



Management Plan

Tapir Mountain Nature Reserve

2021 - 2025



Funded by:



Tapir Mountain Nature Reserve

GOAL: To protect the rich biodiversity and clean water of Tapir Mountain Nature Reserve, supporting engaged and empowered communities, livelihood opportunities, and active research, for a sustainable future

OBJECTIVES

To protect biodiversity and ecosystem services and karst, archaeological and cultural features.

To establish ongoing monitoring and research activities for informing management decisions and measuring management success.

To ensure stakeholders are informed stewards of Tapir Mountain, and have opportunities to benefit socio economically from the protected area.

To provide opportunities for nature-based public use with minimal environmental impact that supports the goal of the protected area.

**Tapir Mountain Nature Reserve
Management Plan
2021 - 2025**



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Management Plan facilitated by:

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Introduction

Background and Context

Tapir Mountain Nature Reserve is located in Cayo District at UTM 300 000 E; 1894 000 N, and is considered an important representation of the karst limestone foothills of Belize (Zisman, 1996). It was established 'to retain in perpetuity a portion of the northern Maya Mountain foot-hills ecosystem', particularly as these northern foothills become increasingly eroded by dereservation for agricultural expansion. The rugged forested limestone terrain of the area contributes towards watershed protection for several communities (Teakettle, Blackman Eddy, Ontario, Barton Creek and Georgeville), and two major tributaries of the Belize River, Barton Creek and Roaring Creek, form the eastern and western boundaries respectively. The limestone topography karstic features, including caves, some containing Maya artifacts. The area sustains a diverse flora and fauna, and harbours representative populations of the game species found in healthy forests in Belize, including the collared and white-lipped peccary (*Pecari tajacu* and *Tayassu pecari*), paca (*Cuniculus paca*) and armadillo (*Dasypus novemcinctus*). It has also been identified as important as a wintering habitat for migratory bird species, and as a forest foraging site for raptors nesting in the Mountain Pine Ridge to the north.

Summary of Key Characteristics:

- Watershed protection and water security
- Ecosystem representation
- Important for protection of two of Belize's high risk species – Central American spider monkey, white lipped peccary
- Protects the iconic and globally endangered Baird's tapir

Summary of Resilience Features

- Forests on limestone tend to have species better adapted to drought conditions, which will assist in adaptation to predicted reduced rainfall and increased seasonality
- Currently has connectivity with the large tract of intact forests of the Maya Mountains Massif

National Protected Areas System Rationalization Report (Walker and Walker, 2013)

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The Nature Reserve originally 6,744 acres, was donated to the Government of Belize in 1975, and was first managed as ‘Society Hall Nature Reserve’. It was officially gazetted as part of the National Protected Areas System in December 1986 (SI 108 of 1986), and in 1994, the name ‘Society Hall Nature Reserve’ was replaced by ‘Tapir Mountain Nature Reserve’, following the transfer of management to Belize Audubon Society. In 2004, 455 acres was separated as a Natural Monument to allow for visitation to the impressive cave system and Maya artifacts of Actun Tunichil Muknal Natural Monument (SI15 of 2004), to be managed jointly by the Institute of Archaeology and the Forest Department. The remaining approximately 6,300 acres has been considered a paper park following relinquishment of management by Belize Audubon Society. In 2019, a new co-management agreement was signed with Belize Karst Habitat Conservation (Belize Karst) an NGO established specifically to fill the management gap and establish a management presence in the protected area.

Tapir Mountain is currently classified as a Nature Reserve (equivalent to IUCN Category 1a), the highest level of protection available under the National Protected Areas System, with only science and education activities being permitted in the area. A rationalization assessment of the National Protected Area System in 2013 recommended that the management regime for Tapir Mountain be amended to allow for environmentally sustainable tourism access, to provide a financial sustainability mechanism for management (Walker and Walker, 2013). The recommended reclassification as a National Park, equivalent to IUCN Category II, in recognition of its role in protecting natural and scenic values for the benefit and enjoyment of the general public, preventing extractive use and retaining the original values – the biodiversity and natural values - for which the protected area was first established.

The provisional co-management agreement, signed in 2019 between the the Government of Belize and Belize Karst Habitat Conservation, recognizes the need for this shift in designation to allow for visitation, with permission for basic visitor infrastructure development. The strategies in this management plan take into account both the current designation as a Nature Reserve and proposed reclassification as a National Park, with those strategies relevant to the current and proposed management context, and those that are only relevant when the reclassification takes place both identified and differentiated in the management programmes.

Purpose and Scope of Management Plan

This Management Plan provides the contextual background for informed management decision making, and a structured framework of activities to assist Belize Karst, as the co-management partner, the Government of Belize and other partners to ensure Tapir Mountain Nature Reserve (TMNR) can be strengthened in its support of biodiversity conservation, maintenance of environmental services (including water security), and support for local livelihoods. Tapir Mountain is designated as a Nature Reserve under the National Park Systems Act of 1981

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(Revised, 2015), Chapter 215, Laws of Belize, Revised Edition 2000), strategies in this management plan reflect the intent behind the co-management agreement, and the legislative process for the reclassification of Tapir Mountain as a National Park.

This Management Plan has been developed to guide the management of the protected area through the next five years (2021 – 2025), as part of a facilitated process of workshops and consultations held with Belize Karst, as the co-management partner, and other stakeholders of TMNR. In line with the National Protected Areas Policy and System Plan, it reflects the participatory approach to management being adopted in Belize today, with the input of key stakeholders of TMNR, through focal group meetings, interviews with community leaders in key buffering communities and tourism stakeholders, the TMNR Board of Directors and Executive Director, as well as input from the Forest Department and the National Biodiversity Office (representing the Ministry of Sustainable Development, Climate Change and Disaster Risk Management (MSDCC&DRM), and the Institute of Archaeology. It should be noted, though, that beyond the initial consultations and workshops, much of the planning had to be conducted on-line as a result of the impacts of Covid-19, restricting the number of stakeholders that could be involved in the latter stages of the planning. It is recommended that once national restrictions on meetings are lifted, Belize Karst present the plan to a larger audience to re-engage stakeholders.

This management plan has been prepared using the framework required by the National Protected Area Policy and System Plan (NPAPSP, 2005), and taking into the account the system-level objectives and strategic actions outlined under the Selva Maya, Maya Mountains Massif and other planning initiatives focused on this and adjacent areas. The Plan is structured in three sections – the first defines the context - documenting the legislative framework and including information on the physical and biological attributes of the protected area. It summarises current uses and management challenges, and integrates information to support tourism, research and education strategies whilst balancing this with protection of the resources of the area.

The second section of the Management Plan summarises the outputs of the conservation planning processes, and integrates the climate change assessment outputs. It identifies the management challenges, and defines the goals and objectives of management for the five-year period.

In the third section, the plan provides a framework for both broad management strategies as well as more specific activities to achieve the goals of maintaining ecosystem functions and natural resource values. It outlines specific management programs based on the best available data and scientific knowledge, integrating conservation planning strategies, as well as relevant strategies of national and regional plans. It also sets in place the indicators for measuring management effectiveness, and recommends an implementation schedule. It is recommended that detailed annual operational plans be developed based on the framework provided by this management plan, with an annual review of implementation success, allowing for adaptive management over the five-year period – 2021 to 2025.

Section One

Current Status



A. Juan / Belize Karst Habitat Conservation

1. CURRENT STATUS

1.1 LOCATION

Tapir Mountain Nature Reserve (TMNR) is an approximately 6,286-acre (2543.854 ha (SI 15 of 2004)) matrix of tropical evergreen seasonal broadleaf lowland forest types over limestone soils located in the Cayo District, the most westerly of Belize's six districts. It lies approximately 4.6 miles (8 km) south of the Western Highway in the Teakettle / Ontario / Blackman Eddy area, on the north-facing foothills of the Maya Mountains Massif, and is centered on UTM 300 000E; 1895 000N). 1.6 miles (2.6 km) to the west lies Barton Creek, with Seven Miles / El Progreso 1.7 miles (2.7 km) to the south west. The Nature Reserve lies entirely within the Belize River watershed system, with protection of partial sub-watersheds of both Barton Creek and Roaring Creek. The western most boundary is partially defined by Barton Creek itself, and the eastern by Roaring Creek (Map 1).

One area has been excised from TMNR since its establishment, to create Actun Tunichil Muknal Natural Monument in the east portion of the protected area. This protects an important tourism site, a culturally important cave system, managed by the Institute of Archaeology.

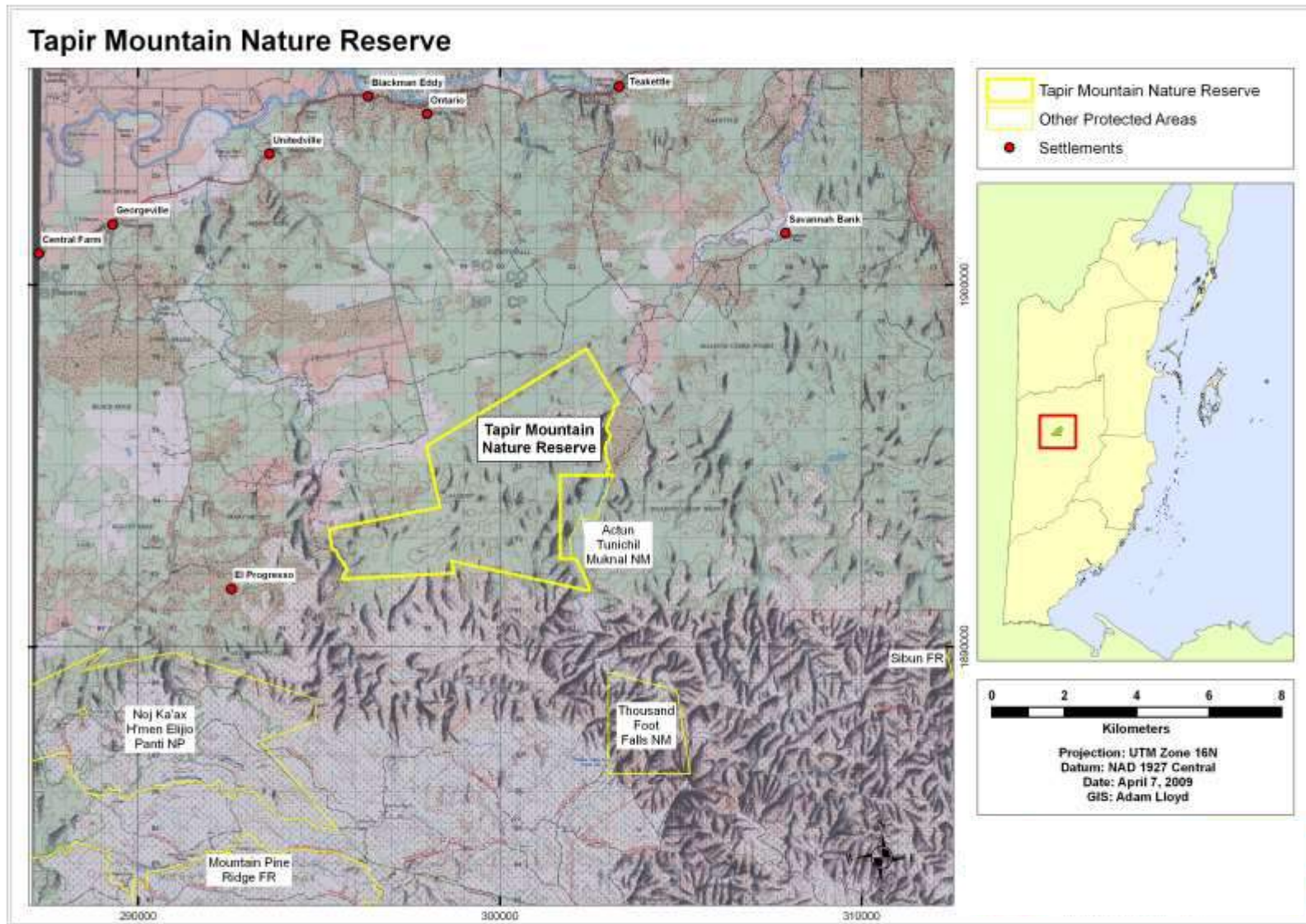
COMMUNITIES ADJACENT TO TAPIR MOUNTAIN NATURE RESERVE

The primary stakeholder communities are located on the Western Highway – Teakettle (population: 1,747), Ontario (population: 775) and Blackman Eddy (population: 534) (SIB, 2010¹), focused primarily on agricultural activities and employment in the tourism sector. Other communities also considered to impact the area include Upper and Lower Barton Creek (populations: 380 and 193 respectively) and El Progreso-7 Miles (population: 483) (SIB, 2010). All three are farming communities.

THE PROTECTED LANDSCAPE

Tapir Mountain lies adjacent to Actun Tunichil Muknal Natural Monument, originally part of the Nature Reserve, but excised to provide visitor access to the cave system, with its karst features and cultural importance. Whilst Tapir Mountain Nature Reserve is not directly connected to other protected areas in the landscape, it still retains forest connectivity with both Elijo Panti National Park and Thousand Foot Falls Natural Monument (through the Bull Run property) – and through these to the larger Maya Mountains Massif, one of Belize two large blocks of forest.

¹ The last national census



MAP 1: LOCATION OF TAPIR MOUNTAIN NATURE RESERVE IN THE PROTECTED AREA LANDSCAPE

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ACCESS

TMNR is accessible by dry-season road from Teakettle, Blackman Eddy, and through Georgeville / Barton Creek. There are also monitored trails that access the area from Pook's Hill and Actun Tunichil Muknal Natural Monument.

Several properties border the protected area, some of which are cleared to the border, providing less monitored access from El Progreso-7 Miles / Barton Creek. The southern Boundary, however, is through steep karstic landscape, with no land clearance or access.

1.2 REGIONAL AND INTERNATIONAL CONTEXT

Belize, recognized as part of the Mesoamerican biodiversity hotspot, was founded on its biodiversity wealth - and it is this that continues to support today's economy, though tourism, fisheries and forestry. An important part of this natural capital is the Maya Mountains Massif (MMM), part of the trinational Selva Maya forest, the largest contiguous forest massif of humid and sub humid tropical forests in Mesoamerica, covering more than four million hectares across 16 protected areas, and 20 ecosystems (Selva Maya, 2019).

The Maya Mountains Massif (MMM), covers an estimated 131,4760 acres (approximately 532,066 hectares) (based on the MMM system-level protected areas identified in Walker and Walker, 2013), encompasses a major part of Belize's primary Key Biodiversity Area and is a central component of the regionally important Selva Maya forest node. The MMM stretches from the Vaca Forest Reserve and Tapir Mountain Nature Reserve at its most northerly extent to Columbia River Forest Reserve in the south, with protected areas administered by the Forest Department, co-management partners, and the Institute of Archaeology. Unlike many of its larger Central American neighbors, the natural landscape in Belize still supports viable populations of wide ranging species such as jaguar (*Panthera onca*) and white-lipped peccary (*Tayassu pecari*), and protects species of international concern, including the endangered Central American black-handed spider monkey (*Ateles geoffroyi*), Baird's tapir (*Tapirus bairdii*), and the endemic Yucatan black howler monkey (*Alouatta pigra*) making it a critical component of the regions efforts in maintaining biodiversity. Tapir Mountain Nature Reserve is included in the MMM system-level management unit, and whilst not connected directly, does currently have forest connectivity to the main MMM block through private lands currently under conservation management. The protected upper watersheds of the MMM maintain the water security (both quality and quantity) of creeks flowing through TMNR into the Belize River Valley, essential for water supply for urban and agricultural areas - and from there on to the Caribbean Sea.

Belize works towards the global Sustainable Development Goals (SDGs). The National Protected Areas System also contributes to national sustainable development through the three key protected area functions – protection of biodiversity, protection and maintenance of ecosystem

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services, and socio-economic benefit for the people of Belize. Tapir Mountain Nature Reserve is part of this contribution, being founded on the protection of watershed functions, biodiversity and cultural resources. Associated activities are focused on assisting local communities reduce poverty through utilizing the Nature Reserve as a focus for tourism. The key management focus links most closely to SDG 15: Life on Land and SDG 13: Climate Action, but effective management of the protected area also contributes towards many of the other SDGs in the local landscape.

LINKS TO SUSTAINABLE DEVELOPMENT GOALS



SDG 15: LIFE ON LAND

15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.

15.5: Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.



SDG 13: CLIMATE ACTION

13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.



SDG 1: NO POVERTY

1.5: By 2030, build the resilience of the poor and those in VU situations and reduce their exposure and vulnerability to climate related extreme events and other economic, social and environmental shocks and disasters.



SDG 2: ZERO HUNGER

2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.



SDG 4: QUALITY EDUCATION

4.7: By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.



SDG 6: CLEAN WATER AND SANITATION

6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes



SDG 16: PEACE, JUSTICE AND STRONG INSTITUTIONS

16.7: Ensure responsive, inclusive, participatory and representative decision making at all levels

From: <https://sdgs.un.org/goals>

Belize is party to a number of global Multilateral Environmental Agreements (MEAs) that focus on biodiversity issues (Table 1). Many of these are legally binding, and are required to be integrated within the national legislative framework. As a signatory of the Convention on Biological Diversity (CBD) (1992), Belize is committed to ensuring it has measures in place to protect biodiversity, with promotion of sustainable use, contributing to the 2011 – 2020 CBD strategic goals. More specific targets of the CDB relevant to Tapir Mountain Nature Reserve include:

- promoting the conservation of the biological diversity of ecosystems, habitats and biomes;
- addressing threats to biodiversity related to the pressures of habitat loss, land use change and degradation, and unsustainable water use;
- addressing challenges to biodiversity from climate change, and pollution;
- maintaining the capacity of ecosystems to deliver goods and services that support sustainable livelihoods, local food security and health care, especially of poor people

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As a requirement of the CBD (Article VI (a)), the CBD focal point in Belize, the National Biodiversity Office, is required to develop and implement the National Biodiversity Strategy and Action Plan (NBSAP) to regulate and manage activities that have or are likely to have significant adverse impacts on the conservation, sustainable use and the sharing of the benefits of Belize’s biological diversity.

Key International and Regional Conventions and Agreements of Relevance to Tapir Mountain Nature Reserve	
Convention on Biological Diversity (Rio de Janeiro, 1992) Ratified in 1993	To conserve biological diversity to promote the sustainable use of its components, and encourage equitable sharing of benefits arising from the utilization of natural resources <i>TMNR is an integral part of Belize’s national protected areas system, protecting biodiversity and threatened species, as per Belize’s commitment under the CBD.</i>
Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972)	The World Heritage Convention requires parties to take steps to identify, protect and conserve the cultural and natural heritage within their territories. <i>With protection of an upper watershed, TMNR, plays a role in maintaining water flow and water quality of the Belize River that flows onto the Belize Barrier Reef sites that together form Belize’s World Heritage Site.</i>
Alliance for the Sustainable Development of Central America (ALIDES) (1994)	Regional alliance supporting sustainable development initiatives. <i>As a national protected area, TMNR provides sustainable benefits to local communities through ecosystem services (including water security) and tourism, whilst also protecting biodiversity and threatened species, as per Belize’s commitment under ALIDES.</i>
Central American Commission for Environment and Development (CCAD) (1989)	Regional organization of Heads of State formed under ALIDES, responsible for the environment of Central America. Initiated Mesoamerican Biological Corridors and Mesoamerican Barrier Reef Systems Programs. <i>TMNR is part of one of the critical forest nodes – the MMM - connected by the Mesoamerican Biological Corridors Program towards long term biodiversity viability.</i>
Convention on the Conservation of Biodiversity and the Protection of Priority Wilderness Areas in Central America (Managua, 1992)	To conserve biological diversity and the biological resources of the Central American region by means of sustainable development <i>TMNR, as part of the MMM, is one of the few remaining large tracts of forest able to support wide-ranging umbrella and key stone species such as white lipped peccary and jaguar.</i>

TABLE 1: KEY INTERNATIONAL CONVENTIONS AND AGREEMENTS OF RELEVANCE TO TAPIR MOUNTAIN NATURE RESERVE

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All of these targets are reflected in the goal and objectives for the Nature Reserve, and in the wider goal, mission and activities of Belize Karst and the Belize Forest Department. Belize has largely met global protection targets for almost all terrestrial ecosystems within the National Protected Areas System, with identification of required actions for those that are under-represented (Walker and Walker, 2012). The protected area lies within Belize’s Key Biodiversity Areas (Level 3) (Meerman, 2007)

Belize is a party to the **United Nations Framework Convention on Climate Change (UNFCCC)** which, whilst not an MEA, is closely associated to the environment, and sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. Belize is considered a Small Island Developing State under this convention, at high risk of negative impacts from climate change, and with those impacts far outweighing the contribution to emissions.

Under the **Convention Concerning the Protection of the World Cultural and Natural Heritage**, Belize has a serial nomination of seven sites, designated in 1996 as components of the Belize Barrier Reef Reserve System - World Heritage Site, representative of the Belize Barrier Reef and impacted by land-based pollution from the watersheds. TMNR is important in contributing towards maintenance of watershed functionality and protecting water quality in the upper watershed, though the coastal plain downstream has significant agricultural development that does impact the water quality and therefore the reef. As a signatory to the regional **Cartagena Convention**, Belize has also ratified the **Land-Based Sources of Pollution Protocol** as part of a concerted global effort to address the potential impacts of land-based sources of pollution on the marine environment. Under this Convention, Belize is required to address the issues of agrochemical pollution, nutrient runoff, deforestation and land use change.

Belize has not yet signed on to the **Convention on Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)**, though this is a target of the National Biodiversity Strategy and Action Plan.

At the regional level, Belize is included in both Central American and Wider Caribbean agreements. The **Central American Integration System (SICA)**, provides a regional coordination and collaboration framework for Central America. Under this is the **Central American Commission for Environment and Development (CCAD)**, the regional organization of Heads of State formed under SICA, responsible for the environment of Central America. CCAD initiated the regional Mesoamerican Biological Corridors and Mesoamerican Barrier Reef Systems Programs. The Maya Mountains Massif is one of the last remaining large blocks of intact forest to be linked through the Mesoamerican Biological Corridors Program to improve long term biodiversity viability. It is also particularly important in the region in its role of watershed protection. The headwaters of fourteen watersheds - the majority of Belize’s river systems - originate within the Maya Mountains, providing water security for 55% of the total land mass of Belize and over 128 communities, as well as supplying water to over 180 communities in Guatemala (Walker et al., 2008). The **Alliance for the Sustainable Development of Central America (ALIDES)** calls for

sustainable development with strategies for improved management of more sustainable resource extraction.

1.3 NATIONAL CONTEXT

1.3.1 NATIONAL PLANNING STRATEGIES

The national goals and objectives for conservation revolve around the sustainable use, conservation and protection of Belize's natural resources within the context of sustainable human development. These objectives are implemented through the **National Biodiversity Strategy and Action Plan** (GoB, 2016), which recognizes the importance of protected areas such as TMNR, and the need to mainstream biodiversity across all sectors in Belize, improve integration of biodiversity and protected areas into national planning strategies, and build both human and institutional capacity to effectively manage the biodiversity resources. It provides a framework for strategies under five national goals:

GOAL A. MAINSTREAMING: *Improved environmental stewardship is demonstrated across all society in Belize, as is an understanding and appreciation of marine, freshwater and terrestrial biodiversity, its benefits and values.*

GOAL B. REDUCING PRESSURES: *Direct and indirect pressures on Belize's marine, freshwater and terrestrial ecosystems are reduced to sustain and enhance national biodiversity and ecosystem services*

GOAL C. PROTECTION: *Functional ecosystems and viable populations of Belize's biodiversity are maintained and strengthened*

GOAL D. BENEFITS: *Strengthened provision of ecosystem services, ecosystem-based management and the equitable sharing of benefits from biodiversity*

GOAL E. IMPLEMENTATION: *Effective implementation of the NBSAP through capacity building, strategic decision making and integrated public participation*

The most relevant to TMNR is **Goal C: PROTECTION**, which focuses on protected areas and species. The **National Protected Areas Policy and System Plan (NPAPSP)** (GoB, 2005; revised: 2015) guides system-level and individual protected area management efforts to support the national objectives of ecological and economic sustainability over the long term, with the development of human and institutional capacity to effectively manage biodiversity resources within the NPAS. The NPAPSP centres on the following policy statement, which has been taken into consideration in the development of this plan:

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The Government of Belize shall promote the sustainable use of Belize’s protected areas by educating and encouraging resource users and the general public to properly conserve the biological diversity contained in these areas in order to maintain and enhance the quality of life for all. This shall be achieved by facilitating the participation of local communities and other stakeholders in decision-making and the equitable distribution of benefits derived from them, through adequate institutional and human capacity building and collaborative research and development.

Tapir Mountain Nature Reserve contributes towards a key goal of the NPAPSP - to ensure that the “*National Protected Areas System includes high*

quality examples of the full range of environment types within Belize, with balanced representation of the ecosystem types they represent” (NPAPSP, 2005). It provides representative coverage of the karstic limestone foothills which, whilst not critical for meeting national representation goals, are important regionally, and harbors a significant percentage of the species found in Belize.

Under the NPAPSP, government seeks to increase management effectiveness through grouping protected areas into system-level management units, in recognition of the fact that resources and threats exist in a larger landscape beyond the boundaries of the individual protected areas themselves.

GOAL C: PROTECTION

TARGET C4. By 2025, average management effectiveness of the National Protected Areas System has improved to 80%

C4.1 Implement the revised National Protected Area System Plan (NPASP) and supporting NPAS Rationalization Report

C4.2 Improve financial sustainability mechanisms for the NPAS

C4.3 Conduct 2016 and 2020 Assessments of management effectiveness of protected areas and implement recommendations

C4.4 10% of PAs have demonstrated economic value and direct

C4.5 Engage buffer communities for collaborative stewardship of the NPAS

KEY STRATEGIES OF GOAL C: PROTECTION OF THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

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MMM Vision Statement

The Maya Mountains Massif of Belize and Guatemala is internationally recognized for its exceptional natural and cultural values. This vast, contiguous forest and complex of watersheds, contributes to national development, regional cooperation and international conservation. The Massif is managed as an exemplary model of integrated management that maintains ecological integrity and preserves cultural heritage for future generations.

Vision Statement Maya Mountains Massif Conservation Planning Outputs (2008)

PROTECTED AREAS OF THE MMM

Chiquibul National Park
Billy Barquedier National Park
Noj K'aax H'Men Elijio Panti National Park
Five Blues National Park
Mayflower Bocawina National Park
St Herman's Blue Hole National Park
Bladen Nature Reserve
Tapir Mountain Nature Reserve
Thousand Foot Falls Natural Monument
Actun Tunichil Muknal Natural Monument
Victoria Peak Natural Monument
Cockscomb Basin Wildlife Sanctuary
Chiquibul Forest Reserve
Columbia River Forest Reserve
Manatee Forest Reserve
Maya Mountain Forest Reserve
Mountain Pine Ridge Forest Reserve
Sibun Forest Reserve
Sittee River Forest Reserve
Vaca Forest Reserve

Rationalization report, 2013

This is to be achieved through improving communication and collaboration between protected area management organizations in the landscape that have similar conservation priorities and face similar threats. Tapir Mountain is one of twenty protected areas that, together, form the Maya Mountains Massif system-level management unit, transcending site-level administrative categories (Figure 2; Map 3). As such, management strategy development for TMNR needs to take into account the MMM vision, as well as the MMM goals and objectives for system-level management. The MMM Conservation Action Plan (Walker et al., 2008) also sets out goals and objectives at system level towards increasing management effectiveness, through improved collaboration for surveillance and enforcement, biodiversity monitoring, education, outreach, and management across MMM protected areas.

Whilst the plan is now outdated and in need of revision, it is still important in ensuring that these protected areas are managed not only for their site-level significance, but also for their contribution to national conservation goals and commitments.

Under a National Protected Areas System rationalization exercise, there was recognition of the need to secure forest connectivity between TMNR and the larger MMM, and reduce anthropogenic fire threats as priority actions for ecosystem and species protection (Walker and Walker, 2013). In light of the more recent impacts of Covid-19, addressing increasing illegal hunting and logging is also identified as a priority.

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Both the NBSAP and the NPAPSP support Belize’s **Growth and Sustainable Development Plan** (GSDS), part of the 15-year national development framework under the **Horizon 2030** framework. The GSDS recognizes effective implementation of both the NBSAP and NPAPSP as critical in achieving national development goals.

The objective of the **National Sustainable Tourism Master Plan** is to “*more than double overnight tourist arrivals while enhancing average length of stay and daily expenditure*”. The qualities of the environment and the need to conserve these qualities are recognised in the MasterPlan, with the sustainable development program providing the framework that will “*ensure the NSTMP maintains a balance of the three pillars of sustainable development: social accountability, environmental conservation and economic prosperity.*” Whilst the NSTMP is primarily focused on destination development, financing and marketing, it does recognize the importance of conservation and environmental management in supporting Belize’s tourism industry. With the recommended changes to the protected area designation, and the focus on development of a tourism destination, TMNR will be able to support the NSTMP in providing another venue in Cayo District, with a specific focus on attracting a niche bird / conservation / science orientated market, with long term plans including facilities for overnight stays and provision for medium term research opportunities.

1.3.2 LEGAL FRAMEWORK

Several key laws have been enacted to protect ecosystems, ecosystem services and biodiversity, contributing to the conservation framework of Belize. The Ministry of Sustainable Development, Climate Change and Disaster Risk Management and is the regulatory authority for the **National Protected Areas System Act (revised, 2015)**, **Forest Act (1927)**, **Fisheries Resource Act (revised, 2020)**, and the **Wildlife Protection Act (1981)**.

The **National Protected Areas System Act** provides the framework for management of the national protected areas in Belize, and is the primary tool for biodiversity planning and management, implemented

KEY NATIONAL LEGISLATION PROTECTING FAUNA, FLORA, AND NATIONAL HERITAGE

The National Protected Areas System Act (2015)

Provides a framework for establishment and maintenance of the national protected areas system.

The Wildlife Protection Act (1981)

Provides for the conservation, restoration and development of wildlife and regulation of its use.

The Forest Act (1927)

Promotes the forestry industry, with the implementation of conservation techniques, Responsible for forestry activities in all types of forest, including littoral forests and mangroves.

The Fisheries Resource Act (2020)

Principal governing legislation regulating the fishing industry, and is directly concerned with maintaining sustainable fish stocks and protecting the marine and freshwater environments.

Environmental Protection Act (1992)

Promotes the preservation and improvement of the environment, the rational use of natural resources, the control of pollution, and associated actions. This is achieved through the EIA / ECP process.

The National Integrated Water Resources Act (2011)

Provides for management of water resources. Its role includes estimating water availability and value, and implementing measures to ensure wise use and long term sustainability of Belize’s water resources.

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through the Ministry of Sustainable Development, Climate Change and Disaster Risk Management. It defines the various categories of protected area, including Nature Reserves, and the activities that can be conducted in each area. It provides the framework for on-going effective management of Belize's natural resources within protected areas.

As a non-extractive Nature Reserve, hunting is not permitted within the boundaries of TMNR under the NPAS Act, and is also managed through the **Wildlife Protection Act (1982)**, which regulates hunting and provides protection for many terrestrial, non-game species in Belize. This Act is scheduled for revision and significant strengthening.

The **Fisheries Resource Act** (revised, 2020) is administered under the Fisheries Department and is the principal governing legislation regulating the fishing industry. It is directly concerned with maintaining sustainable fish stocks and protecting the marine and freshwater environments. This includes the inland fisheries, with regulations that provide for sustainability of freshwater fish resources (though these are seldom implemented outside the National Protected Areas System).

The **National Integrated Water Resources Act (2011)** recognizes that:

“Belizeans have a fundamental right to water “, safeguarded through the “planned development, coordinated management, sustainable use and protection of Belize’s water resources consistent with the social, economic and environmental needs of present and future generations, and to ensure that all Belizeans have access to affordable, safe, adequate and reliable water.”

It also integrates climate change as a key theme. There is recognition of the important role of protected areas in the maintenance of water security in the Integrated Water Resource Management Policy and the Act. In the area of “Gathering Grounds”, the Act strengthens the protection provided to the forests managed under the Forestry Department / National Biodiversity Office:

50. (1) The Authority shall ensure that all gathering grounds shall ...

(a) be retained as forest reserves or national parks, as the case may be, in accordance with the provisions of the Forests Act and the National Parks System Act;

The **Pesticides Control Act (1990)** provides a mechanism for the registration and regulation of pesticide importation and use through the Pesticide Control Board, important for improving pesticide management, and reducing contamination of the rivers. Studies have already shown the presence of glyphosates and organophosphates in standing water on peaks in the Maya Mountains Massif (Kaiser, 2011), as a result of orographic drift from the southern coastal plain, where aerial spraying of agrochemicals is ongoing.

Tourism legislation in Belize falls under the mandate of the Ministry of Tourism and Civil Aviation through the **Belize Tourism Board (BTB)**. This regulates tourism activities such as guide:visitor ratios, guide training and certification, and licensing of tour operators and accommodation, and is focused on maintaining standards for tourism in Belize. Any guided tourism access to TMNR will be required to follow BTB regulations.

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The **Protected Areas Conservation Trust (PACT)** is the primary national financial sustainability mechanism for support of the National Protected Areas System. The Protected Areas Conservation Trust Act was passed in 1995 (Act 15 of 1995), and PACT was established as a statutory body in 1996. Over its 20 years of existence, PACT has assisted local conservation organizations, including Belize Karst, with funding for projects that contribute towards effective protected area management and providing leverage for funding

The functions of PACT are:

“...to contribute to the sustainable management and development of Belize’s natural and cultural assets for the benefit of Belizeans and the global community, both now and for future generations.”

Protected Areas Conservation Trust (Amendment) Act, 2015)

from external sources. PACT’s investments are aligned to the operational framework of the National Protected Areas Policy and System Plan (NPAPSP), and recently strengthened through the PACT Conservation Investment Strategy, focused on building management effectiveness of the NPAS, and strengthening biodiversity conservation and socio-economic benefit outcomes in Belize.

1.3.3 LAND TENURE

SITE LEVEL LEGISLATION

Tapir Mountain Nature Reserve, originally 6,744 acres of privately owned property, was donated to the Government of Belize in 1975 as ‘Society Hall Nature Reserve’, with an agreement to be leased back to the owners at a nominal rent of Bz\$1.00 per annum, to be under their management as a conservation area for a period of 99 years. It was officially gazetted as part of the National Protected Areas System in December 1986 (SI 108 of 1986), and in 1990, at the request of the owners, the lease was transferred to Belize Audubon Society. In 1994, the name ‘Society Hall Nature Reserve’ was replaced by ‘Tapir Mountain Nature Reserve’, considered a more relevant name when engaging stakeholders and funding partners. In 2004, the protected area was divided into two, with 455 acres separated as a Natural Monument through SI 15 of 2004, to allow for visitation to the impressive cave system and Maya artifacts of Actun Tunichil Muknal, to be managed jointly by the Institute of Archaeology and the Forest Department / Belize Audubon Society. A second SI (184 of 2004), finalized the separation with the renaming of the Natural Monument as Actun Tunichil Muknal Natural Monument. BAS stepped down as the protected area co-manager in 2014, with the Institute of Archaeology taking on the primary role of management of the Natural Monument, and the Nature Reserve being managed directly under the Forest Department. In 2019, Belize Karst signed its first co-management agreement for the area (Annex 1).

‘Nature Reserve’ is one of seven distinct categories of protected area under the National Protected Areas System Act (revised, 2015), each of which is protected by restrictions strictly defined by law (Table 2). It is the strictest designation of all the categories, and is for the protection of biological communities or species, and the maintenance of natural processes in an undisturbed state, with no extractive use or tourism access permitted. The management regime is aligned with IUCN designation **Category Ia: Strict Nature Reserve**, defined as:

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“strictly protected areas set aside to protect biodiversity and also possibly geological /geomorphological features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable reference areas for scientific research and monitoring.”

...with the following management objectives:

1. To preserve ecosystems, species and geodiversity features in a state as undisturbed by recent human activity as possible;
2. To secure examples of the natural environment for scientific studies, environmental monitoring and education, including baseline areas from which all avoidable access is excluded;
3. To minimize disturbance through careful planning and implementation of research and other approved activities;
4. To conserve cultural and spiritual values associated with nature.

After consultation, and in line with the terms and conditions of the original land transfer agreement, it is recommended that, as the protected area designation was not based on a unique value (ecosystem or species), that it be revised to National Park, to facilitate regulated, low impact tourism access to the area as a financial sustainability mechanism, with public use planning and zoning to ensure maintenance of the characteristics of the area.

Categories of Protected Areas in Belize		
Category	Purpose	Activities Permitted
Nature Reserve	To protect biological communities or species, and maintain natural processes in an undisturbed state.	Research, education
National Park	To protect and preserve natural and scenic values of national significance for the benefit and enjoyment of the general public.	Research, education, tourism
Natural Monument	To protect and preserve natural features of national significance.	Research, education, tourism
Wildlife Sanctuary (1)	To protect nationally significant species, biotic communities or physical features.	Research, education, tourism
Wildlife Sanctuary(2)	To protect nationally significant species, biotic communities or physical features whilst allowing for sustainable traditional use, following an accepted sustainable use plan.	Research, education, tourism, sustainable traditional use extraction
Forest Reserve	To protect forests for management of timber extraction and/or the conservation of soils, watersheds and wildlife resources.	Research, education, tourism, sustainable extraction
Marine Reserve	To assist in the management, maintenance and sustainable yield of fisheries resources	Sustainable extraction, research, education, tourism

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TABLE 2: CATEGORIES OF PROTECTED AREAS IN BELIZE

National Parks are established to:

“protect and preserve natural and scenic values of national significance for the benefit and enjoyment of the general public.”

This is aligned with the IUCN Category II:

“natural or near-natural areas protecting ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.” (Dudley, 2008)

...with the following management objectives (Dudley, 2008):

Primary Objective: To protect natural biodiversity along with its underlying ecological structure and supporting environmental processes, and to promote education and recreation

Other Objectives:

1. To manage the area in order to perpetuate, in as natural a state as possible, representative examples of physiographic regions, biotic communities, genetic resources and unimpaired natural processes;
2. To maintain viable and ecologically functional populations and assemblages of native species at densities sufficient to conserve ecosystem integrity and resilience in the long term;
3. To contribute in particular to conservation of wide-ranging species, regional ecological processes and migration routes;
4. To manage visitor use for inspirational, educational, cultural and recreational purposes at a level which will not cause significant biological or ecological degradation to the natural resources;
5. To take into account the needs of indigenous people and local communities, including subsistence resource use, in so far as these will not adversely affect the primary management objective;
6. To contribute to local economies through tourism.

This proposed transition to National Park will increase the ability of the local community stakeholders to preferentially benefit from the tourism opportunities that will open up, as supported by the following NPASP Policy Statements

19. Environmental, economic and social sustainability of protected areas shall be considered paramount to the national development of Belize.

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- 20. The protected areas of Belize shall support the sustainable economic development of the local communities that buffer these areas.
- 23. The protected areas system shall seek to maintain itself financially and to contribute to Belize’s national development.

The proposed re-designation process is outlined in 3.2 Management Strategies

1.3.4 EVALUATION OF NATIONAL AND INTERNATIONAL IMPORTANCE

The primary importance of Tapir Mountain Nature Reserve within Belize’s protected areas system lies in its position as part of the Maya Mountains Massif, and in its representation of the northern MMM limestone foothills. Tapir Mountain Nature Reserve encompasses 6,286 acres of lowland broad-leaved moist forest. Whilst too small to support minimum dynamic areas of the ecosystems within its boundaries, it does protect representation of six ecosystems under two broader ecosystem categories – lowland broad-leaved moist forest, and shrubland. The latter only occurs near the edge of the protected area and is indicative of past disturbance such as fire. There is representation of the river ecosystem, with the creeks (Barton and Roaring Creeks) forming part of the boundaries. An eighth, unmapped ecosystem, riparian vegetation, is located on the flood plains of the creeks that run through the area and mark portions of the boundaries to the west and east. The area has been highlighted in the past for its status as a ‘mahogany rich forest’, with estimated densities of one to two mahogany (*Swietenia macrophylla*) per acre within the broadleaf forest ecosystems (Smith, 1996). Cedar (*Cedrela odorata*) and Santa Maria (*Calophyllum brasiliense*), two other commercial species, are also prevalent, resulting in the consistent pressure from illegal loggers, despite the rugged terrain (Lizama, 2013).

