and demarcated? *Process*	The boundary of the protected area is not known by the management authority or local residents/neighbouring land users	0		Survey of the boundaries with Guatemala done; There are some areas that are un-cleared without markers/signs but most strategic locations do have signs. (The boundary is 125 miles along the north-north-eastern flank).	Clear survey lines and post signs at strategic locations.
	The boundary of the protected area is known by the management authority but is not known by local residents/neighbouring land users	1			
	The boundary of the protected area is known by both the management authority and local residents/neighbouring land users but is not appropriately demarcated	2	**2**		
	The boundary of the protected area is known by the management authority and local residents/neighbouring land users and is appropriately demarcated	3			

Issue	Criteria	Score		Comments	Next Steps
7. Management plan Is there a management plan and is it being implemented? *Planning*	There is no management plan for the protected area	0		There are some components of the Plan not being implemented as a result of financial constraints.	
	A management plan is being prepared or has been prepared but is not being implemented	1			
	A management plan exists but it is only being partially implemented because of funding constraints or other problems	2	**2**		
	A management plan exists and is being implemented	3			
Additional points: *Planning*					
7a. Planning process	The planning process allows adequate opportunity for key stakeholders to influence the management plan	+1	**1**	Starting with this version, the process is providing that opportunity.	
7b. Planning process	There is an established schedule and process for periodic review and updating of the management plan	+1	**1**	Done on a 5-year cycle	
7c. Planning process	The results of monitoring, research and evaluation are routinely incorporated into planning	+1		There is only sectorial research activities carried out in collaboration with Universities. Information is used for management but the research is not led by PfB. There is no comprehensive research program – mostly do YHP and the forest plots.	
8. Regular work plan Is there a regular work plan and is it being implemented *Planning/Outputs*	No regular work plan exists	0		Constraints to implementation include sectorial focus and financing availability.	Create an integrated, comprehensive work plan that includes all sectors.
	A regular work plan exists but few of the activities are implemented	1	**1.5**		
	A regular work plan exists and many activities are implemented	2			
	A regular work plan exists and all activities are implemented	3			
9. Resource inventory Do you have enough information to	There is little or no information available on the critical habitats, species and cultural values of the protected area	0		Have done studies on HCV and have been able to prioritize where management actions should be focused;	
	Information on the critical habitats, species, ecological processes and cultural values of the protected area is not sufficient to support planning and decision making	1			

Issue	Criteria	Score		Comments	Next Steps
manage the area? *Input*	Information on the critical habitats, species, ecological processes and cultural values of the protected area is sufficient for most key areas of planning and decision making	2		Have been using remote sensing FIRMS which has helped to identify fire hot spots so that these could be dealt with ASAP	
	Information on the critical habitats, species, ecological processes and cultural values of the protected area is sufficient to support all areas of planning and decision making	3	**3**		
10. Protection systems Are systems in place to control access/resource use in the protected area? *Process/Outcome*	Protection systems (patrols, permits, etc.) do not exist or are not effective in controlling access/resource use	0		Still have evidence of illegal logging; Seismic threats not currently there.	Identify hot spots and adapt enforcement to address the illegal activities.
	Protection systems are only partially effective in controlling access/resource use	1			
	Protection systems are moderately effective in controlling access/resource use	2	**2**		
	Protection systems are largely or wholly effective in controlling access/ resource use	3			
11. Research Is there a programme of management-orientated survey and research work? *Process*	There is no survey or research work taking place in the protected area	0		The current Management Plan has a research program, but has not been fully implemented; it is directed towards the need of RBCMA management.	Fundraising for a Research Coordinator
	There is a small amount of survey and research work but it is not directed towards the needs of protected area management	1	**1.5**		
	There is considerable survey and research work but it is not directed towards the needs of protected area management	2			
	There is a comprehensive, integrated programme of survey and research work, which is relevant to management needs	3			
12. Resource management Is active resource management being undertaken? *Process*	Active resource management is not being undertaken	0		Resource management is not sufficiently integrated.	
	Very few of the requirements for active management of critical habitats, species, ecological processes and cultural values are being implemented	1			
	Many of the requirements for active management of critical habitats, species, ecological processes and, cultural values are being implemented but some key issues are not being addressed	2	**2**		
	Requirements for active management of critical habitats, species, ecological processes and, cultural values are being substantially or fully implemented	3			
13. Staff numbers	There are no staff	0			

Issue	Criteria	Score		Comments	Next Steps
Are there enough people employed to manage the protected area? *Inputs*				Need additional staff resources – had targeted 16 Rangers and currently have 12; Have increased staff numbers on a short-term basis (e.g., 3 months).	Secure financial resources to increase from 12-13 to 16 Rangers.
	Staff numbers are inadequate for critical management activities	1			
	Staff numbers are below optimum level for critical management activities	2	**2**		
	Staff numbers are adequate for the management needs of the protected area	3			
14. Staff training Are staff adequately trained to fulfil management objectives? *Inputs/Process*	Staff lack the skills needed for protected area management	0		Staff turnover; Constantly doing training; Training and skills vary among sectors. Training needs to be consistent.	
	Staff training and skills are low relative to the needs of the protected area	1			
	Staff training and skills are adequate, but could be further improved to fully achieve the objectives of management	2	**2**		
	Staff training and skills are aligned with the management needs of the protected area	3			
15. Current budget Is the current budget sufficient? *Inputs*	There is no budget for management of the protected area	0		Go back to pre-Covid salary scales – has been affecting staff morale; Need more Rangers, management staff, vehicles and equipment; Funding needed for outreach and education	
	The available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage	1			
	The available budget is acceptable but could be further improved to fully achieve effective management	2	**2**		
	The available budget is sufficient and meets the full management needs of the protected area	3			
16. Security of budget Is the budget secure? *Inputs*	There is no secure budget for the protected area and management is wholly reliant on outside or highly variable funding	0		Reliance on the carbon sequestration/DNS/endowment fund has increased (home grown); Also sustainable timber revenue.	
	There is very little secure budget and the protected area could not function adequately without outside funding	1			
	There is a reasonably secure core budget for regular operation of the protected area but many innovations and initiatives are reliant on outside funding	2	**2**		
	There is a secure budget for the protected area and its management needs	3			