Past surveys suggest that Tapir Mountain is relatively species-rich, with over 120 species of plants, at least 55 mammal species, and over 340 species of bird recorded from either the protected area itself or from the adjacent Eljio Panti National Park and Pook’s Hill areas.

This includes four globally endangered and six vulnerable species are known from the area (Table 3).

Game species are considered to be depressed by hunting pressure (community consultations, 2020). However, white-lipped peccary, considered an important indicator of both the health of the forest and hunting pressure, was reported in the area in 2020. TMNR on its own is not large enough to support a herd of this wide-ranging species, or other species requiring large tracts of connected forest – such as jaguar and puma. Connectivity with the Maya Mountains Massif is essential for the continued presence of this and several of the other larger wide-ranging species reported from the Nature Reserve.

THREATENED SPECIES	
ENDANGERED	
Yucatan Black Howler Monkey	<i>Alouatta pigra</i>
Central American Black-handed Spider Monkey¹	<i>Ateles geoffroyi</i>
Baird’s Tapir	<i>Tapirus bairdii</i>
Yaxnik / Fiddlewood	<i>Vitex gaumeri</i>
VULNERABLE	
Agami Heron	<i>Agamia agami</i>
Cedar	<i>Cedrela odorata</i>
Tepejilote Jade	<i>Chamaedorea oblongata</i>
Great Curassow	<i>Crax rubra</i>
Big-leaf Mahogany	<i>Swietenia macrophylla</i>
White-lipped Peccary	<i>Tayassu pecari</i>

¹ To be confirmed

TABLE 3: THREATENED SPECIES OF TMNR (CRITERIA - IUCN, 2020)

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The area is considered important as an overwintering area for migrant birds, and a hunting area for raptors nesting higher in the Mountain Pine Ridge area.

ECOSYSTEM SERVICES OF TAPIR MOUNTAIN NATURE RESERVE

ECOSYSTEM SERVICES OF TAPIR MOUNTAIN NATURE RESERVE	
REGULATION	<ul style="list-style-type: none"> ▪ Water Regulation: The forest cover of the watershed protected by TMNR, as part of the Maya Mountains Massif, is important in regulating the timing and magnitude of runoff, flooding, and aquifer recharge for communities downstream, and for irrigation of agricultural areas ▪ Erosion Regulation: Retention of forest cover on the steep slopes prevents excessive soil erosion and sedimentation of rivers and creeks, assisting in prevention of sedimentation impacts downstream. It provides protection against natural hazards, anchoring soils against landslides in tropical storm events. ▪ Climate regulation: Changes in forest cover have negatively affected local and global climates, with deforestation reducing local rainfall. TMNR largely retains its natural vegetation cover, assisting in mitigation of effects of climate change. ▪ Pollination: Pollination is a critical ecosystem function for the reproduction of most plants, including crops. Viability of pollinators is essential to the long term existence of plant species (and therefore biodiversity in general) of TMNR, and of agricultural crops in the adjacent area.
RECRUITMENT	<ul style="list-style-type: none"> ▪ Game Species Reservoir: The forest acts as a reservoir for game species such as armadillo, paca, white-tailed deer and collared peccary, re-stocking the adjacent landscape, providing game, an important protein source for the communities.
CULTURAL AND SOCIO-ECONOMIC	<ul style="list-style-type: none"> ▪ Spiritual and Religious Values: The karstic cave systems of TMNR are important for their spiritual value. Even though not fully explored or open to the public, they form a bridge linking the current population of the area with the national heritage of Belize. ▪ Recreation and Tourism: The scenic beauty of the forests of TMNR are important as recreational and tourism resources. ▪ Socio-economic benefit: Tourism-based income associated with TMNR has the potential to be important in the adjacent community, providing employment and opportunities for business development. ▪ Education: TMNR will be focusing on its potential as an educational resource, critical if future generations are to take on a conservation leadership role
SUPPORT	<ul style="list-style-type: none"> ▪ The tropical forest of TMNR plays a role as a CO₂ sink. ▪ Primary Production and Nutrient Cycling: Primary production and nutrient cycling are ongoing natural processes essential to the health of TMNR ecosystems, and ensure the future existence of the forest and forest products present – whether peccary, construction materials or commercial tree species. ▪ Soil formation: The presence of the natural vegetation within TMNR provides the organic material essential for the formation of soil, some of which is washed downstream to form the nutrient rich alluvial soils deposited in the river valleys of Barton Creek, Roaring Creek and the Belize River. Whilst this is a long-term supporting service, measured in hundreds of years, it is a vital role that is ongoing.

TABLE 4: ECOSYSTEM SERVICES OF TAPIR MOUNTAIN NATURE RESERVE (ADAPTED FROM MILLENNIUM ECOSYSTEM ASSESSMENT, 2005)

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The protected area protects life support systems through clean air, clean water, flood / erosion control and through acting as a carbon sink (Table 4). It also has heritage, scenic, recreation and tourism values. The educational, recreational and tourism values have the potential to provide important economic benefits to local communities in the landscape. However, within the local landscape, there is limited recognition of the importance of maintaining the Nature Reserve for its contribution to protection for the upper watersheds of Roaring and Barton Creeks, water security and quality, flood control, sediment control, biodiversity and habitat preservation.

1.3.5 SOCIO-ECONOMIC CONTEXT

NATIONAL CONTEXT

Belize has a population currently estimated at 419,199 (Table 5, SIB, 2020), with the lowest population density in Central America, at just over 14.6 persons per sq. km., concentrated primarily on the northern plain, southern coastal plain, Belize River Valley and Stann Creek Valley. Much of the remaining country is less suited to habitation, with swampy lowlands and steep terrain in the Maya Mountains.

BELIZE DEMOGRAPHIC STATISTICS	
Population (2020 est.)	419,199
Population density (2020)	18.2/sq. km.
Life expectancy (2011)	73.7
% population < 15 (2009)	34%
Below Poverty Level	33.5% (2002)
	43% (2010)
Literacy rate (2015)	82.3%
Unemployment rate (2019)	10.4%
GDP (per capita, 2018)	Bz\$7,0628 per capita

TABLE 5: BELIZE DEMOGRAPHIC STATISTICS, (SIB, 2020)

It is a country of many cultures, with Mestizo, Creole, Maya and Garifuna forming the major population groups. Over the last 30 years, there has been a shift in the cultural demographic of the country as a whole, with a significant influx of Central American refugees – primarily from Guatemala and Honduras – in 2010, an estimated 20% of heads of households were born outside of Belize (SIB, 2010). There is also an ongoing emigration of Belizeans to the United States – generally those from urban areas who have completed secondary school or have professional training, and an immigration of people, predominantly from the USA, Canada and Europe, either as seasonal residents or as retirees.

The economy of Belize has historically been based largely on logging, which was then superseded in importance by agriculture, with fisheries, banana, sugar and citrus forming some of the key traditional exports that contribute significantly towards the gross domestic product (GDP). A shift into oil extraction was briefly significant in supporting the economy, but was short lived, and has now declined. The economy is currently being supported by an expanding tourism industry, a major contributor to the tertiary sector (64.2% of GDP). Agriculture, aquaculture and fishing are the major primary sector industries contributing 14.3% of GDP. This is particularly so in the upper Belize River Valley, which has benefits from the rich alluvial soils.

Belize’s tourism industry, one of the fastest growing sectors in Belize, is rapidly becoming the major foreign exchange earner, with over 1,441,300 tourists arriving in Belize in 2017. 427,075 of these were overnight

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visitors, the remaining approximately 1 million are day visitors through the cruise industry (Figure 1; BTB, 2018). Tourism is primarily natural- and cultural-resource based, with visitors focusing on the cayes, coastal communities and coral reef (snorkelling, diving and sport fishing activities), inland protected areas and caves – particularly in the Cayo District.

Overnight tourism in Belize shows a distinct seasonality, with the majority of visitors arriving in the first quarter of the year (BTB, 2018). The lowest months are September and October, the main tropical storm season (Figure 2).

Direct tourism expenditure in Belize exceeded Bz\$555.3 million in 2017 – 15% of the total GDP (WTTC, 2018). When indirect contributions are taken into account from related support industries, this rises to 41.3% of the GDP. In 2017, the tourism industry supported over 21,000 direct jobs – 13.4% of total employment, expanding to 37.3% of total employment when related support industries are taken into account (WTTC, 2018).

Cayo District is an important tourism hub, with 103 tour operators (over 25% of the national tour operator sector) and 478 registered tour guides in 2019 (23.5% of the national tour guide sector) (BTB, 2020).

An estimated 7,635 people (18.6% of the population) were employed directly by the tourism industry in this district in 2019 – representing 26% of the total tourism workforce in Belize (BTB, 2020). The Cay District has an estimated 426 tourism-related businesses (accommodation, restaurants, taxis, equipment rental etc.), approximately 18% of tourism-related businesses in Belize. This includes the accommodation sector, with 151 registered hotels (representing 1,382 rooms, and a total capacity of 2,413 guests) in 2019. Hotel occupancy has declined over the last five years, and stood at 39.6% in 2019. Belize is of growing interest to the global birding world, with 6.4% of visitors participating in bird watching tours during their stay in the country in 2019. Following significant input into building capacity

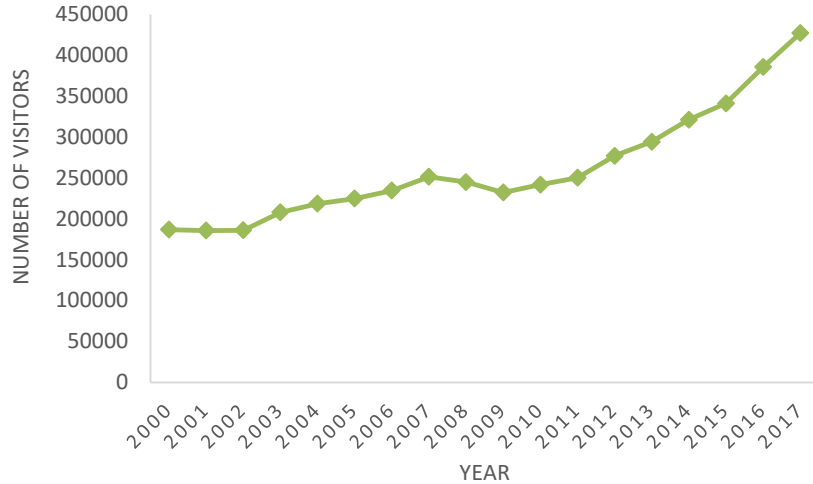


FIGURE 1: BELIZE OVERNIGHT TOURISM ARRIVALS 2000 – 2017, BTB, 2018

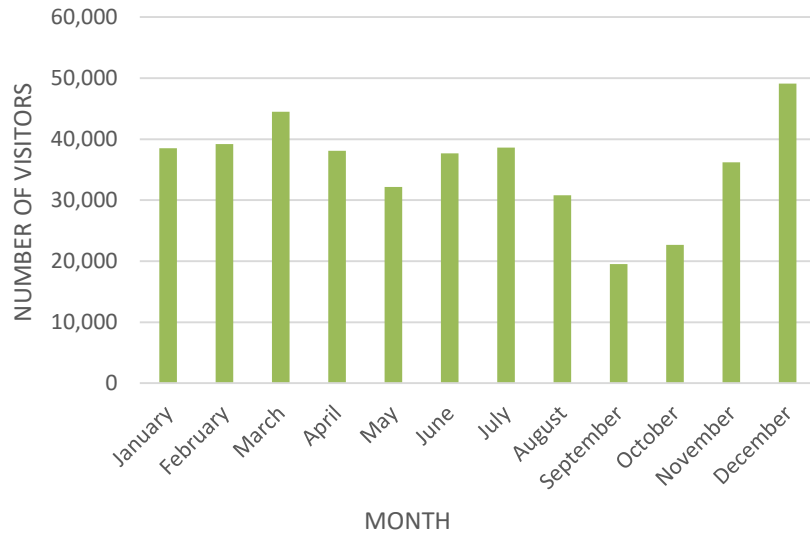


FIGURE 2: BELIZE OVERNIGHT TOURISM ARRIVALS PER MONTH (AVERAGE: 2000 – 2017) (BTB, 2018)

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in tour guides in advanced bird guiding, Belize now has a first class cohort of guides able to lead high quality birding tours.

STAKEHOLDERS AND STAKEHOLDER COMMUNITIES

The primary stakeholder communities for Tapir Mountain Nature Reserve are identified as Teakettle and Unitedville, with Blackman Eddy, Ontario and Upper and Lower Barton Creeks, and El Progreso-7 Miles also being identified as secondary stakeholders (Table 6).

COMMUNITY	DISTANCE TO TMNR (KM)	POPULATION (SIB, 2010)	KEY OCCUPATIONS
Teakettle	7 km	Total: 1,747 Male: 887 Female: 860 Households: 359	25% are farmers, Between 10 and 20 tour guides work with outside operators in San Ignacio or Belize City. Many people work in Belmopan. Some illegal hunting and logging within the protected area. 8 regular hunters, and another 20 who hunt. Increasing Central American immigration.
Unitedville	9.4 km	Total: 971 Male: 476 Female: 495 Households: 213	Largely Creole community with about 30 farmers. Many people work in Spanish Lookout.
Ontario	8 km	Total: 775 Male: 394 Female: 381 Households: 174	Commuting population working in Belmopan and San Ignacio. Also an agricultural and farming community, with farmlands extend towards the protected area boundary
Blackman Eddy	10 km	Total: 534 Male: 287 Female: 247 Households: 110	Largely Creole community with some immigration from other Central American countries. Small scale subsistence farming,
Arizona	5.5 km		Originally established in 1998 as Roaring River Village, an immigrant community of Salvadoran and Guatemalan refugees, at the edge of TMNR. Hunted and farmed in TMNR. Moved by GoB to Arizona to improve access to schools and healthcare.
El Progreso – 7 Miles	2.5 km	Total: 483 Male: 252 Female: 231 Households: 96	Agricultural community, with some employment in the tourism industry in local tourism resorts, San Ignacio and Placencia
Upper Barton Creek	0 km	Total: 380 Male: 201 Female: 179 Households: 54	Agricultural community of conservative Mennonite farmers - large scale agriculture
Lower Barton Creek	1.5 km	Total: 193 Male: 110 Female: 83 Households: 30	Agricultural community of conservative Mennonite farmers - large scale agriculture

Source: Discussions with stakeholders from the communities, 2020; 2010 census (SIB)

TABLE 6: KEY STAKEHOLDER COMMUNITIES OF TAPIR MOUNTAIN NATURE RESERVE

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STAKEHOLDER ANALYSIS FOR TAPIR MOUNTAIN NATURE RESERVE				
Stakeholder	Influence or Impact of TMNR on Stakeholder			Influence or Impact of Stakeholder on TMNR
Teakettle Unitedville Ontario Blackman Eddy	▪ Protection of biodiversity and natural resources for the enjoyment and education of future generations	+	▪ Potential for community support for management of TMNR through use as a tourism destination and local employment	+
	▪ Contributes towards protection of watershed towards long term water security	+	▪ Potential for increased marketing of TMNR by local tour guides	+
	▪ Will provide a resource for local tour guides and guest houses / resorts, improving local employment – socio-economic benefit	+	▪ In the past, low level of cooperation and interest from communities – poor perception of protected areas	-
	▪ Will provide small scale local employment for PA staff	+	▪ Hunting, logging and other extraction impacts within protected areas	-
	▪ Exclusion from traditional hunting and natural resource harvesting areas	-	▪ Potential for illegal clearance of land for agriculture	-
	▪ Exclusion from land for expansion of community agriculture	-	▪ Illegal / escaped fires reducing ecosystem condition	-
			▪ Forest clearance for agriculture in the adjacent landscape	-
Arizona	▪ Protection of natural resources for the enjoyment and education of future generations	+	▪ Potential for community support for management of TMNR through local employment	+
	▪ Provides a resource for local tour guides and guest houses / resorts, improving local employment – socio-economic benefit	+	▪ Refugee community resettled from the TMNR area- limited knowledge of protected areas and legislation	-
	▪ Contributes towards protection of watershed towards long term water security	+	▪ Hunting, logging and other extraction impacts within protected areas	-
	▪ Exclusion from land for community agriculture	-	▪ Potential for illegal clearance of land for agriculture	-
	▪ Exclusion from traditional hunting and natural resource harvesting areas	-	▪ Illegal / escaped fires reducing ecosystem condition	-
			▪ Forest clearance for agriculture in the adjacent landscape	-
Upper and Lower Barton Creek	▪ Contributes towards protection of watershed towards long term water security	+	▪ Limited interest in protected areas	+/-
	▪ Exclusion from land for agricultural expansion	-	▪ Removal of riparian vegetation along Roaring Creek and Barton Creek, increasing erosion / sediment impacts in creeks	-
			▪ Potential extraction of water from the creeks for irrigation of crops	-
			▪ Potential for use of agrochemicals, resulting in water pollution	-
El Progreso-7 Miles	▪ Protection of natural resources for the enjoyment and education of future generations	+	▪ Low-level hunting impacts within protected areas	-
	▪ Exclusion from hunting / logging / NTFP extraction	+	▪ Potential for illegal clearance of land for agriculture	-
	▪ Exclusion from land for expansion of community agriculture	-	▪ Forest clearance for agriculture in the adjacent landscape	-

TABLE 7: STAKEHOLDER ANALYSIS FOR TAPIR MOUNTAIN NATURE RESERVE

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STAKEHOLDER ANALYSIS FOR TAPIR MOUNTAIN NATURE RESERVE / 2				
Stakeholder	Influence or Impact of TMNR on Stakeholder		Influence or Impact of Stakeholder on TMNR	
Belize Karst Habitat Conservation	<ul style="list-style-type: none"> ▪ A focus of the organization’s conservation management activities ▪ A venue for future education and awareness activities ▪ A potential revenue generation mechanism for the protected area ▪ A management cost to the organization 	+ + + -	<ul style="list-style-type: none"> ▪ Current co-management agency responsible for day to day effective management ▪ On-site presence and effective management should improve biodiversity viability, ecosystem services and socio-economic benefit for stakeholders ▪ Poor management will be detrimental to biodiversity viability, ecosystem services and socio-economic benefit for stakeholders 	+ + -
Pook’s Hill Lodge	<ul style="list-style-type: none"> ▪ Provides forest connectivity to MMM and larger area for maintenance of biodiversity ▪ Ensures protection of watershed and health of Roaring Creek, as it comes out of TMNR / ATM ▪ Benefits from advertising as a buffer to TMNR ▪ Provides research site for visitors 	+ + + +	<ul style="list-style-type: none"> ▪ Supportive of the conservation goals of TMNR ▪ Located adjacent to TMNR, and prevents illegal access ▪ Positive support of conservation and protected areas ▪ Long-term knowledge of the biodiversity of the area 	+ + + +
Other Local Resorts	<ul style="list-style-type: none"> ▪ Protection of biodiversity and natural resources ▪ Assists in protection of watershed towards long term water security ▪ Will benefit from having TMNR as an actively managed tourism destination 	+ + +	<ul style="list-style-type: none"> ▪ Supportive of the conservation goals of TMNR ▪ Can actively promote TMNR to guests ▪ Potential to market TMNR nationally and internationally as a visitor destination 	+ + +
Bull Run	<ul style="list-style-type: none"> ▪ Provides a buffer from local community incursions ▪ Provides a continuum in ecosystem representation into the lowland foothills 	+ +	<ul style="list-style-type: none"> ▪ Provides forest connectivity to MMM and larger area for maintenance of biodiversity ▪ Supportive of the conservation goals of TMNR 	+ +
Tour Guides	<ul style="list-style-type: none"> ▪ Will be able to benefit from having TMNR as an actively managed tourism venue, once the designation has changed 	+	<ul style="list-style-type: none"> ▪ Support the conservation goals of TMNR ▪ Will provide interpretation for visitors, facilitating overall visitor appreciation ▪ Potential to provide marketing for TMNR as a tourism destination ▪ Presence will deter hunting and other illegal activities ▪ If fully engaged, have the potential to assist with visitor management within the protected area when open for tourism ▪ If poorly trained, can result in poor visitor management and increased impact on biodiversity / cave systems 	+ + + + -

TABLE 7: STAKEHOLDER ANALYSIS FOR TAPIR MOUNTAIN NATURE RESERVE / 2

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STAKEHOLDER ANALYSIS FOR TAPIR MOUNTAIN NATURE RESERVE / 3				
Stakeholder	Influence or Impact of TMNR on Stakeholder		Influence or Impact of Stakeholder on TMNR	
Belize Tourism Board / Belize Tourism Industry Association	<ul style="list-style-type: none"> ▪ Benefit from having TMNR as an actively managed tourism destination, once the designation has changed 	+	<ul style="list-style-type: none"> ▪ Support the conservation goals of TMNR ▪ Potential to provide national and international marketing for TMNR as a tourism destination, once the designation has changed 	+
Academic Institutions (UB-ERI and Galen)	<ul style="list-style-type: none"> ▪ Potential for using TMNR as a study site ▪ Benefit from past and future research work conducted at TMNR 	+	<ul style="list-style-type: none"> ▪ Improved knowledge of the Nature Reserve for integration into adaptive management planning ▪ Increased activity within area deters illegal activities ▪ Potential impact of research activities on terrestrial / aquatic environments and wildlife 	+
Visitors: Tourists	<ul style="list-style-type: none"> ▪ Will be able to enjoy TMNR as a tourism destination, once the designation has changed ▪ Will benefit from education and awareness opportunities 	+	<ul style="list-style-type: none"> ▪ Potential for entrance fee contributing towards PA financial sustainability ▪ Potential to provide marketing nationally and internationally by word of mouth, if happy with level of product ▪ Presence deters hunting / other illegal activities within PA ▪ May negatively impact the environment and wildlife if poorly regulated 	+
Visitors: Researchers	<ul style="list-style-type: none"> ▪ Benefit from being linked to TMNR ▪ Benefit from information on past research activities within the protected area 	+	<ul style="list-style-type: none"> ▪ Researchers outputs provide greater knowledge for guiding informed management of TMNR ▪ Increased activity within area deters illegal activities ▪ Possible impact of research activities on terrestrial / aquatic environments 	+
General Belize Public	<ul style="list-style-type: none"> ▪ Maintenance of biodiversity / environmental services ▪ Cultural and aesthetic appreciation ▪ Increased awareness through education ▪ Assists in watershed protection / water security 	+	<ul style="list-style-type: none"> ▪ Support of the general public will strengthen the security of the protected area ▪ Lack of general support in Belize may increase risk of dereservation 	-
Ministry of SD, CC& DRM (Forest Department and National Biodiversity Office)	<ul style="list-style-type: none"> ▪ TMNR is part of the National Protected Areas System ▪ TMNR is included in system level planning for the Maya Mountains Massif ▪ TMNR assists in meeting NBSAP targets for ecosystem and wildlife protection 	+	<ul style="list-style-type: none"> ▪ Supports management strategies on the ground ▪ Provides occasional surveillance and enforcement support ▪ Provides support for the co-management partner ▪ Supports resource mobilization efforts ▪ Supports drafting of policies and legislations. 	+

TABLE 7: STAKEHOLDER ANALYSIS FOR TAPIR MOUNTAIN NATURE RESERVE / 3

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STAKEHOLDER ANALYSIS FOR TAPIR MOUNTAIN NATURE RESERVE / 3				
Stakeholder	Influence or Impact of TMNR on Stakeholder		Influence or Impact of Stakeholder on TMNR	
Institute of Archaeology / National Institute of Culture and Heritage	▪ Surveillance activities protecting the caves	+	<ul style="list-style-type: none"> ▪ IoA has the mandate for protection and management of caves in Belize ▪ IoA has the technical expertise for interpretation of the cave artefacts ▪ IoA is enforcing closure of all but the current caves system open to visitation, until the resources are in place for effective management 	+
	▪ Maya artefacts of TMNR contribute towards Belize’s cultural and archaeological heritage	+		+
	▪ Research studies of the caves and Maya artefacts of TMNR contribute to knowledge of Belize’s cultural and archaeological heritage	+		-
Government of Belize	▪ Tapir Mountain Nature Reserve is part of the National Protected Areas System	+	<ul style="list-style-type: none"> ▪ Political support (currently through the signing of a new co-management agreement with Belize Karst) ▪ Uncertainty of long term future commitment of Government 	+
	▪ Assists in demonstrating Belize Government’s commitment to the conservation of natural resources, CCAD and CBD	+		-
	▪ Potential to provide employment opportunities in stakeholder communities (tourism)	+		
	▪ Provides environmental services, including watershed protection, carbon sequestration, representation of ecosystems, and species protection	+		

TABLE 7: STAKEHOLDER ANALYSIS FOR TAPIR MOUNTAIN NATURE RESERVE / 4

1.4 PHYSICAL CHARACTERISTICS

1.4.1 CLIMATE

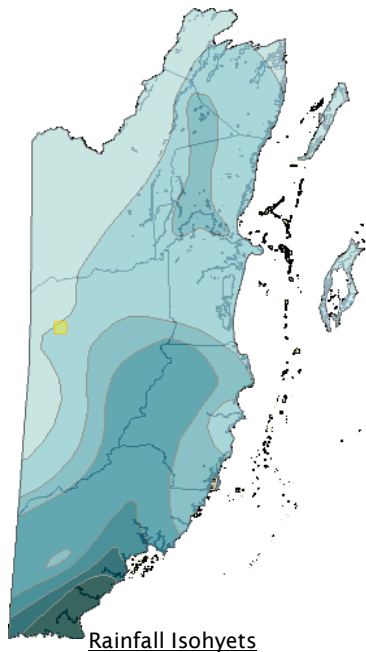
Belize lies within the outer tropical geographical belt – with the relatively high temperature and rainfall patterns associated with the tropics being one of the factors that promote and sustain the high levels of biodiversity within the region. Prevailing winds are easterly, from the Caribbean.

Belize is affected by three very distinct seasonal weather systems: trade winds, northers and tropical storms. All three have an influence on the rainfall and temperature patterns. The predominant winds are the **Trade Winds**, blowing from the east and south-east from April to October, interspersed by tropical storms. **Northers** - high-pressure fronts moving down from the north - occur between October and April, bringing cooler weather.

RAINFALL

Tapir Mountain Nature Reserve is situated on the lower, north-facing slopes of the Maya Mountains Massif, an area defined climatically as sub-tropical, with distinct wet and dry seasons. It lies within the second driest rainfall belt in Belize, with a general average annual rainfall of 1,778 mm (70”) per annum (National Meteorological Service, 2005; Figure 3).

Mean annual rainfall is 1,812 mm, with a pronounced dry season from February to May (average rainfall falls to 41 mm) (Figure 3). During this season, the karst areas become parched, and more vulnerable to fire, generally escaped from adjacent agricultural areas, or from hunting camp fires or cigarettes. The dry season is followed by a wetter season (June to December / January) with June and July, September and October being the wettest with rainfall averages ranging from 209 to 279 mm, with reduced rain in August (179 mm). The majority of the rain falls within the hurricane season (June to November), associated with passing tropical depressions or storms (particularly between September and November) which can bring more than 80 mm of rain in one day - these daily extremes strongly influence the monthly averages.



- 40 - 60" (1016 - 1524mm)
- 60 - 80" (1524 - 2032mm)
- 80 - 100" (2032 - 2540mm)
- 100 - 120" (2540 - 3048mm)
- 120 - 140" (3048 - 3556mm)
- 140 - 160" (3556 - 4064mm)
- 160 - 180" (4064 - 4572mm)

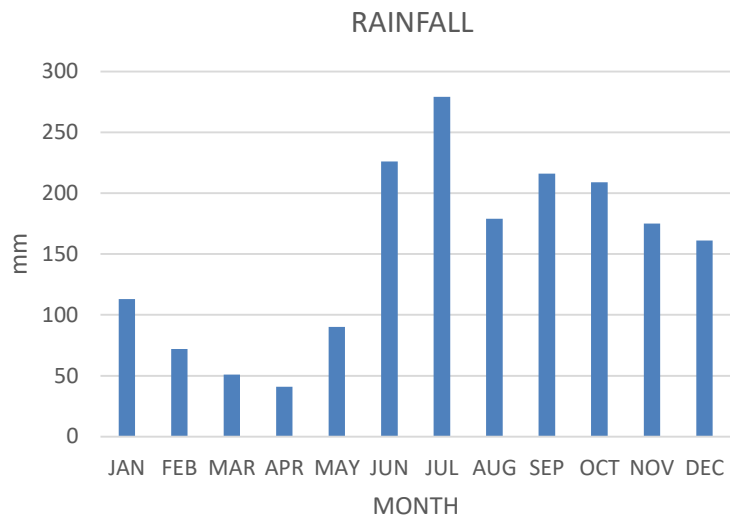


FIGURE 3: RAINFALL IN TEAKETTLE
 (based on simulated data from 1982 to 2012
www.climate-data.org)

TEMPERATURE

Lying within the subtropics, annual temperatures in the inland area of western central Belize (including Tapir Mountain Nature Reserve) average approximately 24.9°C. Minimum mean temperatures of 17.7°C occur in January, during the cold fronts, whilst maximum mean temperatures of 31.2°C are recorded in May (Figure 4; www.climate-data.org, 2020).

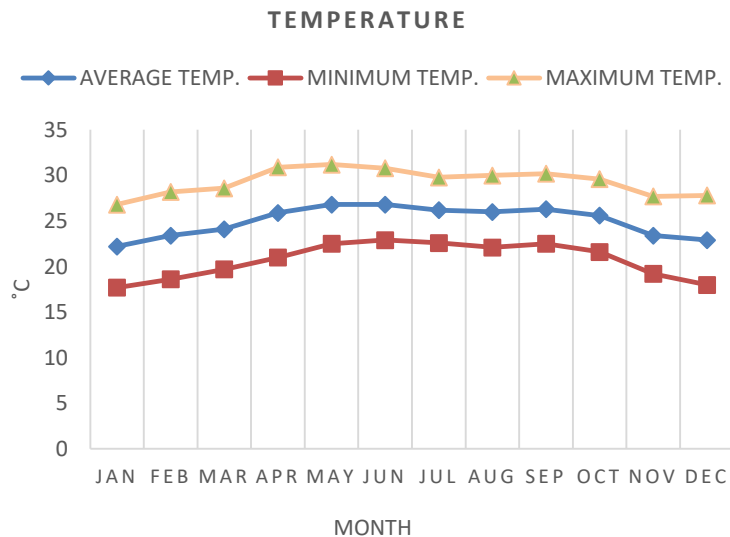


FIGURE 4: MAXIMUM, MINIMUM AND MEAN TEMPERATURE AVERAGE PER MONTH - TEAKETTLE (based on simulated data from 1984 to 2012, www.climate-data.org)

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TROPICAL STORMS

Tropical storms affect Belize every year between the beginning of June and end of November. Originating in the Atlantic Ocean over warm, tropical waters, these storms are non-frontal, developing highly organized circulations, and ranging in scale from tropical depressions and storms (with sustained wind speed < 74 mph) to hurricanes (with sustained wind speed > 74 mph up to 160 mph or more). These storms move westward towards the Caribbean and Central American coastline, gathering strength until they hit land. They generally bring extreme weather conditions – heavy rains, destructive winds.

Whilst many hurricanes have very focused paths of destruction, their effects are wide ranging. Despite being in the more sheltered wet of the country, far from the coastal landfall points, this part of Belize has been impacted by significant tropical storms approximately 8 times between 1851 and 2016 (Figure 5; Table 8), resulting in excessive rainfall and uprooting of trees. Hurricane Hattie, in 1961, was considered to have the most severe impact, leveling the forest and destroying most of the houses in the northern foothills of the Maya Mountains Massif.

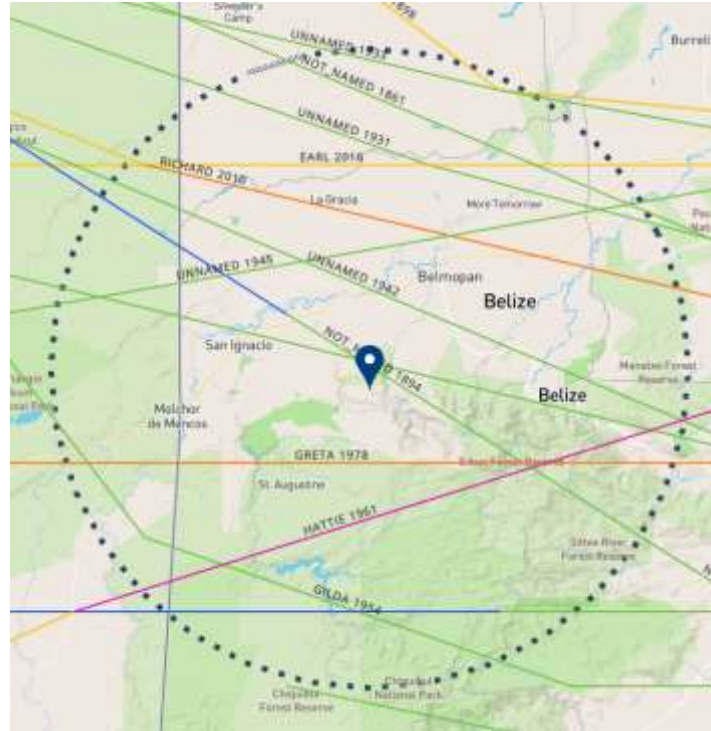


FIGURE 5: TROPICAL STORMS PASSING WITHIN 50 KM OF TMNR (<https://coast.noaa.gov/hurricanes>)

The most recent impacts seen at Tapir Mountain were caused by Hurricane Earl, which passed north of the protected area, causing significant tree fall, opening up the forest canopy and changing the structure, with secondary species taking advantage of the extra light. Since 2016, the forest canopy has recovered, and a more normal tropical forest structure is returning, with a more open, shaded understory. The storm changed the structure of the Roaring Creek, moving sand bars and eroding river banks (Staff consultations, 2020).

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HURRICANES AFFECTING TAPIR MOUNTAIN NATURE RESERVE LANDSCAPE (50 KM RADIUS)				
YEAR	HURRICANE	CATEGORY PASSING	DATE OF LANDFALL	NOTES
1931	Un-named	Tropical Storm	16/08/1931	Made landfall just north of Dangriga as a Tropical Storm, with winds of 40 mph, then passed within 10 miles of the north of TMNR, with winds of 35 mph
1934	Un-named	Tropical Storm	6/06/1934	Made landfall as a Tropical Storm, with 40 mph winds. Passed through Teakettle / San Ignacio with 40 mph winds
1945	Un-named	Tropical Storm	31/08/1945	Made landfall at Belize City as a Tropical Storm, with winds of 40 mph, then passed within 10 miles to the north of TMNR, with winds dropping to 35 mph
1961	Anna	Hurricane Cat. 1	24/07/1961	Made landfall as a Category 2 hurricane, with winds of 80 mph, dropping to 70 mph as it passed through Cayo
1961	Hattie	Tropical Storm	31/10/1961	Made landfall as a Category 4 hurricane, with 120 mph winds. Passed south of TMNR as a tropical storm, with winds dropping to 60 mph
1978	Greta	Hurricane Cat. 2	19/09/1978	Made landfall just north of Dangriga as a Category 3 hurricane, with 100 mph winds. Passed south of TMNR as a Category 2 hurricane, with winds dropping to 95 mph
2010	Richard	Hurricane Cat. 2	25/10/2010	Made landfall east of Gales Point, crossing Belize as a Category 2 hurricane, dropping to Category 1 when entering Guatemala. It passed north of TMNR with winds of approximately 76 mph
2016	Earl	Hurricane Cat. 1	4/8/2016	Made landfall just south of Belize City as a Category 1 hurricane, dropping to tropical storm once it reached Guatemala, passing to the north of TMNR.

Data Source: National Hurricane Centre (<http://coast.noaa.gov/hurricanes>)

TABLE 8: HURRICANES AFFECTING THE TMNR AREA

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1.4.2 GEOLOGY

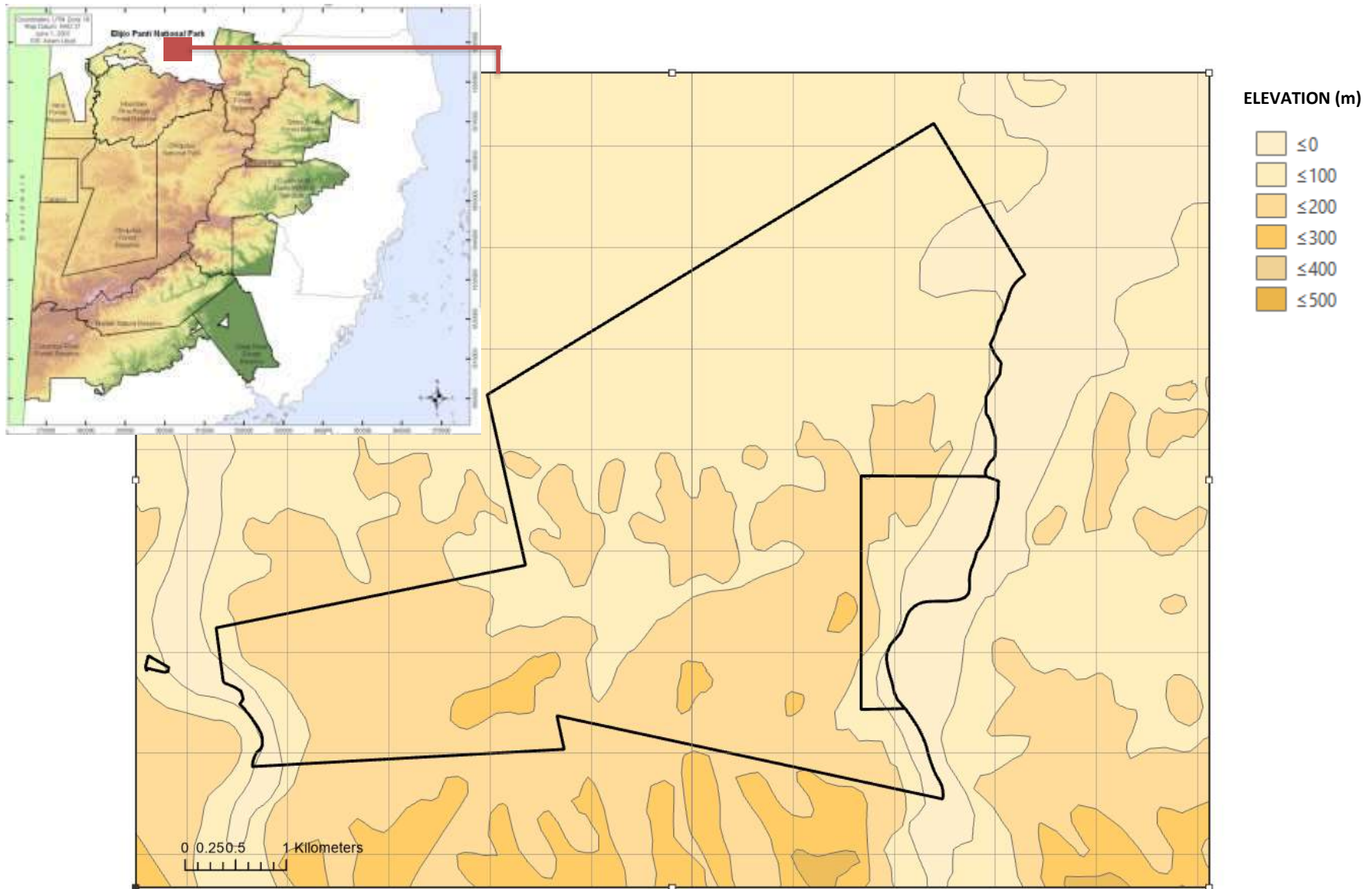
Tapir Mountain Nature Reserve lies on the periphery of the Maya Mountains Massif (MMM), the prominent elevated geological and topographical feature that dominates the south west of Belize. The protected area has steep terrain, with maximum elevation of 400m above sea level (Map 2). The MMM consists of hard Paleozoic rocks laid down during two separate stages of sedimentation. Meta-sediments of the Santa Rosa Group, some of the oldest rocks in Central America, deposited in the Carboniferous and Permian Periods between 225 to 350 million years ago, created during times of uplift (Ower, 1928; Dixon, 1956; Bateson and Hall, 1977). This is seen in the south-eastern-most corner of the protected area, where rocks are volcanic in origin from the Late Carboniferous-Permian period of the Palaeozoic Era (Table 9).

Remnants of the Triassic limestone that once blanketed the Maya Mountains, laid down over the earlier, harder rock, in the Mesozoic period can still be seen in a central band across the protected area, running from west to east (Map 3), and to the north of this, limestone from the Paleocene era. Here, characteristic landscape features are the rugged limestone topography of sinkholes, underground streams and caves, formed from the erosion of the limestone layer. Water is scarce in this karst landscape, especially during the dry months, and smaller streams that emerge as springs within the hill slopes then disappear underground again after flowing a short distance – characteristic of this limestone topography.

TIME SCALE OF FORMATION OF MAYA MOUNTAIN MASSIF GEOLOGY			
ERA	PERIOD	TIME SPAN (MILLION YEARS AGO)	GEOLOGICAL ACTIVITY
Palaeozoic Era	Permian	225 – 570	Belize covered by a shallow ocean. Sedimentary rocks of the Santa Rosa Group) deposited. Volcanic activity in the Bladen area
	Carboniferous		
Mesozoic Era	Triassic Period	190-225	Tectonic uplifts and folding of sedimentary rocks, forming Maya Mountains. Granite intrusion occurs, with contact metamorphosis of adjacent sedimentary rocks to form slate and quartzite
	Jurassic Period	136 – 190	Rift valleys form with erosion of Maya Mountains
	Cretaceous Period	65 – 136	Marine inundation by oceanic water covers the Maya Mountains with limestone
Cenozoic Era	Tertiary Period	2 – 65	Renewed uplift of Maya Mountains creating present high relief topography. Coastal zone sediments deposited. Erosion of Cretaceous limestone
	Quaternary Period	0 – 2 million	Continued erosion of limestone sequence from Maya Mountains, incision of mountains by streams and rivers

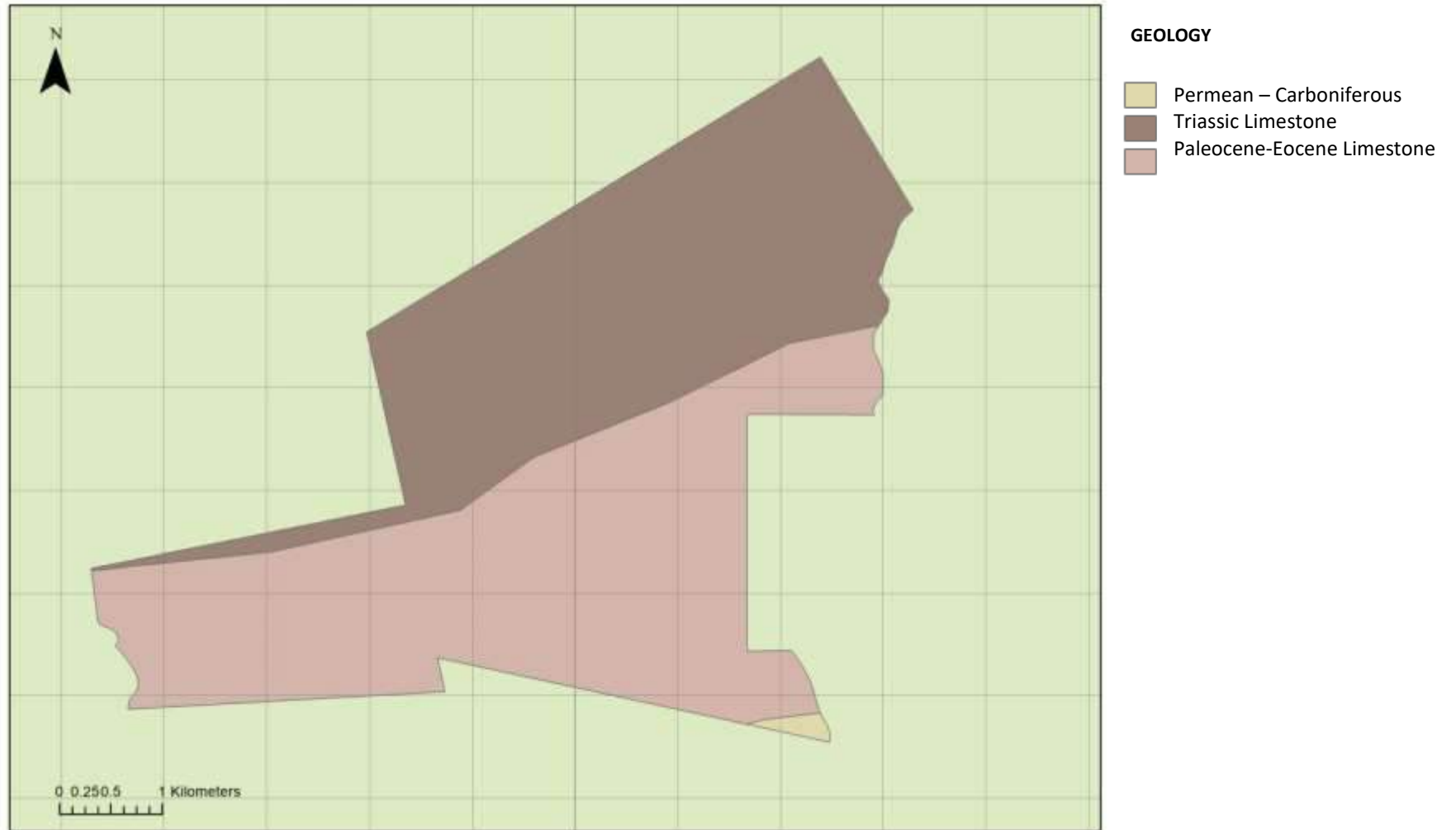
TABLE 9: TIME SCALE OF FORMATION OF MAYA MOUNTAIN MASSIF GEOLOGY (Based on Bateson and Hall, 1977)

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MAP 2: TAPIR MOUNTAIN NATURE RESERVE: TOPOGRAPHY

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MAP 3: TAPIR MOUNTAIN NATURE RESERVE - GEOLOGY

TAPIR MOUNTAIN NATURE RESERVE – Management Plan 2021-2025

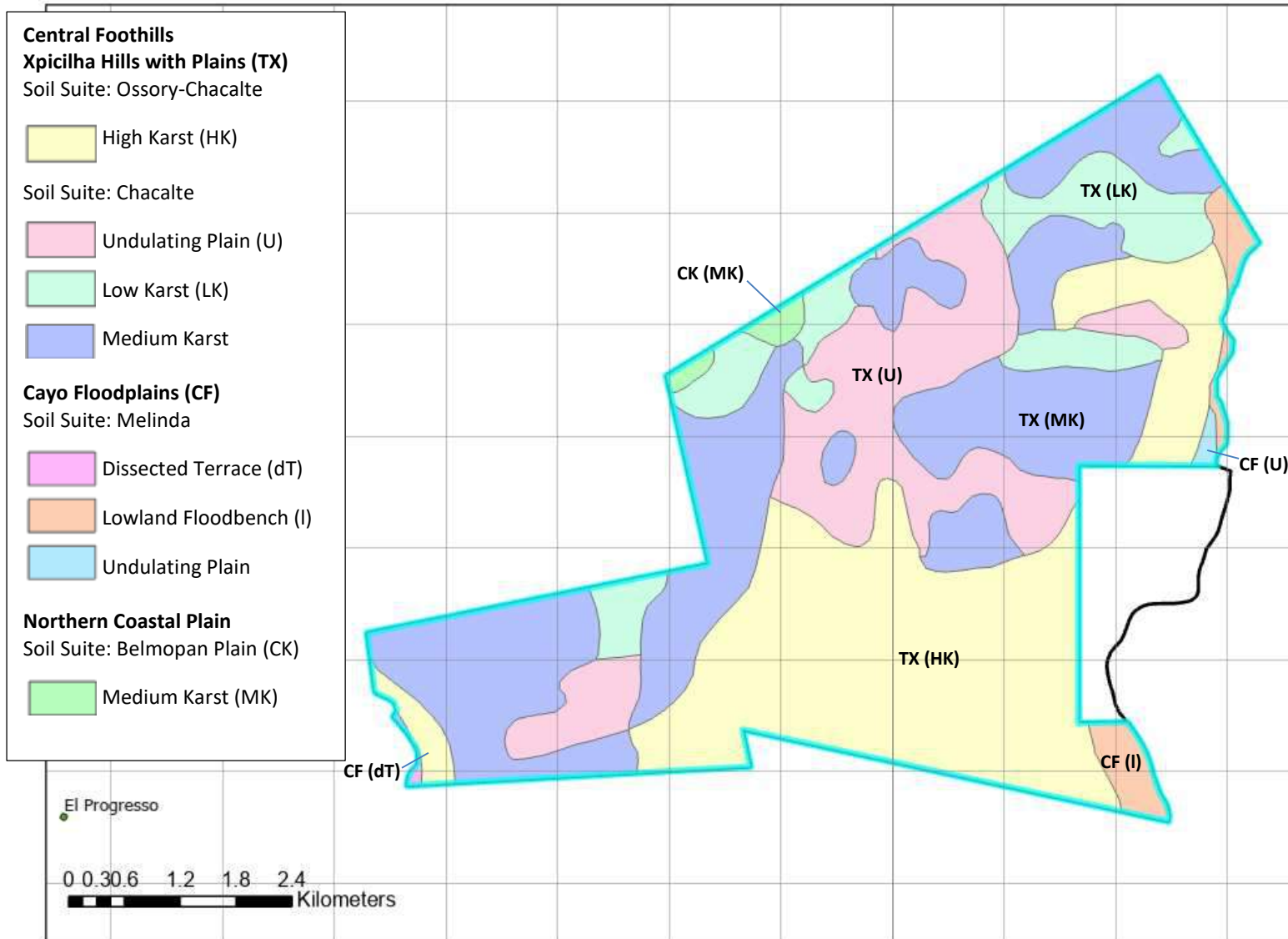
1.4.3 SOILS

Soils in the Nature Reserve belong to these three soil regimes (Map 4; Table 10; King et al. 1992)

- **Acidic Melinda and Ossory soils** originating from the granitic rocks of the Maya Mountains,
- **Constantly lime-enriched and intermittently lime enriched Chacalte soils**, originating from the Cretaceous limestone
- **Riverine alluvial** recently deposited soils of the floodplains in valleys, supplemented by flooding during storm events Tapir Mountain Nature Reserve lies in the Western Uplands / Central Foothills, forming a continuum of acidic soils at the southernmost point, from the metasediments of the Maya Mountains, to the limestone-covered northern foothills of the Western Uplands. Predominant soils are of the *Xpicilha Hills with Plains (TX)* Land Region (King et al., 1992). This land type is represented by steep (High (HK), Medium (MK) and Low Karst (LK)) slopes, with no agricultural value (King et al., 1992). Between the hills, an undulating plain (U) runs north to south through the centre of the protected area, with slightly richer, deeper, alkali soils washed down from the hillslopes, but still considered to be of very limited agricultural value. To the very north, the protected area includes representation of small patches of *Belmopan Plain (CK)*, with limestone soils that support much of the agriculture north of Tapir Mountain Nature Reserve.

Two creeks form the west and east boundaries, both resulting in low floodplain benches with a more fertile, flatter riparian landscape of alluvial soils that becomes flooded during storm events, replenishing the soils.

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MAP 4: LAND SYSTEMS AND SOILS OF THE TAPIR MOUNTAIN NATURE RESERVE (AFTER KING ET AL., 1992)

TAPIR MOUNTAIN NATURE RESERVE – Management Plan 2021-2025

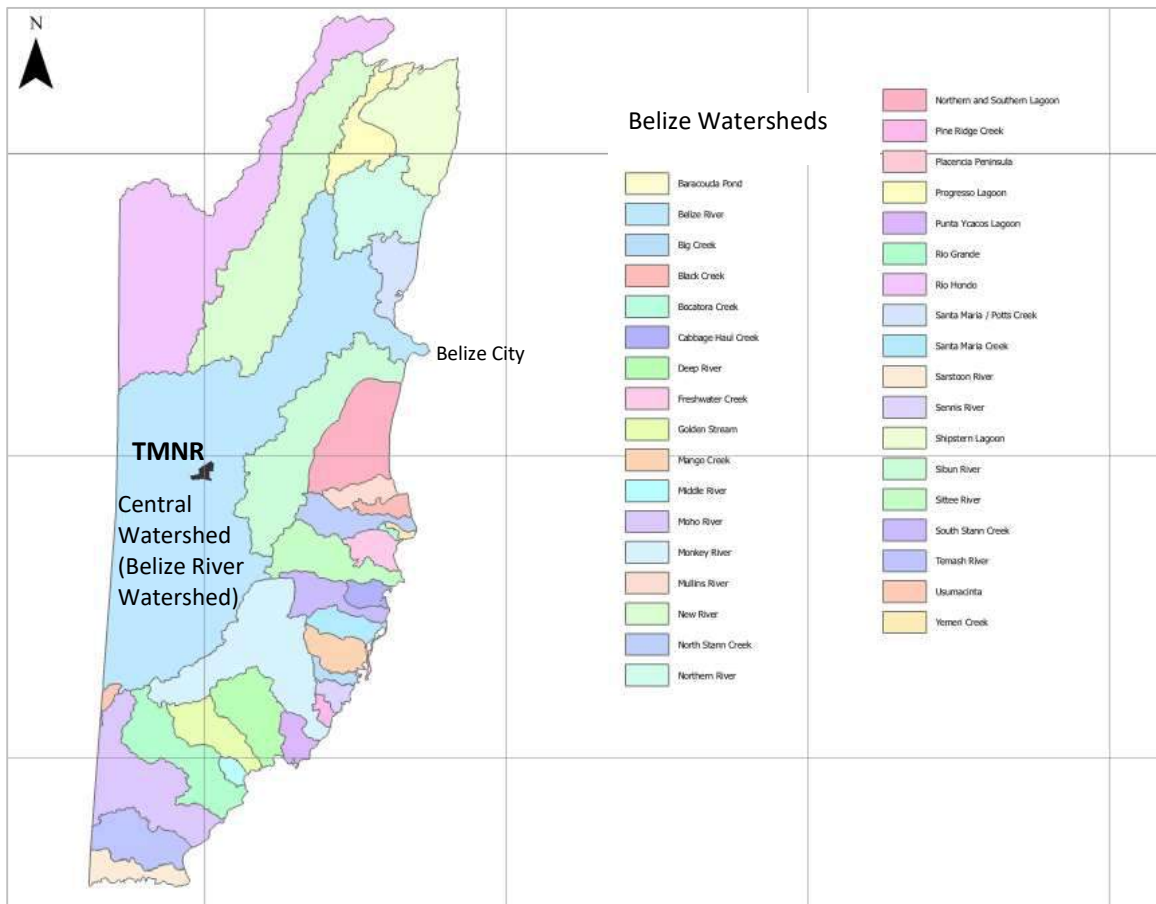
Land Region	Land System	Soil Type (Suite and Sub-suites)	Characteristics
Western Uplands / Central Foothills	Xpiciha Hills with Plains (TX) High Karst (HK) Medium Karst (MK) Low Karst (LK) Undulating Plain (U) Rolling Plain (R)	Ossory-Chacalte Granodoro + Chacalte + Cuxu	A combination of the acidic, leached soils of the Maya Mountains and the Cretaceous limestone soils of the karstic foothills. Located in areas where erosion through the surrounding limestone reveals the harder, acidic metasediments and granite underneath, in a Low Karst (LK) landscape..
		Chacalte Chacalte + Cuxu	Soils derived from both cretaceous limestone and Santa Rosa metasediments, occurring in the transitional area between the Western Uplands karst and Maya Mountains metasediments, in a High Karst (HK) landscape
		Chacalte Cabro	Shallow, stony clay soils, neutral to slightly acidic over alkali clays in pockets between steep slopes in a Medium Karst (MK) landscape
		Chacalte Xpiciha	Deeper, dark, slightly acidic soils with a higher clay content formed from cretaceous limestone in an Undulating Plain (U) landscape
		Chacalte Xpiciha + Cuxu	Fine textured, moderately deep, basic, soils formed from cretaceous limestone in a Rolling Plain (R) landscape
	Cayo Floodplains (CF) Low Floodplain Bench (I) Dissected Grit Terrace (dT) Undulating Plain (U)	Melinda Monkey River	Riverine acidic alluvium of loams and clays in the flood plains of Roaring and Barton Creeks, deposited from erosion impacts on the acidic rocks of the Maya Mountains to the south. At exceptional to high flood risk.
Northern Coastal Plain	Belmopan Plain (CK) Medium Karst (MK)	Yaxa Cuxu	Neutral or alkali dark limestone soils found on karstic limestone with underground drainage. Often found near swampy / bajo areas.

TABLE 10: SOILS OF THE TAPIR MOUNTAIN NATURE RESERVE (AFTER KING ET AL., 1992)

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1.4.4 WATERSHEDS

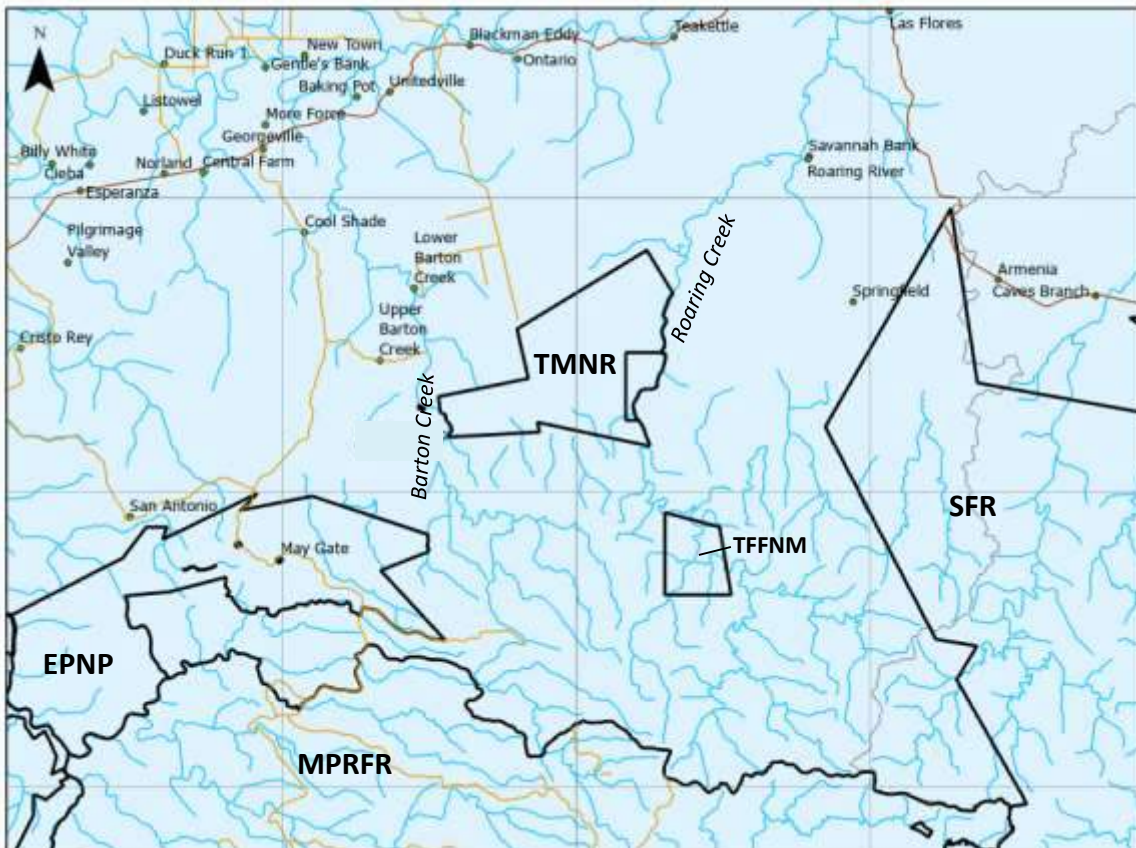
The Nature Reserve lies within the Central Watershed Region, as part of the Belize River Watershed (Map 5), and is defined on some of its borders by hydrological features – Barton Creek to the west and Roaring Creek to the east. The hydrology of the area is largely dictated by the geology, a combination of limestone and Santa Rosa group metasediments. In the karstic limestone areas, surface streams are limited, and features such as sinkholes and disappearing streams occur. Fast-running streams drain the upland metasedimentary rocks of the Maya Mountains Massif to the south, disappearing when reaching the karstic landscape of Tapir Mountain Nature Reserve, with much of the water then flowing underground (Map 6). With highly permeable limestone bedrock, water doesn't stay on the surface, but permeates down to perennial water channels that flow through the rock, eroding over the years to cause cave systems.



MAP 5: LOCATION OF TAPIR MOUNTAIN NATURE RESERVE WITHIN THE CENTRAL BELIZE WATERSHED

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The streams reappear to the south of Tapir Mountain, at the base of the karstic foothills, joining the Belize River. Two exceptions are the Barton Creek, which forms the western boundary of the protected area, and Roaring Creek, which defines the eastern boundary after flowing over the Thousand Foot Falls. Both flow throughout the year, though in 2019, with an exceptional dry season, the water in the Actun Tunichil Muknal cave system fell to record low levels, and the Roaring Creek stopped flowing in the Pook's Hill area, with water flow thought to be restricted to underground channels (Tour Guide Consultations, 2020).



TMNR: Tapir Mountain Nature Reserve

SFR: Sibun Forest Reserve

EPNP: Elijio Panti National Park

TFFNM: Thousand Foot Falls Natural

MPRFR: Mountain Pine Ridge Forest Reserve

Monument

MAP 6: WATER SYSTEMS WITHIN THE TMNR LANDSCAPE

Between Pook's Hill and the ATM cave, the river continued to flow, providing water for irrigation for the farmland to the east. With the predicted increasing dry seasons and unpredictable rainfalls, it is possible that this occurrence will occur more frequently, impacting water availability downstream.

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The limited surface water flowing through the protected area itself (except sheet flow during peak rainfall) impacts wildlife distribution and seasonality, with the movement of large vertebrates towards the creeks and rivers, increasing their vulnerability to hunting pressure. With the intense dry season of 2020, a herd of white lipped peccary, a highly threatened species in Belize, was reported to be seen migrating from Tapir Mountain Nature Reserve to the Belize River to access water, crossing the George Price Highway and agricultural areas to reach water (Community Consultations, 2020). This resulted in a significant loss of individuals from the herd as a result of targeted hunting by hunters from the key stakeholder communities (Community Consultations, Teakettle, 2020).

1.5 BIODIVERSITY OF MANAGEMENT AREA

1.5.1 ECOREGIONS / KEY BIODIVERSITY AREAS

Ecoregions can be defined as “*Relatively large units of land containing a distinct assemblage of natural communities sharing a large majority of species, dynamics, and environmental conditions...with boundaries that approximate the original extent of natural communities prior to land use.*” (WWF Conservation Science Program, 2001). Of the six ecoregions that occur in Belize, one is represented in TMNR, the Petén-Veracruz Moist Forest - defined by geology, altitude, rainfall and temperature. This ecoregion stretches through Belize, Guatemala and southern Mexico. Throughout their range, these forests tend to be a matrix of moist tropical forest, bajo, wetlands and riparian habitats. Species-richness is high (though the number of endemic species is low) with a high proportion of tightly linked ecological interactions such as symbiosis. Many tree, vertebrate and invertebrate species occur at relatively low densities, resulting in large areas being needed for the support of viable populations, particularly of the larger predators. These tropical and sub-tropical forests are very susceptible to change, with understory species being sensitive to even small disturbances in the microclimate, and unwilling to move through more open habitats, making them particularly vulnerable to habitat fragmentation. For all these reasons, tropical moist forests such as that of TMNR typically require large protected areas and high forest connectivity to maintain viable populations and sustain ecological processes, with buffering from edge effects, and provision for linkage through natural habitat corridors.

1.5.2 ECOSYSTEMS OF TAPIR MOUNTAIN NATURE RESERVE

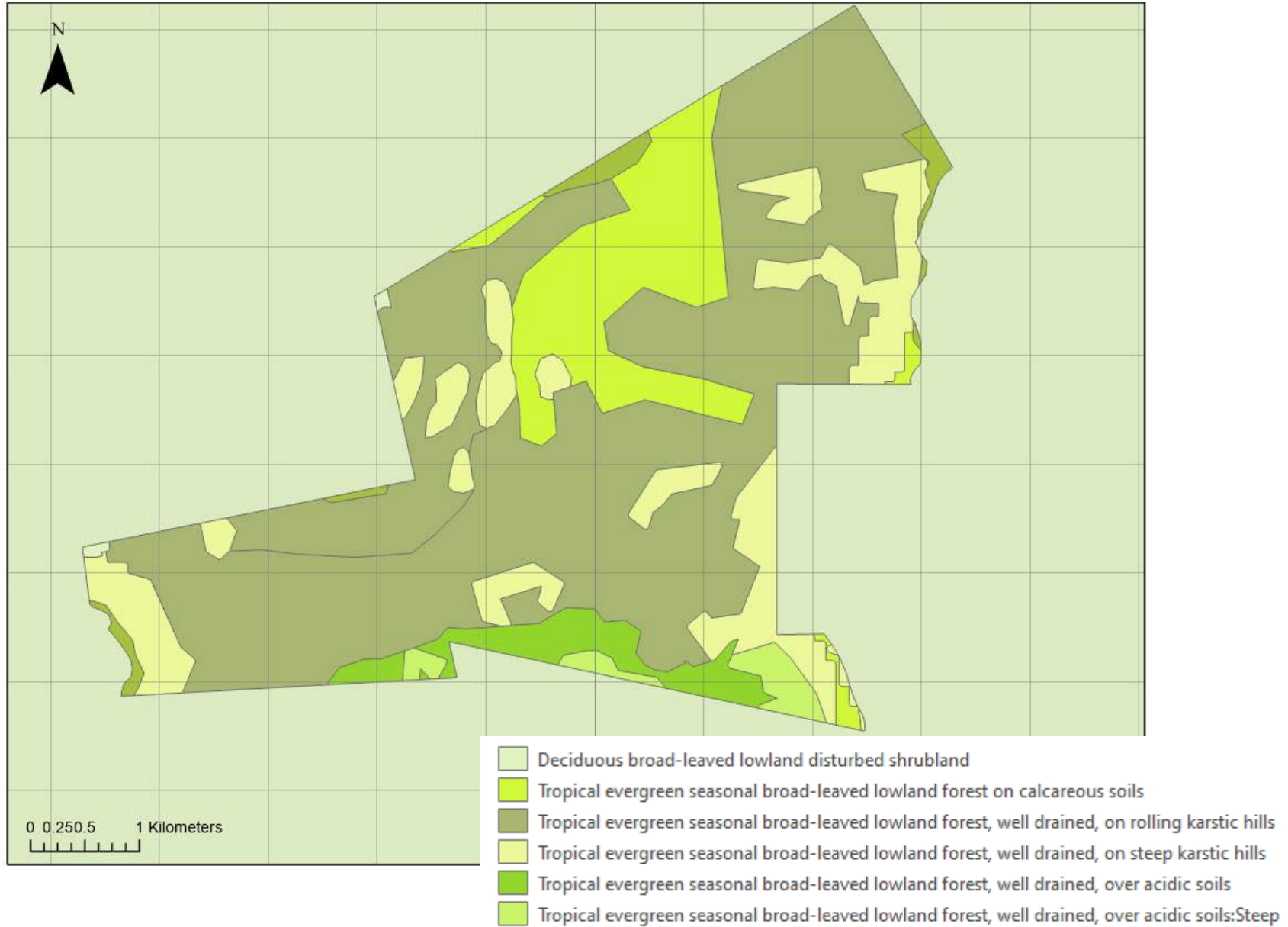
Under the UNESCO classification system, six natural terrestrial ecosystems have been identified to date within Tapir Mountain Nature Reserve, as well as the aquatic ecosystem associated with the river, represented by the creeks that form part of the protected area boundaries (Table 11; Map 7).

ECOSYSTEMS

- Tropical evergreen seasonal broad-leaved lowland forest, well drained, on rolling karstic hills
- Tropical evergreen seasonal broad-leaved lowland forest, well drained, on steep karstic hills
- Tropical evergreen seasonal broad-leaved lowland forest on calcareous soils
- Deciduous broad-leaved lowland disturbed shrubland
- Tropical evergreen seasonal broad-leaved lowland forest, well drained, over acidic soils
- Tropical evergreen seasonal broad-leaved lowland forest, well drained, over acidic soils: Steep River

TABLE 11: ECOSYSTEMS OF TMNR

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MAP 7: TAPIR MOUNTAIN NATURE RESERVE - ECOSYSTEMS (after Meerman, 2017)

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The predominant vegetation is broadly defined as tropical evergreen seasonal broad-leaved lowland forest, which is found on the limestone soils. Three ecosystems have been identified – the first on the steep slopes of the karstic hills (Tropical evergreen seasonal broadleaf lowland forest over steep karstic hills), the second in the valleys between these hills (Tropical evergreen seasonal broadleaf lowland forest over rolling karstic hills, and the third in the flatter areas (Tropical evergreen seasonal broadleaf lowland forest on calcareous soils).

The ecosystems overlying the more nutrient-poor metasedimentary rocks in the south of the protected area is characterized by well drained Tropical evergreen seasonal broad-leaved lowland forest, over acidic soils. Deciduous broad-leaved lowland disturbed shrubland is found in small patches along the edges of the protected area, where fires have escaped from adjacent farmlands and degraded the forest edge.

Tropical evergreen seasonal broadleaf lowland forest over rolling karstic hills

This ecosystem occurs in the flatter valley floors between the karstic hills that dominate the Nature Reserve. Occurring on relatively deep, humid, rich soils, this forest has a high, dense canopy and relatively open understory, it is an aesthetically pleasing and rich forest with significant tourism potential. It has also been highlighted in the past for its status as a ‘mahogany rich forest’, with estimated densities of one to two mahogany (*Swietenia macrophylla*) per acre within the broadleaf forest ecosystems (Smith, 1996). Cedar (*Cedrela odorata*) and Santa Maria (*Calophyllum brasiliense*), two other commercial species, are also prevalent, resulting in the consistent pressure from illegal loggers, despite the rugged terrain (Lizama, 2013).

Where this ecosystem transitions into riparian vegetation along Roaring Creek, the spiny bamboo (*Guadua spinosa*) is prevalent. The understory is rich in Araceae and Maranthaceae (Meerman, 1995). On the lower ridges the Cohune palm (*Orbignya*

KEY SPECIES OF TROPICAL EVERGREEN SEASONAL BROADLEAF LOWLAND FOREST OVER ROLLING KARSTIC HILLS

Wild Tamarind	<i>Acacia dolychostachya,</i>
Wild Mamey	<i>Alseis yucatenensis,</i>
My lady	<i>Aspidosperma megalocarpon,</i>
Cohune	<i>Attalea cohune,</i>
Ramon, Breadnut	<i>Brosimum alicastrum,</i>
Santa Maria	<i>Calophyllum brasiliense,</i>
Spanish Cedar	<i>Cedrela odorata,</i>
	<i>Cordia sp.,</i>
Escoba palm	<i>Cryosophila stauracantha,</i>
	<i>Cupania sp.,</i>
Heliconia	<i>Heliconia aurantiaca</i>
Sapote	<i>Manilkara zapota,</i>
Allspice	<i>Pimenta dioica,</i>
Pouteria	<i>Pouteria sp.,</i>
Copal	<i>Protium copal,</i>
Bayleaf, Botan	<i>Sabal mauritiiiformis,</i>
	<i>Sebastiana tuerckheimiana,</i>
Hogplum	<i>Spondias radlkoferi,</i>
Cojeton	<i>Stemmadenia donnell-smithii,</i>
Bastard Line	<i>Trichilia havanensis,</i>
Yaxox, Red Breadnut	<i>Trophis racemosa,</i>
Yaxnik	<i>Vitex gaumeri</i>
Prickly Yellow sp.	<i>Zanthoxyulum sp.</i>

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cohune) becomes the dominant species, then replaced by botan (*Sabal mauritiiformis*) and give and take palms (*Crysophila argentea*) (Meerman, 1995). The Nature Reserve is considered particularly rich in fern species, with more than 51 species identified (Meerman, 1995). This taxon is considered a good indicator for the bio-integrity of the ecosystems (Lizama, 2013).

Tropical evergreen seasonal broadleaf lowland forest over steep karstic hills

This is limited to the steeper areas of the protected area within the rolling karstic hill landscape. As its name implies, it occurs on steep limestone terrain - gradients vary from a minimum of approx. 45 degrees to almost vertical. There is a significant shift in species composition and canopy height along the altitudinal gradient on the hills (from 25m on the lower slopes to 1m on the hill-tops), with the hill-tops being very parched during the dry season and having a lower, more deciduous forest than that on the lower slopes.

Past surveys suggest that Tapir Mountain is relatively species-rich, with over 120 species of plants. At least four plant species are considered globally threatened, including three commercial species – the mahogany (*Swietenia macrophylla*), xate (*Chamaedorea oblongata*) and cedar (*Vitex gaumeri*) (Table 12).

THREATENED SPECIES	
ENDANGERED	
Yaxnik / Fiddlewood	<i>Vitex gaumeri</i>
VULNERABLE	
Cedar	<i>Cedrela odorata</i>
Tepejilote Jade	<i>Chamaedorea oblongata</i>
Big-leaf Mahogany	<i>Swietenia macrophylla</i>

TABLE 12: GLOBALLY THREATENED PLANT SPECIES OF TMNR (CRITERIA - IUCN, 2020)

1.5.3 FAUNA

A rapid assessment of the Nature Reserve in 1994 (Meerman, 1995) and ongoing survey work and research conducted at Pook’s Hill Lodge over the last thirty years has provided considerable data on the wildlife of the area. The fauna of the Nature Reserve is representative of typical lowland tropical forests in Belize, with at least 55 mammal species and over 325 species of bird recorded from either the protected area itself or from the adjacent Elijio Panti National Park and Pook’s Hill areas.

Game species are considered to be depressed by hunting pressure (community consultations, 2020). However, white-lipped peccary, considered an important indicator of both the health of the forest and hunting pressure, was reported in the area in 2020, in large numbers (250 to 300, community consultation, 2020), migrating from the TMNR area to the Belize River during the dry season. TMNR on its own is not large enough to support a herd of this wide-ranging species, or other species requiring large tracts of connected forest – such as jaguar (*Panthera onca*) and puma (*Puma concolor*). Connectivity with the Maya Mountains Massif is essential for the continued presence of these and the other larger wide-ranging species reported from the

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Nature Reserve. The Nature Reserve does, however, contribute towards the maintenance of viable populations of at least six species of international concern (rated as ‘Endangered’ or ‘Vulnerable’ (IUCN, 2020).

MAMMALS OF TAPIR MOUNTAIN NATURE RESERVE

A total of fifty-five mammals are confirmed as present to date within the Nature Reserve (Table 14). Three species – Baird’s tapir (*Tapirus bairdii*), Central American black-handed spider monkey (*Ateles geoffroyi*) and the Yucatan black howler monkey (*Alouatta pigra*) – are globally ‘Endangered’ under IUCN

THREATENED SPECIES	
ENDANGERED	
Yucatan Black Howler Monkey	<i>Alouatta pigra</i>
Central American Black-handed Spider Monkey	<i>Ateles geoffroyi</i> *
Baird’s Tapir	<i>Tapirus bairdii</i>
VULNERABLE	
White-lipped Peccary	<i>Tayassu pecari</i>

TABLE 13: THREATENED MAMMALS OF TMNR (IUCN, 2020)

classification, and one (the white-lipped peccary (*Tayassu pecari*)) is classified as ‘Vulnerable’ (Table 13; IUCN, 2020). Whilst the howler monkey and Baird’s tapir have been recorded in the area, the spider monkey is still to be confirmed. However, this species is present in the nearby Elijio Panti National Park, and has been seen around the San Antonio area, so may occur in TMNR, especially as fire impacts and forest clearance force it to move from its current range. spider monkeys are considered one of 25 globally most threatened primate species, as a result of the increasing level of deforestation within its range, and the demand for the pet trade (Schwitzer et al., 2017).

Yucatan black howler monkeys (*Alouatta pigra*), endemic to a small area of the Yucatan Peninsula, Belize and the Peten, were decimated by yellow fever in 1956/1957, compounded by the effects of Hurricane Hattie in 1961, and by local hunting pressure. A reintroduction Program centred on Chaa Creek was implemented in 1997 to restore populations in the Lower Macal Drainage, with genetically diverse individuals translocated from Scotland Half Moon and Monkey River. The reintroduction was successful and howler monkeys are now recorded from the national and private lands of the area, with reports of increasing numbers in the Tapir Mountain and Elijio Panti, extending down to the outer fringes of San Ignacio Town and along the Belize River.

Baird’s tapir (*Tapirus bairdii*), the iconic species that represents Tapir Mountain Nature Reserve, is the largest herbivore present in TMNR, and is associated with the riverine areas along the creeks, where this large herbivore grazes on the herbaceous vegetation. It is shy, and seen infrequently, though tracks can be commonly found in the adjacent Pook’s Hill property (J. Snaddon, pers. comm., 2020). Illegal hunting of this species has been reported from the adjacent Elijio Panti National Park in 2019 / 2020 (Itzamna Society, pers. comm., 2020).

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All five of Belize's wild cats are recorded, including the 'Near Threatened' jaguar (*Panthera onca*) and margay (*Leopardus wiedii*), as well as the Neotropical river otter (*Lutra longicaudis*) (IUCN, 2020). Indications are that the mammal densities are low, particularly the game species such as collared peccary (*Pecari tajacu*) and white tailed deer (*Odocoileus virginianus*). Wide ranging species such as white-lipped peccary (*Tayassu pecari*), collared peccary (*Tayassu tajacu*) and Baird's tapir (*Tapirus bairdii*) are also highlighted as of concern because of their dwindling populations in Central America, as hunting pressure increases and forested habitat decreases outside of the protected areas. The recent report of a large group of 250 to 300 white-lipped peccary in peak dry season in 2020 is significant, though movements of large numbers such as these from the protected dry karst areas of TMNR to the Belize River valley in search of water increases their vulnerability to hunters (community consultations, 2020). This species requires an area larger than TMNR, and continued connectivity with the Maya Mountains is important for long term viability. This is currently provided by the Bull Run property to the south, a privately protected area. Other game species – the Central American agouti (*Dasyprocta punctata*), paca (*Cuniculus paca*) and nine-banded armadillo (*Dasyopus novemcinctus*) are also present in the area.

Twenty-seven of the species (49% of the total number of species recorded) are bats, with representation from the Emballonuridae, Mormoopidae, Phyllostomidae and Vespertilionidae families.

Whilst the species list cannot be considered comprehensive, it does indicate that the area supports a mammal diversity typical of a tropical broadleaf forest ecosystem in Belize. The data is drawn from recorded sightings from Pook's Hill / TMNR by Belize Audubon Society 1993, Meerman and Boomsma, 1995; Snaddon et al, 2002, and Hewitt et al. (draft).