Issue	Criteria	Score		Comments	Next Steps
17. Management of budget Is the budget managed to meet critical management needs? *Process*	Budget management is very poor and significantly undermines effectiveness (e.g. late release of budget in financial year)	0		All critical management needs are met.	
	Budget management is poor and constrains effectiveness	1			
	Budget management is adequate but could be improved	2	**2.5**		
	Budget management is excellent and meets management needs	3			
18. Equipment Is equipment sufficient for management needs? *Input*	There are little or no equipment and facilities for management needs	0		Vehicle needs	Equipment needs assessment and fundraising for implementation.
	There are some equipment and facilities but these are inadequate for most management needs	1			
	There are equipment and facilities, but still some gaps that constrain management	2	**2**		
	There are adequate equipment and facilities	3			
19. Maintenance of equipment Is equipment adequately maintained? *Process*	There is little or no maintenance of equipment and facilities	0		Upgrading of La Milpa cabanas needed; New restaurant and cabana in place for Hill Bank.	Funding needs to be identified for this.
	There is some *ad hoc* maintenance of equipment and facilities	1			
	There is basic maintenance of equipment and facilities	2	**2.5**		
	Equipment and facilities are well maintained	3			
20. Education and awareness Is there a planned education programme linked to the objectives and needs? *Process*	There is no education and awareness programme	0			Implement an education and awareness program.
	There is a limited and *ad hoc* education and awareness programme	1	**1**		
	There is an education and awareness programme but it only partly meets needs and could be improved	2			
	There is an appropriate and fully implemented education and awareness programme	3			

Issue	Criteria	Score		Comments	Next Steps
21. State and commercial neighbours Is there co-operation with adjacent land and water users? *Process*	There is no contact between managers and neighbouring official or corporate land and water users	0		Regular meetings with officials and informal but regular contact with others (such as landowners at Blue Creek and Indian Creek)	Outreach activities; Establish cooperation mechanisms.
	There is contact between managers and neighbouring official or corporate land and water users but little or no cooperation	1			
	There is contact between managers and neighbouring official or corporate land and water users, but only some co-operation	2	**2**		
	There is regular contact between managers and neighbouring official or corporate land and water users, and substantial co-operation on management	3			
22. Local communities Do local communities resident or near the protected area have input to management decisions? *Process*	Local communities have no input into decisions relating to the management of the protected area	0		More contact with neighboring communities may be necessary; There needs to be more community involvement in decision-making for the protected area.	Conduct bi-annual neighbor meetings to share work programs, best practices/lessons learned and identify potential areas for cooperation.
	Local communities have some input into discussions relating to management but no direct role in management	1	**1**		
	Local communities directly contribute to some relevant decisions relating to management but their involvement could be improved	2			
	Local communities directly participate in all relevant decisions relating to management, e.g. co-management	3			
Additional points *Local communities/indigenous people*					
22a. Impact on communities	There is open communication and trust between local people, stakeholders and protected area managers	+1			
22b. Impact on communities	Programmes to enhance community welfare, while conserving protected area resources, are being implemented	+1		There have been past programs in some communities but due to financing constraints these have not been sustained.	Community livelihood programs should be developed and implemented once financing is secured.
22c. Impact on communities	Local people actively support the protected area	+1			
23. Economic benefit	The protected area does not deliver any economic benefits to local communities	0		Covid has affected tourism;	Community livelihood

Issue	Criteria	Score		Comments	Next Steps
Is the protected area providing economic benefits to local communities, e.g. income, employment, payment for environmental services? *Outcomes*	Potential economic benefits are recognised and plans to realise these are being developed	1		Need to recover the industry over the next 2 years.	programs/ opportunities need to be identified for implementation.
	There is some flow of economic benefits to local communities	2	**2**		
	There is a major flow of economic benefits to local communities from activities associated with the protected area	3			
24. Monitoring and evaluation Are management activities monitored against performance? *Planning/Process*	There is no monitoring and evaluation in the protected area	0		Sectoral M&E takes place but there is no integrated M&E system in place.	Develop M&E system.
	There is some *ad hoc* monitoring and evaluation, but no overall strategy and/or no regular collection of results	1	**1.5**		
	There is an agreed and implemented monitoring and evaluation system but results do not feed back into management	2			
	A good monitoring and evaluation system exists, is well implemented and used in adaptive management	3			
25. Visitor facilities Are visitor facilities adequate? *Outputs*	There are no visitor facilities and services despite an identified need	0		La Milpa facilities need improvement (e.g., solar system, cabanas) – would have been addressed if it had not been for Covid which closed the tourism operations; Hill Bank has been improved (new restaurant, walk way system, solar system); Need to go up to BTB Gold standard.	Secure funding
	Visitor facilities and services are inappropriate for current levels of visitation	1			
	Visitor facilities and services are adequate for current levels of visitation but could be improved	2	**2**		
	Visitor facilities and services are excellent for current levels of visitation	3			
26. Commercial tourism operators	There is little or no contact between managers and tourism operators using the protected area	0			

Issue	Criteria	Score		Comments	Next Steps
Do commercial tour operators contribute to protected area management? *Process*	There is contact between managers and tourism operators but this is largely confined to administrative or regulatory matters	1		Tourism closed at this time due to Covid; otherwise (pre-Covid) it would have remained at 3	
	There is limited co-operation between managers and tourism operators to enhance visitor experiences and maintain protected area values	2			
	There is good co-operation between managers and tourism operators to enhance visitor experiences, and maintain protected area values	3	**3**		
27. Fees If fees (i.e. entry fees or fines) are applied, do they help protected area management? *Inputs/Process*	Although fees are theoretically applied, they are not collected	0		Tourism closed at this time due to Covid; otherwise (pre-Covid) it would have remained at 2.5;	A Financial Sustainability Strategy needs to be developed to account for the post-Covid reality.
	Fees are collected, but make no contribution to the protected area or its environs	1			
	Fees are collected, and make some contribution to the protected area and its environs	2			
	Fees are collected and make a substantial contribution to the protected area and its environs	3	**2.5**		
28. Condition of values What is the condition of the important values of the protected area as compared to when it was first designated? *Outcomes*	Many important biodiversity, ecological or cultural values are being severely degraded	0		Illegal logging activity is constant threat; needs to be properly assessed and addressed.	
	Some biodiversity, ecological or cultural values are being severely degraded	1			
	Some biodiversity, ecological and cultural values are being partially degraded but the most important values have not been significantly impacted	2	**2**		
	Biodiversity, ecological and cultural values are predominantly intact	3			
Additional Points: Condition of values					
28a: Condition of values	The assessment of the condition of values is based on research and/or monitoring	+1			
28b: Condition of values	Specific management programmes are being implemented to address threats to biodiversity, ecological and cultural values	+1			
28c: Condition of values	Activities to maintain key biodiversity, ecological and cultural values are a routine part of PA management	+1			
TOTAL SCORE (% of total 84)			**71.4**		

APPENDIX 8: REVIEW OF MANAGEMENT SUCCESS 2015-2019

For this review, the management programmes and strategic actions outlined in the 2015-2019 management plan are assessed for the degree to which they have been implemented, and to what effect. This methodology has been adapted from the National Protected Areas Policy and System Plan and is used to guide management actions for the new management plan period.