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MAMMALS OF TAPIR MOUNTAIN NATURE RESERVE

Common Name

Species Name

Didelphimorphia

Didelphidae

Common Opossum

Didelphis marsupialis

Virginia Opossum

Didelphis virginiana

Grey Four-eyed Opossum

Philander opossum

Water Opossum

Chironectes minimus

Edentata

Myrmecophagidae

Northern Tamandua

Tamandua mexicana

Dasypodidae

Nine-banded Armadillo

Dasypus novemcinctus

Chiroptera

Emballonuridae

Proboscis Bat

Rhynchonycteris naso

Mormoopidae

Common Mustached Bat

Pteronotus parnellii

Phyllostomidae

Tome's Sword-nosed Bat

Lonchorhina aurita

Pale Spear-nosed Bat

Phyllostoma discolor

Greater Spear-nosed Bat

Phyllostomus hastatus

Wrinkle-faced Bat

Centuro senex

Woolly False Vampire Bat

Chrotopterus auritus

Palla's Long-tongued Bat

Glossophaga soricina

Underwood's Long-tongued Bat

Hylonycteris underwoodi

Silky Short-tailed Bat

Carollia brevicauda

Seba's Short-tailed Bat

Carollia perspicillata

Little Yellow-shouldered Bat

Sturnira lilium

Great Fruit-eating Bat

Artibeus lituratus

Intermediate Fruit-eating Bat

Artibeus intermedius

Jamaican Fruit-eating Bat

Artibeus jamaicensis

Toltec Fruit-eating Bat

Artibeus toltecus

Pygmy Fruit-eating Bat

Dermanura phaeotis

Thomas' Fruit-eating Bat

Dermanura watsoni

Golden Bat

Mimon bennettii

Fringe-Lipped Bat

Trachops cirrhosus

Common Tent-making Bat

Uroderma bilobatum

Heller's Broad-nosed Bat

Platyrrhinus helleri

Little Yellow-eared Bat

Vampyressa pusilla

Common Vampire Bat

Desmodus rotundus

Vespertilionidae

Sinaloan Mastiff Bat

Molossus sinaloae

Hairy-legged Myotis

Myotis keaysi

Cave Myotis

Myotis velifer

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MAMMALS OF TAPIR MOUNTAIN NATURE RESERVE

Common Name

Species Name

Primate

Atelidae

Yucatan Black Howler

Alouatta pigra

Rodentia

Sciuridae

Deppe's Squirrel

Sciurus deppei

Erethizontidae

Mexican Porcupine

Coendou mexicanus

Dasyproctidae

Central American Agouti

Dasyprocta punctata

Cuniculidae

Paca

Cuniculus paca

Carnivora

Canidae

Grey Fox

Urocyon cinereoargenteus

Procyonidae

Northern Raccoon

Procyon lotor

White-nosed Coati

Nasua narica

Kinkajou

Potos flavus

Carnivora

Mustelidae

Tayra

Eira barbara

Striped Hog-nosed Skunk

Conepatus semistriatus

Neotropical River Otter

Lutra longicaudis

Felidae

Ocelot

Leopardus pardalis

Margay

Leopardus wiedii

Jaguarundi

Herpailurus yagouaroundi

Puma

Puma concolor

Jaguar

Panthera onca

Perissodactyla

Tapiridae

Baird's tapir

Tapirus bairdii

Artiodactyla

Tayassuidae

Collard Peccary

Pecari tajacu

White-lipped Peccary

Tayassu pecari

Cervidae

White-tailed Deer

Odocoileus virginianus

Red brocket Deer

Mazama americana

TABLE 14: MAMMAL SPECIES OF TAPIR MOUNTAIN NATURE RESERVE

BIRDS OF TAPIR MOUNTAIN NATURE RESERVE

Birds are the best surveyed of the vertebrate groups, with over 340 species recorded to date, either through reports from TMNR itself or the contiguous Pook’s Hill Lodge (J. Snaddon pers. comm., 2020; Table 16) and from peer-reviewed E-bird reports from Actun Tunichil Muknal Natural Monument (Ebird, 2020), and the adjacent Elijo Panti National Park. A further twenty-one species have been highlighted as in need of confirmation as they are only recorded from one of the three sources.

The majority of the species are characteristic of broadleaf forest, though some riverine species such as the bare-throated tiger-heron (*Tigrisoma mexicanum*), agami heron (*Agamia agami*) and green heron (*Butorides virescens*) are present along the two creeks.

Three IUCN-red listed international species of concern have been highlighted for TMNR, all listed as Vulnerable – the agami heron, great curassow (*Crax rubra*), and cerulean warbler (*Setophaga cerulea*) (Table 15). The keel-billed motmot (*Electron carinatum*), also listed as globally vulnerable, is on the list of species to be confirmed, having been reported from Elijo Panti National Park.

The great curassow (*Crax rubra*) and crested guan (*Penelope purpurascens*), both prized game species, and considered nationally endangered (Walker, 2020 draft²) are declining in Belize, even in the National Protected Areas System, where they are considered to be protected from

Birds of International Concern

Vulnerable

Agami Heron	<i>Agamia agami</i>
Great Curassow	<i>Crax rubra</i>
Cerulean Warbler	<i>Setophaga cerulea</i>

IUCN Red List, 2020

Birds of National Concern

Critically Endangered

Orange-breasted Falcon	<i>Falco deiroleucus</i>
Crested Eagle	<i>Morphnus guianensis</i>

Endangered

Mealy Parrot	<i>Amazona farinose</i>
Crested Guan	<i>Penelope purpurascens</i>
Great Curassow	<i>Crax rubra</i>
Ornate Hawk-Eagle	<i>Spizaetus ornatus</i>

Vulnerable

White-crowned Parrot	<i>Pionus senilis</i>
Red-lored Parrot	<i>Amazona autumnalis</i>
Hook-billed Kite	<i>Chondrohierax uncinatus</i>
Black Hawk-Eagle	<i>Spizaetus tyrannus</i>
King Vulture	<i>Sarcoramphus papa</i>
Agami Heron	<i>Agamia agami</i>
Black-throated Shrike-Tanager	<i>Lanio aurantius</i>
Singing Quail	<i>Dactylortyx thoracicus</i>
Strong-billed Woodcreeper	<i>Xiphocolaptes promeropirhynchus</i>

Wildtracks, 2020 (Draft)

TABLE 15: BIRD SPECIES OF INTERNATIONAL (IUCN, 2020) AND NATIONAL CONCERN (WALKER, 2020)

Tapir Mountain Nature Reserve – Management Plan 2021-2025

hunting (Walker, 2020, draft¹). Both are heavily hunted outside the protected areas system and throughout the rest of Central America, with significant population decline (Birdlife International, 2020). Within TMNR and the adjacent area, the population is thought to have declined, following increasing incursions and hunting pressure by local community hunters, as is also indicated by the depressed game species populations (Community consultations, 2020).

The broadleaved forest of TMNR an important hunting area for raptors, umbrella species such as the orange-breasted falcon (*Falco deiroleucus*) and solitary eagle (*Buteogallus solitaries*) that nest in the Mountain Pine Ridge. The orange-breasted falcon is considered Critically Endangered in Belize (Walker, 2020, draft²) and very rare, perhaps extinct in the region south of Belize and Petén, Guatemala (Belize threatened bird species consultations, 2020), with the next known breeding population located in Panama. It is only known to nest in a limited number of locations in Belize, linked to karstic cliff faces. It is known to nest in the Vaca area and has been recorded at Pook's Hill, but whether it is these individuals that are using the Pook's Hill / TMNR area for foraging or whether there is a nest in the area is unknown.

The crested and solitary eagles (*Morphnus guianensis* and *Buteogallus solitaries*) are both considered critically endangered on the national species list (Walker, 2020, draft²), and both are recorded from the TMNR landscape - crested eagles hunt beneath the forest canopy, and therefore requires well-structured tropical broadleaved forest with a relatively open understory, whilst the solitary eagle soars above the canopy, covering large areas of forest, but forages from perches.

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TAPIR MOUNTAIN NATURE RESERVE: BIRD SPECIES LIST

EPNP: Based on Birds Without Borders data, Vaca Wet and Dry Season Surveys (L. Gentle, 2005), and eBird 2020 (Peer reviewed georeferenced reports)

PH: Pook's Hill – TMNR data (J. Snaddon)

ATM: eBird data for Actun Tunichil Muknal Natural Monument

Family	Species	EPNP	PH	ATM		
Tinamidae	Great Tinamou	<i>Tinamus major</i>	x	x	x	
	Little Tinamou	<i>Crypturellus soui</i>	x	x	x	
	Slaty-breasted Tinamou	<i>Crypturellus boucardi</i>	x	x	x	
	Thicket Tinamou	<i>Crypturellus cinnamomeus</i>	x	x	x	
Anatidae	Black-bellied Whistling Duck	<i>Dendrocygna autumnalis</i>		x		
	Muscovy Duck	<i>Cairina moschata</i>		x		
Ardeidae	Agami Heron	<i>Agamia agami</i>		x	x	
	Bare-throated Tiger-heron	<i>Tigrisoma mexicanum</i>	x	x	x	
	Great Blue Heron	<i>Ardea herodias</i>	x	x		
	Great Egret	<i>Ardea alba</i>	x	x	x	
	Snowy Egret	<i>Egretta thula</i>	x	x	x	
	Cattle Egret	<i>Bubulcus ibis</i>	x	x	x	
	Little Blue Heron	<i>Egretta caerulea</i>	x	x	x	
	Green Heron	<i>Butorides virescens</i>	x	x	x	
	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>		x		
	Yellow-crowned Night-heron	<i>Nyctanassa violaceus</i>	x	x		
	Boat-billed Heron	<i>Cochlearius cochlearius</i>	x			
	Phalacrocoracidae	Neotropic Cormorant	<i>Phalacrocorax brasilianus</i>		x	x
	Anhingidae	Anhinga	<i>Anhinga anhinga</i>		x	
Fregatidae	Magnificent Frigatebird	<i>Fregata magnificens</i>	x			
Ciconiidae	Wood Stork	<i>Mycteria americana</i>		x	x	
Cathartidae	King Vulture	<i>Sarcoramphus papa</i>	x	x	x	
	Black Vulture	<i>Coragyps atratus</i>	x	x	x	
	Turkey Vulture	<i>Cathartes aura</i>	x	x	x	
	Lesser Yellow-headed Vulture	<i>Cathartes burrovianus</i>		x	x	
Pandionidae	Osprey	<i>Pandion haliaetus</i>		x	x	
Acciptridae	White Hawk	<i>Leucopternis albicollis</i>	x	x	x	
	Common Black-hawk	<i>Buteogallus anthracinus</i>	x		x	
	Great Black Hawk	<i>Buteogallus urubitinga</i>	x	x	x	
	Roadside Hawk	<i>Buteo magnirostris</i>	x	x	x	
	Zone-tailed Hawk	<i>Buteo albonotatus</i>		x	x	
	Gray Hawk	<i>Buteo plagiatus</i>	x	x	x	

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TAPIR MOUNTAIN NATURE RESERVE: BIRD SPECIES LIST

EPNP: Based on Birds Without Borders data, Vaca Wet and Dry Season Surveys (L. Gentle, 2005), and eBird 2020 (Peer reviewed georeferenced reports)

PH: Pook's Hill – TMNR data (J. Snaddon)

ATM: eBird data for Actun Tunichil Muknal Natural Monument

Family	Species	EPNP	PH	ATM	
Acciptridae	Broad-winged Hawk	<i>Buteo platypterus</i>		x	
	Crane Hawk	<i>Geranospiza caerulescens</i>	x	x	
	Hook-billed Kite	<i>Chondrohierax uncinatus</i>	x		x
	Double-toothed Kite	<i>Harpagus bidentatus</i>		x	x
	Gray-headed Kite	<i>Leptodon cayanensis</i>		x	x
	Plumbeous Kite	<i>Ictinia plumbea</i>	x	x	
	Swallow-tailed Kite	<i>Elanoides forficatus</i>		x	
	White-tailed Hawk	<i>Elanus leucurus</i>		x	
	Bicolored Hawk	<i>Accipiter bicolor</i>	x	x	
	Ornate Hawk-eagle	<i>Spizaetus ornatus</i>	x	x	x
	Short-tailed Hawk	<i>Buteo brachyurus</i>	x	x	
	Black-and-white Hawk-Eagle	<i>Spizaetus melanoleucus</i>		x	x
	Black Hawk-eagle	<i>Spizaetus tyrannus</i>	x		x
	Crested Eagle	<i>Morphnus guianensis</i>		x	
Falconidae	Laughing Falcon	<i>Herpetotheres cachinnans</i>	x	x	x
	Collared Forest-Falcon	<i>Micrastur semitorquatus</i>	x	x	x
	Barred Forest-Falcon	<i>Micrastur ruficollis</i>	x	x	x
	American Kestrel	<i>Falco sparverius</i>		x	x
	Bat Falcon	<i>Falco rufifularis</i>	x	x	x
	Peregrine Falcon	<i>Falco peregrinus</i>		x	
	Orange-breasted Falcon	<i>Falco deiroleucus</i>	x	x	
Cracidae	Crested Guan	<i>Penelope purpurascens</i>	x	x	
	Great Curassow	<i>Crax rubra</i>	x	x	
	Plain Chachalaca	<i>Ortalis vetula</i>	x	x	x
Odontoridae	Singing Quail	<i>Dactylortyx thoracicus</i>	x		
	Spotted Wood-quail	<i>Odontophorus guttatus</i>	x		
Rallidae	Ruddy Crake	<i>Laterallus ruber</i>	x	x	
	Uniform Crake	<i>Amaurolimnas concolor</i>		x	
	Russet-naped Wood-Rail	<i>Aramides cajanea</i>	x		x
Heliornithidae	Sungrebe	<i>Heliornis fulica</i>		x	
Aramidae	Limpkin	<i>Aramus guarauna</i>		x	x
Charadriidae	Killdeer	<i>Charadrius vociferus</i>		x	x

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TAPIR MOUNTAIN NATURE RESERVE: BIRD SPECIES LIST

EPNP: Based on Birds Without Borders data, Vaca Wet and Dry Season Surveys (L. Gentle, 2005), and eBird 2020 (Peer reviewed georeferenced reports)

PH: Pook's Hill – TMNR data (J. Snaddon)

ATM: eBird data for Actun Tunichil Muknal Natural Monument

Family	Species	EPNP	PH	ATM
Charadriidae	Northern Jacana <i>Jacana spinosa</i>		x	x
Scolopacidae	Least Sandpiper <i>Calidris minutilla</i>		x	x
	Spotted Sandpiper <i>Actitis macularius</i>			x
Columbidae	Pale-vented Pigeon <i>Columba cayennensis</i>	x	x	
	Scaled Pigeon <i>Columba speciosa</i>	x	x	x
	Red-billed Pigeon <i>Columba flavirostris</i>	x	x	x
	Short-billed Pigeon <i>Columba nigrirostris</i>	x	x	x
	Ruddy Ground-Dove <i>Columbina talpacoti</i>	x	x	x
	Blue Ground-Dove <i>Claravis pretiosa</i>	x	x	x
	Plain-breasted Ground-Dove <i>Columbina minuta</i>		x	x
	Mourning Dove <i>Zenaida macroura</i>		x	
	White-tipped Dove <i>Leptotila verreauxi</i>	x	x	x
	Gray-headed Dove <i>Leptotila plumbeiceps</i>	x	x	x
Psittacidae	Gray-chested Dove <i>Leptotila cassini</i>	x	x	x
	Ruddy Quail-Dove <i>Geotrygon montana</i>	x	x	x
	Olive-throated Parakeet <i>Aratinga nana</i>	x	x	x
	Brown-hooded Parrot <i>Pionopsitta haematotis</i>	x	x	x
	White-crowned Parrot <i>Pionus senilis</i>	x	x	x
	White-fronted Parrot <i>Amazona albifrons</i>	x	x	x
	Red-lored Parrot <i>Amazona autumnalis</i>	x	x	x
Cuculidae	Mealy Parrot <i>Amazona farinosa</i>	x	x	x
	Squirrel Cuckoo <i>Piaya cayana thermophila</i>	x	x	x
	Yellow-billed Cuckoo <i>Coccyzus americanus</i>	x		
	Striped Cuckoo <i>Tapera naevia</i>		x	
Tytonidae	Groove-billed Ani <i>Crotophaga sulcirostris</i>	x	x	x
	Common Barn-Owl <i>Tyto alba</i>		x	
Strigidae	Vermiculated Screech-Owl <i>Megascops guatemalae</i>	x	x	
	Spectacled Owl <i>Pulsatrix perspicillata</i>	x	x	
	Ferruginous Pygmy Owl <i>Glaucidium brasilianum</i>	x	x	
	Mottled Owl <i>Ciccaba virgata</i>	x	x	
Caprimulgidae	Black-and-white Owl <i>Ciccaba nigrolineata</i>	x	x	
	Common Parakeet <i>Nyctidromus albicollis</i>	x	x	x

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TAPIR MOUNTAIN NATURE RESERVE: BIRD SPECIES LIST

EPNP: Based on Birds Without Borders data, Vaca Wet and Dry Season Surveys (L. Gentle, 2005), and eBird 2020 (Peer reviewed georeferenced reports)

PH: Pook's Hill – TMNR data (J. Snaddon)

ATM: eBird data for Actun Tunichil Muknal Natural Monument

Family	Species	EPNP	PH	ATM	
Caprimulgidae	Lesser Nighthawk	<i>Chordeiles acutipennis</i>	x		
	Common Nighthawk	<i>Chordeiles minor</i>	x	x	
	Yucatan Poorwill	<i>Nyctiphrynus yucatanicus</i>	x		
Nyctibiidae	Common Potoo	<i>Nyctibius griseus</i>		x	
Apodidae	White-collared Swift	<i>Streptoprocne zonaris</i>	x	x	x
	Chimney Swift	<i>Chaetura pelagica</i>		x	
	Vaux's Swift	<i>Chaetura vauxi</i>	x	x	x
	Lesser Swallow-tailed Swift	<i>Panyptila cayennensis</i>	x	x	x
Trochilidae	White-necked Jacobin	<i>Notharchus hyperhynchus</i>	x	x	x
	Long-tailed Hermit	<i>Phaethornis superciliosus</i>	x	x	
	Little Hermit	<i>Phaethornis longuemareus</i>	x	x	
	Stripe-throated Hermit	<i>Phaethornis striigularis</i>	x		x
	Purple-crowned Fairy	<i>Heliothryx barroti</i>	x	x	
	Scaly-breasted Hummingbird	<i>Phaeochroa cuvierii</i>	x	x	x
	Wedge-tailed Sabrewing	<i>Campylopterus curvipennis</i>	x	x	
	Green-breasted Mango	<i>Anthracothorax prevostii</i>	x	x	
	Ruby-throated Hummingbird	<i>Archilochus colubris</i>		x	x
	Violet Sabrewing	<i>Campylopterus hemileucurus</i>	x	x	x
	Canivet's Emerald	<i>Chlorostilbon canivetii</i>	x	x	
	White-bellied Emerald	<i>Amazilia candida</i>	x	x	x
Rufous-tailed Hummingbird	<i>Amazilia tzacatl</i>	x	x	x	
Azure-crowned Hummingbird	<i>Amazilia cyanocephala</i>		x		
Trogonidae	Black-headed Trogon	<i>Trogon melanocephalus</i>	x	x	x
	Gartered Trogon	<i>Trogon caligatus</i>	x	x	x
	Collared Trogon	<i>Trogon collaris</i>		x	x
	Slaty-tailed Trogon	<i>Trogon massena</i>	x	x	x
Momotidae	Tody Motmot	<i>Hylomanes momotula</i>	x	x	x
	Lesson's Motmot	<i>Momotus momota</i>	x	x	x
Alcedinidae	Amazon Kingfisher	<i>Chloroceryle amazona</i>	x	x	x
	Green Kingfisher	<i>Chloroceryle americana</i>	x	x	x
	American Pygmy Kingfisher	<i>Chloroceryle aenea</i>	x	x	x
	Belted Kingfisher	<i>Megaceryle alcyon</i>		x	x

Tapir Mountain Nature Reserve – Management Plan 2021-2025

TAPIR MOUNTAIN NATURE RESERVE: BIRD SPECIES LIST

EPNP: Based on Birds Without Borders data, Vaca Wet and Dry Season Surveys (L. Gentle, 2005), and eBird 2020 (Peer reviewed georeferenced reports)

PH: Pook's Hill – TMNR data (J. Snaddon)

ATM: eBird data for Actun Tunichil Muknal Natural Monument

Family	Species	EPNP	PH	ATM	
Alcedinidae	Ringed Kingfisher	<i>Ceryle torquata</i>		x	x
Bucconide	White-necked Puffbird	<i>Notharchus macrorhynchos</i>	x	x	x
	White-whiskered Puffbird	<i>Malacoptila panamensis</i>	x	x	x
Galbulidae	Rufous-tailed Jacamar	<i>Galbula ruficauda</i>	x	x	x
Ramphastidae	Northern Emerald Toucanet	<i>Aulacorhynchus prasinus</i>	x	x	x
	Collared Aracari	<i>Pteroglossus torquatus</i>	x	x	x
	Keel-billed Toucan	<i>Ramphastos sulfuratus</i>	x	x	x
	Black-cheeked Woodpecker	<i>Melanerpes pucherani</i>	x	x	x
Picidae	Red vented Woodpecker	<i>Melanerpes pygmaeus</i>	x	x	
	Golden-fronted Woodpecker	<i>Melanerpes aurifrons</i>	x	x	x
	Chestnut-colored Woodpecker	<i>Celeus castaneus</i>	x	x	x
	Smoky-brown Woodpecker	<i>Veniliornis fumigatus</i>	x	x	x
	Golden-olive Woodpecker	<i>Piculus rubiginosus</i>	x	x	x
	Lineated Woodpecker	<i>Dryocopus lineatus</i>	x	x	x
	Pale-billed Woodpecker	<i>Campephilus guatemalensis</i>	x	x	x
Furnaridae	Plain Xenops	<i>Xenops minutus</i>	x	x	x
	Rufous-breasted Spinetail	<i>Synallaxis erythrothorax</i>	x	x	x
	Scaly-throated Leaf-tosser	<i>Sclerurus guatemalensis</i>	x	x	
	Buff-throated Foliage-gleaner	<i>Automolus ochrolaemus</i>	x	x	x
Dendrocolaptidae	Tawny-winged Woodcreeper	<i>Dendrocincla anabatina</i>	x	x	x
	Ruddy Woodcreeper	<i>Dendrocincla homochroa</i>	x	x	x
	Olivaceous Woodcreeper	<i>Sittasomus griseicapillus</i>	x	x	x
	Wedge-billed Woodcreeper	<i>Glyphorhynchus spirurus</i>	x	x	
	Northern Barred Woodcreeper[1]	<i>Dendrocolaptes sanctithomae</i>	x	x	x
	Ivory-billed Woodcreeper	<i>Xiphorhynchus flavigaster</i>	x	x	x
	Streak-headed Woodcreeper	<i>Lepidocolaptes souleyetii</i>	x	x	x
Thamnophilidae	Strong-billed Woodcreeper	<i>Xiphocolaptes promeropirhynchus</i>	x	x	
	Great Antshrike	<i>Taraba major</i>	x	x	x
	Barred Antshrike	<i>Thamnophilus doliatus</i>	x	x	x
	Russet Antshrike	<i>Thamnistes anabatinus</i>	x		
	Plain Antwreio	<i>Dysithamnus mentalis</i>		x	x

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Family	Species	EPNP	PH	ATM	
Thamnophilidae	Dot-winged Antwren	<i>Microrhophias quixensis</i>	x	x	x
	Dusky Antbird	<i>Cercomacra tyrannina</i>	x	x	x
Formacariidae	Black-faced Antthrush	<i>Formicarius analis</i>	x	x	x
Tyranidae	Yellow-bellied Tyrannulet	<i>Ornithion semiflavum</i>	x	x	x
	Northern Beardless-Tyrannulet	<i>Camptostoma imberbe</i>		x	
	Greenish Elaenia	<i>Myiopagis viridicata</i>	x	x	x
	Yellow-bellied Elaenia	<i>Elaenia flavogaster</i>	x	x	x
	Ochre-bellied Flycatcher	<i>Mionectes oleagineus</i>	x	x	x
	Sepia-capped Flycatcher	<i>Leptopogon amaurocephalus</i>	x	x	x
	Northern Bentbill	<i>Oncostoma cinereigulare</i>	x	x	x
	Slate-headed Tody-Flycatcher	<i>Poecilotriccus sylvia</i>	x	x	x
	Eye-ringed Flatbill	<i>Rhynchocyclus brevirostris</i>	x	x	x
	Yellow-olive Flycatcher	<i>Tolmomyias sulphurescens</i>	x	x	x
	Common Tody-Flycatcher	<i>Todirostrum cinereum</i>		x	x
	Stub-tailed Spadebill	<i>Platyrrinchus cancrominus</i>	x	x	x
	Black Phoebe	<i>Sayornis nigricans</i>		x	x
	Royal Flycatcher	<i>Onychorhynchus coronatus</i>	x	x	x
	Ruddy-tailed Flycatcher	<i>Terenotriccus erythrurus</i>		x	x
	Sulphur-rumped Flycatcher	<i>Myiobius sulphureipygius</i>	x	x	
	Olive-sided Flycatcher	<i>Contopus cooperi</i>	x	x	
	Eastern Wood-Pewee	<i>Contopus virens</i>	x	x	x
	Tropical Pewee	<i>Contopus cinereus</i>	x	x	x
	Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	x	x	x
Tyranidae	White-throated Flycatcher	<i>Empidonax albigularis</i>	x	x	
	Acadian Flycatcher	<i>Empidonax virescens</i>	x	x	
	Least Flycatcher	<i>Empidonax minimus</i>	x	x	x
	Bright-rumped Attila	<i>Attila spadiceus</i>	x	x	x
	Rufous Mourner	<i>Rhytipterna holerythra</i>	x	x	x
	Vermilion Flycatcher	<i>Pyrocephalus rubinus</i>		x	
	Dusky-capped Flycatcher	<i>Myiarchus tuberculifer</i>	x	x	x
	Great Crested Flycatcher	<i>Myiarchus crinitus</i>	x	x	x
	Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>	x	x	x

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Family	Species	EPNP	PH	ATM	
Tyranidae	Dot-winged Antwren	<i>Microrhoppus quixensis</i>	x	x	x
	Great Kiskadee	<i>Pitangus sulphuratus</i>	x	x	x
	Boat-billed Flycatcher	<i>Megarynchus pitangua</i>	x	x	x
	Social Flycatcher	<i>Myiozetetes similis</i>	x	x	x
	Streaked Flycatcher	<i>Myiodynastes maculatus</i>	x	x	
	Sulphur-bellied Flycatcher	<i>Myiodynastes luteiventris</i>	x	x	x
	Piratic Flycatcher	<i>Legatus leucophaeus</i>	x	x	
	Tropical Kingbird	<i>Tyrannus melancholicus</i>	x	x	x
	Couch's Kingbird	<i>Tyrannus couchii</i>	x	x	x
	Fork-tailed Flycatcher	<i>Tyrannus savana</i>		x	
Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>		x		
Tityridae	Cinnamon Becard	<i>Pachyramphus cinnamomeus</i>	x	x	
	Gray-collared Becard	<i>Pachyramphus major</i>	x	x	x
	White-winged Becard	<i>Pachyramphus polychopterus</i>	x	x	x
	Rose-throated Becard	<i>Pachyramphus aglaie</i>	x	x	x
	Masked Tityra	<i>Tityra semifasciata</i>	x	x	x
	Black-crowned Tityra	<i>Tityra inquisitor</i>		x	
	Northern Schiffornis	<i>Schiffornis veraepacis</i>	x	x	x
Cotingidae	Rufous Piha	<i>Lipaugus unirufus</i>	x	x	
Pipridae	White-collared Manakin	<i>Manacus candei</i>	x	x	x
	Red-capped Manakin	<i>Pipra mentalis</i>	x	x	x
Hirundinidae	Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	x	x	x
	Barn Swallow	<i>Hirundo rustica</i>		x	x
	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>		x	x
	Gray-breasted Martin	<i>Progne chalybea</i>		x	
	Purple Martin	<i>Progne subis</i>		x	x
	Tree Swallow	<i>Tachycineta bicolor</i>		x	
	Mangrove Swallow	<i>Tachycineta albilinea</i>		x	x
Corvidae	Green Jay	<i>Cyanocorax yncas</i>	x	x	
	Brown Jay	<i>Cyanocorax morio</i>	x	x	x
Troglodytidae	Band-backed Wren	<i>Campylorhynchus zonatus</i>	x	x	x
	Spot-breasted Wren	<i>Thryothorus maculipectus</i>	x	x	x

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Family	Species	EPNP	PH	ATM	
Troglodytidae	White-bellied Wren	<i>Uropsila leucogastra</i>	x	x	x
	White-breasted Wood-Wren	<i>Henicorhina leucosticta</i>	x	x	x
	House Wren	<i>Troglodytes aedon</i>		x	x
	Nightingale Wren	<i>Microcerculus philomela</i>	x	x	x
Sylviidae	Long-billed Gnatwren	<i>Ramphocaenus melanurus</i>	x	x	x
	Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	x	x	x
	Tropical Gnatcatcher	<i>Polioptila plumbea</i>	x	x	x
Turdidae	Swainson's Thrush	<i>Catharus ustulatus</i>	x	x	x
	Gray-cheeked Thrush	<i>Catharus minimus</i>	x		x
	Wood Thrush	<i>Catharus mustelinus</i>	x	x	x
	Clay-colored Thrush	<i>Turdus grayi</i>	x	x	x
	White-throated Thrush	<i>Turdus assimilis</i>	x	x	
Mimidae	Gray Catbird	<i>Dumetella carolinensis</i>	x	x	x
	Tropical Mockingbird	<i>Mimus gilvus</i>	x	x	
Vireonidae	White-eyed Vireo	<i>Vireo griseus</i>	x	x	x
	Mangrove Vireo	<i>Vireo pallens</i>	x	x	
	Yellow-throated Vireo	<i>Vireo flavifrons</i>	x	x	x
	Red-eyed Vireo	<i>Vireo olivaceus</i>	x	x	x
	Yellow-green Vireo	<i>Vireo flavoviridis</i>	x	x	x
	Tawny-crowned Greenlet	<i>Hylophilus ochraceiceps</i>	x	x	x
	Lesser Greenlet	<i>Hylophilus decurtatus</i>	x	x	x
	Green Shrike-Vireo	<i>Vireolanius pulchellus</i>	x	x	x
	Rufous-browed Peppershrike	<i>Cyclarhis gujanensis</i>	x	x	
Parulidae	Blue-winged Warbler	<i>Vermivora pinus</i>	x	x	x
	Tennessee Warbler	<i>Vermivora peregrina</i>	x	x	
	Yellow Warbler	<i>Dendroica petechia</i>	x	x	x
	Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	x	x	x
	Yellow-throated Warbler	<i>Dendroica dominica</i>		x	x
	Bay-breasted Warbler	<i>Setophaga castanea</i>	x	x	
	Yellow-rumped Warbler	<i>Setophaga coronata</i>		x	
	Magnolia Warbler	<i>Dendroica magnolia</i>	x	x	x
Black-throated Green Warbler	<i>Dendroica virens</i>	x	x	x	

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Family	Species	EPNP	PH	ATM	
Parulidae	Grace's Warbler	<i>Dendroica graciae</i>	x		
	Black-and-white Warbler	<i>Mniotilta varia</i>	x	x	x
	Northern Parula	<i>Setophaga americana</i>		x	x
	Blackburnian Warbler	<i>Setophaga fusca</i>		x	
	American Redstart	<i>Setophaga ruticilla</i>	x	x	x
	Prothonotary Warbler	<i>Protonotaria citrea</i>	x	x	x
	Worm-eating Warbler	<i>Helmitheros vermivorus</i>	x	x	x
	Ovenbird	<i>Seiurus aurocapillus</i>	x	x	x
	Northern Waterthrush	<i>Seiurus noveboracensis</i>	x	x	x
	Louisiana Waterthrush	<i>Seiurus motacilla</i>	x	x	x
	Kentucky Warbler	<i>Oporornis formosus</i>	x	x	x
	Common Yellowthroat	<i>Geothlypis trichas</i>	x	x	x
	Hooded Warbler	<i>Wilsonia citrina</i>	x	x	x
	Wilson's Warbler	<i>Wilsonia pusilla</i>	x	x	x
	Golden-crowned Warbler	<i>Basileuterus culicivorus</i>	x	x	x
	Yellow-breasted Chat	<i>Icteria virens</i>	x	x	x
Thraupidae	Golden-hooded Tanager	<i>Tangara larvata</i>	x	x	x
	Red-legged Honeycreeper	<i>Cyanerpes cyaneus</i>	x	x	x
	Green Honeycreeper	<i>Chlorophanes spiza</i>	x	x	
	Scrub Euphonia	<i>Euphonia affinis</i>	x	x	x
	Yellow-throated Euphonia	<i>Euphonia hirundinacea</i>	x	x	x
	Olive-backed Euphonia	<i>Euphonia gouldi</i>	x	x	x
	Yellow-winged Tanager	<i>Thraupis abbas</i>	x		x
	Gray-headed Tanager	<i>Eucometis penicillata</i>	x	x	x
	Black-throated Shrike-Tanager	<i>Lanio aurantius</i>	x	x	x
	Red-crowned Ant-Tanager	<i>Habia rubica</i>	x	x	x
	Red-throated Ant-Tanager	<i>Habia fuscicauda</i>	x	x	x
	Rose-throated Tanager	<i>Piranga roseogularis</i>	x		
	Hepatic Tanager	<i>Piranga flava</i>	x	x	
	Summer Tanager	<i>Piranga rubra</i>	x	x	x
	Crimson-collared Tanager	<i>Ramphocelus sanguinolentus</i>	x	x	x
Scarlet Tanager	<i>Piranga olivacea</i>	x	x		

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Thraupidae	Scarlet-rumped Tanager	<i>Ramphocelus passerinii</i>	x	x
	Blue-gray Tanager	<i>Thraupis episcopus</i>	x	x
	Yellow-winged Tanager	<i>Thraupis abbas</i>	x	x
Emberizidae	Blue-black Grassquit	<i>Volatinia jacarina</i>	x	x
	Yellow-faced Grassquit	<i>Tiaris olivaceus</i>		x
	Variable Seedeater	<i>Sporophila americana</i>	x	x
	Morelet’s Seedeater	<i>Sporophila moreletii</i>	x	x
	Blue Seedeater	<i>Amaurospiza concolor</i>		x
	Orange-billed Sparrow	<i>Arremon aurantirostris</i>	x	
	Green-backed Sparrow	<i>Arremonops chloronotus</i>	x	x
	Grayish Saltator	<i>Saltator coerulescens</i>	x	x
Therapidae	Buff-throated Saltator	<i>Saltator maximus</i>	x	x
	Black-headed Saltator	<i>Saltator atriceps</i>	x	x
	Black-faced Grosbeak	<i>Caryothraustes poliogaster</i>	x	x
	Thick-billed Seed-Finch	<i>Oryzoborus funereus</i>		x
	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	x	x
Cardinalidae	Blue-black Grosbeak	<i>Cyanocompsa cyanooides</i>	x	x
	Blue Grosbeak	<i>Passerina caerulea</i>	x	x
	Blue Bunting	<i>Cyanocompsa parellina</i>	x	x
	Indigo Bunting	<i>Passerina cyanea</i>	x	x
	Painted Bunting	<i>Passerina ciris</i>		x
	Icteridae	Melodious Blackbird	<i>Dives dives</i>	x
Great-tailed Grackle		<i>Quiscalus mexicanus</i>	x	x
Bronzed Cowbird		<i>Molothrus aeneus</i>	x	x
Giant Cowbird		<i>Molothrus oryzivorus</i>		x
Black-cowled Oriole		<i>Icterus prothemelas</i>	x	x
Yellow-backed Oriole		<i>Icterus chrysater</i>	x	x
Yellow-tailed Oriole		<i>Icterus mesomelas</i>	x	x
Baltimore Oriole		<i>Icterus galbula</i>	x	x
Orchard Oriole		<i>Icterus spurius</i>		x
Eastern Meadowlark		<i>Sturnella magna</i>		x
Yellow-billed Caticue	<i>Amblycercus holosericeus</i>	x	x	

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Icteridae	Chestnut-headed Oropendola	<i>Psarocolius wagleri</i>	x	
	Montezuma Oropendola	<i>Psarocolius montezuma</i>	x	x
BIRDS NEEDING CONFIRMATION				
	Bananaquit	<i>Coereba flaveola</i>		x
	Band-tailed Barbthroat	<i>Threnetes ruckeri</i>	x	
	Blackburnian Warbler	<i>Setophaga fusca</i>		x
	Black-throated Blue Warbler	<i>Setophaga caerulescens</i>		x
	Black-whiskered Vireo	<i>Vireo altiloquus</i>		x
	Cabanis’s Wren	<i>Cantorchilus modestus</i>	x	
	Carolina Wren	<i>Thryothorus albinucha</i>	x	
	Cerulean Warbler	<i>Setophaga cerulea</i>		x
	Eastern Kingbird	<i>Tyrannus tyrannus</i>		x
	Gray-crowned Yellowthroat	<i>Geothlypis poliocephala</i>	x	
	Gray-throated Chat	<i>Granatellus sallaei</i>	x	
	Hooded Oriole	<i>Icterus cucullatus</i>		x
	Mourning Warbler	<i>Geothlypis philadelphia</i>		x
	Northern Cardinal	<i>Cardinalis cardinalis</i>	x	
	Olive Sparrow	<i>Arremonops rufivirgatus</i>		x
	Plain Wren	<i>Cantorchilus modestus</i>		x
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	x	
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	x	
	Striped Owl	<i>Asio clamator</i>		x
	Tawny-throated Leaf-tosser	<i>Sclerurus mexicanus</i>	x	
	Thrush-like Schiffornis	<i>Schiffornis turdinus</i>		x
	Veery	<i>Catharus fuscescens</i>		x
	Western Tanager	<i>Piranga ludoviciana</i>		x
	White-vented Euphonia	<i>Euphonia minuta</i>		x
	White-winged Tanager	<i>Piranga leucoptera</i>	x	
	Yellow-lored Parrot	<i>Amazona xantholora</i>	x	

TABLE 16: BIRD SPECIES OF TAPIR MOUNTAIN NATURE RESERVE

Tapir Mountain Nature Reserve – Management Plan 2021-2025

REPTILES AND AMPHIBIANS

There is currently very limited data on the herpetofauna of Tapir Mountain Nature Reserve, with only a tiny fraction of the protected area having been surveyed in a structured manner. The opportunities for permanent or even temporary ponds is poor within the area, with low diversity of amphibians in the surveyed conducted. Six amphibian species have been recorded in the contiguous Pook’s Hill property (J. Snaddon, pers. comm., 2020).

Reptiles, however, are more abundant, with twenty species being recorded during surveys of TMNR by Belize Audubon Society and Meerman (Meerman, 1995), and of Pook’s Hill (J. Snaddon; Table 17).

REPTILES AND AMPHIBIANS OF TAPIR MOUNTAIN NATURE RESERVE		
Family	Species	
BUFONIDAE	Cane Toad	<i>Rhinella marina</i>
	Gulf Coast Toad	<i>Incilius valliceps</i>
HYLIDAE	Red-eyed Treefrog	<i>Agalychnis callidryas</i>
	Hour-glass Tree-Frog	<i>Dendropsophus ebraccatus</i>
RANIDAE	Rainforest Frog	<i>Lithobates vaillanti</i>
RHINOPHRYNIDAE	Mexican Burrowing Toad	<i>Rhinophrynus dorsalis</i>
CORYTOPHANIDAE	Common Basilisk	<i>Basiliscus vittatus</i>
DACTYLOIDAE	Ghost Anole	<i>Anolis lemurinus</i>
DACTYLOIDAE	Slender Anole	<i>Anolis limifrons</i>
DACTYLOIDAE	Lesser Scaly Anole	<i>Anolis uniformis</i>
IGUANIDAE	Common Iguana	<i>Iguana iguana</i>
PHRYNOSOMATIDAE	Yellow-spotted Spiny Lizard	<i>Sceloporus chrysostictus</i>
BOIDAE	Boa Constrictor	<i>Boa constrictor</i>
COLUBRIDAE	Green Ratsnake	<i>Senticolis triaspis</i>
COLUBRIDAE	Middle American Indigo Snake	<i>Drymarchon melanurus</i>
COLUBRIDAE	Yellow-bellied Snake	<i>Coniophanes fissidens</i>
COLUBRIDAE	Indigo Snake	<i>Drymarchon corais</i>
COLUBRIDAE	Brown Vine Snake	<i>Oxybelis aeneus</i>
COLUBRIDAE	Banded Cat-eyed snake	<i>Leptodeira annulata</i>
COLUBRIDAE	Green Parrot Snake	<i>Leptophis ahaetulla</i>
COLUBRIDAE	Mussarana	<i>Clelia clelia</i>
COLUBRIDAE	Blackbelly Centipede Snake	<i>Tantilla moesta</i>
DISADIDAE	Redback Coffee Snake	<i>Ninia sebae</i>
ELAPIDAE	Mayan Coral Snake	<i>Micrurus hippocrepis</i>
ELAPIDAE	Variable Coral Snake	<i>Micrurus diastema</i>
VIPERIDAE	Fer-De-Lance	<i>Bothrops asper</i>

TABLE 17: REPTILE AND AMPHIBIAN SPECIES OF TAPIR MOUNTAIN NATURE RESERVE

FISH

Only three species are currently recorded for TMNR (Meerman and Boomsma, 1995), though it is known that more species are present (Table 18). Roaring Creek and Barton Creek both drain into the Belize River and are part of the Belize River watershed. Reviewing data from surveys in similar conditions in the mid-reaches of the Macal system with cichlids (the yellowbelly cichlid (*Cichlasoma salvini*) and blue-eye cichlid (*Cichlasoma spilurum*), and a number of other mid to lower reaches species that are unable to move past the higher waterfalls of the Mountain Pine Ridge area. Reports of portions of the creeks drying in peak dry season may restrict the number of species able to move into these systems, but this an area requiring more data.

FISH OF OF TAPIR MOUNTAIN NATURE RESERVE		
FAMILY	COMMON NAME	SPECIES NAME
CHARACIDAE	Mexican tetra	<i>Astyanax belizianus</i>
CICHLIDAE	Northern Checkmark Cichlid	<i>Theraps intermedium</i>
POECILIIDAE	Green Swordtail	<i>Xiphophorus helleri</i>

TABLE 18: FISH SPECIES OF TAPIR MOUNTAIN NATURE RESERVE

2.4 Cultural Values of Management Area

The karstic geology of the Tapir Mountain Nature Reserve has led to cave formations, such as the Actun Tunich Muknal system, one of the most impressive archaeological cave sites in Belize, is a popular tourism destination. First discovered in 1989, the name Actun Tunichil Muknal can be translated as “Cave of the Stone Sepulcher”. Whilst originally part of TMNR, Actun Tunich Muknal Natural Monument was excised in 2004 to allow for tourism access, and is now managed by the Institute of Archaeology. However, other cave systems are expected to be present in the protected area itself, with high expectation that they will have a similar historical background.

The Actun Tunichil Muknal system is approximately 5km long, and has a stream flowing through the major cave passage throughout the year. It contains spectacular cave formations – stalactites, stalagmites, rimstone dams and calcite pools. Studies have shown that the Maya first visited the entrance to the ATM cave during the Early Classic period (300 – 600AD), penetrating deeper into the system in the Late to Terminal Classic Period (700 – 900 AD). Their visits had a ceremonial purpose, and over 1,400 ceremonial and non-ceremonial artifacts have currently been documented, ranging from stone tools to ceramic vessels and stelae, as well as fourteen separate human skeletal remains, including the skeleton of the ‘Crystal Maiden’, now calcified by the natural processes of the cave.

Section Two

Conservation Planning



A. Juan, Belize Karst Habitat Conservation

2. CONSERVATION PLANNING

This conservation planning section looks at the species and ecosystems of concern, at the threats that impact them, and the strategies that can be used within the management of the area to abate these threats.

Conservation planning is a structured process that identifies and assesses the species and ecosystems of concern, the threats that impact them, and the strategies that can be used within the management of the area to mitigate these threats (TNC, 2007). Over the years, it has evolved into the Open Standards approach integrated into the Protected Areas Management Planning Framework used in Belize today.

This section summarizes the outputs of workshops held with TMNR stakeholders in 2020, to plan for future management of Tapir Mountain Nature Reserve. Workshop participants included the National Biodiversity Office and Forest Department, representative from the Protected Area Conservation Trust, Belize Karst Habitat Conservation, as the co-management partner, and representatives from the tourism and research sectors².

2.1 CONSERVATION TARGETS

Conservation targets are species, species assemblages or ecosystems that are selected as representing the biodiversity of a protected area – such that strategic actions, taken to ensure their continued viability and reduce the pressures impacting them, will adequately address the needs of the system as a whole.

For the purposes of the Conservation Action Planning process, the selected biodiversity targets were required to meet the following criteria, where possible:

- **Targets should represent the biodiversity of TMNR.** The focal targets should represent or capture the array of ecological systems, communities, and species of importance at the project area and the multiple spatial scales at which they occur.
- **Targets reflect ecoregion or other existing conservation goals.** Focal targets should reflect efforts at the regional and national level where they exist, such as landscape level planning for the Maya Mountain Massif, the planning for the National Protected Areas System Plan, the NPAPSP Rationalization recommendations, the National Biodiversity Strategy and Action Plan,

² With Covid-19 restrictions on travel, the process had to rely on virtual workshops after the initial selection of targets, to minimise risk to the participants.

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for building climate change resilience, and for maintaining national biological corridors. Focal targets should be grounded in the reasons for the Nature Reserve’s current status of protection.

- **Targets are viable or at least feasibly restorable.** Viability (or integrity) indicates the ability of a conservation target to persist for many generations. If a target is on the threshold of collapse, or conserving a proposed target requires extraordinary human intervention, it may not represent the best use of limited conservation resources. The exceptions are cultural targets that are non-living.
- **Targets are highly threatened.** All else being equal, focusing on highly threatened targets will help ensure that critical threats are identified and addressed through conservation actions.

2.1.1 IDENTIFICATION OF CONSERVATION TARGETS

Seven conservation targets have been selected for Tapir Mountain Nature Reserve (Table 19) can be divided into three subgroups:

Species Level: Specific species selected for their relevance to the protected area:

- ***Central American (Baird’s) Tapir***

Ecosystem Level: Assemblages of ecological communities that occur together, share common ecological processes, and have similar characteristics. Two terrestrial ecosystems have been selected, the third represents the freshwater and watershed properties of the protected area:

- ***Broadleaf Forest***
- ***Rivers and Creeks***
- ***Karst Landscape***

Species Assemblages: Groups of species that share common natural process or have similar conservation requirements:

- ***Game Species***
- ***Charismatic Species***
- ***Raptors***

CONSERVATION TARGETS FOR TAPIR MOUNTAIN NATURE RESERVE

Central American (Baird’s) Tapir Broadleaf Forest

- Forest wildlife and plants
- Commercial tree species
- Medicinal plants
- General forest vertebrate / invertebrate species
- Archaeological Sites

Rivers and Creeks

- Hydrology
- Water quality
- Fish and other water dependent species
- Piscivorous birds
- Hook-billed kites

Karst Landscape

- Caves
- Bats
- Archaeological artifacts
- Endemic fish species

Game Species

- Game birds
- Game mammals

Charismatic Species

- Jaguars
- Howler Monkeys
- Endemic Birds

Raptors

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CONSERVATION TARGETS		
CONSERVATION TARGET	JUSTIFICATION FOR TARGET SELECTION	SPECIES, COMMUNITIES OR ECOLOGICAL SYSTEMS REPRESENTED BY TARGET
Central American (Baird’s) Tapir	A large, emblematic species reflected in the name of the protected area. Globally Endangered, this wide-ranging species is a good indicator of forest health and connectivity.	Other wide-ranging species of broadleaf forest. Raptors such as the solitary eagle, which nest in the higher elevation pine ridge, but hunt in the forested foothills. Although relatively small, the protected area does provide protection for landscape species, as long as connectivity is maintained with the Maya Mountain Massif
Broadleaf Forest	Protection of the broadleaf forest provides protection for a large number of species, as well as maintaining ecosystem processes and watershed protection	General tropical forest biodiversity including birds, amphibians and reptiles, insects. Mammal species include the regionally endemic Yucatan black howler monkeys. Commercial tree species including Santa Maria (<i>Calophyllum antillanum</i>), Billy webb (<i>Acosmium panamensis</i>), and four threatened species, cedar (<i>Cedrela odorata</i>), the <i>Gaussia</i> palm (<i>Gaussia maya</i>), Mahogany (<i>Swietenia macrophylla</i>) and Fiddlewood (<i>Vitex gaumeri</i>), as well as a range of medicinal plants. Also protects archaeological sites in the area
Rivers and Creeks	Barton Creek and Roaring Creek are recognized as an important component of the resources of the Nature Reserve – particularly in its role of watershed protection	Fish and other water-dependent species. Piscivorous species and other water birds, including the hook-billed kite, a snail-specialist
Karst Landscape	Rugged limestone terrain with characteristic cave and other karstic structures	Cave species – bats, endemic fish, and Maya artefacts. The underground aquifer providing clean water to downstream communities and agricultural lands. Maya artefacts found in cave systems
Game Species	Species targeted by local hunters, and considered of cultural dietary importance	Great curassow, crested guan, paca, white tailed deer, brocket deer, white-lipped and collared peccary
Charismatic Species	Species of symbolic value or widespread popular appeal that add value to the area as a tourism attraction	Jaguars, Yucatan black howler monkeys, keel-billed toucans, parrots – large mammals and colorful birds indicative of tropical forests
Raptors	Birds of prey that hunt other vertebrates. TMNR is thought to be an important foraging area for large raptors that nest in the Mountain Pine Ridge	At least twenty species of raptor, including the solitary eagle and three species of hawk-eagles

TABLE 19: CONSERVATION TARGETS

2.1.2 ASSESSMENT OF CONSERVATION TARGET VIABILITY

The Viability Assessment conducted under the Conservation Planning process provides:

- A means for determining changes in the status of each focal target over time, to measure success of conservation strategies, compare the status of a specific conservation target with future conditions, and with other projects in Belize / Central America that focus on that target
- A basis for the identification of current and potential threats to a target and identification of past impacts that require mitigation actions
- A basis for strategy design and the foundation for monitoring

For each conservation target, the viability is assessed to give a reflection of target abundance and condition. Each is rated as VERY GOOD, GOOD, FAIR, or POOR, based on site specific knowledge of the ecosystems and species chosen, local knowledge and social conditions, using four viability criteria (Table 20).

Viability Ratings	
VERY GOOD	Requires little or no human intervention to maintain conservation target at acceptable level (e.g. healthy, breeding populations, minimally impacted ecosystems)
GOOD	May require some human intervention to maintain conservation target at acceptable level (e.g. reducing / preventing hunting pressure)
FAIR	Requires human intervention - if unchecked, the conservation target will be seriously degraded
POOR	If allowed to remain in the present status, restoration or preventing local extinction will be impossible

TABLE 20: VIABILITY RATINGS USED TO ASSESS CONSERVATION TARGETS

Justification is provided for the current viability rating, and a future viability goal is determined that is considered feasible within the 5-year term of the management plan, assuming the identified strategic actions are successfully implemented (Table 21). Viability indicators are also listed, to enable the co-management organization to monitor progress on an ongoing basis.

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CONSERVATION TARGET ASSESSMENT			
CONSERVATION TARGET	2020	2026	JUSTIFICATION FOR RATING, GOAL AND INDICATOR
Central American (Baird’s) Tapir	FAIR	GOOD	There has been significant habitat loss for this species, and though there is still forest connectivity with the Maya Mountains Massif, indications from the adjacent Eljio Panti National Park are that they are being hunted for meat.
Broadleaf Forest	GOOD	GOOD	The forest structure is considered good, though there have been significant levels of illegal logging over recent years. While this has changed the abundance of key commercial tree species, the structure of the forest still remains intact, providing essential ecosystem services and maintaining the majority of representative forest species not targeted under other conservation targets Forest connectivity to the Maya Mountains Massif is still good.
Rivers and Creeks	GOOD	GOOD	Climate change is impacting water supply – some smaller creeks are running dry during droughts, but the water quality is thought to be good. Agriculture and tourism activities in the watershed (El Progreso, Barton Creek), outside TMNR, will impact water quality of the two creeks that define the western and eastern boundaries.
Karst Landscape	GOOD	GOOD	The caves are largely undisturbed, with cave dwelling species continuing to be undisturbed by visitation. There has been past looting of Maya artefacts, and once these have gone, their cultural significance is lost, along with knowledge of the history of the area.
Game Species	FAIR	GOOD	Illegal hunting within TMNR is reducing game species populations in and around the area. With no on-site rangers, patrols are limited to availability of Forest Officers, so hunters are still entering. White-lipped peccary are still found in TMNR, but in dry season, they move to the rivers, where they are hunted. Prey populations are depressed from hunting.
Charismatic Species	GOOD	GOOD	White lipped peccary, jaguar, and puma are all found within the protected area, but there have been indications of hunting of jaguar in the adjacent Eljio Panti National Park for skin and teeth. Bird populations are generally considered good.
Raptors	FAIR	GOOD	Many of the raptors in Belize rely on large areas of connected broadleaf forest for hunting – in the MPR area foothills, these forests have been disappearing as a result of land use change. Whilst soaring raptors still able to hunt in the agricultural landscape, this puts them at risk, as they are shot on sight for taking livestock.

TABLE 21: CONSERVATION TARGET ASSESSMENT

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The 2020 ratings allow us to prioritize targeted conservation strategies and actions at those targets that most need it (Table 22).

PRIORITY	CONSERVATION TARGET	VIABILITY RATING
HIGHER PRIORITY	Central American (Baird's) Tapir	FAIR
	Game Species	FAIR
	Raptors	FAIR
LOWER PRIORITY	Broadleaf Forest	GOOD
	Karst Landscape	GOOD
	Charismatic Species	GOOD
	Rivers and Creeks	GOOD
OVERALL RATING		GOOD

TABLE 22: PRIORITIZED LIST OF TMNR CONSERVATION TARGETS

2.2 THREATS TO BIODIVERSITY

2.2.1 IDENTIFIED THREATS

Six threats were identified and assessed in 2020, using the Open Standards methodology as part of the conservation planning process (Table 23). The assessment focused on the direct and indirect threats affecting the conservation targets, and providing each threat with a rating to allow prioritization of conservation actions and resources towards mitigating of those identified as the most critical threats.

This was achieved through analyzing each threat based on three criteria – Area, Severity and Urgency. The summary results from the threat assessment process provide each focal target with a threat status rating.

- the area affected by the threat
- the severity of the threat
- the urgency of actions needed to mitigate the threat

IDENTIFIED THREATS TO TAPIR MOUNTAIN NATURE RESERVE

HIGH

- Illegal Logging
- Illegal hunting

MEDIUM

- Fire
- Looting
- Persecution of Raptors

LOW

- Reduced Water Flow / Quality
-

TABLE 23: KEY THREATS TO CONSERVATION VALUES OF TMNR

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RATING CRITICAL THREATS

The critical threats are assessed by Area, Severity and Urgency, using the following criteria:

Area: The area of the threat (how much of the conservation target area it affects)

Proportion of Area Affected (adapted from WCS)		
Criteria	Score	
Area	4	Will affect throughout >50% of the area
	3	Widespread impact, affecting 26 – 50% of the area
	2	Localized impact, affecting 11 – 25% of the area
	1	Very localized impact, affecting 1 – 10% of the area

Severity: The severity of the threat – how intense or great the impact is

Severity Ranking (adapted from WCS)		
Criteria	Score	
Severity	3	Local eradication of target possible
	2	Substantial effect but local eradication unlikely
	1	Measurable effect on density or distribution
	0	None or positive

Urgency: The likelihood of the threat occurring over the next five years

Urgency Ranking (adapted from WCS)		
Criteria	Score	
Urgency	3	The threat is occurring now and requires action
	2	The threat could or will happen between 1 – 3 years
	1	The threat could happen between 3 – 10 years
	0	Won't happen in > 10 years

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THREATS TO CONSERVATION VALUES OF TAPIR MOUNTAIN NATURE RESERVE

ILLEGAL LOGGING

Status: Historical, Active, Potential

Target: Broadleaf Forest

Threats (Direct):
Logging

Source (Indirect Threat):
Income - Commercial use

Area	2	Illegal logging is widespread across the more accessible parts of the protected area
Severity	2	There is a measurable effect on the density of those species targeted, but the structure of the forest remains in tact
Urgency	2	Illegal logging has been an ongoing activity in 2020

Management Goal: Prevent illegal logging

Management Strategies:

Strategy 1: Increased surveillance and more effective enforcement of laws – establishment of a ranger team, transportation, equipment.

Strategy 2: Increased collaboration - with FD, BDF, police, other agencies and landowners adjacent to TMNR towards more effective surveillance and enforcement

Strategy 3: Maintain clear boundary and boundary signs at all known access points.

Strategy 4: Implement outreach activities that improve local knowledge and awareness re. environmental benefits of the protected area

Strategy 5: Establish mechanisms for participation of key communities in management, and tourism benefits

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THREATS TO CONSERVATION VALUES OF TAPIR MOUNTAIN NATURE RESERVE

ILLEGAL HUNTING	Status: Historical / Active / Potential	
	Target: Game Species, Charismatic Species	
	Threats (Direct): Hunting from all stakeholder communities	
	Source (Indirect Threat): Traditional food source Game species populations reduced outside of the protected area Recreational hunting Income generation (small scale) – meat, Income generation from jaguar parts – skin and teeth	
	Area	3
Severity	2	Heavy hunting pressure from Teakettle (8 regular hunters and 20 occasional hunters) and other communities. Game species considered overhunted and harder to fin. Limited forest available in the TMNR landscape, so hunting pressure is largely focused on TMNR
Urgency	3	Ongoing
Management Goal: Reduce hunting within the protected area		
Management Strategies:		
Strategy 1: Increased surveillance and more effective enforcement of laws – increased number of rangers, transportation, equipment.		
Strategy 2: Increased collaboration - with FD, BDF, police, other agencies and landowners adjacent to TMNR towards more effective surveillance and enforcement		
Strategy 3: Maintain clear boundary and boundary signs at all known access points.		
Strategy 4: Increase general presence in the protected area through tourism, education / school activates		
Strategy 5: Implement outreach activities that improve local knowledge and awareness re. environmental benefits of the protected area		
Strategy 6: Establish mechanisms for participation of key communities in management, and tourism benefits		

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THREATS TO CONSERVATION VALUES OF TAPIR MOUNTAIN NATURE RESERVE

FIRE	Status: Historical, Active and Potential	
	Target: Broadleaf forest, Karst Landscape	
	Threats (Direct): <ul style="list-style-type: none"> ▪ Burning of forest 	
	Source (Indirect Threat): <ul style="list-style-type: none"> ▪ Escaped agricultural fires ▪ Escaped fires from hunting camps ▪ Smoking 	
Area	1	In 2020, widespread fires across the TMNR landscape. Impact on TMNR was less than 10%
Severity	2	Wild fires in karst landscapes can be very damaging based on intensity, duration of fire, and the time of the year. Increasing drought conditions is exacerbating the fire risk to the area
Urgency	2	Fire is an annual threat, but may not happen each year
<p>Management Goal: To ensure effective fire management in the TMNR landscape</p> <p>Management Strategies:</p> <p>Strategy 1: Develop a Fire Management Plan, in collaboration with the Forest Department</p> <p>Strategy 2: Build the capacity of TMNR staff for fire management through trainings with the Forest Department and ensure on-site equipment are procured.</p> <p>Strategy 3: Establish an agreement and protocols for collaboration with the Forest Department in managing and fighting fires.</p> <p>Strategy 4: Ensure boundary lines are kept clear to act as fire breaks adjacent to agricultural areas.</p> <p>Strategy 5: Build community awareness and education on fires, particularly for farmers, and training farmers in basic fire management at the start of each dry season.</p> <p>Strategy 6: Work closely with landowners in the landscape to address local fires.</p> <p>Strategy 7: Liaise with Agricultural Department for enforcement of Agricultural Fire Act</p>		

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THREATS TO CONSERVATION VALUES OF TAPIR MOUNTAIN NATURE RESERVE

LOOTING	Status: Historical, Active and Potential	
	Target: Cultural resources	
	Threats (Direct):	
	<ul style="list-style-type: none"> ▪ Damage to structures and artifacts ▪ Removal of artifacts 	
	Source (Indirect Threat):	
	<ul style="list-style-type: none"> ▪ Income generation from sale of artefacts ▪ Lack of respect for cultural values ▪ Demand from buyers for artefacts 	
Area	3	Many known archaeological cave sites have signs of looting
Severity	3	Looting is destructive and irreparable, with removal and loss of artifacts
Urgency	2	Looting may occur in the next 1 to 3 years
Management Goal: To prevent looting of archaeological sites within the Nature Reserve		
Management Strategies:		
Strategy 1: Increased surveillance and enforcement targeted at addressing the issues of illegal hunting, looting and logging		
Strategy 2: Increased collaboration – with compliance Monitoring Unit-NBIO, FD, BDF, police, FCD, IoA and other agencies towards more effective surveillance and enforcement		
Strategy 4: Develop memorandum of understanding with Institute of Archaeology for protection of caves, and technical support from IoA in management.		
Strategy 5: Increase tourism for increased human presence		

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THREATS TO CONSERVATION VALUES OF TAPIR MOUNTAIN NATURE RESERVE

PERSECUTION OF RAPTORS IN THE TMNR LANDSCAPE

Status: Historical, Active and Potential

Target: Raptors

Threats (Direct):

- Shooting of raptors as pests

Source (Indirect Threat):

- Loss of small livestock to raptors

Area	1	This will impact only a small percentage of raptors resident or using TMNR. However, for those that hunt over agricultural areas, there is a high probability that raptors will be targeted as pests.
Severity	2	Not all targeted raptors end of dead. There will be a measurable impact on the raptor population, especially that of larger raptors such as the Solitary Eagle, where populations are very small (so for some species, this may rate as 3).
Urgency	3	Persecution of raptors is a part of the culture, and most will be shot at when seen by farmers

Management Goal: To reduce the level of persecution of raptors in the landscape

Management Strategies:

Strategy 1: Collaborate with bird-orientated organizations (Peregrine Fund, Hawk Watch, Belize Bird Conservancy, Belize Bird Rescue, Belize Audubon Society, Forest Department (Wildlife Program) etc.) towards an effective awareness campaign to address raptor persecution and improve knowledge of the benefits (pest control / tourism) they provide

Strategy 2: Engage youths from the stakeholder communities in bird-orientated conservation and citizen science activities to build bird advocates

Strategy 3: Improve knowledge in the schools and communities of the Wildlife Protection Act and the need for protection of species on the national threatened bird list

Strategy 4: Establish mechanisms for participation of key communities in management, and improve tourism benefits, linked to bird tourism and the value of raptors

Strategy 5: Collaborate with landowners in the landscape towards long term protection of forest connectivity between TMNR and the Maya Mountain Massif

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THREATS TO THE CONSERVATION VALUES OF TAPIR MOUNTAIN NATURE RESERVE

REDUCED WATER QUALITY / FLOW

Status: Historical, Active, Potential

Target: Rivers and Creeks and aquatic biodiversity and other wildlife that relies on them (Game Species, Charismatic Species, Tapir). Riparian vegetation.

Threats (Direct):

- Change in water flow
- Change in water quality / sedimentation (water clarity)
- Drying up of springs and streams
- Death of aquatic organisms and impacts on riparian vegetation
- Reduced water availability for wildlife during dry season

Source (Indirect Threat):

Potential impacts –

- Water extraction for irrigation
- Removal of riparian vegetation – increased erosion
- Tourism impacts from Barton Creek

Area	2	Both Roaring and Barton creeks have been impacted by reduced rainfall and drought conditions, with drying of some areas and mortality of aquatic organisms during the 2020 drought. Unknown whether, and to what extent, agricultural areas adjacent to the creeks are drawing water
Severity	1	Water bodies still have expected aquatic life, with recovery after droughts
Urgency	3	Occurred this year – will increase with expected climate change impacts

Management Goal: To protect the watershed functionality and aquatic biodiversity of the Nature Reserve

Management Strategies:

Strategy 1: Establish a baseline map of the existing land uses and impacts on both creeks upstream and as they run along the boundary of the protected area, in collaboration with Forest Department and the Dept. of Agriculture

Strategy 2: Monitor land use change in the watershed to the south of TMNR and address any perceived threats

Strategy 3: Establish a water quality / climate monitoring program to improve information on water flow rates, patterns and quality in collaboration with DoE, Hydrology Unit, and the Forest Department

Strategy 4: Improve farmer and community engagement / awareness on climate change and water management, with dissemination of water use best practices for household and agriculture use in collaboration with the Department of Agriculture and Hydrology

2.2.2 PRIORITIZING THREATS

Once the threat assessment has been completed, the threats are transferred from the threat tables and prioritized through a standard prioritization process. This provides an indication of where financial and human resources need to be most focused (Table 24).

PRIORITIZATION OF IDENTIFIED THREATS					
Threat	Criteria Ratings			Total Threat Score AxSxU	Rank
	Area	Severity	Urgency		
Hunting	3	2	3	18	1
Looting	3	3	2	18	1
Logging	2	2	2	8	2
Reduced water flow	2	1	3	6	3
Persecution of raptors	1	2	3	6	3
Fire	1	2	2	4	4

TABLE 24: PRIORITIZED THREATS

The threat with the highest total threat score is ranked as the highest threat. This places illegal hunting, and looting as the highest threats, with the greatest impact on the conservation values of the protected area. Hunting and looting have been occurring throughout the protected area, whereas illegal logging, also a high priority, through doesn't impact as much of the protected area as hunting, as it is limited to the more accessible areas and times.

There is limited information on reduced water flow in the landscape – on whether the drought and climate change is entirely responsible for the drying of creeks in 2020, or whether it is exacerbated by water draw in the watershed for irrigation.

Persecution of raptors occurs outside the protected area, in the agricultural landscape, but can target species that are resident in the protected area, and cause significant impacts to larger raptors such as the solitary eagle, a species considered as Critically EN nationally (Wildtracks 2020, draft). It should be noted that a recent assessment of threatened bird species in Belize also identified a new threat from the pet trade over the last five to six years, with an increasing

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number of raptors (from white hawks to ferruginous pygmy owls) entering rehabilitation with clipped wings and tethers on their legs.

With the droughts in 2020, fire is seen as an increasing threat, especially to the drier karstic hillslopes, and one that has had significant impacts on the forests and biodiversity in the landscape.

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2.2.3 STRATEGIES TO REDUCE THREATS

During the threat assessment process, the primary cross cutting strategies were identified for effective management of Tapir Mountain Nature Reserve, and the leverage of each activity analyzed in terms of the number of targets they impact (Table 25).

STRATEGIES	Central American Tapir	Game Species	Raptors	Broadleaf Forest	Karst Landscape	Charismatic Species	Rivers and Creeks	Total
Establish an effective surveillance and enforcement presence with an equipped, trained ranger team								
Strengthen collaboration with, NBIO FD, loA, BDF, police for surveillance and enforcement								
Implement outreach activities that improve recognition of environmental benefits of TMNR								
Establish mechanisms for participation of key communities in management, and flow of benefits from tourism								
Collaborate with landowners in the landscape towards long term protection of forest connectivity between TMNR and the MMM								
Engage local youths in conservation activities to nurture conservation leaders in the communities								
Maintain clear boundaries and signs in areas of potential illegal entry								
Develop and implement a Fire Management Plan								
Improve knowledge in the schools and communities of the Wildlife Protection Act and the need for protection of species on the national threatened bird list								
Key	Low							
	Medium							
	High							

TABLE 25: STRATEGY LEVERAGE

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Of the nine strategies, six are highlighted as having an impact across all conservation targets:

- Establish an effective surveillance and enforcement presence with an equipped, trained ranger team
- Strengthen collaboration with NBIO FD, IoA, BDF, police for surveillance and enforcement
- Implement outreach activities that improve recognition of environmental benefits of TMNR
- Establish mechanisms for participation of key communities in management, and flow of benefits from tourism
- Collaborate with landowners in the landscape towards long term protection of forest connectivity between TMNR and the MMM
- Engage local youths in conservation activities to nurture conservation leaders in the communities
- If prioritized and implemented, these will have the greatest positive effect on the Tapir Mountain Nature Reserve.

A further two strategies impact six of the seven targets, and are considered second tier priorities:

- Maintain clear boundaries and signs in areas of potential illegal entry
- Develop and implement a Fire Management Plan

A third tier strategy impacts four targets, and is also considered important as a supporting strategy:

- Improve knowledge in the schools and communities of the Wildlife Protection Act and the need for protection of species on the national threatened bird list

2.3 PLANNING FOR CLIMATE CHANGE

Planning for climate change is based on determining the protected area resilience and vulnerability, and identifying adaptive strategies that can assist in maintaining the viability of biodiversity and increase social resilience at both site and stakeholder community level. This assessment of the predicted implications of climate change has been conducted for Tapir Mountain Nature Reserve, based on the **conservation targets** identified during conservation planning, and on the **environmental services** provided by the protected area, identified in the management plan context.

2.3.1 SITE RESILIENCE ASSESSMENT

The following assessment has been based on Belize’s *“Guidelines for Integrating Climate Change Adaptation Strategies into Protected Areas Management Plans”* management planning framework, and provides a mechanism for assessing the implications of climate change through a series of steps:

1. Understanding climate change projections for the Nature Reserve
2. Identifying vulnerability factors and resilience features
3. Identifying focal targets threatened by climate change
4. Assessing, rating and prioritizing the threat of climate change for each conservation target
5. Situation Analysis and baseline
6. Development of adaptation objectives and strategies

IDENTIFICATION OF THE PRIMARY CLIMATE CHANGE ELEMENTS

The primary climate change elements associated with Tapir Mountain Nature Reserve and the associated landscape are identified as:

- Increased intensity of storms
- Increased flood / drought events
- Increased air temperature
- Increased water temperature

IDENTIFIED RESOURCES OF TAPIR MOUNTAIN NATURE RESERVE

An initial assessment was conducted of the primary resources important to TMNR (Table 26). Also reviewed were the conservation targets identified during the preliminary conservation planning workshop.

IDENTIFIED KEY RESOURCES OF TAPIR MOUNTAIN NATURE RESERVE

Ecosystem Services: The health of the forest environment of the Maya Mountains Massif is critical to the social and economic health of many communities in Belize, including those of TMNR. Particularly key is the protection the forest provides for maintaining watershed functionality – the quality and flow of water from the protected area and adjacent hill slopes

<ul style="list-style-type: none"> ▪ Broadleaf Forest 	Watershed functionality and water security
	Steep slope protection of soils
	Supporting game species, acting as a replenishment zone for local hunters
	Flood water control for Barton Creek and Roaring Creek, reducing vulnerability to flooding
	Carbon sequestration
	Clean air for the communities
<ul style="list-style-type: none"> ▪ Rivers and Creeks 	Provision of water to stakeholder communities from Barton Creek and Roaring Creek, and the underground aquifer.
	Maintenance of biodiversity linked to the rivers and creeks
	Provision of water for key tourism attractions at Barton Creek and Actun Tunichil Muknal

The Tourism Sector provides employment for local tour guides based on the natural values of Belize. With a shift in designation, there is the potential for tour guides to become regular users of the protected area, with a user group of knowledgeable tour guides based from the stakeholder communities, resorts and San Ignacio.

<ul style="list-style-type: none"> ▪ Healthy Broadleaf Forest ▪ Charismatic Wildlife 	Easily accessible, scenic tropical broadleaved forest, accessed through a series of trails, with opportunities for wildlife sightings. Jaguar and tapir footprints, peccary, howler monkeys calling, parrots and toucans – there is the potential to see and hear wildlife while on the trails.
<ul style="list-style-type: none"> ▪ Diverse Bird Species 	TMNR is being developed as an easily accessible birding destination with a rich variety of over 340 bird species, including large raptors
<ul style="list-style-type: none"> ▪ Karst Landscape ▪ Caves 	The steep sloped karst landscape provides a wilderness aspect to the protected area despite its size. The karstic features also include cave system, used in the past by Maya as sacred sites. Whilst not open to the public, these sacred caves are important for their speleothems and troglodytic species. They were important ritualistic sites, containing archaeological artefacts from the Maya era and can be integrated into the interpretive materials.
<ul style="list-style-type: none"> ▪ Barton Creek / Actun Tunichil Muknal 	Whilst not inside the protected area, both these archaeological sites depend on the karst aquifer and interconnected cave systems for their tourism appeal

TABLE 26: IDENTIFIED KEY RESOURCES OF TAPIR MOUNTAIN NATURE RESERVE

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For each target, the impacts of the identified primary climate change elements (increased intensity of storms, decreased precipitation, increased air temperature and increased water temperature), were rated on a scale of 1 to 4 (Table 27). Ratings took into account the severity, scope, contribution and irreversibility of each climate change element.

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

TABLE 27: RATINGS FOR PRIORITIZATION OF CONSERVATION TARGETS

Four conservation targets were identified as at highest risk from climate change impacts, and were selected for the assessment (Table 28):

- Rivers and Creeks
- Tropical Broadleaf Forest
- Karst Landscape
- Game Species

The climate change predictions for the Tapir Mountain Nature Reserve landscape were identified from recent literature and climate change models, and an assessment was conducted on the expected impacts on the selected conservation targets (Table 29). The impacts of each of these climate change factors is then assessed on the four selected protected area values (Table 30; A-C), to provide an understanding of the expected changes in the protected area environment over the next 50 to 100 years.

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PREDICTED CLIMATE CHANGE ELEMENT	CONSERVATION TARGETS						
	<i>Rivers and Creeks</i>	<i>Broadleaf Forest</i>	<i>Karst Landscape</i>	<i>Game Species</i>	<i>Charismatic Species</i>	<i>Raptors</i>	<i>Central American Tapir</i>
<i>Increased Intensity of Storms</i>	High (3)	Medium (2)	Medium (2)	Medium (2)	Low (1)	Medium (2)	Low (1)
<i>Decreased Precipitation</i>	High (3)	Medium (2)	Medium (2)	High (3)	Medium (2)	Medium (2)	High (3)
<i>Increased Air / Water Temperature</i>	High (3)	High (3)	High (3)	Medium (2)	Low (1)	Low (1)	Low (1)
AVERAGED RATING	3.00	2.33	2.33	2.33	1.33	1.66	1.66
	Selected	Selected	Selected	Selected			

TABLE 28: ASSESSMENT OF PREDICTED IMPACTS OF CLIMATE CHANGE ON CONSERVATION TARGETS

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CLIMATE CHANGE PREDICTIONS (B2 SCENARIO) TAPIR MOUNTAIN NATURE RESERVE AND ADJACENT LANDSCAPE			
	Current Status	25 – 50 yrs	100 yrs
Increased frequency of storms	Increased storm activity from 1999 onwards, with annual fluctuations. More storms during El Nina, fewer El Nino. Stronger storms (more Cat 4 / 5).		
Decreased Precipitation	Mean annual rainfall over Belize has decreased at an average rate of 3.1 mm per month per decade since 1960 (UNDP). Reliability of rainfall is decreasing, resulting in increased droughts and floods.	Predicted annual rainfall decrease of approximately 10%, with increasing unpredictability. Ecological shifts up the altitudinal gradient of the Maya Mountains Massif may reduce the catchment functionality important for orographic rainfall, with rivers drying up in prolonged dry season droughts in the TMNR landscape. Significant changes in rainfall patterns are predicted.	Predicted decrease in precipitation of up to 26% by 2099 (IPCC, 2007), with significant fluctuations attributed to El Niño
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 (NCSP/UNDP).	Both seasonal and annual air temperatures are predicted to increase by approximately 2°C	Predicted mean annual temperature increase is 3.5° by 2099 (UNDP, 2009)

TABLE 29: PREDICTED CLIMATE CHANGE IMPACTS FOR WESTERN BELIZE

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INCREASED FREQUENCY OF STORMS			
Rivers and Creeks	Tropical Broadleaved Forest	Karst Landscape	Game Species
<p>Increasing storm runoff during tropical storm events will cause increased soil erosion in the upper reaches of Roaring Creek and Barton Creek, increasing the sediment load before they reach TMNR. This will result in decreased water quality in the communities and decreased aesthetic beauty of the waterfalls and rivers / creeks within the archaeological sites – Barton Creek and Actun Tunichil Muknal, with turbid water for a greater percentage of the time, challenges in access, and increased risk in guiding cave tours.</p> <p>While TMNR protects one side of the Roaring Creek, the other is impacted by farming activities from Barton Creek, with storms washing soils into the creek.</p> <p>Excessive storm runoff may also impact aquatic flora and fauna of the streams.</p>	<p>Whilst forests in Belize are adapted to be relatively resilient to tropical storm damage, TMNR has been impacted in the past, with trees being uprooted and reports of wildlife mortality. The predicted increase in hurricane intensity will have the potential to cause greater damage, impacting forest stature and structure, with a short term decrease in biodiversity - of species less tolerant of disturbance at this scale. Resilience to recover may well decrease, leading to a degraded forest ecosystem over time, with a broken canopy that is less able to maintain watershed functionality.</p> <p>Reduced forest cover on the steep karstic slopes will result in reduced soil moisture and increased soil erosion. There will be increased vulnerability downstream to flooding, with reduced water retention during storm events. Increased soil erosion will also reduce water clarity downstream.</p>	<p>Increasingly strong tropical storm events will affect the forest structure overlying the karst cave systems, reducing the effectiveness of the forest canopy in regulating the external environment, with higher temperatures, and reduced water catchment, which in turn would have an effect on the cave environment.</p> <p>The potential for increasing storm runoff, with higher flood levels, is also an issue, with flooding of some cave systems, impacts on the speleothems, and damage to archaeological artefacts. It will also result in mortality of cave dwelling, non-aquatic species unable to move out of the way of flood waters.</p>	<p>Hurricane damage to forests will reduce food availability for game species, with trees sometimes taking years to recover. This can result in the death of smaller species such as paca, and the displacement of larger more mobile species, sometimes to areas where they will be more VU to being hunted.</p> <p>Impacts of storms will also result in the direct mortality of wildlife from tree falls and floods.</p>

TABLE 30A: PREDICTED CLIMATE CHANGE IMPACTS FOR WESTERN BELIZE – INCREASED INTENSITY OF STORMS

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DECREASED PRECIPITATION			
Rivers and Creeks	Tropical Broadleaved Forest	Karst Landscape	Game Species
<p>Reduced flow of rivers and creeks, particularly during the dry season. At its most extreme, some stretches of rivers / creeks may dry up completely, impacting aquatic species such as fish, hute, shrimps, crabs. Reduced runoff will lead to higher concentrations of chemicals and pollutants in the water system; less 'flushing' and dilution of chemical will occur.</p> <p>Reduced water availability may lead to damming or diversion of the creeks for water supply / irrigation adjacent to TMNR. This would reduce water flow downstream, increasing the potential for seasonal disappearance of rivers and creeks, with associated impacts on water supply in the communities.</p>	<p>Whilst limestone forest is already adapted to drought condition, decreased reliability of rainfall will impact the forest tree species composition, with a shift towards more drought tolerant species, as well as an associated shift in forest fauna.</p>	<p>Decreased precipitation may impact troglodyte species. A reduction in precipitation in the external environment will lead to changes in the condensation or evaporation rates of water vapour, with the threat of significant desiccation, changing the ways in which cave structures evolve. This will also impact the relative humidity of the cave atmosphere, important in the development of speleothems.</p>	<p>As water availability decreases, larger game species such as the white-lipped peccary will move downstream out of TMNR towards the river where they are more exposed and VU to being hunted.</p> <p>Smaller species such as paca may be able to survive on water available in their food, but if fruiting trees and herbaceous vegetation fail, numbers may decrease, though they should recover in the short term. In the medium to long term, some species may not be able to adapt to drier conditions.</p>

TABLE 30B: PREDICTED CLIMATE CHANGE IMPACTS FOR WESTERN BELIZE – DECREASED PRECIPITATION

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INCREASED AIR TEMPERATURE			
Rivers and Creeks	Tropical Broadleaved Forest	Karst Landscape	Game Species
<p>Increased water temperature will lead to increased water temperatures, with an associated decrease in the dissolved oxygen content of the water. Whilst the streams are well aerated, there is the potential that this will impact the ability for slower moving runs and pools in the both the Barton Creek and Roaring Creek to sustain current species diversity higher water temperatures result in lower DO and reduced ability to sustain life.</p> <p>There may be a reduction of species diversity of water-reliant species such as amphibians.</p>	<p>Increasing temperatures will take some forest species outside their tolerance zone, with general ecosystem shifts towards more drought tolerant species. TMNR may lose the humid end of the species spectrum.</p> <p>The increased fire risk may degrade or remove forest, particularly where there is hurricane damage.</p> <p>There may be a reduction of species diversity of water-reliant species such as amphibians.</p>	<p>An increase in the external air temperature will have an impact on the cave environment, particularly combined with decreased precipitation. Conditions in the caves in the dry season may become too hot and dry for some species, particularly near the mouths of the caves, leading them to move deeper into the cave system.</p>	<p>Whilst relatively adaptable to changes in air temperature, game species may alter their activity patterns to avoid the heat, retreating to caves in the area.</p> <p>Of greater impact may be the increased fire risk, which has the potential to result in the death of those individuals not able to out run it, and the degradation of the ecosystem to a point where it is not able to support a healthy population of game species and no longer acts as a source population for the landscape.</p>

TABLE 30C: PREDICTED CLIMATE CHANGE IMPACTS FOR WESTERN BELIZE – INCREASED AIR TEMPERATURES

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2.3.2 CLIMATE CHANGE-RELATED THREAT ASSESSMENT

The threat assessment identified the highest current anthropogenic threats to each of the key conservation targets (Table 31). Potential threats that may evolve as a result of climate change have also been identified (Table 32). The threats have then been assessed using a series of ratings, based on certainty, severity, scope and irreversibility (Table 33).