Ratings are awarded as follows:

Scale	***Rating***	***Criteria***
A	Succeeded	Objectives successfully met
B	Improved	Objectives not completely met but situation improved
C	No change	Objectives not met, no change in status
D	Worse	Objectives not met, situation worsened

+ and – are assigned where it is judged that actions are more or less effective within a given rating.

The 2015-2019 plan identified primary revenue-generating programmes (those that demonstrate appropriate use of RBCMA resources and underpinning annual operational budgets), conservation programmes (i.e., those addressing threats to conservation targets) and cross-cutting programmes (those targeting training, public awareness and deepening and disseminating information).

STRATEGY 1: STAKEHOLDER OUTREACH, EDUCATION AND ADVOCACY			
Sub-programme/action	***Score***	***Notes***	***Action***
Objective #1: By 2019, strengthen the relationship between PfB and the RBCMA's neighboring communities that traditionally depended on the area for subsistence			
7. Establish alternative livelihood projects in the key RBCMA buffer communities (i.e., Lemonal and San Carlos)			
c) Design projects and seek funding to create alternative livelihood opportunities for communities	C	Did not do anything with this.	Implement
d) Explore, develop and implement a game meat farming pilot project (e.g., gibnut, white-tailed deer)	C	Did not do anything with this.	Would depend on FD's policy and Wildlife Protection Act

e) Explore, develop and implement viable and sustainable harvesting of NTFPs as a pilot project (e.g., popta seeds)	C	Was an attempt at harvesting cohune nuts by NRE but was discontinued	
8. Conduct regular assessments of the economic benefits of RBCMA to communities	C	Last one was 2014	
9. Support the provision of access to training and funding opportunities in agricultural best practices			
d) Implement capacity building training programs on best farming practices	C	Did not do anything with this.	
e) Establish partnership with agriculture research institutions to assist in providing better crop varieties, increase yields and reduce cost (farming methods)	C	Did not do anything with this.	
f) Promote water conservation	C	Did not do anything with this.	
10. Create linkages to micro-financing, agro-processing, and marketing opportunities	C	Did not do anything with this.	
11. Develop entrepreneurship development through partnership with BELTRAIDE, etc.	C	Did not do anything with this.	
12. Develop and institute a disaster relief plan for Lemonal and San Carlos by 2017			
a) Provide disaster relief assistance (as needed)	C	Did not do anything with this; NEMO's responsibility to provide disaster relief assistance	Develop and institute a disaster relief plan for Lemonal and San Carlos
Objective #2: Develop and implement a public awareness strategy that focuses on the ecological importance and economic contributions of the RBCMA			
1. Use social media platforms to bring awareness to the Yellow-headed Parrot programme and other conservation efforts within the RBCMA	B	Paid Love FM for a few years, did Ruta Maya outreach, one year of the COO who had meetings	Needs to be continued and expanded
2. Highlight the tourism benefits and potential of the RBCMA, as well as the potential for NTFPs and alternative livelihood initiatives for communities that surround the RBCMA	C	PA campaign was mostly on fire prevention and YHP	
3. Utilize the print and electronic media to highlight the RBCMA management challenges as well as the opportunities	C+	Didn't do much here; however, have a new Facebook page	Needs to be continued and expanded

Objective #3: Develop and implement an environmental education strategy for the RBCMA			
1. Develop and implement a community education and outreach campaign to develop appreciation for flora and fauna			
a) Recruit an Community Education and Outreach Officer	C	There was a COO for about a year (2019); person went to further their education; partial funding only	Needs to be continued
b) Visit at least 2 RBCMA community primary schools annually to make presentations	C	This was done while COO was on staff	Needs to be continued and expanded, dependent on funding
c) Conduct one annual Community Open Day, with competitions, etc.	C-	Nothing done with this	Implement
d) Foster a sense of civic pride for the RBCMA through the promotion and support of tree planting, and so on	C-	Nothing done with this	Implement
2. Establish a volunteer program to support the various RBCMA programs	C+	Nothing much done with this; a volunteer came in 2 years ago with FD; other volunteers do come in periodically (YHP, ESTM, SJCJCS, etc.) – on a needs basis	Implement (refer to UB Internship Program)
3. Conduct one annual training for neighbouring farmers on the proper use of pesticides and fertilizers to reduce chemical runoffs around the RBCMA	C-	Nothing done with this	Implement
Objective #4: Foster an understanding among policy makers and community leaders about the importance of maintaining the RBCMA's natural resources			
1. Lobby the government for the formulation and/or enactment, or updating of legislation and regulations pertaining to the harvesting of and trade in endangered species (e.g., Mahogany)	C+	Attend the relevant meetings; invitees on relevant committees; Did lobbying viz CITES legislation (not sure if finalized)	
2. Lobby the government for the formulation and/or enactment of legislation and regulations pertaining to the use of sawmills	C	Some movement with preparing Draft Sawmill Regs (still a problem, not regulated); have made presentations along with FD to the "sawmill community" (Shipyard)	