CONSERVATION TARGET	CURRENT ANTHROPOGENIC THREATS	POTENTIAL CLIMATE CHANGE-RELATED ANTHROPOGENIC THREATS
Rivers and Creeks	<ul style="list-style-type: none"> ▪ Clearance of riparian vegetation ▪ Increased use for irrigation ▪ Tourism impacts 	<ul style="list-style-type: none"> ▪ Diversion of river or excessive extraction of water from Roaring Creek / Barton Creek for irrigation ▪ Increased agrochemical pollution to counter emerging diseases and invasive pests associated with climate change
Tropical Broadleaved Forest	<ul style="list-style-type: none"> ▪ Illegal logging ▪ Poorly managed agricultural fires ▪ Hunter-set fires ▪ Accidental fires from hunting camps ▪ Forest clearance in the landscape 	<ul style="list-style-type: none"> ▪ Increased storms result in increased fuel load, increasing the fire risk ▪ As land degradation increases elsewhere in Belize, and as coastal populations relocate inland as a result of sea level rise, there may be increased demand for land in TMNR and the upper watershed of the MPR for agriculture ▪ Increasing pressure for dereservation for farming.
Karst Landscape	<ul style="list-style-type: none"> ▪ Looting of archaeological artefacts 	<ul style="list-style-type: none"> ▪ Increased incidence of looting associated with deteriorating socio-economic conditions in adjacent communities as agricultural base deteriorates with increasing drought and pests
Game Species	<ul style="list-style-type: none"> ▪ Illegal hunting ▪ Forest clearance in the landscape 	<ul style="list-style-type: none"> ▪ Increased incidence of illegal hunting associated with deteriorating socio-economic conditions in adjacent communities as agricultural base deteriorates with increasing drought and pests

TABLE 31: CURRENT AND POTENTIAL KEY CLIMATE CHANGE-RELATED ANTHROPOGENIC THREATS

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Ranking Criteria	Rating		Rating Definitions
Certainty: The certainty that the effect of Climate Change will occur or the cause of the described impact will affect the target	Very High	4	Confirmed
	High	3	Considered very probable but not confirmed
	Medium	2	Considered probable
	Low	1	Considered a limited probability, much debate
Severity: Level or damage to this key element, which can destroy it in 50 years	Very High	4	Destroys the ecosystems or its production activities
	High	3	Seriously degrades the target
	Medium	2	Moderately degrades the target
	Low	1	Slightly impairs the target
Scope: Geographical coverage of the target that will be impacted in 50 years	Very High	4	75% - 100% of the geographic coverage
	High	3	50% - 75% of the geographic coverage
	Medium	2	25% - 50% of the geographic coverage
	Low	1	<25% of the geographic coverage
Irreversibility: The impact is permanent or cannot be reversed naturally or through human action	Very High	4	Not reversible, even with human intervention
	High	3	Reversible but at high cost or very long term (> 100 yrs)
	Medium	2	Reversible with human intervention
	Low	1	Naturally reversible or with little human intervention and / or little cost

TABLE 32: RATING CRITERIA FOR ASSESSING CLIMATE CHANGE ADAPTATION THREATS PER TARGET (AFTER TNC)

The output of the assessment of climate change adaptation threats identifies the highest impacting climate change adaptation strategies – measures taken by people in reaction to climate change impacts (Table 33). Some of these are current actions taken by stakeholders that have an increased threat risk because of climate change (e.g. use of agricultural fires – as the area becomes drier and hotter, the risk of fires escaping will increase). Some of the actions are ‘maladaptation’, which provide benefits in the short term, but exacerbate the problem in the long run (e.g. increasing irrigation for crops may decrease water availability in the landscape for others, leading to water scarcity).

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TABLE 33: ASSESSMENT OF CLIMATE CHANGE ADAPTATION THREATS					
	<i>Certainty</i>	<i>Severity</i>	<i>Scope</i>	<i>Irreversibility</i>	<i>Averaged Score</i>
<i>Rivers and Creeks</i>					
<i>Diversion or excessive extraction of water from Roaring Creek and Barton Creek for irrigation</i>	<i>High (3):</i> As rainfall unpredictability continues to increase, there will be greater incentive for farmers to extract more water from the creeks. Seven Miles-El Progreso is already drawing water from Barton Creek for supplying both the community and agricultural irrigation It is unknown whether Springfield and Barton Creek communities are or will start using the creeks for irrigation	<i>High (3):</i> Reduced water flow will impact water availability downstream in the communities, leading to water shortage for domestic use, and increased expense for purchasing water. Reduced water availability for farming (livestock and irrigation), increasing production costs. It would also reduce tourism appeal of the two archaeological cave sites, affecting income of local tour guides, and impact aquatic species	<i>Very High (4):</i> Alteration of the natural flow could significantly impact all water systems within the Nature Reserve, and, by extension, the ecosystem and biodiversity values, and the touristic and recreational appeal for visitors.	<i>High (3):</i> There will be increasing competition for water if drought frequency increases. Once long term and reoccurring drought periods impact water security, the only options for accessing water in the immediate landscape would be to invest in deep wells, which will be very expensive, and will draw down the aquifer with unknown consequences	3.25
<i>Increased agrochemical pollution to counter emerging diseases and invasive pests, entering watershed</i>	<i>Low (1):</i> Predicted increase in pests with increased temperatures may increase pesticide use, but Belize is also working to reduce its pesticide use through improved farming practices.	<i>Medium (2):</i> Pesticide use in the TMNR landscape may impact both water quality and reduce populations of less resilient aquatic organisms. However, Belize is working to reduce its pesticide use through improved farming practices and the use of less toxic / non-toxic alternatives.	<i>High (3)</i> Any use of pesticides in the TMNR landscape will have the potential to impact the creeks that form part of the boundaries of the protected area.	<i>High (3):</i> Pesticide use can be mitigated through improved practices, but would be difficult to eliminate altogether.	2.25

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TABLE 33: ASSESSMENT OF CLIMATE CHANGE ADAPTATION THREATS					
	<i>Certainty</i>	<i>Severity</i>	<i>Scope</i>	<i>Irreversibility</i>	<i>Averaged Score</i>
<i>Tropical Forest</i>					
Increased potential for fires	High (3): Increased drought conditions will increase the risk of fire in forests on the dry karst slopes.	High (3): Fire will seriously degrade the forest structure, increase the edge effect in boundary areas and significantly degrade forest viability in the long term	Low (1): Fires may spread quickly through the drier forests on shallow soils over limestone during drought periods, but less so in wetter forests over deeper soils.	High (3): Reversible, but would require effective fire management, and engagement of farmers to minimize fire risk	2.50
Clearance of broadleaved forest in the landscape for agriculture	Very High (4): There is increasing clearance of broadleaf forest in the landscape with agricultural expansion. This will reduce connectivity in the landscape, and increasing pressure on the non-timber forest products and game species in TMNR	High (3): Clearance of forest to the TMNR boundary will increase edge effect and accessibility for illegal activities, as well as reducing forest connectivity important for long term viability of many species in TMNR. Removal of other forested areas in the landscape / watershed will reduce the availability of game species outside the protected areas, increasing pressure from illegal hunting inside the Nature Reserve.	Medium (2): The pressure for land will increase adjacent to the Nature Reserve as Belize's population increases, leading to clearance of the majority of non-protected forested areas for agriculture	High (3): Once forest has been cleared for agriculture, it would take significant time, finance and/or effort to return it to forest	2.75
Increased pressure for dereservation of TMNR for farmland	Low (1): The increasing recognition of water security provided by the MPR and other PAs strengthens the position for no dereservation. When TMNR succeeds in building community support through increased benefit, this too will strengthen arguments for retaining the protected area.	Very High (4): Once an area has been cleared for agriculture, it can no longer support the biodiversity or deliver the ecosystem services of the natural ecosystems.	High (3): Dereservation as a result of increased demand for more agricultural land may not be the whole protected area, as much of TMNR is steep karstic slopes unsuitable for agriculture.	Very High (4): Once an area has been dereserved for agriculture, it will be very difficult to place under protection again. Once forest has been cleared for agriculture, it would take significant time, finance and/or effort to return it to forest	3.00

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TABLE 33: ASSESSMENT OF CLIMATE CHANGE ADAPTATION THREATS					
	<i>Certainty</i>	<i>Severity</i>	<i>Scope</i>	<i>Irreversibility</i>	<i>Averaged Score</i>
<i>Caves</i>					
<i>Increased incidence of looting associated with deteriorating socio-economic conditions</i>	<i>High (3):</i> Climate change is predicted to cause increased socio-economic hardship, increasing the pressure for illegal extraction and sale of Maya artefacts	<i>Very High (4):</i> Once artefacts are taken, they are lost forever and cannot be replaced	<i>High (3):</i> Not all the cave systems are known or accessible	<i>Very High (4):</i> Once artefacts are taken, they are lost forever and cannot be replaced	<i>3.50</i>

TABLE 33: ASSESSMENT OF CLIMATE CHANGE ADAPTATION THREATS

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Ranked Outputs

The assessment provides a prioritisation for potential threats that may occur as a result of changes in climate, based on the level of impact they would have on the specific targets (Table 34). The highest ranked threat is the predicted (and already occurring) increase in illegal removal and sale of Maya artefacts from the caves

CLIMATE CHANGE RELATED THREAT	Averaged Score
Increased incidence of looting associated with deteriorating socio-economic conditions	3.50
Diversion /excessive extraction of water from Roaring Creek and Barton Creek for irrigation	3.25
Increased pressure for dereservation of TMNR for farmland	3.00
Clearance of broadleaf forests in the landscape for agriculture	2.75
Increased potential for fire risk	2.50
Increased agrochemical pollution to counter emerging diseases and invasive pests, entering watershed	2.25

TABLE 34: SUMMARY OF CLIMATE CHANGE-RELATED THREAT ASSESSMENT OUTPUTS

With the establishment of the protected area being driven in part by watershed protection, the impacts on the watershed are also identified as of high priority. Predicted reduced rainfall (both total annual rainfall and its reduced predictability) raises concerns of increased water use in the adjacent landscape, and potential diversion of water from the creeks as they flow along the boundaries of the Nature Reserve. Whilst perhaps not considered an immediate threat, the implications of any changes in water flow could have long term and significant impacts. The same is true of increasing deforestation in the landscape, which would not only reduce connectivity but, as climate change negatively impacts the socio-economic context, will also concentrate community focus on TMNR for the provision of game species, based on strong cultural demand in the community, leading to increased illegal hunting.

2.3.3 BUILDING RESILIENCE TO CLIMATE CHANGE

A series of climate change adaptation strategies were then developed based on the assessment outputs, and including performance indicators for measuring success of implementation (able 35).

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CLIMATE CHANGE ADAPTATION STRATEGIES: RIVERS AND CREEKS				INDICATORS
Goal	Maintain and improve the watershed protection values of Tapir Mountain Nature Reserve			% of TMNR creeks / watershed considered free of anthropogenic impacts
Objective	Reduce the identified potential anthropogenic impacts on the creeks associated with TMNR			
<i>Strategy</i>	<i>Strategic Actions</i>	<i>Responsible Body</i>	<i>Complementary Activities</i>	<i>Indicator</i>
Improve knowledge on the hydrology of TMNR	<ul style="list-style-type: none"> ▪ Map the creeks associated with TMNR, the riparian vegetation, human impacts and land use from source to TMNR, and from TMNR to the communities ▪ Establish a water quality monitoring program that includes monitoring of water flow, to provide a baseline for monitoring future change 	Belize Karst	<p>Chiquibul-Mountain Pine Ridge-Caracol Complex Sustainable Development Plan</p> <p>FCD transboundary water quality monitoring program</p>	<ul style="list-style-type: none"> ▪ Maps of hydrology associated with TMNR ▪ Mapping of level of disturbance to the riparian vegetation in the watershed ▪ Mapping of land use and land use change, in the watershed, updated on a biennial basis
Improve stakeholder awareness of the watershed and water conservation	<ul style="list-style-type: none"> ▪ Improve awareness of importance of the watershed, and natural water flow and best practices for water conservation for all stakeholders ▪ Encourage farmers to retain riparian vegetation along the creeks and tributaries associated with TMNR 	Belize Karst	Chiquibul-Mountain Pine Ridge-Caracol Complex Sustainable Development Plan	<ul style="list-style-type: none"> ▪ Baseline report on use / extraction / diversion of water by resorts and other stakeholders in the TMNR landscape
Reduce agrochemical use / improve best practices in farmland buffering on the TMNR creeks	<ul style="list-style-type: none"> ▪ Partner with the Agricultural Department and Pesticide Control Board to identify best agricultural practices for reduced agrochemical use in farmland buffering on the TMNR creeks ▪ Encourage farmers and other land owners to retain riparian vegetation along the TMNR creeks and associated tributaries 	Belize Karst	Belize Pesticide Board Organic farming initiatives	<ul style="list-style-type: none"> ▪ % of riparian vegetation still intact along the TMNR creeks and associated tributaries

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CLIMATE CHANGE ADAPTATION STRATEGIES: TROPICAL BROADLEAVED FOREST					INDICATORS
Goal	Maintain the current extent, viability and connectivity of broadleaved forest in Tapir Mountain Nature Reserve				% of TMNR under broadleaf forest cover
Objective	Reduce the identified potential anthropogenic impacts on the broadleaf forest of TMNR				
<i>Strategy</i>	<i>Strategic Actions</i>	<i>Responsible Body</i>	<i>Complementary Activities</i>	<i>Timeline</i>	<i>Indicator</i>
Build capacity of local farmers for fire management	<ul style="list-style-type: none"> ▪ Effective communication and engagement of farmers /landowners for reducing fire risk through best practices ▪ Establish Neighbourhood Watch with local landowners / tour guides for rapid reporting of fires ▪ Partner with Agriculture Dept. for training of farmers in safe use of fire in agriculture ▪ Ensure TMNR has access to fire-fighting equipment 	Belize Karst	National fire management initiative Fire management activities and training in the TMNR landscape	5 years	<ul style="list-style-type: none"> ▪ Number of landowners / farmers / tour guides considered to be engaged in Neighbourhood Watch ▪ % of farmers using fire management best practices ▪ Number of farmers completing fire management training ▪ Fire-fighting equipment ▪ Number of fires / uncontrolled fires
Ensure maintenance of forest connectivity	<ul style="list-style-type: none"> ▪ Investigate potential for securing forest connectivity with MPR ▪ Partner with Itzamna Society and landowners for investigating options for strengthening forest connectivity between the two protected areas 	Belize Karst / Itzamna Society		3 years	<ul style="list-style-type: none"> ▪ Map of forest cover between TMNR and EPNP ▪ % of riparian vegetation still intact in the Enclave
Improve stakeholder support for TMNR	<ul style="list-style-type: none"> ▪ Improve stakeholder recognition of water security and community resilience role and benefits of protected areas (including TMNR) ▪ Establish an active Advisory Committee for stakeholder input into management decisions 	Belize Karst	FCD	5 years	<ul style="list-style-type: none"> ▪ % of stakeholders surveyed who recognize the water security, resilience role and benefits of TMNR ▪ TMNR Advisory Committee members list ▪ ToR and meeting minutes

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CLIMATE CHANGE ADAPTATION STRATEGIES: Karst Landscape					
GOAL	Maintain the caves of Tapir Mountain Nature Reserve in the current state or better				Indicator
OBJECTIVE	Reduce climate change-related impacts to the caves of Tapir Mountain Nature Reserve				
Strategy	Strategic Actions	Responsible Body	Complementary Activities	Timeline	Indicator
Ensure maintenance of forest cover in TMNR	<ul style="list-style-type: none"> ▪ Ensure effective surveillance, enforcement and prosecution against illegal logging / forest clearance for agriculture within TMNR ▪ Prioritise fire management in karst forest areas known to have underlying cave systems 	Belize Karst		5 years	<ul style="list-style-type: none"> ▪ Patrol reports ▪ Number of logging / agricultural incursions per year ▪ Area of karstic broadleaf forest impacted annually by illegal logging / forest clearance
Improve security at the caves	<ul style="list-style-type: none"> ▪ Develop a management plan for the caves in collaboration with IoA for monitoring / surveillance and enforcement ▪ Increase surveillance and enforcement presence at the caves ▪ Map caves and documentation of cave features and artefacts within the cave systems. 	Belize Karst / IoA	Institute of Archaeology input on cave management	5 years	<ul style="list-style-type: none"> ▪ IoA / Belize Karst Cave management plan ▪ Patrol reports – inclusion of cave entrances ▪ Digital folder of baseline photos, document and mapping of caves, cave features and artefacts

TABLE 35: STRATEGIES FOR BUILDING RESILIENCE IN THE TMNR LANDSCAPE

Section Three

Management Planning



3. MANAGEMENT PLANNING

3.1 MANAGEMENT GOALS

The overall goal for the management is that:

Tapir Mountain Nature Reserve is known for its rich biodiversity and provision of clean water, supporting engaged and empowered communities, livelihood opportunities, and active research, for a sustainable future

Management activities are framed by a series of site-level management objectives that provide the framework for the five-year management plan:

MANAGEMENT OBJECTIVES

To protect biodiversity and ecosystem services and karst, archaeological and cultural features

To establish a monitoring and research program for informing management decisions and measuring management success

To ensure stakeholders are informed stewards of Tapir Mountain, and have opportunities to benefit socio economically from the protected area

To provide opportunities for nature-based public use with minimal environmental impact that supports the goal of the protected area

These objectives and their associated individual management program objectives and activities cannot be taken as discrete units, as they exist as a part of an integrated overall management concept. To succeed, all parts of the whole have to be addressed and acted upon, as actions of each management program support the others.

3.2 MANAGEMENT AND ORGANIZATIONAL BACKGROUND

3.2.1 PROTECTED AREA AUTHORITY

Regulatory authority for Tapir Mountain Nature Reserve lies with the Forest Department through the Chief Forest Officer with support in coordination and alignment of site level efforts with other national initiatives, laws and policies provided by the national Biodiversity Office within the Ministry of Sustainable Development, Climate Change and Disaster Risk Management. Tapir Mountain Nature Reserve is managed as a part of the National Protected Areas System (NPAS), towards the vision of...

“An effectively managed National Protected Areas System that maintains healthy ecosystems and maximizes its social, cultural and economic contribution to local and national development.”

Vision, National Protected Areas System Plan (revised 2015)

...with the four specific NPAS goals of:

1: Formal recognition and integration of the fundamental role of protected areas and natural resources as a pillar in national economic development.

2: Inter-sectoral buy-in, participation and support for PAs in both public and private sectors

3: Establishment of an enabling environment for private sector involvement in protected areas management.

4: Integration of protected areas as a tool in the holistic management approach of landscapes and seascapes

The Forest Department has a five-year co-management agreement with Belize Karst Habitat Conservation, a registered NGO established with the purpose of developing and managing Tapir Mountain Nature Reserve, focusing on protection of the natural and cultural resources, and improved community benefit. The Board of Directors has a strong background in tourism management and the tourism industry, with the potential for Belize Karst to provide a solid foundation for the development of the protected area as a model for successful tourism destination management. The agreement, signed on 25th January, 2019, lays out the activities that may be implemented during the management period for the following program areas: Protection, Research and Monitoring, Public Awareness, and the identification and implementation of financial sustainability mechanisms.

The protected area has been impacted by wide scale illegal hunting and logging in the years prior to Belize Karst taking up the co-management role in 2019, with the dual challenges of

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establishing a management presence, and strengthening Belize Karst as the co-management organization.

Belize Karst Habitat Conservation is guided by a Board of five directors, with skills in tourism, business and financial administration and management. This Board meets to oversee the protected area activities, the implementation of ongoing projects, and to identify future activities and potential funding avenues. Protected area activities are implemented by the Executive Director, who is working on a voluntary basis during the establishment phase.

There are currently no paid protected area staff, and strengthening of the organization is identified as a priority, with the following activities recommended for implementation in the first year / two years of the management plan:

- Developing the Strategic Plan for Belize Karst
- Developing organizational Policies and Procedures
- Developing a Communication Plan for Tapir Mountain
- Hiring a Development Officer experienced in successful proposal development and financial sustainability planning
- Hiring of three rangers
- Annual operational planning, integrating recommendations from evaluation and review of previous annual operational plan
- Develop a Tourism Development Plan, including business planning and limits of acceptable change framework
- Develop a Research and Monitoring Plan
- Strengthening partnerships in the landscape – with:
 - the Forest Department - training and collaboration for fire and pine bark beetle management
 - Friends for Conservation and Development - training and collaboration for surveillance and enforcement, environmental monitoring, watershed awareness, and agroecology
 - The Institute of Archaeology – protection of caves and artefacts, collaboration for interpretive materials
- Institutionalise the Monitoring and Evaluation framework and adaptive management processes as the organization grows
- Develop diversified funding sources, including grant funding

3.2.2 REVIEW OF PREVIOUS MANAGEMENT PLAN

There is no previous management plan for Tapir Mountain Nature Reserve. Previous management under Belize Audubon Society was based on annual operational plans that guided surveillance and education / awareness activities.

3.2.3 MANAGEMENT EFFECTIVENESS

Tapir Mountain has been a paper park for many years following the withdrawal of the first co-management partner, Belize Audubon Society, in 2013. In 2019, Belize Karst participated in the National Protected Areas System – Management Effectiveness Evaluation in 2019, shortly after taking on the co-management. The NPAS-MEE results therefore provide a concrete baseline to measure the progress of management effectiveness during the first five years of co-management. The management effectiveness assessment for Tapir Mountain provides a snapshot of the protected area at a given point in time - June, 2019. The assessment is based on the National Management Effectiveness Tool, first developed in 2005 (Young et al., 2005), and then revised to strengthen indicators and improve alignment with the World Commission on Protected Areas (WCPA) framework.

The assessment tool has a total of 79 indicators, divided between seven Management Categories. In 2019, the average management effectiveness across all management categories was rated as **FAIR**, with a score of 42.5%. Management Category scores ranged from 31.3% for Management Planning to 54.2% for Human Resources (Figure 6), reflecting the new co-management status under a newly formed NGO.

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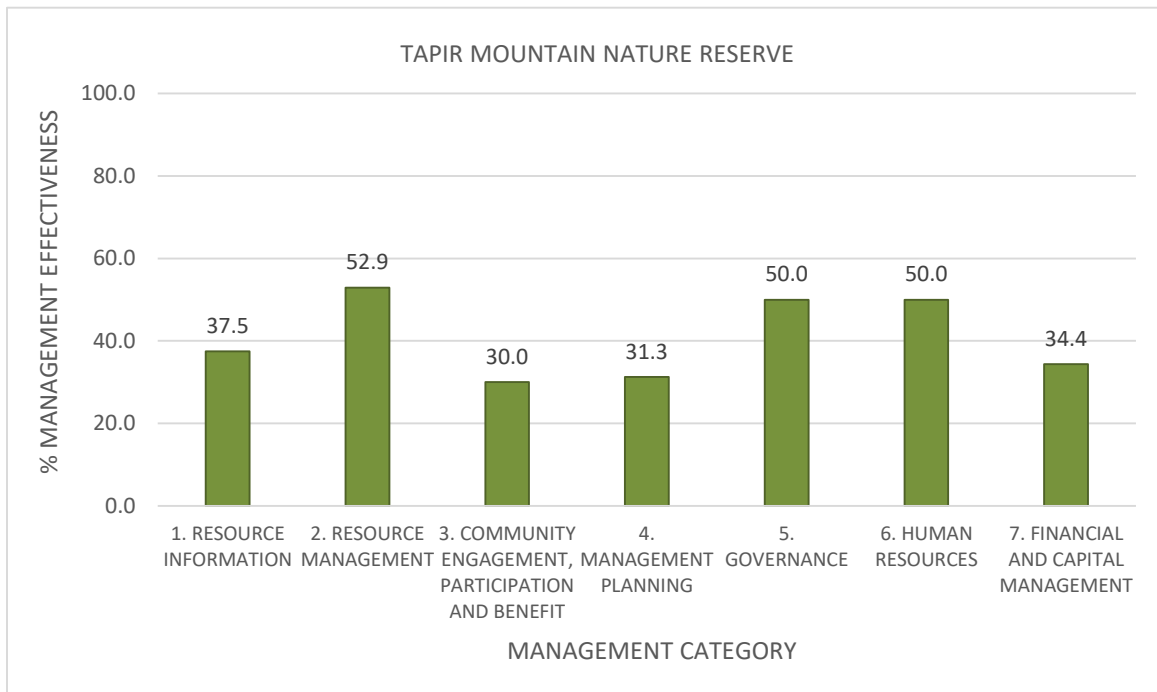


FIGURE 6: MANAGEMENT EFFECTIVENESS OUTPUTS PER ASSESSMENT CATEGORY

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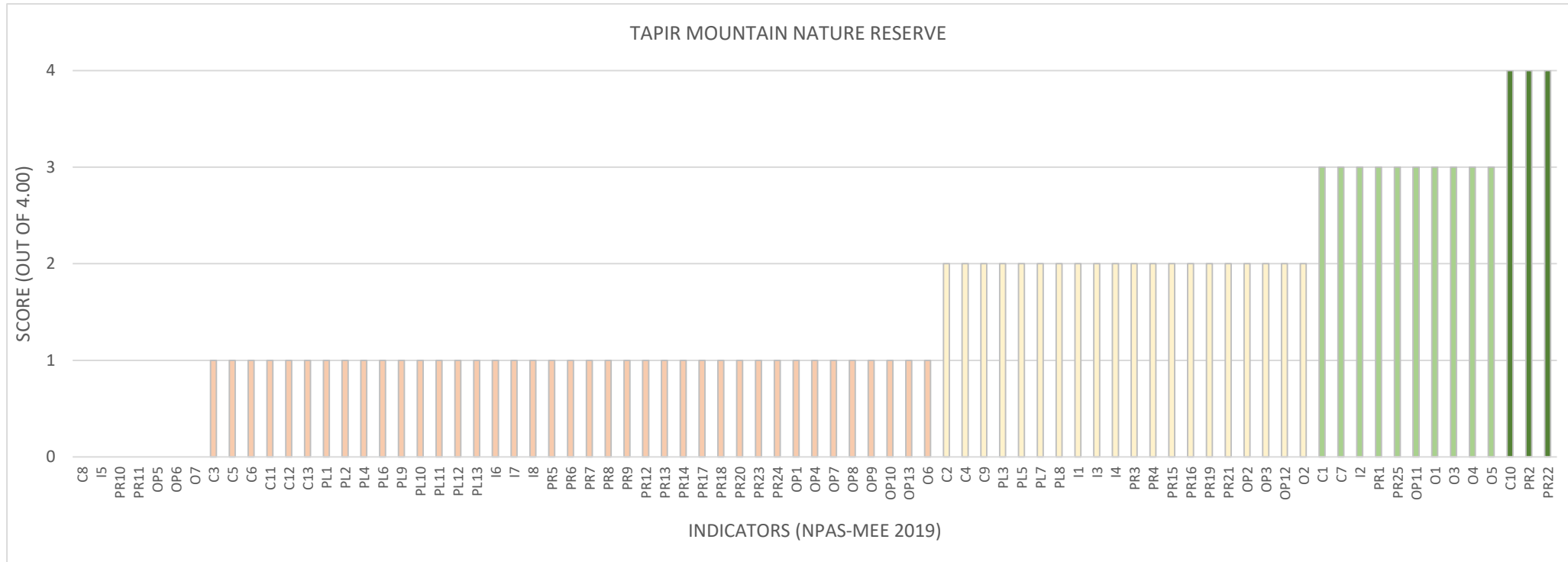


FIGURE 7: RESULTS BY INDICATOR (NPAS-MEE, 2019)

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Of the seventy-two indicators, seven were not considered applicable to Tapir Mountain (Figure 7):

- C8: Legal Resource Use
- I5: Entrance Fees
- PR10: Legal Extractive Resource Use
- PR11: Visitor and Tourism Management
- OP5: Sustainable Extraction of Natural resources
- OP6: Environmentally Sustainable Visitor Use
- O7: Level of Socio-Economic Benefit

These are linked to TMNR's designation as a Nature Reserve, which does not permit natural resource extraction or tourism use. It should be noted that as this reduces its ability to provide socio-economic benefits in the landscape, Belize Karst is requesting a change in designation to open the area for nature-based, minimal impact tourism (from Nature Reserve to either Wildlife Sanctuary (1) or National Park), which will change the applicability of these indicators in the next assessment.

Thirty-nine indicators rate as POOR (1.00) and in need of strengthening. A further twenty rate as FAIR (2.00), with management effectiveness scores below 50%. Only thirteen indicators score above 50% - ten of these rating as MODERATE (3.00) and three as VERY GOOD (4.00) (Figure 7).

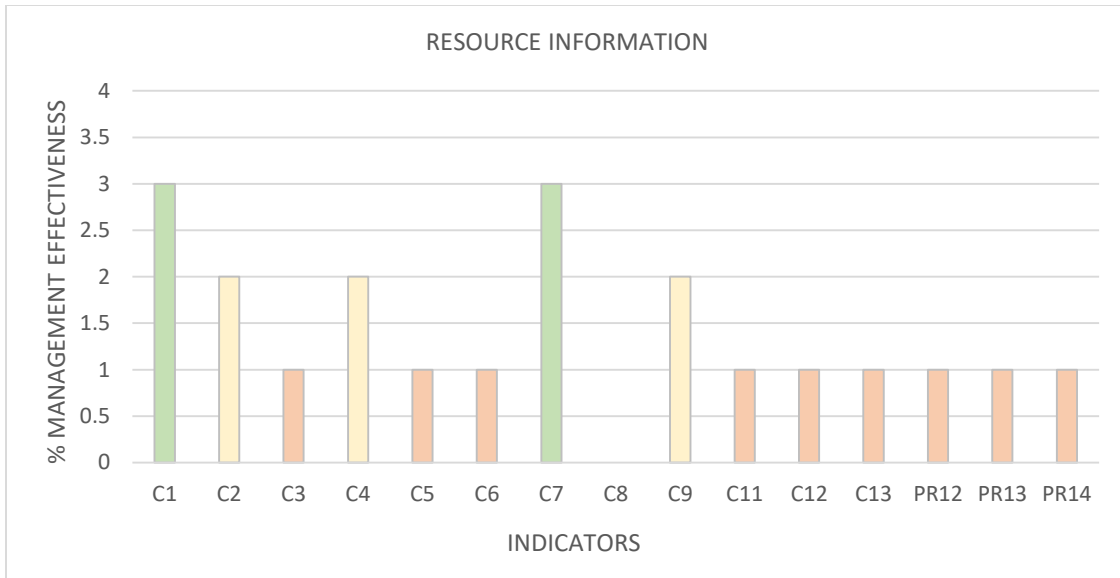
1. RESOURCE INFORMATION

The indicators in this section provide an assessment of the availability and accessibility of up-to-date information that Belize Karst, as the co-management organization for Tapir Mountain, has available for making well informed management decisions. Fifteen indicators were identified as being aligned with Management Category 1: Resource Information - all but one (B8: Legal Resource Use) are considered relevant to Tapir Mountain.



In 2019, Tapir Mountain scored an average of 1.50 (37.5%) (**FAIR**), with indicator scores ranging from 1.00 (**POOR**) to 3.00 out of 4.00 (**MODERATE**) (Figure 8). As a new co-management organization, Belize Karst has limited baseline information available on the protected area. Three indicators rate as **FAIR** and nine as **POOR**, with strengthening of information required in all areas.

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MANAGEMENT CATEGORY 1: RESOURCE INFORMATION

INDICATORS

C1	Physical Environment	C9	Illegal Resource Use
C2	Biotic Environment	C11	Conservation Targets
C3	Ecosystem Services	C12	Threat Assessment
C4	Archaeological and Cultural Resources	C13	Climate Change Assessment
C5	Social and Economic Resources	PR12	Systematic Environmental Monitoring Activities
C6	Stakeholder Analysis	PR13	Scientific Research Activities
C7	Strength of Social Capital	PR14	Information Management System
C8	Legal Resource Use		

FIGURE 8: MANAGEMENT CATEGORY 1: RESOURCE INFORMATION (2019)

AREAS OF STRENGTH (>50%)

Two indicators rate as MODERATE (3.00 out of a possible 4.00). **C1: Physical Environment:** Maps of the protected area physical environment, access points and boundaries are available, but could be strengthened. **C7: Strength of Social capital:** Many local stakeholders, both in the communities and the tourism sector, have the capacity to understand and participate in provision of inputs and ideas into management of the protected area.

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AREAS OF CONCERN (<50%)

Nine indicators rate as **POOR** (1.00 out of 4.00), and are highlighted as areas where information gaps may significantly limit effective management:

C3: Ecosystem Services

C5: Social and Economic Resources

C6: Stakeholder Analysis

C11: Conservation Targets

C12: Threat Assessment

C13: Climate Change Assessment

PR12: Systematic Environmental Monitoring Activities

PR13: Scientific Research Activities

PR14: Information Management System

A further three indicators rate as **FAIR**:

C2: Biotic Environment (species lists)

C4: Archaeological and Cultural Resources

C9: Illegal Resource Use

The management planning process will address some of these gaps (C11: Conservation Targets, C12: Threat Assessment, C13: Climate Change Assessment), and management strategies will be implemented to ensure targeted research and monitoring activities improve the information available for management decisions.

RECOMMENDATIONS

- Ensure the management plan includes conservation planning, threat assessment and climate change assessment.
- Conduct a socio-economic / knowledge, attitudes and perceptions (KAP) assessment of local stakeholder communities to inform management

2. RESOURCE MANAGEMENT

This section identifies strengths and weaknesses in the management processes that are in place to address and manage legal uses of the protected areas, and adequately control illegal activities. The indicators assess the extent to which the protected area is legally established and demarcated, and the effectiveness of management of outside influences, and conflicting rights and uses.

52.9%

SUMMARY OF RESULTS

Twenty-one indicators provide information on **Management Category 2: Resource Management** - seventeen are considered relevant to Tapir Mountain, with four not considered applicable (PR10: Legal Extractive Use, PR11: Visitor and Tourism Management, OP5: Sustainable Extraction of Natural Resources, and OP6: Environmentally Sustainable Visitor Use), all related to activities not permitted under the Nature Reserve designation.

In 2019, Tapir Mountain rated at the lower end of MODERATE, with a score of 52.9%, and individual indicator scores ranging from 1.00 (**POOR**) to 4.00 out of 4.00 (**VERY GOOD**) (Figure 9). Two indicators are rated as **VERY GOOD**, with five indicators rated as **MODERATE**, three as **FAIR** and seven as **POOR**.

AREAS OF STRENGTH

Two indicators have scores of 4.00 out of a possible 4.00 – resource management in BNR is considered to be highly effective in the following areas:

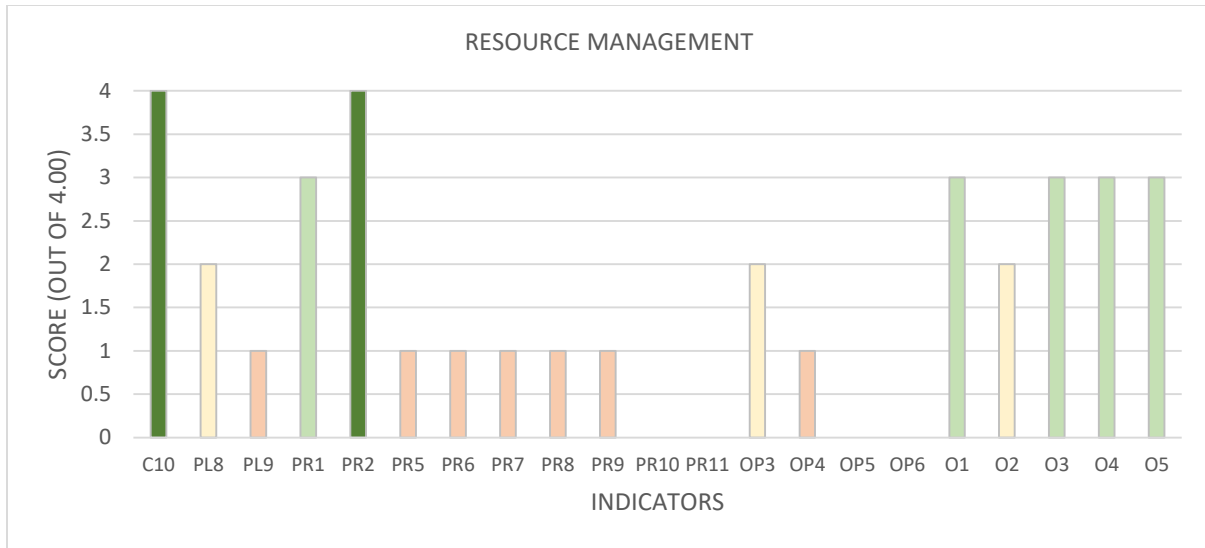
C10: Legal Status

PR2: Knowledge of Boundaries

Tapir Mountain Nature Reserve was designated through Statutory Instrument 15 of 2004 under the National Parks Act (revised as the National Protected Areas System Act), giving it strong legal status as part of Belize’s National Protected Areas System (**C10: Legal Status**). The second indicator rating as VERY GOOD is **PR2: Knowledge of Boundaries** - as one of its first actions, Belize Karst has been working with Forest Department in the confirmation and re-clearing of the Tapir Mountain boundaries.