3. Continuously lobby for improved policy and legislation as it relates to law enforcement and institution of higher penalties for trespassing, illegal logging, and poaching in private protected areas	B	Legislation has improved and penalties increased viz illegal logging	Currently, FD focusing on wildlife policy and Wildlife Protection Act (Selva Maya support); need to continue lobbying
STRATEGY 2: ECOSYSTEMS PROTECTION AND MANAGEMENT			
Sub-programme/action	***Score***	***Notes***	***Action***
Objective #5: By mid-2015, institute a strengthened and expanded resource protection and enforcement program at the RBCMA			
1. Create a ranger protection and surveillance plan			
a) Increase the number of rangers to an optimal size (year 1 = 10, year 3 = 16, and year 5/ongoing = 23)	B-	12 to 13 Rangers on staff currently	Increase the number of rangers to an optimal size (year 1 = 13, year 3 = 16, and year 5/ongoing = 23); collaborate with and provide support to the BMF (possible funding from Global Conservation Network)
b) Increase the number of RBCMA patrols c) Conduct proper, regular scheduled protection patrols	B+	Started with 10 Rangers and 3 gates to managed to launch additional patrols for YHP (~550-600 patrols/year currently – 2021) – did less than half of this before	Maintain current level of patrols; need to improve aerial patrols (target is 4/year)
d) Properly equip the ranger team (by year 2)	B	Installed mobile radios, upgraded/replaced hand held radios, GPS units, computerized reporting systems and use of SMART, upgraded fire-fighting equipment	Need to replace at least 1 vehicle in 2022; additional Ranger gears and equipment; additional fire-fighting equipment; need at least 2 additional Mules/ATVs; repairs/retrofitting of boat(s) – replace boat; personal defensive equipment (such as pepper spray (?), Tasers (?), body cameras, hidden cameras with satellite technology, etc.)
e) Provide adequate supervision and coordination of patrols (scheduling, implementation, monitoring, reporting)	B+	Has improved; however, lacking FD's support (they decided they would not support patrols from Fridays thru Monday)	Need to continue coordination with the authorities; innovative ways to collaborate
2. Install two ranger/conservation posts at strategic locations (San Felipe savannah, Lemonal area)	C	Did a mobile trailer for this purpose; Ranger numbers affected this; have increased overnight camping patrols (YHP/Lemonal area)	Install two ranger/conservation posts at strategic locations (San Felipe savannah, Lemonal area); also need a fire observation tower (consider personnel and maintenance)
3. Acquire new patrol vehicles and equipment	B	Acquired new vehicles but current vehicle conditions has deteriorated	Need to replace at least 2 vehicles; also ATVs

4. Reinforce boundary demarcation through the use of proper signage	B	Signage around the hotspots; Some signs need to be replaced; improved border signs along the border with Guatemala	Continue to reinforce boundary demarcation through the use of proper signage (from the East Gate to NR Lagoon and the Int'l Border signs need to be maintained); add more signage
5. Maintain access year-round of the San Felipe/Bergen road	B+	Invest every year from the timber funds	Maintain access year-round of the San Felipe/Bergen road
6. Provide logistical support to the Forest Department when possible	A	Always done so when FD comes to assist; also to the security forces	Continue providing logistical support to the Forest Department when possible
7. Formulate policy on the use of firearms within the RBCMA	C	Policy on the use of firearms exists – no firearms currently; has been discussed but unchanged; risk level to Rangers has increased	Revisit policy on the use of firearms within the RBCMA, and address the risk/safety of Rangers
Objective #6: Develop and institute a fire management program by the end of 2016 guided by the National Fire Management Strategy			
1. Update the fire management plan (for the savannah and broad-leaved forests) by year 1 and implement fully by year 2 and beyond			
a) Re-institutionalize the fire management team with clear roles and chain of command	A	The team – first responders; backed up by the Forestry Crew and then rest of staff	
b) Conduct training sessions on burning techniques and other fire management systems	B+	One training session per year over the last 3 years	Conduct annual training sessions on burning techniques and other fire management systems
c) Institute fire response protocol commensurate with the level of threat	A	In place	
d) Implement prescribed burns of pine savannah on a maintained schedule (rangers and forestry staff)	A	Doing this over the last 2 years – prescribed burns at certain years (scheduled annually to meet the 5 year cycle)	Maintain/continue prescribed burns of pine savannah on a maintained schedule (rangers and forestry staff) – 5 year cycle
e) Document every fire in RBCMA – size, location, impact/damage, etc., regardless of size/location	B	Have documented as good as possible (over the last 2-3 years)	Continue documenting fires in RBCMA
f) Increase the number of patrols in the hot spots to prevent and maintain fires	A	Have increased patrols supported by FIRMS	Maintain the number of patrols in the hot spots to prevent and contain fires
g) Conduct routine training of rangers, forestry personnel and community members	B	Refer to b) above; idea here is to contain fires in the BRV before they get to the RBCMA	Continue; Depends on funding for community members ("community rangers")

h) Maintain adequate equipment for fire management (tractor, swatters, fire gauges, etc.)	B+	Have maintained; procured a bowser; need gear like fire jackets, etc.; need to replace some fire equipment	Maintain adequate equipment for fire management (tractor, swatters, fire gauges, etc.)
i) Conduct an annual review of fire-fighting equipment – acquire adequate fire-fighting equipment	A	Done annually by the Forestry Crew and Hill Bank Manager; at the start of the fire season	Continue conducting annual review of fire-fighting equipment – acquire adequate fire-fighting equipment
j) Education and awareness on fire management for communities, staff, and guests	B	Did this for 1.5 years; need to continue	
2. Establish and train a community fire brigade (rapid response team) that will act as a support in RBCMA and the communities	C	Fire brigade was not established	Establish and train a community fire brigade (rapid response team) that will act as a support in RBCMA and the communities
3. Develop a hurricane response plan in the event of damage/impact from tropical storm winds	C+	A hurricane response plan was not developed but an informal protocol is in place	Develop a hurricane response plan
Objective #7: Strengthen the savannah protection program			
1. Develop and implement a Yellow-headed Parrot (YHP) conservation program			
a) Develop and implement a media awareness campaign on the YHP and the RBCMA (including print and electronic media, as well as social media)	C	Some done when had the COO	Develop and implement a media awareness campaign on the YHP and the RBCMA
b) Assign rangers seasonally for YHP protection (year 2 = 2, year 5 = 4)	A		Assign rangers seasonally for YHP protection (year 2 = 2, year 5 = 4)
c) Schedule and implement regular patrols to the pine savannahs	A		Schedule and implement regular patrols to the pine savannahs
d) Improve monitoring of YHP nests/breeding success (February to June)	A	Covid affected current year's monitoring but has improved overall	Continue monitoring of YHP nests/breeding success (February to June)
e) Establish a community volunteer program for YHP monitoring	C	Not done; this could be a double-edged sword	Evaluate the need for a community volunteer program for YHP monitoring
f) Develop a YHP adopt-a-parrot initiative (nesting site/parrot family)	C	Nothing done	Develop a YHP adopt-a-parrot initiative (nesting site/parrot family)
g) Establish and strengthen partnerships with interested organizations, such as Defiance College, Reigate College, Francisco Villella	B+	Have a strong working relationship with Charles Britt (via Belize Bird Conservancy)	Continue / expand partnerships with interested organizations, such as Defiance College and BBC
Objective #8: Strengthen the broad-leaved forest management program			