A further five indicators rate as MODERATE (between 50% and ≤75%). This includes PR1: Boundary Demarcation and the Outcome indicators **O1: Status of Ecosystems**, **O3: Status of Ecosystem Values**, **O4: Status of Archaeological and Cultural Resources** and **O5: Management in the Landscape**. These Outcome indicators suggest that the area is sufficiently remote to have low levels of illegal incursions – however, since the assessment was conducted, more time on in the protected area suggests that the level of incursions may be higher than previously thought, and the indicator score may be optimistic.

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INDICATORS

C10	Legal Status	PR11	Visitor and Tourism Management
PL8	Permitting Process	OP3	Reduced Illegal Incursions
PL9	Guidelines, Strategies and Plans	OP4	Resilience to Climate Change
PR1	Boundary Demarcation	OP5	Sustainable Extractive Use Management
PR2	Knowledge of Boundaries	OP6	Sustainable Visitor Management
PR5	Conflict Resolution	O1	Status of Ecosystems
PR6	Surveillance	O2	Status of Biodiversity
PR7	Enforcement	O3	Status of Ecosystem Values
PR8	Prosecution	O4	Status of Archaeological Values
PR9	Natural Resource Management	O5	Management in the PA Landscape
PR10	Legal Commercial Resource Use Management		

FIGURE 9: MANAGEMENT CATEGORY 2: RESOURCE MANAGEMENT (2019)

AREAS OF CONCERN

Seven indicators rate as **POOR** (1.00 out of 4.00), and are highlighted as in need of strengthening:

- PL9 Guidelines, Strategies and Plans*
- PR5 Conflict Resolution*
- PR6 Surveillance*
- PR7 Enforcement*
- PR8 Prosecution*
- PR9 Natural Resource Management*
- OP4 Resilience to Climate Change*

Belize Karst is in the first stages of co-management, with the development of the management plan to guide its resource management activities, including the establishment of surveillance and enforcement activities within the protected area, and preparation of organizational guidelines, strategies and plans.

RECOMMENDATIONS

- Ensure key organization policies, plans and guidelines are in place, covering: surveillance enforcement, financial management,
- Establish a surveillance and enforcement presence in Tapir Mountain.
- Ensure all rangers are trained and equipped for their role.
- Implement strategies identified for building resilience to climate change in the protected area and the landscape

3. COMMUNITY ENGAGEMENT, PARTICIPATION AND SOCIO-ECONOMIC BENEFIT

Indicators in this section highlight the level of engagement of local communities and stakeholders in the support of the protected area, whether they are benefiting from the presence of protected areas, and whether there is recognition of, and appreciation for, the goods and services provided by the protected area and the national contribution they make to national development.



30.0%

Eleven indicators provide information on **Management Category 3: Community Engagement, Participation and Socio-economic Benefit**. Ten are considered relevant to Tapir Mountain, the exception being **O7: Level of Local Economic Benefit**, as the protected area is not open to local resource use of any kind, included tourism. In 2019, Tapir Mountain scored an average of 37.5% (**FAIR**), with indicator scores ranging from 1.00 (**POOR**) to 2.00 out of 4.00 (**FAIR**) (Figure 10). Two indicators rate as **FAIR** with the majority (eight) rating as **POOR**. No indicators rate as **MODERATE** or **VERY GOOD**.

AREAS OF STRENGTH

There are no indicators rating as **VERY GOOD** or **MODERATE**. In the past five years, Tapir Mountain has not had on-site management. Belize Karst, in its new role as co-manager of Tapir Mountain, is starting to reach out to the community leaders during the management planning process, but engagement at this stage is not high. Strategies for engagement, participation and socio-economic benefit need to be integrated into the management plan to address this priority area.

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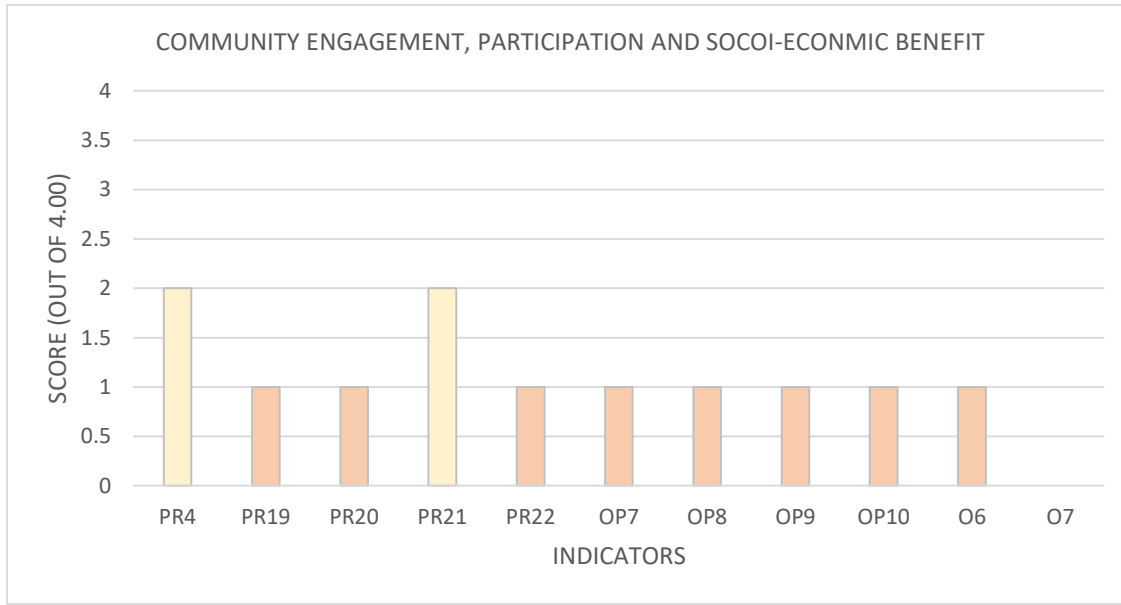


FIGURE 10: MANAGEMENT CATEGORY 3: COMMUNITY ENGAGEMENT, PARTICIPATION AND SOCIO-ECONOMIC BENEFIT (2019)

AREAS OF CONCERN

This Management Category is the weakest of the seven in 2019, with eight indicators rated as **POOR** (1.00 out of 4.00) and highlighted as areas considered in need of strengthening:

PR19 Communication with Stakeholders

PR20 Education / Awareness

O6: Provision of Socio-Economic Benefit

PR22 Stakeholder Participation in Management Actions

OP7 Support for Protected Area

OP8 Recognition of Protected Area Benefits

OP9 Generation of Job Opportunities

OP10 Stakeholder Income Diversification

O6 Provision of Socio-Economic Benefit

As part of the management planning process, Belize Karst has been identifying its stakeholders (primarily the four local communities and the tourism sector), and encouraging them to become engaged in the planning. There is no stakeholder analysis or socio-economic assessment of the communities to provide in-depth knowledge of perceptions and potential for participation in management activities, but these are integrated into the management plan strategies.

RECOMMENDATIONS

- Strengthen stakeholder understanding and recognition of protected area benefits from Tapir Mountain.
- Implement youth engagement activities focused on building conservation stewardship and conservation leaders in the communities.
- Provide opportunities for VU sectors in the communities in skills training for improved income generation / diversification opportunities, linked to conservation stewardship.
- Engage the tourism sector in active participation in management and youth engagement activities at Tapir Mountain.

4. MANAGEMENT PLANNING

Indicators for Management Planning highlight strengths and weaknesses in the management planning processes – that management plans, operational plans, site design plans and guidelines, regulations and zoning are in place and well structured, and that management resource needs have been identified. It also assesses the processes of management, including monitoring and evaluation, and the level of adaptive management.



31.3%

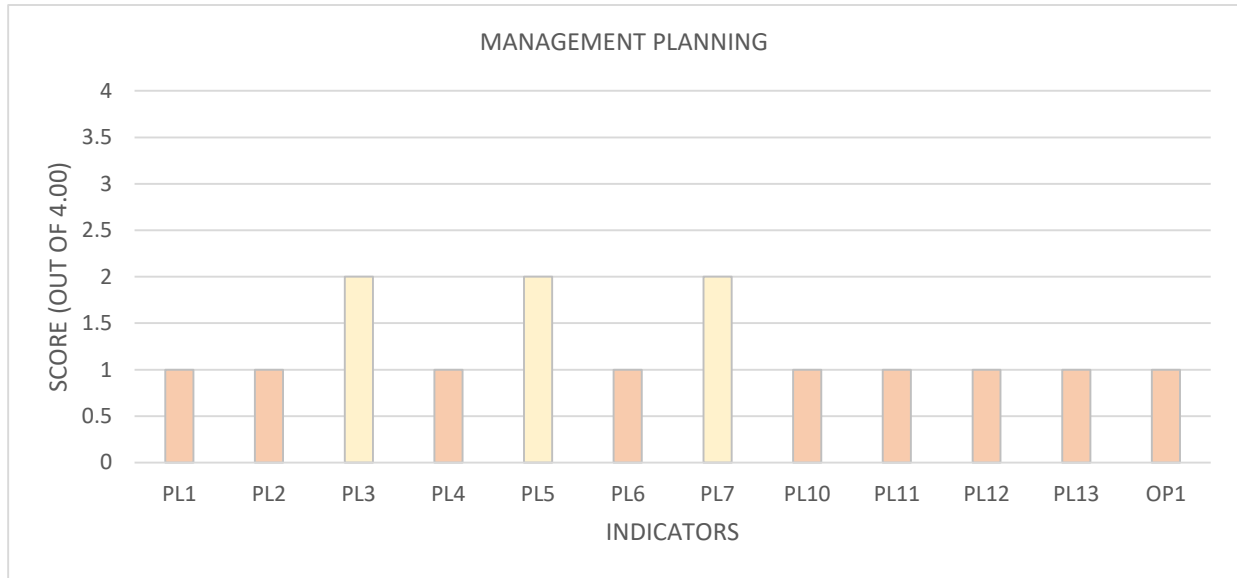
SUMMARY OF RESULTS

Twelve indicators provide information on **Management Category 4: Management Planning**, and all are considered relevant to Tapir Mountain. In 2019, the protected area rated as **FAIR**, with a score of 31.3%, with indicator scores ranging from 1.00 out of 4.00 (**POOR**) for seven of the indicators, to 2.00 (**FAIR**) for the remaining three (Figure 11). No indicators rate as **MODERATE** or **VERY GOOD**.

AREAS OF STRENGTH

There are no indicators rating as **VERY GOOD** or **MODERATE**. In the past five years, Tapir Mountain has not had on-site management. Belize Karst, in its new role as co-manager of Tapir Mountain, is developing its first management plan for the area, and identifying those areas of the organizational framework that need strengthening for effective management

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POOR

PL1 Management Planning
 PL2 Protected Area Objectives
 PL4 Planning in the Landscape
 PL6 Regulation and Zoning
 PL10 Program Monitoring and Evaluation
 PL11 Planning for Socio-Economic Benefit
 PL12 Long Term Financial Sustainability Planning
 PL13 Long Term Management Needs
 OP1 Adaptive Management

FAIR

PL3 Protected Area Design
 PL5 Planning in the National Context
 PL7 Annual Operational / Workplan

FIGURE 11: MANAGEMENT CATEGORY 4: MANAGEMENT PLANNING (2019)

AREAS OF CONCERN

All twelve indicators rate as either **POOR** or **FAIR**.

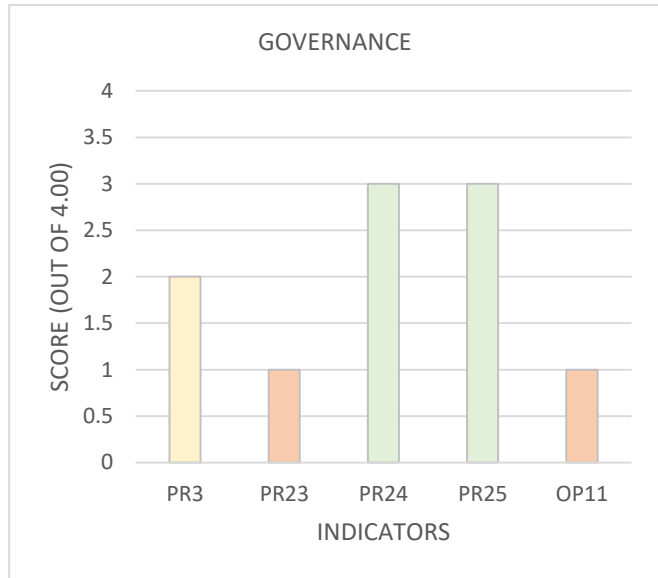
RECOMMENDATIONS

- Develop a five-year management plan, following the national management planning framework, and approved / endorsed by Government.
- Develop an Adaptive Management framework, with annual operational planning based on the management plan and informed by information-based
- Develop a Research and Monitoring Plan for guiding measurement of management success.
- Develop a financial sustainability plan for the protected area, ensuring diversification of income generation strategies.

5. GOVERNANCE

Indicators in this section focus on the governance of the protected areas – on whether essential governance structures and supporting processes are in place, well designed and implemented, and the level of management responsibility, and accountability at site level. The indicators also assess the effectiveness of relations, communication and collaboration between partners, and the extent to which stakeholders are involved in the management decisions making processes.

Five indicators provide information on **Management Category 5: Governance**. All five are considered relevant to Tapir Mountain. In 2019, Tapir Mountain rated as **FAIR**, with an average of 50.0%, and indicator scores ranging from 1.00 (**POOR**) to 3.00 out of 4.00 (**MODERATE**) (Figure 12). Two indicators rate as **MODERATE** (3.00 out of 4.00), one indicator rates as **FAIR** (2.00) and two as **POOR** (1.00 out of 4.00). No indicator rates as **VERY GOOD**.



INDICATORS

- PR3: Inter-organizational Communication
- PR23 Advisory Committee
- PR24 Board of Directors
- PR25 Administrative Authority
- OP11 Stakeholder Participation in Decision Making

FIGURE 12: MANAGEMENT CATEGORY 5 GOVERNANCE (2019)

AREAS OF STRENGTH

Two indicators rate as **MODERATE**, with scores of 3.00 out of a possible 4.00):

- PR25 Administrative Authority*
- PR24: Board of Directors*

As a co-management partner with the Forest Department, Belize Karst has administrative authority over day to day management activities Tapir Mountain (**PR25: Administrative Authority**). Belize Karst has established a Board of Directors with the skills required for the governance of the protected area, with a strong tourism stakeholder component, but with a need for strengthening the inclusion of local community representation.

AREAS OF CONCERN

Two indicators rate as **POOR** (1.00 out of 4.00) and are highlighted as areas considered in need of strengthening:

PR23: Advisory Committee

OP11: Stakeholder Participation in Decision Making

One indicator rates as **FAIR** (2.00 out of 4.00) – PR3: Inter-Organizational Communication

RECOMMENDATIONS

- Build the governance frameworks required for good governance over time – including organizational policies and procedures, Board procedures, minutes of Board meetings, annual filing for good standing and FIU, annual reporting and audits.
- Maintain a committed and engaged Board of Directors, ensuring representation from community and tourism sector stakeholders.
- Assess the feasibility of establishing an Advisory Committee as a mechanism for improving engagement and collaboration with communities and stakeholders in the Tapir Mountain landscape, and for improved two-way communication.
- Strengthen inter-organizational communication with the regulatory authority, NICH / IoA, other conservation organizations (e.g. FCD), community leaders, enforcement partners and other key stakeholders in the Tapir Mountain landscape.

6. HUMAN RESOURCES

This section assesses management effectiveness in terms of human resources – the presence of sufficient, trained staff, available at the site, with ongoing training and assessment that guides staff development.



50.0%

SUMMARY OF RESULTS

Six indicators provide information on **Management Category 6: Human Resources** - all six are considered relevant to the protected area. In 2019, Tapir Mountain rated at the top end of **FAIR** (50.0%), with indicator scores ranging from 2.00 out of 4.00 (**FAIR**) to 3.00 (**MODERATE**) (Figure ...). One indicator rates as **MODERATE**, five as **FAIR** and one as **POOR**. No indicator rates as **VERY GOOD**.

AREAS OF STRENGTH

One indicator scores 3:00 out of a possible 4.00 (**MODERATE**):

I2 Site Manager Preparation

The Site Manager has relevant experience related to the management responsibilities for the protected area, and this will continue to improve over time, with more experience in the job.

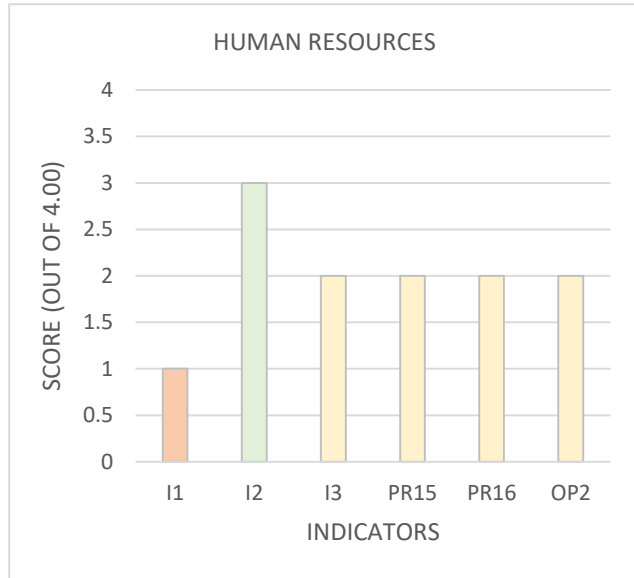
AREAS OF CONCERN

One indicator rates as **POOR**, with no staff present at the site on a day to day basis:

I1 Human Resources for Site Management

Five indicators rate as **FAIR**:

- I3 Site Manager Availability*
- PR15 Human Resource Assessment*
- PR16 Staff Training and Development*
- OP2 Equipped, Trained Operational Staff*



INDICATORS

- I1 Human Resource for Site Management
- I2 Site Manager Preparation
- I3 Site Manager Availability
- PR15 Human Resource Assessment
- PR16 Staff Training and Development
- OP2 Equipped, Trained Operational Staff

FIGURE 13: MANAGEMENT CATEGORY 6: HUMAN RESOURCES (2019)

Whilst there are no paid staff, the Board members volunteer their time to the protected area, and have the skills and access to the equipment for laying the groundwork for protected area management. With no paid staff, there is no current structured needs assessment or ongoing training and development.

RECOMMENDATIONS

- Locate funding to employ core staff members – Executive Director and rangers
- Build the organizational human resources as funding becomes available, based on annual needs assessments

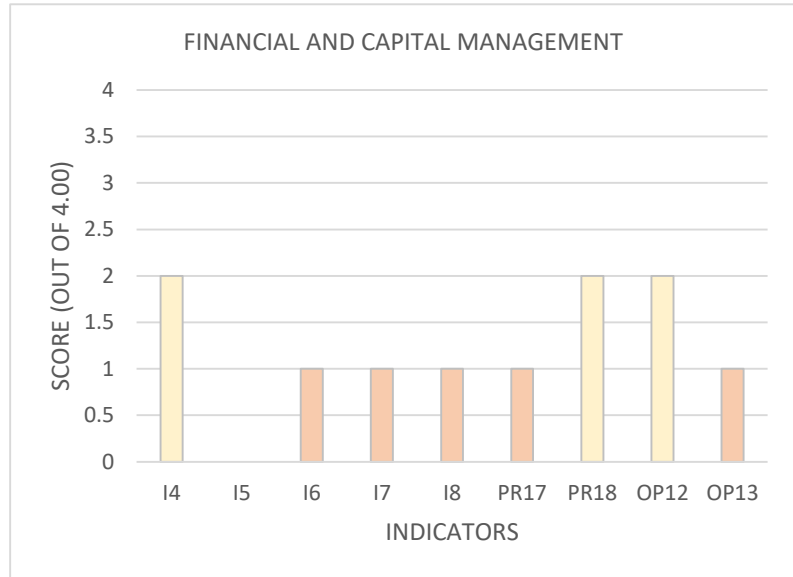
7. FINANCIAL AND CAPITAL MANAGEMENT

The Financial and Capital Management indicators assess the extent to which adequate funds are raised and available towards financial security, and the measures taken to ensure good financial management and transparency. It also assesses whether infrastructure, equipment, signs, and other assets are adequate for management of the protected area, and are properly managed and maintained.

34.4%

Nine indicators provide information on **Management Category 7: Financial and Capital Management**

One of the nine indicators is not currently considered relevant to Tapir Mountain (I5 Entrance Fees), as the Nature Reserve designation does not permit tourism visitation. In 2019, the protected area rated as **FAIR** (34.4%), with three indicators rating as **POOR** (1.00 out of 4.00) and three as **FAIR** (2.00 out of 4.00) (Figure 14.). No indicators rate as **MODERATE** or **VERY GOOD**.



AREAS OF STRENGTH

No indicators rate as **MODERATE** or **VERY GOOD**. Belize Karst is in the early stages of establishing itself as the co-management partner for Tapir Mountain, and is putting the relevant financial management framework in place. It currently has limited infrastructure and equipment dedicated to the protected area.

INDICATORS

I4	Funding Adequacy	PR17	Maintenance of Equipment and Infrastructure
I5	Entrance fees	PR18	Financial Management
I6	Infrastructure Adequacy	OP12	Financial Security
I7	Equipment Adequacy	OP13	Financial Transparency
I8	Signage Adequacy		

FIGURE 14: MANAGEMENT CATEGORY 7: FINANCIAL AND CAPITAL MANAGEMENT (2019)

AREAS OF CONCERN

All eight relevant indicators rate as **POOR** or **FAIR**, and are therefore of concern. Five indicators rate as **POOR** and are considered priorities for action:

- I6 Infrastructure Adequacy*
- I7 Equipment Adequacy*
- I8 Signage Adequacy*
- PR17 Maintenance of Equipment and Infrastructure*
- OP13 Financial Transparency*

None of the required infrastructure or equipment is considered to be in place, with the priority being the construction of the Tapir Mountain Ranger Station and equipping of the first ranger team. Signage is a priority to ensure the boundaries are clearly marked for enforcement purposes. Establishing a financial management system that ensures financial transparency is also an area that needs strengthening, with annual audits that are shared in summary form in the Annual Report, and compliance with FIU requirements.

Three indicators rate as **FAIR**:

- I4 Funding Adequacy*
- PR18 Financial Management*
- OP12 Financial Security*

As a new organization, Belize Karst has no initial funding, and is currently applying for its first grant. Financial management conforms to business models, and is handled by a skilled administrator (a member of the Board), though accounts are not yet aligned to the NPAS accounting system. Belize Karst is being supported financially in its early development phase by Maya Walk, a tourism operation based in the area, and will be engaging other tour operators across Belize in use of the area for tourism, as a financial sustainability mechanism. As a well-established and successful tour operator, Maya Walk brings its knowledge of the tourism industry to the development of the protected area for its tourism potential.

RECOMMENDATIONS

- Identify and implement additional financial sustainability mechanisms for support of the protected area, exploring diversification into both tourism and non-tourism related income generation options.
- Ensure signage is prioritized in areas of highest potential conflict.
- Establish and maintain a financial transparency framework.
- Address priority infrastructure and equipment needs
- Establish a schedule of proactive maintenance of equipment and infrastructure where possible.

3.3 MANAGEMENT STRATEGIES

3.3.1 POLICY AND LEGAL FRAMEWORK

Management strategies are guided by national protected area legislation and objectives. Tapir Mountain Nature Reserve functions as a component of the National Protected Areas System, providing biodiversity and ecosystem services protection. The designation as a Nature Reserve is specifically to:

“protect biological communities or species, and maintain natural processes in an undisturbed state”.

The legislated permitted activities are restricted to research and education. In view of the small size of the protected area and current impacts on biodiversity following several years as a paper park, coupled with the increasing need for the protected area to be able to provide socio-economic benefit opportunities to the local stakeholder communities, it is recommended that Tapir Mountain be re-designated. This is reflected in the recommendations of the NPAS Rationalization exercise (Walker and Walker, 2012) and in the recent Status of Protected Areas management effectiveness assessment (Walker, 2020) - that Tapir Mountain be redesignated as either a Wildlife Sanctuary (1), in its role in protection of species (including the charismatic Baird’s tapir) and karst landscape, or as a National Park, in its role in protecting natural and scenic values for the benefit and enjoyment of the general public (Table 36).

TAPIR MOUNTAIN - CURRENT AND POTENTIAL PROTECTED AREAS CATEGORIES		
Category	Purpose	Activities Permitted
Nature Reserve	To protect biological communities or species, and maintain natural processes in an undisturbed state.	Research, education
Wildlife Sanctuary (1)	To protect nationally significant species, biotic communities or physical features.	Research, education, tourism
National Park	To protect and preserve natural and scenic values of national significance for the benefit and enjoyment of the general public.	Research, education, tourism

TABLE 36: TAPIR MOUNTAIN - CURRENT AND POTENTIAL PROTECTED AREA CATEGORIES

Both maintain the biodiversity focus of the protected area, particular with relevance to the iconic tapir, whilst also opening up the area for nature-based tourism, with prioritised strategies to ensure that local communities are provided with opportunities to benefit.

3.3.2 REGULATIONS

The National Protected Areas System Act (Revised, 2015), states that:

PART VIII: OFFENCES, EVIDENTIARY PROVISIONS AND ENFORCEMENT

37: General prohibited acts

- (a) no person shall be entitled to enter any national park except for the purpose of observing the fauna and flora therein and for the purpose of education, recreation and scientific research;
- (b) no person shall be entitled to enter any nature reserve or in any way disturb the fauna and flora therein;
- (c) no animal shall be hunted, killed or taken and no plants shall be damaged, collected or destroyed in a national park or nature reserve;

Prohibited Activities

37. Except as may be otherwise provided in this Act-

- (a) no person shall be entitled to enter any national park except for the purpose of observing the fauna and flora therein and for the purpose of education, recreation and scientific research;
- (b) no person shall be entitled to enter any nature reserve or in any way disturb the fauna and flora therein;**
- (c) no animal shall be hunted, killed or taken and no plants shall be damaged, collected or destroyed in a national park or nature reserve;

39: Prohibited activities within National Parks

- (1) No person shall, within any national park, nature reserve, wildlife sanctuary or natural monument, except with the written authorization of the Chief Forest Officer-
 - a) permanently or temporarily reside in or build any structure of whatever nature whether as a shelter or otherwise;
 - (b) damage, destroy or remove from its place therein any species of flora;
 - (c) hunt any species of wildlife;
 - (d) quarry, dig or construct roads or trails;
 - (e) modify or replace any sign and facilities provided for public use and enjoyment;
 - (f) introduce organic or chemical pollutants into any water;
 - (g) clear land for cultivation;
 - (h) graze domestic livestock;
 - (i) carry firearms, spears, traps or other means for hunting or fishing;
 - (j) introduce exotic species of flora or fauna;
 - (k) catch fish by any means whatsoever.

3.3.3 RECLASSIFICATION CONSIDERATIONS

Whilst reclassification of the protected area is beyond the scope and role of the co-manager, it is an important step toward strengthening the protected area and its future conservation outcomes, and will lobbying will be required from Belize Karst to move the process forward. The following points summarize the history and arguments that support reclassification as a National Park.

Summary of the Current Situation:

- The current designation as Nature Reserve was based on the intent of the previous owner (Svea Ward, now deceased) to ensure long term biodiversity protection. The protected area, whilst representative of the ecosystems of the northern foothills of the Maya Mountains Massif, does not fulfill the high biodiversity values required of a Nature Reserve.
- The previous owner recognized the need for financial sustainability, agreeing to the excision of ATMNM to permit visitation, but wished the core values of biodiversity protection to remain intact.
- The excision of ATMNM occurred, but the funds from ATMNM were never allocated to the management of TMNR, leading to the termination of the co-management agreement with Belize Audubon Society in 2013/2014
- Tapir Mountain Nature Reserve was without on-site management for the six years following this, presence restricted to quarterly patrols of the perimeter by the Forest Department when time, funds and human resources were available.
- The level of hunting and logging incursions in this period became significant, and threatened to undermine the biodiversity and ecosystem values of the protected area.
- In 2013, an assessment of the NPAS identified the urgent need for on-site presence (Walker et al., 2013), but there was no interest from NGOs in co-management, as the Nature Reserve designation precluded the option for tourism as a financial sustainability mechanism.
- In January, 2019, Belize Karst Habitat Conservation stepped forward and signed a five-year interim co-management agreement with the Forest Department that included provision for visitor fee collection as a financial sustainability mechanism, and verbal approval for transition to National Park.
- The current designation as a Nature Reserve now places the protected area values at risk. Without the option of developing tourism as a financial sustainability mechanism, the current management presence may not be feasible. Should the current co-management organization withdraw, the protected area will once again be open to illegal incursions, and be vulnerable to dereservation.
- Transition to a National Park with planned, low impact tourism with a footprint limited to less than 25% of the protected area will maintain these core values whilst also ensuring that the protected area can be effectively managed.

- This also aligns with the need for co-management organizations to be able to develop financial sustainability mechanisms is being encouraged at the national level, but currently does not align with the Nature Reserve designation.
- In 2020, the Status of Protected Areas report identified TMNR as one of several protected areas recommended for reclassification to improve the financial sustainability, management effectiveness and ability to provide socio-economic benefits to local communities through opening up livelihood opportunities.

The following outlines the considerations associated with the reclassification of the area that have been integrated into the above summary points.

Establishment: Tapir Mountain Nature Reserve was originally established as a private reserve, Society Hall Nature Reserve, with the objectives of:

- Repaying nature for the owner's presence and use of Earth's resources
- To protect the area for the sole use of its original fauna and flora
- To guard against human inroads determined to exploit the area

In 1975, the land was deeded to the Government of Belize and leased as a 99-year lease back to the owner, with the agreement that the land should remain under protection.

Transfer to Belize Audubon Society: Increasing incursions into the property proved beyond the management capacity of the leasee, with the transfer of management to Belize Audubon Society in 1990. In recognition of the need for a financial sustainability, it was agreed to excise 500 acres containing the ATM cave system as a Natural Monument, providing a supportive financial sustainability mechanism for the larger Tapir Mountain Nature Reserve. Unfortunately, the funding was not applied to Tapir Mountain Nature Reserve, and Belize Audubon Society was eventually unable to continue as the co-management organization for the protected area.

Trends in Protected Area Management: Since the establishment of Tapir Mountain Nature Reserve, the global practices for protected area management have evolved from complete exclusion of human presence in the 1970's to the acceptance of the need for protected areas to provide not only biodiversity protection, but also ecosystem services and socio-economic benefits. There has also been a move for protected area managers to seek ways to improve financial sustainability through a diversity of mechanisms, including tourism.

The IUCN now takes this into account, recognizing the need for supporting activities such as tourism for financial sustainability, and recommends that up to 25 percent of land within a protected area can be managed for other purposes - as long as these are compatible with the primary objective of the protected area (Dudley, 2008). For a Nature Reserve, with the primary goal of biodiversity and ecosystem protection, low impact tourism would be a compatible activity, and would require access to less than 25% of the protected area

Rationalization Process: Tapir Mountain Nature Reserve was identified in the National Protected Areas System Rationalization report as a protected area that needs to strengthen its management presence and financial sustainability through reclassification from a Nature Reserve (IUCN Category 1a) to a National Park (IUCN Category II), to allow for tourism use and improved benefits for the local communities and other stakeholders (Walker and Walker, 2013).

Status of Protected Areas report 2020

Belize's most recent Status of Protected Areas report identified recommendations for strengthening the management effectiveness of the National Protected Areas System. This included the need for reclassification of Tapir Mountain Nature Reserve, to improve engagement of co-management partners and financial sustainability (Walker, 2020). The justifications for reclassification can be summarized as follows:

Socio-economic: The local community stakeholder leaders are currently not positive about protected areas, with the non-arrival of promised benefits following their support for the excision of ATMNM. The focus behind reclassification is not just for the development of a financial sustainability mechanism for the protected area, but also to provide opportunities for employment, training and experience in tourism. The management plan also calls for increased presence and engagement in schools, improving community awareness of the roles and importance of Belize's protected areas in providing water security and supporting livelihoods.

Improved community inclusion in governance: The management strategies include the development of an Advisory Committee drawn from the communities and other stakeholders to provide input into management decision making and act as a two-way communication mechanism, bridging the gap between the protected area manager and the communities.

Biodiversity protection: There is an increasing need for protected area managers to be able to generate funding outside the norm of grants, generally through tourism. The concepts for tourism for TMNR are of nature-based, low impact, minimal footprint activities, with facilities and trails tailored to ensure visitor management that mitigates effects on biodiversity. The funds generated will contribute towards more effective surveillance and enforcement operations, and continuity of outreach and awareness, improving biodiversity protection. The presence of tourists in the area also deters illegal activities, and the employment of local community members in tourism activities related to TMNR will increase local respect for the protected area. All these will lead to improved biodiversity and ecosystem service protection.

Interim Co-management agreement

In January, 2019, Belize Karst signed a five-year interim co-management agreement with the Forest Department that included provision for the establishment of a visitor fee as a financial sustainability mechanism, with the institution of fee collection and the development of business and marketing plans to guide development:

8. Launching of a Tapir Mountain Nature Reserve financial sustainability plan to enable effective long-term management, with activities that may include...

- *Developing an instituting a fee collection system based on multiple users of TMNR along with the Forest Department, to help sustain the management of TMNR*
- *Developing a Business Plan for TMNR will include a marketing plan and a financial plan based on a market assessment*

As visitor activities are not permitted within a Nature Reserve (with the exception of research and education), initial discussions focused on the steps to be taken for reclassification to National Park, as was originally recommended in 2013 (Walker and Walker, 2013).

3.3.4 RECLASSIFICATION PROCESS

Reclassification of protected areas is included in the NPAS Act of 2015, with the stipulation that it needs to take into consideration

- (a) socio-economic aspects;
- (b) general environmental situations, such as ecosystems and species of concern; and
- (c) potential impact or any other factor of concern.

The NPAS Act sets out conditions to be met prior to re-classification (NPAS Act: Section 14 (2)). This management plan provides for both conditions (a) and (b):

- (a) an integrated assessment of the ecological, social and economic status of the area, potential impacts and contribution to the National Protected Areas System*
- (b) the preparation of a preliminary management plan*
- (c) any other study, plan or requirement deemed necessary by the Minister*

The NPAS Act also states (NPAS Act: Section 19 (1)):

19 (1) Any declaration, alteration, re-classification or revocation of a declaration, of a protected area, and the preparation of a protected area management plan, shall follow:

- (a) an integrated assessment of the ecological, social and economic status of the area, potential impacts and contribution to the National Protected Areas System; and*

(b) such consultative process as may be appropriate in the circumstances, but must ensure consultation with nearby communities and affected parties of the area and follow a process of public participation in accordance with the requirements of subsection (2).

(2) In accordance with subsection (1), the Minister or the appropriate Minister under the Fisheries Act or the Forests Act shall publish the intention to declare, alter, re-classify or revoke a declaration of a protected area in two of the leading national newspapers and the government Gazette and also on air on two national radio stations.

(3) The publication contemplated in the subsection (2) above shall:

(a) invite members of the public and all affected persons to submit to the Minister written representations on or objections to the proposed

(b) contain sufficient information to enable members of the public to submit meaningful representations or objections, and must include a clear indication of the area that will be affected.

(4) The Minister or other appropriate Minister may in appropriate circumstances allow any interested person to make oral representations or objections.

(5) The Minister or other appropriate Minister shall give due consideration to all representations including community observations received or presented before publishing the relevant notice; but shall not be bound by any representation or objection given and shall make an independent determination

The steps to be taken for the reclassification include the following:

1. A formal/technical reclassification 'proposal' submitted by the co-manager to the Forest Department and the Minister, annexing the management plan and letters that support the socio-economic justifications
2. Published intention for legal reclassification by the Minister through orders published in the gazette, and
3. Revision of the Statutory Instrument by the Forest Department / Ministry to reflect the reclassification
4. Revision of the co-management agreement by the Forest Department / Ministry reflecting the change in the protected area classification

3.3.5 Prioritized Activities

Two timelines have been identified for the human resource needs and implementation of prioritized activities for establishment of an effective management regime and financial sustainability mechanisms for the protected area. The first is based on the Protected area remaining as a Nature Reserve (Table 37). The second takes into account reclassification of the protected area as a National Park, to allow for tourism use (Table 38).

YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
HUMAN RESOURCES Site manager Rangers (3) Administrator / Communication	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (3) ▪ Administrator / Communication 	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (6) ▪ Administrator / Communicators ▪ Research Coordinator ▪ Part-time cook / housekeeping 	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (6) ▪ Administrator ▪ Research Coordinator ▪ Outreach Officer ▪ Part-time cook / housekeeping 	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (6) ▪ Administrator ▪ Research Coordinator ▪ Outreach Officer ▪ Part-time cook / housekeeping
<ul style="list-style-type: none"> ▪ Ranger Station Phase 1, with: <i>Solar / water collection / vehicle / radio communication / equipment tool shed</i>) ▪ Investigate feasibility for drilling well ▪ Improve access road ▪ Establish trail system ▪ Entrance gate ▪ Bathroom Facility ▪ Equip Programs ▪ Develop maintenance program ▪ Medivac Helicopter Landing Site 	<ul style="list-style-type: none"> ▪ Maintain infrastructure ▪ Maintain equipment ▪ Watchtower – fire surveillance and raptor migration 	<ul style="list-style-type: none"> ▪ Research Station Phase 1 (accommodation) ▪ Ranger Station Phase 2 (<i>Solar / water / vehicle / radio communication</i>) ▪ Maintain infrastructure ▪ Maintain equipment 	<ul style="list-style-type: none"> ▪ Expansion of Research Station ▪ Maintain infrastructure ▪ Maintain equipment 	<ul style="list-style-type: none"> ▪ Expansion of Research Station ▪ Maintain infrastructure ▪ Maintain equipment

TABLE 37: PRIORITY RESOURCE REQUIREMENTS FOR THE NEXT FIVE YEARS (AS NATURE RESERVE)

YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
<p>HUMAN RESOURCES</p> <p>Site manager Rangers (3) (also visitor management / communication skills) Administrator / Communicator</p>	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (3) (also visitor management / communication skills) ▪ Administrator / Communicator 	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (6) ▪ Administrator / Communicator ▪ Research Coordinator ▪ Part-time cook / housekeeping 	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (6) ▪ Administrator ▪ Research Coordinator ▪ Outreach Officer ▪ Part-time cook / housekeeping 	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (6) ▪ Administrator ▪ Research Coordinator ▪ Outreach Officer ▪ Part-time cook / housekeeping
<ul style="list-style-type: none"> ▪ Ranger Station Phase 1, with: <i>Solar / water collection / vehicle / radio communication / equipment tool shed</i>) ▪ Investigate feasibility for drilling well Improve access road ▪ Map / plan of visitor facility development bearing in mind flooding / fire / security / visitor management ▪ Establish trail system ▪ Visitor signage ▪ Entrance gate ▪ Parking Lot ▪ Bathroom Facility ▪ Equip Programs ▪ Develop maintenance program ▪ Visitor Centre Phase 1 ▪ Medivac Helicopter Landing Site 	<ul style="list-style-type: none"> ▪ Improve Visitor Centre Facilities ▪ Maintain infrastructure ▪ Maintain equipment ▪ Watchtower – fire surveillance and raptor migration 	<ul style="list-style-type: none"> ▪ Research Station Phase 1 (accommodation) ▪ Improve Visitor Centre Facilities ▪ Ranger Station Phase 2 (<i>Solar / water / vehicle / radio communication</i>) ▪ Maintain infrastructure ▪ Maintain equipment 	<ul style="list-style-type: none"> ▪ Expansion of Research Station ▪ Improve Visitor Centre Facilities ▪ Maintain infrastructure ▪ Maintain equipment 	<ul style="list-style-type: none"> ▪ Expansion of Research Station ▪ Improve Visitor Centre Facilities ▪ Maintain infrastructure ▪ Maintain equipment

TABLE 38: PRIORITY RESOURCE REQUIREMENTS FOR THE NEXT FIVE YEARS (AS NATIONAL PARK)

3.4 MANAGEMENT PROGRAMS AND OBJECTIVES

Management Programs are a means of grouping management objectives within related areas – for example, those related to natural resource management, or to environmental education. The strength of the combined programs is greater than the sum of the individual Programs, as each supports the others over space and time, with areas of overlap that strengthen the overall management of the protected area. The inclusion of strategies to strengthen communication and collaboration between Programs is also important, with inter-Program collaboration mechanisms for greater adaptive management effectiveness.