i. Reduce illegal logging within the RBCMA (see the resource protection and enforcement program)	B	Illegal logging reduced; exponential increase abated; lower number of incidents currently; could be that illegal loggers have changed tactics; threat still high	Maintain and continually improve resource protection and enforcement
i. Direct funds from confiscated logs directly for fuel for patrols	B+	Not much money; minimum impact on the fuel bill; protection budget has financed fuel costs	Ensure adequate funding for fuel (patrols); Maintain activity with FD's support
Objective #9: Strengthen the management and protection of the aquatic ecosystem within the RBCMA			
1. Implement training session with the Pesticides Control Board for farmers in pesticides and fertilizer use	C	Not done; more relevant for PCB	Conduct an assessment of pesticide and fertilizer use within the RBCMA/NR Lagoon zone of influence
2. Develop and implement an invasive species education and outreach programme	C	Tilapia and now Armoured Catfish	Collaborate with FiD to implement an invasive species education and outreach programme (liaise with Fisheries Department)
3. By 2016, develop and implement a water quality monitoring program			
a) Conduct water quality testing in the New River watershed	B	Done by Defiance College	Continue conducting water quality testing in the New River watershed with support of universities, DOE, FNR, NRTF
b) Conduct studies to determine levels and methods of agrochemicals use in neighbouring farms	C	Not done; more relevant for PCB	Related to #1 above
c) Implement education programs for best farming practices	C	Not done; more relevant for Agriculture Department	After assessment (see #1), develop a strategy; Collaborate with Agriculture Department? Defiance College?
d) Lobby GOB for increased and sustained monitoring of pesticides and fertilizer use within the New River watershed	B-	NRTF; development of a NR Watershed Plan (currently underway)	PfB's involvement on the New River Task Force – collaborate and support
4. Conduct fish surveys in the New River Lagoon and associated waterways	C	None during this period	Reword: Conduct assessments of fish stock status within the New River Lagoon and associated waterways – ecological and sociological – link to hicatee/turtle and bay snook
Objective #10: By 2019, develop and implement a water conservation program			
1. Maintain adequate protection efforts to prevent deforestation	A		Maintain adequate protection efforts to prevent deforestation

2. Establish partnerships with local authorities			???
3. Institute an education program on watershed management and protection	C	Did not do	Develop and institute an education program on watershed management and protection
4. Monitor forest cover change around the RBCMA	C		Monitor forest cover change around the RBCMA (annually – via satellite imagery)
5. Work with land holders for forest connectivity	B+	BMF and MFC	Continue to work with neighbouring land holders for forest connectivity
STRATEGY 3: RESEARCH AND MONITORING			
Sub-programme/action	***Score***	***Notes***	
Objective #11: By 2017, develop and institute a research and monitoring program for the RBCMA			
1. Conduct feasibility studies on the production of NTFP goods and services	C	Nothing done	Explore the potential of NTFP goods and services (feasibility study) – based on the request of an interested party (and possibly financed by them)
2. Develop and implement standardized biodiversity monitoring protocols in liaison with other national, regional and international initiatives	B	Monitoring sample plots in place an standardized; need to expand bird monitoring	Maintain and expand standardized biodiversity monitoring protocols in liaison with other national, regional and international initiatives
3. Develop and implement a fish survey monitoring programme	C	None during this period	Conduct assessments of fish stock status within the New River Lagoon and associated waterways – ecological and sociological – link to hicatee/turtle and bay snook
4. Promote the field stations as central bases for research activities in the RBCMA	B	Both stations provide facilities at reduced cost for researchers	Continue promoting the field stations as central bases for research activities in the RBCMA
5. Facilitate research into population structure and composition of key wildlife species, in particular the Mahogany, Jaguar, Yellow-headed Parrot, Central American River Turtle, and cichlids.	B	YHP (Britt) and Jaguar (M. Kelly) research done; mahogany PSPs in place	Continue, and expand with hicatee and cichlids
6. Develop and implement a microclimate change monitoring plan for RBCMA target habitats.	B	METT office has installed a weather data logger at Hill Bank; automatic weather station at La Milpa	Undertake an updated climate change analysis for RBCMA; develop a basic climate monitoring strategy
Objective #12: Develop and institute a monitoring, reporting and verification (MRV) system for the RBCMA			
1. Conduct monitoring of High Conservation Value Forests	A	Ongoing; need to update the document if get additional HCVF data	Continue monitoring of High Conservation Value Forests
2. Develop a database and format for monitoring and reporting activities	C	Need to do it for 2021	Develop a database and format for monitoring and reporting activities

STRATEGY 4: INSTITUTIONAL STRENGTHENING AND MANAGEMENT			
Sub-programme/action	***Score***	***Notes***	
Objective #13: Develop a resource mobilization strategy for the RBCMA by mid-2016 and implement thereafter			
1. Develop and implement a financial sustainability and fundraising strategy for the RBCMA, including provisions for the establishment of an Endowment Fund and for merchandizing	B	Need to do again; sale of carbon offsets was successful	Develop and implement a new/updated financial sustainability and fundraising strategy for the RBCMA
2. Explore innovative financing mechanisms, such as carbon sequestration and REDD+	B-	Were able only to work on C-seq; need to focus on REDD+	Explore innovative financing mechanisms
3. Identify and maintain donor agencies and cultivate/strengthen donor relations	B	Ongoing	Identify and maintain donor agencies and cultivate/strengthen donor relations
4. Strengthen and expand the implementation of the sustainable timber management program	A	Constant need; cyclical; will not expand	Strengthen the implementation of the sustainable timber management program
5. Strengthen the tourism management and development program			
a) Conduct research on the tourism potential of the RBCMA	C	Using the same	Conduct research on the tourism potential of the RBCMA
b) Based on the results of the research, revise the RBCMA tourism development plan to adequately incorporate Hill Bank, marketing, etc.	--		Based on the results of the research, revise the RBCMA tourism development plan to adequately incorporate Hill Bank, marketing, etc.
c) Explore the viability of rehabilitating portions of the La Milpa Archaeological Site	C	Under discussion – needs to be done with IOA	Explore the viability of rehabilitating portions of the La Milpa Archaeological Site
d) Develop the Hill Bank Field Station to showcase its colonial history and put it on par with the La Milpa Ecolodge and Field Station	C	Improved the Hill Bank field station in terms of infrastructure; needs more improvement; no focus on colonial history showcase	
e) Support the development of a Creole Heritage Centre at St. Paul's Bank	C	Not done	Need to explore with them; Conduct socioeconomic assessment
f) Recruit a Public Relations Officer to focus on building the image and culture of PfB and the RBCMA	C	Not done	PRO amalgamated with COO? – OR: Incorporate PRO responsibilities into the JD's of senior field staff (?)
Objective #14: Improve the branding and marketing of the RBCMA			

1. Develop and implement a marketing strategy for the RBCMA	C	Strategy not developed; did some marketing	
2. Upgrade website for PfB and the RBCMA, linked to the websites of other protected area management and tourism agencies	A	Accomplished	Maintain and improve where necessary to keep fresh
3. Develop professional and attractive organizational and RBCMA logos	C	No new logos developed; discussions underway for La Milpa and Hill Bank logos	Develop professional and attractive logos for sites
Objective #15: Manage and enhance the human resources of the RBCMA			
1. Conduct a comprehensive training needs assessment (identification of gaps) for effective management of the RBCMA	C+	Only sectoral training needs assessed	
2. Develop and implement a training program for RBCMA staff			
a) Train staff on the use and maintenance of equipment	B+	Continuous process	
b) Train field staff on the pertinent Laws of Belize (e.g., the Wildlife Protection Act, EPA and regulations, Forests Act and regulations, etc.)	B+	Continuous process	
c) Train rangers in protocols for patrols	B+	Continuous process	
Objective #16: Strengthen staff recruitment and retention for the RBCMA			
1. Prepare clear and detailed Terms of Reference (job descriptions) for all staff posts	B	Revisited as a result of Covid and needs to be revisited again (periodic)	
2. Develop and implement a Staff Recruitment Policy and Plan (including Succession Planning) to fill vacant RBCMA staff posts	C	Formal document not in place; have an Employees Manual	Develop and implement a Staff Recruitment Policy and Plan (including Succession Planning)
3. Develop and implement preferential hiring policy for employment from local communities	A	In place	
4. Develop Compensation Framework including compensation philosophy and pay policy	B	Reflected in Employees Manual; needs to be revised	
5. Review and strengthen an Administrative and Personnel Policy Manual	B	Manager's Manual in place – needs revision	
6. Strengthen performance evaluation framework for staff	C	Need to improve	Strengthen performance evaluation framework for staff

Objective #17: Develop and/or strengthen the equipment procurement system for the RBCMA			
1. Develop and implement a five-year infrastructure development and equipment procurement plan	C	Need to do; mostly sectoral needs addressed	
a) Procure equipment for patrols			
b) Procure 4X4 vehicles and ATVs for protection patrols and outreach activities			
c) Procure one heavy-duty tractor with trailer			
d) Maintain large boat in a "sea-worthy" state at all times			
Objective #18: Conduct annual review of management activities			
1. Conduct management effectiveness assessments on an annual basis (using the METT tool), for submission to the Forest Department	C	Do it every 5 years; did the IUCN Green List Evaluation	Mid-cycle (2-3 years)
2. Conduct "Measures of Success" monitoring	C	Do it every 5 years	Mid-cycle (2-3 years)
3. Preparation and review of annual work plans	C	Only sectoral	
4. Review of management plan after 2.5 years and after 5 years	C	Do it every 5 years	Mid-cycle (2-3 years)
STRATEGY 5: OIL AND ROADS CONTINGENCY PLAN			
Sub-programme/action	***Score***	***Notes***	
Objective #19: Develop a resource mobilization strategy for the RBCMA by mid-2016 and implement thereafter			
1. Direct where new roads can be built		Didn't do anything here; need to do an assessment of road impacts; need to develop a Roads Monitoring Plan	
2. Implement the monitoring plan for seismic lines			
3. Work with GOB and the seismic company(ies) to adequately fund the monitoring plan			
4. Develop a "needs" plan related to seismic lines (to include additional rangers, vehicles, and equipment).			

APPENDIX 9: MONTHLY STATUS REPORT FORM

Monthly Status Report
Rio Bravo Conservation & Management Area
Programme for Belize

Form: RBCMA-0001

Management Objectives/Actions	Responsibility	Target Date	Completed? (Yes, No, Ongoing)	Comments

Submitted by:

Name	Signature	Position	Date

Approved by:

Name	Signature	Position	Date

APPENDIX 10: OBJECTIVE, RESPONSIBILITIES AND TARGETS (ORT) REPORT FORM

ORT Report Form
Rio Bravo Conservation and Management Area
Programme for Belize

Form: RBCMA-0002

Unfinished Management Actions	Adjustment Required	Responsibility	Proposed Target Date	Adjusted Target Date

Submitted by:

Name	Signature	Position	Date

Approved by:

Name	Signature	Position	Date

APPENDIX 11: METT SELF-ASSESSMENT TOOL[12]

METT Self-Assessment Tool Form
Rio Bravo Conservation and Management Area
Programme for Belize

Form: RBCMA-0003

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
1. Legal status Does the protected area have legal status (or in the case of private reserves is covered by a covenant or similar)? *Context*	The protected area is not gazetted/covenanted	0			
	There is agreement that the protected area should be gazetted/covenanted but the process has not yet begun	1			
	The protected area is in the process of being gazetted/covenanted but the process is still incomplete (includes sites designated under international conventions, such as Ramsar, or local/traditional law such as community conserved areas, which do not yet have national legal status or covenant)	2			
	The protected area has been formally gazetted/covenanted	3			
2. Protected area regulations Are appropriate regulations in place to control land use	There are no regulations for controlling land use and activities in the protected area	0			
	Some regulations for controlling land use and activities in the protected area exist but these are major weaknesses	1			
	Regulations for controlling land use and activities in the protected area exist but there are some weaknesses or gaps	2			

[12] This Self-Assessment Tool is designed to be utilized by PfB/RBCMA staff without the need for an independent consultant.

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
and activities (e.g., hunting)? *Planning*	Regulations for controlling inappropriate land use and activities in the protected area exist and provide an excellent basis for management	3			
3. Law enforcement Can staff (i.e., those with responsibility for managing the site) enforce protected area rules well enough? *Input*	The staff have no effective capacity/resources to enforce protected area legislation and regulations	0			
	There are major deficiencies in staff capacity/resources to enforce protected area legislation and regulations (e.g., lack of skills, no patrol budget, lack of institutional support)	1			
	The staff have acceptable capacity/resources to enforce protected area legislation and regulations but some deficiencies remain	2			
	The staff have excellent capacity/resources to enforce protected area legislation and regulations	3			
4. Protected area objectives Is management undertaken according to agreed objectives? *Planning*	No firm objectives have been agreed for the protected area	0			
	The protected area has agreed objectives, but is not managed according to these objectives	1			
	The protected area has agreed objectives, but is only partially managed according to these objectives	2			
	The protected area has agreed objectives and is managed to meet these objectives	3			
5. Protected area design Is the protected area the right size and shape to	Inadequacies in protected area design mean achieving the major objectives of the protected area is very difficult	0			
	Inadequacies in protected area design mean that achievement of major objectives is difficult, but some mitigating actions are being taken (e.g., agreements with adjacent land owners for wildlife corridors or introduction of appropriate catchment management)	1			

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
protect species, habitats, ecological processes and water catchments of key conservation concern? *Planning*	Protected area design is not significantly constraining achievement of objectives, but could be improved (e.g., with respect to larger scale ecological processes)	2			
	Protected area design helps achievement of objectives; it is appropriate for species and habitat conservation; and maintains ecological processes such as surface and groundwater flows at a catchment scale, natural disturbance patterns, etc.	3			
6. Protected area boundary demarcation Is the boundary known and demarcated? *Process*	The boundary of the protected area is not known by the management authority or local residents/neighbouring land users	0			
	The boundary of the protected area is known by the management authority but is not known by local residents/neighbouring land users	1			
	The boundary of the protected area is known by both the management authority and local residents/neighbouring land users but is not appropriately demarcated	2			
	The boundary of the protected area is known by the management authority and local residents/neighbouring land users and is appropriately demarcated	3			
7. Management plan Is there a management plan and is it being implemented? *Planning*	There is no management plan for the protected area	0			
	A management plan is being prepared or has been prepared but is not being implemented	1			
	A management plan exists but it is only being partially implemented because of funding constraints or other problems	2			
	A management plan exists and is being implemented	3			
Additional points: *Planning*					

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
7a. Planning process	The planning process allows adequate opportunity for key stakeholders to influence the management plan	+1			
7b. Planning process	There is an established schedule and process for periodic review and updating of the management plan	+1			
7c. Planning process	The results of monitoring, research and evaluation are routinely incorporated into planning	+1			
8. Regular work plan Is there a regular work plan and is it being implemented? *Planning/Outputs*	No regular work plan exists	0			
	A regular work plan exists but few of the activities are implemented	1			
	A regular work plan exists, and many activities are implemented	2			
	A regular work plan exists, and all activities are implemented	3			
9. Resource inventory Do you have enough information to manage the area? *Input*	There is little or no information available on the critical habitats, species and cultural values of the protected area	0			
	Information on the critical habitats, species, ecological processes and cultural values of the protected area is not sufficient to support planning and decision making	1			
	Information on the critical habitats, species, ecological processes and cultural values of the protected area is sufficient for most key areas of planning and decision making	2			
	Information on the critical habitats, species, ecological processes and cultural values of the protected area is sufficient to support all areas of planning and decision making	3			

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
10. Protection systems Are systems in place to control access/resource use in the protected area? *Process/Outcome*	Protection systems (patrols, permits etc) do not exist or are not effective in controlling access/resource use	0			
	Protection systems are only partially effective in controlling access/resource use	1			
	Protection systems are moderately effective in controlling access/resource use	2			
	Protection systems are largely or wholly effective in controlling access/ resource use	3			
11. Research Is there a programme of management-orientated survey and research work? *Process*	There is no survey or research work taking place in the protected area	0			
	There is a small amount of survey and research work but it is not directed towards the needs of protected area management	1			
	There is considerable survey and research work but it is not directed towards the needs of protected area management	2			
	There is a comprehensive, integrated programme of survey and research work, which is relevant to management needs	3			
12. Resource management Is active resource management being undertaken?	Active resource management is not being undertaken	0			
	Very few of the requirements for active management of critical habitats, species, ecological processes and cultural values are being implemented	1			
	Many of the requirements for active management of critical habitats, species, ecological processes and, cultural values are being implemented but some key issues are not being addressed	2			
Process	Requirements for active management of critical habitats, species, ecological processes and, cultural values are being substantially or fully implemented	3			
13. Staff numbers	There are no staff	0			

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
Are there enough people employed to manage the protected area? *Inputs*	Staff numbers are inadequate for critical management activities	1			
	Staff numbers are below optimum level for critical management activities	2			
	Staff numbers are adequate for the management needs of the protected area	3			
14. Staff training Are staff adequately trained to fulfil management objectives? *Inputs/Process*	Staff lack the skills needed for protected area management	0			
	Staff training and skills are low relative to the needs of the protected area	1			
	Staff training and skills are adequate, but could be further improved to fully achieve the objectives of management	2			
	Staff training and skills are aligned with the management needs of the protected area	3			
15. Current budget Is the current budget sufficient? *Inputs*	There is no budget for management of the protected area	0			
	The available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage	1			
	The available budget is acceptable but could be further improved to fully achieve effective management	2			
	The available budget is sufficient and meets the full management needs of the protected area	3			
16. Security of budget	There is no secure budget for the protected area and management is wholly reliant on outside or highly variable funding	0			
	There is very little secure budget and the protected area could not function adequately without outside funding	1			

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
Is the budget secure? *Inputs*	There is a reasonably secure core budget for regular operation of the protected area but many innovations and initiatives are reliant on outside funding	2			
	There is a secure budget for the protected area and its management needs	3			
17. Management of budget Is the budget managed to meet critical management needs? *Process*	Budget management is very poor and significantly undermines effectiveness (e.g., late release of budget in financial year)	0			
	Budget management is poor and constrains effectiveness	1			
	Budget management is adequate but could be improved	2			
	Budget management is excellent and meets management needs	3			
18. Equipment Is equipment sufficient for management needs? *Input*	There is little or no equipment and facilities for management needs	0			
	There are some equipment and facilities, but these are inadequate for most management needs	1			
	There are equipment and facilities, but still some gaps that constrain management	2			
	There are adequate equipment and facilities	3			
19. Maintenance of equipment Is equipment adequately maintained?	There is little or no maintenance of equipment and facilities	0			
	There is some *ad hoc* maintenance of equipment and facilities	1			
	There is basic maintenance of equipment and facilities	2			
	Equipment and facilities are well maintained	3			

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
Process					
20. Education and awareness Is there a planned education programme linked to the objectives and needs? *Process*	There is no education and awareness programme	0			
	There is a limited and *ad hoc* education and awareness programme	1			
	There is an education and awareness programme but it only partly meets needs and could be improved	2			
	There is an appropriate and fully implemented education and awareness programme	3			
21. State and commercial neighbours Is there co-operation with adjacent land and water users? *Process*	There is no contact between managers and neighbouring official or corporate land and water users	0			
	There is contact between managers and neighbouring official or corporate land and water users but little or no cooperation	1			
	There is contact between managers and neighbouring official or corporate land and water users, but only some co-operation	2			
	There is regular contact between managers and neighbouring official or corporate land and water users, and substantial co-operation on management	3			
22. Local communities Do local communities' resident or near the protected area have input to management decisions?	Local communities have no input into decisions relating to the management of the protected area	0			
	Local communities have some input into discussions relating to management but no direct role in management	1			
	Local communities directly contribute to some relevant decisions relating to management, but their involvement could be improved	2			
	Local communities directly participate in all relevant decisions relating to management, e.g., co-management	3			

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
Process					
Additional points Local communities					
22a. Impact on communities	There is open communication and trust between local and/or indigenous people, stakeholders and protected area managers	+1			
22b. Impact on communities	Programmes to enhance community welfare, while conserving protected area resources, are being implemented	+1			
22c. Impact on communities	Local and/or indigenous people actively support the protected area	+1			
23. Economic benefit Is the protected area providing economic benefits to local communities, e.g., income, employment, payment for environmental services? *Outcomes*	The protected area does not deliver any economic benefits to local communities	0			
	Potential economic benefits are recognised and plans to realise these are being developed	1			
	There is some flow of economic benefits to local communities	2			
	There is a major flow of economic benefits to local communities from activities associated with the protected area	3			
24. Monitoring and evaluation Are management activities monitored against performance?	There is no monitoring and evaluation in the protected area	0			
	There is some *ad hoc* monitoring and evaluation, but no overall strategy and/or no regular collection of results	1			
	There is an agreed and implemented monitoring and evaluation system but results do not feed back into management	2			
	A good monitoring and evaluation system exists, is well implemented and used in adaptive management	3			

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
Planning/Process					
25. Visitor facilities Are visitor facilities adequate? *Outputs*	There are no visitor facilities and services despite an identified need	0			
	Visitor facilities and services are inappropriate for current levels of visitation	1			
	Visitor facilities and services are adequate for current levels of visitation but could be improved	2			
	Visitor facilities and services are excellent for current levels of visitation	3			
26. Commercial tourism operators Do commercial tour operators contribute to protected area management? *Process*	There is little or no contact between managers and tourism operators using the protected area	0			
	There is contact between managers and tourism operators, but this is largely confined to administrative or regulatory matters	1			
	There is limited co-operation between managers and tourism operators to enhance visitor experiences and maintain protected area values	2			
	There is good co-operation between managers and tourism operators to enhance visitor experiences, and maintain protected area values	3			
27. Fees If fees (i.e., entry fees or fines) are applied, do they help protected area management? *Inputs/Process*	Although fees are theoretically applied, they are not collected	0			
	Fees are collected, but make no contribution to the protected area or its environs	1			
	Fees are collected, and make some contribution to the protected area and its environs	2			
	Fees are collected and make a substantial contribution to the protected area and its environs	3			

Issue	Criteria	Score: Tick only one box per question		Comments/Explanation	Next steps
28. Condition of values What is the condition of the important values of the protected area as compared to when it was first designated? *Outcomes*	Many important biodiversity, ecological or cultural values are being severely degraded	0			
	Some biodiversity, ecological or cultural values are being severely degraded	1			
	Some biodiversity, ecological and cultural values are being partially degraded, but the most important values have not been significantly impacted	2			
	Biodiversity, ecological and cultural values are predominantly intact	3			
Additional Points: Condition of values					
2880a: Condition of values	The assessment of the condition of values is based on research and/or monitoring	+1			
28b: Condition of values	Specific management programmes are being implemented to address threats to biodiversity, ecological and cultural values	+1			
28c: Condition of values	Activities to maintain key biodiversity, ecological and cultural values are a routine part of park management	+1			
TOTAL SCORE					

Submitted by:

Name	Signature	Position	Date

Approved by:

Name	Signature	Position	Date

APPENDIX 12: MANAGEMENT SUCCESS REVIEW TOOL

Management Success Review Tool Form
Rio Bravo Conservation and Management Area
Programme for Belize

Form: RBCMA-0004

The review takes the management actions set out in the 2021-2026 management plan and assesses the degree to which they have been implemented, and to what effect. This methodology is set out for the National Protected Area System Plan (Wildtracks, 2005) and is used to guide management actions for the upcoming period. Ratings are awarded as follows:

Scale	Rating	Criteria
A	Succeeded	Successfully met
B	Improved	Not completely met but situation improved
C	No change	No change in status
D	Worse	Not met, situation worsened

+ and **–** are assigned where it is judged that actions are more or less effective within a given rating.

Management Action	Score	Notes	Action
Programme:			

Submitted by:

Name	Signature	Position	Date

Approved by:

Name	Signature	Position	Date