Six Management Programs are identified to provide the framework for management of the marine protected area (Table 40):

- A. Natural Resource Management and Protection**
- B. Research and Monitoring**
- C. Community Development and Outreach**
- D. Public Use**
- E. Infrastructure, Equipment and Maintenance**
- F. Management and Administration**

The plan integrates strategies for improving conservation target viability and mitigation of threats identified during the conservation planning process – strategies that are incorporated into the management programs, and into the measures of success program for effective management.

Under each Program, the strategies identified by green in the timeline are those that are equally relevant for both the Nature Reserve and National Park and required regardless of whether there is a change in classification. Those identified by orange are strategies that become relevant only once the re-classification to National Park has taken place (Table 39).

NRM 1: Surveillance and Enforcement	Years				
	1	2	3	4	5
<input type="checkbox"/> Rangers are fully trained for surveillance and enforcement activities, Green Laws, use of SMART, self-defence training, case file preparation, public relations					
<input type="checkbox"/> Ensure ongoing capacity building for all staff for effective surveillance and enforcement of tourism regulations, in collaboration with BTB					

TABLE 39: EXAMPLE OF STRATEGIES RELEVANT FOR THE NATURE RESERVE (GREEN), AND ADDITIONAL STRATEGIES (ORANGE) ONCE THE RECLASSIFICATION TO NATIONAL PARK HAS BEEN COMPLETED

TAPIR MOUNTAIN NATURE RESERVE PROGRAM AREAS

NATURAL RESOURCE MANAGEMENT AND PROTECTION	RESEARCH AND MONITORING	COMMUNITY DEVELOPMENT AND OUTREACH	TOURISM AND RECREATION ¹	MANAGEMENT AND ADMINISTRATION	INFRASTRUCTURE, OPERATIONS AND MAINTENANCE
<ul style="list-style-type: none"> ▪ <i>Surveillance and Enforcement</i> ▪ <i>Boundaries and Zoning</i> ▪ <i>Ecosystem and Species Management</i> ▪ <i>Addressing Specific Threats</i> 	<ul style="list-style-type: none"> ▪ <i>Research and Monitoring Framework</i> ▪ <i>Monitoring</i> ▪ <i>Research</i> ▪ <i>Collaboration</i> ▪ <i>Data Management and Dissemination of results</i> 	<ul style="list-style-type: none"> ▪ <i>Environmental Education</i> ▪ <i>Public Outreach and Information</i> ▪ <i>Alternative Livelihoods / Income Diversification</i> ▪ <i>Community Capacity Building</i> 	<ul style="list-style-type: none"> ▪ <i>Visitor Management (Safety and Protection)</i> ▪ <i>Visitor Education and Interpretation</i> 	<ul style="list-style-type: none"> ▪ <i>Planning</i> ▪ <i>General Management and Administration</i> ▪ <i>Human Resources</i> ▪ <i>Financial Management</i> ▪ <i>Partnership Relations</i> 	<ul style="list-style-type: none"> ▪ <i>General</i> ▪ <i>Administration and Operational Infrastructure</i> ▪ <i>Visitor Infrastructure</i> ▪ <i>Research infrastructure</i> ▪ <i>Equipment</i>

¹The Tourism and Recreation Program is only relevant if the designation changes to National Park

TABLE 40: MANAGEMENT PROGRAMS FOR TAPIR MOUNTAIN NATURE RESERVE

3.4.1 NATURAL RESOURCE MANAGEMENT PROGRAM

PROGRAM OBJECTIVE

To improve the status of biodiversity and ecosystem services and karst, archaeological and cultural features

The Natural Resource Protection Program focuses on protection of biodiversity and the maintenance of healthy, functional ecosystems through direct management interventions - surveillance and enforcement and direct biodiversity management interventions. Four sub-programs have been identified.

In 2019, a co-management agreement was signed with Belize Karst, which has a presence on the ground, but no dedicated, trained and equipped surveillance and enforcement team

NATURAL RESOURCE MANAGEMENT AND PROTECTION

- *Surveillance and Enforcement*
- *Boundaries and Zoning*
- *Addressing Specific Threats*
- *Reporting*

PRIORITY STRATEGIES

- Establish a surveillance and enforcement presence
- Ensure TMNR has the human resources, equipment and training for effective surveillance and enforcement
- Engage other enforcement agencies for collaborative surveillance and enforcement
- Build effective fire management capacity in the TMNR staff and in the TMNR landscape

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Natural Resource Management Program						
NRM 1: Surveillance and Enforcement	Timeframe					Measuring Success Indicators (per year)
	1	2	3	4	5	
<input type="checkbox"/> Develop & implement a Surveillance and Enforcement Plan (policies and protocols) to guide surveillance and enforcement in the field						<ul style="list-style-type: none"> ▪ Surveillance and Enforcement Plan ▪ % of equipment identified during annual needs assessment that is available to staff ▪ # patrols per year ▪ # of joint patrols with other enforcement agencies ▪ Mapping of patrol routes ▪ Mapping of incursion hotspots ▪ # reported incursion events ▪ # of warnings given per year ▪ # of cases taken to court and successful convictions ▪ # NPAS Act and Wildlife Act infractions ▪ # IoA infractions ▪ # repeat offenders ▪ # of adjacent landowners engaged and participating in 'neighbourhood watch' for natural resource violations ▪ % incidences reported by 'neighbourhood watch' that have been responded to by Tapir Mountain staff
<input type="checkbox"/> Ensure surveillance activities are strategic and effective, based on TM enforcement data, incidence mapping and identification of hotspots, key times, and with integration of SMART technology						
<input type="checkbox"/> Ensure Tapir Mountain staff have the equipment they need for effective surveillance and enforcement						
<input type="checkbox"/> Enforce national protected area and wildlife regulations						
<input type="checkbox"/> Strengthen cost and time effectiveness of surveillance through use of drone, camera and acoustic traps and other technologies						
<input type="checkbox"/> Establish and strengthen collaboration with the Forest Department and enforcement agencies towards monthly joint patrols						
<input type="checkbox"/> Strengthen communication and collaboration mechanisms with the Belize Tourism Board for effective enforcement of visitor regulations in Tapir Mountain, in collaboration with BTB						
<input type="checkbox"/> Engage local landowners in neighbourhood watch network towards improved protection of Tapir Mountain and adjacent properties						
Awareness of Regulations						
<input type="checkbox"/> Ensure signs are in place with rules and regulations						
<input type="checkbox"/> Ensure community leaders and members are aware of rationale for the protected area, location, rules and regulations, and boundaries through brochures, handouts and other related educational material						
<input type="checkbox"/> Ensure tour guides are aware of rationale for the protected area, location, rules and regulations, and boundaries through brochures, handouts and other related educational material						

Natural Resource Management Program						
NRM 1: Surveillance and Enforcement	Timeframe					Measuring Success Indicators (per year)
	1	2	3	4	5	
Human Resources and Training						
<input type="checkbox"/> Ensure Tapir Mountain has the staff for effective surveillance and enforcement activities						<ul style="list-style-type: none"> ▪ % of staff positions identified as required for effective surveillance and enforcement of Tapir Mountain that are filled ▪ % patrol staff who are considered fully trained for effective enforcement of regulations ▪ % staff familiar with tourism regulations relevant to Tapir Mountain ▪ % of staff that demonstrate an adequate knowledge on the ecosystem services provided by Tapir Mountain and the purpose of the protected areas
<input type="checkbox"/> Construct Ranger Post at Blackman Eddy entrance						
<input type="checkbox"/> Construct Ranger Post at Teakettle entrance						
<input type="checkbox"/> Rangers are fully trained for surveillance and enforcement activities, Green Laws, use of SMART, self-defence training, case file preparation, public relations						
<input type="checkbox"/> Ensure ongoing capacity building for all staff for effective surveillance and enforcement of tourism regulations, in collaboration with BTB						
<input type="checkbox"/> Rangers are trained for fire fighting						
<input type="checkbox"/> Ensure staff are aware of the critical role they and the protected area plays in maintenance of key ecosystem services, threatened species, tourism resource and livelihoods						
NRM 2: Boundaries and Zones						
<input type="checkbox"/> Effective demarcation of protected area in key identified areas of conflict						<ul style="list-style-type: none"> ▪ % of boundary that is cleared in critical areas ▪ % of Tapir Mountain staff who know the location and regulations of protected area zones ▪ % of Tapir Mountain users who know the location and regulations of protected area zones ▪ % border signs identified as required that are in place
<input type="checkbox"/> Ensure clear zone demarcation where relevant and dissemination of information on zones and zone regulations to all users of Tapir Mountain						
<input type="checkbox"/> Maintenance and replacement of boundary signs as needed						

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Natural Resource Management Program						
NRM 3: Addressing Specific Threats	Timeframe					Measuring Success Indicators (per year)
	1	2	3	4	5	
<input type="checkbox"/> Surveillance and enforcement to prevent illegal extraction of natural resources						<ul style="list-style-type: none"> ▪ # infractions reported for possession of game species ▪ # logging infractions reported ▪ % of Tapir Mountain affected by fires ▪ # of stakeholders trained in basic fire management ▪ % of stakeholders participating in fire management ▪ # of adjacent landowners engaged in improved fire management in the landscape ▪ # adjacent landowners actively participating in addressing fires in the landscape ▪ Map showing area of forest connectivity with MMM ▪ Agreements for maintaining forest connectivity with MMM
<input type="checkbox"/> Engagement of landowners and NGOs (e.g. Itzamna Society) adjacent to Tapir Mountain in addressing fire management in the landscape						
<input type="checkbox"/> Development of area-specific, trained fire task force – including adjacent landowners / local farmers / community / tourism sector						
<input type="checkbox"/> Training in basic fire management through the Forest Department / NBIO						
<input type="checkbox"/> Effective prevention / management of fires within the protected area and adjacent landscape						
<input type="checkbox"/> Work with adjacent landowners towards permanent protection of forest connectivity with Maya Mountains Massif						
NRM 4: Reporting	Timeframe					Measuring Success Indicators
<input type="checkbox"/> Maintain comprehensive patrol reports - number of patrols, zones patrolled, infractions noted, warnings given, and arrests made - strengthened with integrated use of SMART system						<ul style="list-style-type: none"> ▪ Quarterly and annual reports that include patrol data, infractions etc. ▪ Annual map of patrol routes / effort / hotspot areas for illegal activities and entrance points
<input type="checkbox"/> Produce quarterly reports, and submit FD and Advisory Committee						
<input type="checkbox"/> Produce annual reports and submit to FD and Advisory Committee						

3.4.2 RESEARCH AND MONITORING PROGRAM

PROGRAM OBJECTIVE

To establish ongoing monitoring and research activities for informing management decisions and measuring management success

Research and monitoring are essential activities to ensure informed, effective management, and to assess the effectiveness of Tapir Mountain in achieving its objectives of ecosystem and biodiversity management. The Research and Monitoring Program falls under the responsibility of the Research Coordinator, and is administered under four sub-programs.

Tapir Mountain has not been actively managed for many years, and there is no updated information on the biodiversity of the protected area. Seven conservation targets have been identified, but there is limited baseline data against which to measure management success. Once baselines have been established, a Research and Monitoring Plan will be developed to identify monitoring and research priorities and guide program activities.

Information should be available on the use of the area by Baird's Tapir (*Tapirus bairdii*), as the focal species after which the protected area was named. There is also a strong interest in building the information available on the bird species of the protected area, providing a logical focal point for the research and monitoring program, along with the monitoring of other identified conservation targets and threats.

PRIORITY STRATEGIES

- Establish a research and monitoring plan and framework for Tapir Mountain to guide program activities

Research and Monitoring

- *Research and Monitoring Framework*
- *Biodiversity and Environmental Monitoring*
- *Priority Research*
- *Collaboration*

CONSERVATION TARGETS

Central American (Baird's) Tapir

Charismatic Species

- Jaguars
- Howler Monkeys
- Endemic Birds

Game Species

- Game birds
- Game mammals

Raptors

Broadleaf Forest

- Forest Species
- Tree species
- Medicinal plants
- General forest vertebrate / invertebrate species
- Archaeological Sites

Rivers and Creeks

- Hydrology
- Water quality
- Fish and other water dependent species
- Piscivorous birds
- Hook-billed kites

Karst Landscape

- Caves
- Bats
- Archaeological artifacts
- Endemic fish species

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- Ensure the human resources and equipment are in place for implementation of the Research and Monitoring Plan
- Establish monitoring activities for priority conservation targets and threats
- Provide scientifically credible information for informing management decisions
- Establish an information management system to store and manage research and monitoring information (data, reports etc.)

Priority Targets

- ***Central American (Baird's) Tapir***
 - Baseline and ongoing monitoring tapir as a focal species
- ***Bird Species***
 - Baseline and ongoing monitoring of bird species
- ***Karst Landscape***
 - Mapping and inventory of karst features, including caves
- ***Rivers and Creeks***
 - Monitoring of weather

Priority Threats

- ***Illegal Hunting and logging***
 - Baseline and monitoring of game species (Threat: illegal hunting)
 - Baseline and monitoring of illegal hunting activities
 - Baseline and monitoring of illegal logging activities
 - Baseline and monitoring of illegal agricultural incursions
- ***Fire***
 - Monitoring of fire damage

Research priorities

- Hydrology
- Threatened Species
- Archaeological features and artefacts

In the first two years, monitoring activities will need to fall largely to the rangers as funds are located for a Research Coordinator and equipment to consolidate and expand the program and activities. Volunteers, particularly from the increasing ranks of Belize's bird network and Belize Bird Conservancy, may be an option for building baseline data on biodiversity during this initial period, as may partnering with other organizations such as the Environmental Research Institute (UB) and Panthera. There are concerns during this initial period, however, of the safety of field workers and equipment, with the extensive hunting and logging activity currently in the

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area, and as a result, monitoring and research activities may be limited until the security situation can be resolved.

Once the threats have been reduced to manageable levels, and the protected area designation amended, research will become a more established focus of the protected area, with the construction and equipping of a basic research base for hosting individuals and groups interested in conducting scientific and educational research in the area. Belize Karst will engage research partners through formal collaborative partnerships to address the identified priority research needs in three key areas: biodiversity, hydrology and archaeology.

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RESEARCH AND MONITORING PROGRAM						
RMP 1: Research and Monitoring Framework	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Develop the Tapir Mountain Research and Monitoring Plan, identifying the research and monitoring priorities, human resources and equipment needs, potential collaborations and the timeframe for implementation of activities						<ul style="list-style-type: none"> ▪ Research and Monitoring Plan ▪ Integration of national monitoring targets ▪ Integration of Management Effectiveness biodiversity indicators ▪ % of equipment identified by a needs assessment that has been acquired ▪ % identified partners that have been successfully engaged ▪ Research Coordinator ▪ # Community Researcher ▪ # rangers trained for key biodiversity monitoring ▪ Research Facilities ▪ Accessible information from research and monitoring disseminated to partners, community leaders, schools etc. through social media, presentations, video etc. ▪ Improved understanding of research outputs by local stakeholders
<input type="checkbox"/> Ensure the relevant biodiversity indicators from the Management Effectiveness Evaluation Tool are integrated into the plan						
<input type="checkbox"/> Develop Limits of Acceptable Change indicators and monitoring program for monitoring visitor impacts at Tapir Mountain and integrate monitoring indicators into Research and Monitoring Plan						
<input type="checkbox"/> Equip the Research and Monitoring Program (at minimum, laptop, GPS, field guides, binoculars, camera traps)						
<input type="checkbox"/> Use technology and on-line platforms for improved data collection and analysis (SMART, iNaturalist, e-bird, GIS, drone imagery, remote sensing)						
<input type="checkbox"/> Ensure the Research and Monitoring Program has the trained human resources for effective implementation of the Research and Monitoring Plan (Research Coordinator, Community Researchers, collaborative partnerships)						
<input type="checkbox"/> Build capacity within the organization and community for participation in research and monitoring activities						
<input type="checkbox"/> Ensure effective data and information management within the organization to facilitate cross-program analysis and to provide a platform from which the results can be communicated to a wider audience						
<input type="checkbox"/> Construct Research Facilities in Tapir Mountain						
<input type="checkbox"/> Ensure information from research and monitoring outputs is effectively informing management decisions						

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RESEARCH AND MONITORING PROGRAM						
RMP 1: Research and Monitoring Framework	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Provide data to the National Biodiversity Monitoring Program						<ul style="list-style-type: none"> ▪ Presence of TM in relevant national / regional databases ▪ Annual research and monitoring report, integrated into the Tapir Mountain Annual Report ▪ % recommendations from Annual Reports that are integrated into annual workplans
<input type="checkbox"/> Ensure outputs from the research and monitoring activities are presented in the Annual Report						
<input type="checkbox"/> Translate research and monitoring outputs into a form that the public understands, and make available to stakeholders and disseminate to conservation partners and national and local stakeholders						
RMP 2: Biodiversity and Environmental Monitoring	Timeframe					Measuring Success Indicators
<input type="checkbox"/> Key baseline surveys: Mammals, birds, reptiles, amphibians, fish, plants / trees, mapping of karst features,						<ul style="list-style-type: none"> ▪ Baseline information on key species ▪ Monitoring data and reporting on key conservation targets ▪ Data and reporting on key threats ▪ Data on visitation / use of Tapir Mountain ▪ Data on Limits of Acceptable Change indicators
<input type="checkbox"/> Baseline Socio-economic assessment of communities and stakeholders in the Tapir Mountain Landscape						
<input type="checkbox"/> Monitor key environmental parameters (water flow / water quality, climate)						
<input type="checkbox"/> Monitor priority conservation targets: game species, tapir, birds						
<input type="checkbox"/> Monitor priority threats: illegal hunting, fire damage						
<input type="checkbox"/> Monitor land use change in the Tapir Mountain landscape						
<input type="checkbox"/> Stakeholder Analysis of the Tapir Mountain Landscape						
<input type="checkbox"/> Monitor number of visitors / researchers using Tapir Mountains						
<input type="checkbox"/> Monitor researcher / visitor / tour guide satisfaction under the Limits of Acceptable Change Program						
<input type="checkbox"/> Monitor Limits of Acceptable Change indicators						

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RESEARCH AND MONITORING PROGRAM						
RMP 3: Research	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Priority research: Hydrology of the Tapir Mountain area						<ul style="list-style-type: none"> ▪ Report on hydrology of the area ▪ Reports on status of threatened species in the area ▪ Reports on status of karst and archaeological features of Tapir Mountain
<input type="checkbox"/> Priority research: Status of threatened species in Tapir Mountain						
<input type="checkbox"/> Priority research: Karst and archaeological features of Tapir Mountain						
RMP 4: Collaboration and Partnerships	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Establish partnerships with conservation organizations / universities in Belize to strengthen monitoring and research at Tapir Mountain						<ul style="list-style-type: none"> ▪ List of identified organizations ▪ % of identified organizations that have been successfully engaged ▪ # youths / community stakeholders engaged as Community Researchers ▪ # research partnerships established ▪ # universities engaged for hosting of student research projects ▪ # students / student groups hosted
<input type="checkbox"/> Establish Community Researcher program, with training for youths in the Tapir Mountain stakeholder communities						
<input type="checkbox"/> Establish research partnerships with Universities for addressing identified research priorities						
<input type="checkbox"/> Establish partnerships with universities for hosting of research students and student research projects						
<input type="checkbox"/> Ensure all researchers / research students have the relevant research permits and are aware of the zones, rules and regulations of the protected area						
<input type="checkbox"/> Ensure all researchers / research students have an orientation to the protected area, covering rules and regulations and health and safety						
<input type="checkbox"/> Ensure all researchers / research students have access to biodiversity, ecosystem data, maps and shape files relevant to their research topic						

3.4.3 COMMUNITY OUTREACH AND PARTICIPATION PROGRAM

PROGRAM OBJECTIVE

To ensure stakeholders are informed stewards of Tapir Mountain, and have opportunities to benefit socio economically from the protected area

Belize Karst recognizes the importance of ensuring community engagement and participation as part of effective management of the protected area. However, as a newly formed organization in a new co-management role, it has significant work ahead to engage stakeholders and stakeholder communities. Past initiatives in the area (previous management of TMNR, and the establishment of Actun Tunichil Muknal as a tourism destination) have not yielded the benefits the communities were hoping for, increasing the challenge in re-engaging them and encouraging their participation over the next five years.

COMMUNITY OUTREACH AND PARTICIPATION

- *Education and Awareness*
- *Outreach*
- *Community / Stakeholder Participation Activities*
- *Socio-Economic Benefits to Communities and Stakeholders*

This program seeks to achieve six key outcomes:

- Community leaders, groups and stakeholders with sustained, active partnerships with Belize Karst
- Communities and stakeholders that are engaged and actively participating in the protection of ecosystem services and biodiversity
- Communities and stakeholders that support conservation and sustainable use in the landscape
- Communities that understand and are building their resilience to climate change
- Youths that are engaged and are active conservation leaders in their communities and the Tapir Mountain landscape
- Communities and stakeholders benefiting from the presence of Tapir Mountain, improving their livelihoods and reducing their impacts on the natural resources
- Engage landowners immediately outside the PA boundary, with priority given to those with cleared land along the protected area boundary.

A watershed / water security approach will assist in framing the interventions, focusing on improving awareness of watershed values, and promoting best practices in the watershed and water conservation in the communities. Climate change and building resilience is also an important focus – Belize Karst needs to continue building staff, volunteer and community understanding and capacity for identifying and implementing strategies that will improve

protected area and community resilience to climate change. The third focus is on engaging youths and other stakeholders in an understanding and appreciation of the birds of the TMNR landscape.

EDUCATION AND AWARENESS

Increasing awareness is essential as a foundation and starting point towards reducing anthropogenic threats and improving support for the protected area. Strengthening education and awareness is critical to improve recognition of the role of Tapir Mountain in the landscape in providing ecosystem services as well as its potential to offer economic benefits through access to opportunities to communities. Five thematic knowledge areas are identified as important for nurturing an enabling environment:

- Value of protected areas to community health and to the local and national economy
- Ecosystem service value and benefits of protected areas in the TMNR landscape (with an emphasis on water security)
- TMNR conservation targets and threats
- Threatened Species, protected area, wildlife protection and fire legislation
- Climate change impacts, adaptation and resilience

Reaching out to the communities requires a multi-pronged approach, strategic communication strategies and outreach / awareness strategies with messages tailored to each of the six identified target audiences:

- Community Members
- Community Leaders
- Community Groups
- Schools and Youths
- Tourism Sector
- Farming Sector

Outreach activities are tightly linked with the development of the Communication Plan, which will define the best mechanisms for reaching each of the target groups (presentations and activities in the schools, meetings with community leaders and community groups, posters in the communities on key awareness topics, social media postings for reaching the youths etc.), frequency of communication, and target group priority.

Youth engagement in conservation and developing a connection with nature is considered increasingly important as Belize moves into the future. Developing an understanding of the natural world, of the importance of ecosystem services, support for protected areas and promoting leadership in conservation of species and ecosystem is critical. The importance of engaging youths through education and awareness activities cannot be over-emphasized, and

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structured educational youth activities are an important component of community engagement. Analysis of school-focused education and outreach programs (Walker, Z., 2019) has shown that:

- Multi-year outreach strengthens student engagement and understanding. Continuity is important, starting from the Infants and extending to High School, with the need to move beyond project-based, one-year programs to an integrated, well-structured, multi-year program.
- Field activities and outdoor experiences are critical in successful engagement of youths and inspiring the next generation of conservation leaders. They are identified in the as the most effective mechanism for engaging interest in the environment and building conservation leadership skills.
- Outreach should also focus on creating conservation leaders, with mechanisms for continued participation to keep youths engaged beyond school – Community Researcher and Internship Programs have been used successfully in other organizations to achieve this.
- Where more than one conservation organization is targeting a community for outreach activities, outreach will be more successful if it is coordinated, with unified messaging. It will also be more cost-effective, with sharing of costs between participating partners (potential partners include Forest Department / NBIO, Itzamna Society and FCD).
- Activities are best designed for after school / at weekends, with endorsement by the schools but with permission for participation in activities coming directly from the parents – this reduces the complexities and liability issues of working through the schools.
- The after-school student engagement programs should be self-contained and not rely on the participation of teachers. Teachers are already overworked and very few have the time, enthusiasm and energy to commit to extracurricular activities

Engagement of youths beyond school through programs such as Community Researchers provides opportunities for learning new skills and gaining experience, whilst also filling critical human resource gaps within the organization. Belize Karst does not currently have the human resources to launch a full education and awareness program, and will need to be strategic in where it invests its human and financial resources, integrating the above guidelines into education and awareness strategies.

OUTREACH

As an organization in its startup phase, Belize Karst does not currently have the staff, budget or logistical support for a sustained outreach program, and needs to be strategic in what can be achieved in the first two to three years, guided by a Communication Plan. In the long term, however, the organization should work towards a program that is more focused on sustained

outreach, based on a well-structured Communication Plan that can assist it maintain contact with relevant partners and stakeholders, and strengthen engagement over time.

SOCIO-ECONOMIC BENEFIT

Belize Karst has identified a number of strategies for reducing pressure from the communities but still need to put in place the structures, processes and partnerships for successful investment in activities that support protected area outcomes. Before embarking on any livelihood initiatives, it is recommended that Belize Karst discuss lessons learnt with other organizations (e.g. FCD, Ya'axche Conservation Trust, BAS, SACD). Another important first step before investing in projects that improve community and other stakeholder opportunities and benefits is investment in building capacity to improve the chances of project success.

Any project-based investment in community initiatives should be targeted at reducing pressures on the protected area and improving long term climate change resilience in the landscape. Investments need to be tied into the goal and objectives of the protected area and be based on in-depth consultation and assessment of need and capacity of potential project participants. Investments should also be guided by the organizational strategic framework, the management plan and a structured Community / Stakeholder Investment Plan, to ensure clear investment goals and objectives, targeted for maximum conservation outcomes.

Projects focused on agriculture need to be tailored to address the challenges of increasing impacts of drought and unpredictable rainfall, and the need to shift to climate-smart agriculture, and not exacerbate the situation. This may be through focusing on shade houses, drought-resistant crops and varieties, agro-ecology / agro-forestry techniques, changes in planting times, more efficient use of water, and retention of forest services in the community landscapes as mechanisms that can be used to strengthen agricultural resilience to climate change.

Identified potential projects could include:

- Improving marketing of the protected area to increase opportunities for income generation through tourism
- Support of ongoing and new climate-smart agroforestry systems in the communities that build soil fertility and promote shade, with priority going to high-poverty families that are known to conduct illegal logging and hunting.
- Support of tourism and other entrepreneurial initiatives in the communities that will improve the socio-economic environment and job opportunities, while increasing support for conservation.
- Building capacity for fire management in stakeholders and communities
- Building capacity of youths as conservation leaders
- Developing site-specific best practices with tour guides

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- Piloting water conservation mechanisms in the schools
- Providing increased access to skills training for youths, for improved opportunities for employment, with priority going to high-poverty families that are known to conduct illegal logging and hunting in the area.

Strategies should integrate the following guidelines for selection of projects / partners:

- Project alignment with TMNR objectives / management strategies
- Reliability of, and community respect for, applicant (person / group applying)
- Importance of support of applicant for improving conservation outputs for TMNR (e.g. a high priority would be projects by past or current illegal hunter)
- Predicted future direct impact of applicant on TMNR
- Level of commitment of person / group applying
- Capacity of the applicant to implement the project
- Level of understanding of applicant of project implementation, monitoring and evaluation
- Clear link to (and understanding of) conservation return in the application / proposal
- Evidence of ability to provide any co-financing / loan repayments required
- Willingness of applicant to participate in training opportunities and support TMNR events
- Ability of project to increase employment opportunities in the communities
- Project improves opportunities for youths / women
- Project benefits will be spread equitably among beneficiaries, taking into account relative input of participants
- Project support of community stability and development, and potential to address identified key community issues
- Presence of a viable market for the proposed business
- Potential of the business venture to be self-sustaining after 3 years
- Project has potential and is designed for expansion beyond initial investment

Three pre-conditions have been identified for facilitating success of income diversification investments in communities:

- Community understanding of projects, funding cycles, project implementation and project reporting.
- Consistent support of community groups: Good communication, building community capacity based on a training needs assessment, continuity of presence and support beyond the start-up
- An environment that enables project success – project location has secure land tenure ship, access to project site, utilities if needed (water, electricity), and ongoing technical support beyond the project lifespan.

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Belize Karst needs to be in a position to be able to provide the level of support needed before starting on any significant income diversification initiatives, with an investment plan, and the personnel in place to provide the skills and level of support required for the specific projects selected for implementation. As part of its gender policy, Belize Karst should also assess any strategies for their implications for women and men, and ensure equitable spread of opportunities before implementation. There should also be adequate end-of project evaluation – did the investment provide the expected conservation returns (e.g. reduced hunting pressure, improved water conservation).

COMMUNITY OUTREACH AND PARTICIPATION						
COP 1: Education And Awareness	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Develop a structured Community Engagement Plan with well-defined goals and objectives that focuses on ensuring effective transfer of key concepts and is linked to the Communication Plan						<ul style="list-style-type: none"> ▪ Community Engagement Plan ▪ % of community members surveyed that: <ul style="list-style-type: none"> ▪ consider TMNR important ▪ recognize the ecosystem services of TMNR ▪ recognize the watershed values of TMNR ▪ recognize the role of Belize Karst in watershed protection ▪ understand climate change impacts ▪ know how to build their household resilience ▪ are aware of the regulations under the National Protected Areas System Act ▪ are aware of the regulations under the Wildlife Protection Act ▪ # teachers participating in development of Belize Karst School calendar ▪ # activities implemented per school per community
<input type="checkbox"/> Collaborate with other conservation partners in the landscape in delivery of coordinated conservation awareness messaging to stakeholder communities (FCD, Itzamna Society, Forest Department/NBIO)						
<input type="checkbox"/> Increase awareness and recognition of ecosystem services, biodiversity and importance of protected areas / TMNR in the communities.						
<input type="checkbox"/> Improve awareness of watershed values and the role of Belize Karst / TMNR in ensuring these values are maintained in community leaders, community groups, farmers, women and youths						
<input type="checkbox"/> Improve awareness of climate change impacts and adaptation for building resilience in community leaders, community groups, farmers, women and youths						
<input type="checkbox"/> Improve stakeholder awareness of protected area and wildlife legislation						
<input type="checkbox"/> Meet with teachers for guidance on school activities and how they can be aligned and scheduled to support learning topics in the schools, linked to the national curriculum						
<input type="checkbox"/> Provide regular awareness activities/lessons for the stakeholder community schools, in collaboration with the schools - one visit per school per quarter.						

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COMMUNITY OUTREACH AND PARTICIPATION						
COP 1: Education And Awareness	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Host structured school visits to Tapir Mountain to improve student engagement and build a sense of ownership						<ul style="list-style-type: none"> ▪ # of field trips to TMNR per school per community ▪ List of collaborating conservation organizations ▪ List of coordinated conservation awareness messages ▪ # of bird-related activities per school per community ▪ # of community members surveyed who recognize the importance of birds to local tourism ▪ # of community members surveyed who know that it is illegal to keep wildlife as pets (including parrots) ▪ # of parrots surrendered / permitted ▪ # of other wildlife species surrendered
<input type="checkbox"/> Build community support for bird tourism, integrating school and community activities on birds, school bird gardens, joint schools bird fair, and advocating for a no shooting of birds /no illegal pet bird community policy						
<input type="checkbox"/> Partner with the Forest Department, Belize Bird Rescue, Belize Wildlife and Referral Clinic and Wildtracks to improve awareness of the wildlife law and advocate for surrendering of wildlife pets (or grandfather clause permitting of parrots)						
COP 2: Outreach	Timeframe					Measuring Success Indicators
<input type="checkbox"/> Develop a Communication Plan that guides and prioritizes structured communication activities and targeted messaging, identifying the best mechanisms for communicating with each stakeholder sector						<ul style="list-style-type: none"> ▪ Communication Plan ▪ Information on research and monitoring outputs provided to the communities, tourism stakeholders and conservation partners – presentation, social media ▪ # of meetings with IoA / ATM rangers ▪ # tour guides considered fully engaged ▪ # tour operators considered fully engaged ▪ # resorts / tourism facilities in the TMNR landscape considered fully engaged ▪ % community groups considered fully engaged
<input type="checkbox"/> Translate research and monitoring outputs into formats that the communities will understand, and make available to communities, conservation partners and national and local stakeholders						
<input type="checkbox"/> Strengthen communication with IoA and IoA rangers at ATM						
<input type="checkbox"/> Strengthen communication with, and engagement of, farming, tourism, women and youth sectors in the communities						

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COMMUNITY OUTREACH AND PARTICIPATION						
COP 3: Community Participation	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Develop, equip and implement a Citizen Science Plan for youth / community participation						<ul style="list-style-type: none"> ▪ # TMNR community conservation activities ▪ # structured youth conservation activities ▪ # participants in conservation activities
<input type="checkbox"/> Conduct events to facilitate community participation in conservation / natural resource management activities (e.g. Bioblitz, bird banding, use of inaturalist / e-bird)						<ul style="list-style-type: none"> ▪ # TMNR community conservation activities ▪ # structured youth conservation activities ▪ # Youth group / school conservation projects implemented
<input type="checkbox"/> Engage communities in assisting with monitoring and reporting fires						<ul style="list-style-type: none"> ▪ # community participants in conservation activities
<input type="checkbox"/> Invest in small youth group, school and community activities linked to watershed protection and / or birds						<ul style="list-style-type: none"> ▪ # farmers participating in basic fire management
<input type="checkbox"/> Engage farmers through fire awareness and training in basic fire management						
COP 4: Socio-Economic Benefits	Timeframe					Measuring Success Indicators
<input type="checkbox"/> Develop and implement a Community / Stakeholder Benefit Strategy as part of the Community Engagement and investment Plan, focused on diversified options, based on in-depth consultation and assessment of need, and guided by the organizational strategic framework to ensure identified projects contribute to achieving protected area goal and objectives						<ul style="list-style-type: none"> ▪ Community / stakeholder benefit strategy as a component of the Community Engagement and investment Plan ▪ # stakeholders surveyed that perceive that they have benefitted from the TMNR Benefit Strategy ▪ Tourism Marketing Plan for TMNR
<input type="checkbox"/> Improve marketing of TMNR to promote use as a tourism resource for the benefit of stakeholder communities						<ul style="list-style-type: none"> ▪ # visitors ▪ # stakeholders surveyed that perceive that they have benefitted from the presence of TMNR
<input type="checkbox"/> Build community capacity through trainings (organizational management, planning, financial management, proposal development etc.)						<ul style="list-style-type: none"> ▪ # stakeholders participating in community capacity trainings

COMMUNITY OUTREACH AND PARTICIPATION						
COP 3: Community Participation	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Invest in youth skills trainings for improved employment opportunities						<ul style="list-style-type: none"> ▪ # youths participating in skills training opportunities ▪ # scholarships per community
<input type="checkbox"/> Invest in high school conservation scholarships for students from higher poverty families that rely heavily on the natural resources, with an interest in the environment, to continue education						

3.4.4 PUBLIC USE PROGRAM

PROGRAM OBJECTIVE

To provide opportunities for nature-based public use with minimal environmental impact that supports the goal of the protected area.

Belize Karst sees Tapir Mountain as an opportunity to engage researchers from different fields (mammals, birds, insects, plants, archaeologists, speleologists) and bringing knowledge together while protecting the environment and improving benefits for the local communities. Reclassification as a National Park will also open the area for carefully controlled, low impact tourism, providing a financial sustainability mechanism. The development of the area as a research and educational destination will also provide the foundation for the proposed move into nature-based tourism and international student groups, with facilities and information for hosting not only international visitors, but also local student and community groups, building knowledge and appreciation of the protected area. Belize Karst is able to bring their high level of business and tourism expertise, and their partnerships with the international tourism sector to provide a strong foundation to developing TMNR as a model for tourism as an effective financial sustainability mechanism.

PUBLIC USE

- *Visitor Management*
- *Visitor Interpretation*
- *Marketing*

The Public Use Program addresses visitor use to the protected area – whether researchers, tourists, students or school groups. For all these sectors, activities in TMNR should be tailored to increase awareness of the conservation value of the area, developing broad-scale public support, and providing a tourism destination that can provide financial sustainability for the protected area and benefits for communities and other stakeholders.

The development of a Visitor Use Plan (Public Use Plan) will assist in designing trail systems and zoning use areas, taking into account different visitor use types during the planning process, and provision of positive visitor experience for all visitor types. With the rich birdlife of the area, a significant focus on bird tourism can provide a starting point for the development of information, facilities and marketing for the protected area. The second focus, particularly for local visitors, should be on the biodiversity and watershed characteristics of the area – the protection of the underground water system and its importance to the local farmers and communities.

The Visitor Use planning process should be fully participatory, engaging tour guides, tour operators and local resorts / tourism facilities, providing opportunities for their input into its development, and participation in the development of best practice tourism use guidelines for the area.

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In the current Covid-19 environment, the plan also needs to be the integration of standard procedures in place to ensure the safety of both visitors and staff, with effective infrastructure and signage in place to reduce the threat of transmission. These procedures would need to be in place as soon as the Nature Reserve opens for visitation, whether by local school parties or international visitors.

Tourism at Tapir Mountain Nature Reserve should be:

- Proactive and planned, to ensure maintenance of protected area values and objectives
- Planned within the capacity of sustainable use of natural resources available within and around the protected areas and with respect to environmental limits (e.g. water use and availability, disposal of sewage and liquid and solid wastes)
- Conducted by experienced, knowledgeable and competent tour guides
- Acceptable to local communities, with their participation in the planning process
- A partnership, with engagement of community and private sector, collaborating in support of biodiversity conservation
- Providing realistic and equitable benefits to local communities and other stakeholders
- Developed cautiously, with avoidance of development that is driven by demand rather than conservation priorities, or that exceeds predicted market demand
- Effectively managed through zoning to provide diverse recreational opportunities and to meet visitor expectations
- Effectively managed to ensure visitor behaviour impacts to the natural and social environment are within acceptable limits
- Informed by an effective Limits of Acceptable Change framework, with action being taken to correct any adverse impacts on protected area management and conservation goals
- Planned with an awareness of the changing climate change and associated impacts

The development of visitor use in the area over the five years is scheduled as follows:

YEAR 1

- Reclassification as a National Park
- Engagement of tour operators / tour guides, with familiarization activities in the area, and participation in the development of the Visitor Use Plan and tourism best practices
- Access: Road maintenance for improved access.
 - Parking lot
- Development of first phase tourism hub facilities by Blackman Eddy Ranger Station:
 - Installation of compost toilets,
 - Construction of sheltered picnic area. by gate.
 - Development of good trail system and visitor signs
- Development of Visitor Use Plan (Years 1 and 2)
- Development of Health, Safety and Emergency Response Plan

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YEAR 2

- Construction of Visitor Centre
- On site staff trained in meet and greet
- Day tours coordinated through Belize Karst Habitat Conservation
- Marketing of day tours to the protected area
- Hosting of school and youth learning and conservation activities
- Hosting of international student groups
- Visitor management zoning – tourism / school zones and research / management zones
- Development of Limits of Acceptable Change framework

YEAR 3

- Construction of overnight accommodation for researchers
- Marketing to universities for hosting research projects
- Engagement of international tour companies for hosting nature based tourism – hiking / birdwatching
- On site night manager
- Self-guided trails
- Visitor management / signs / liability waiver

YEAR 5

- Construction of research facility

PUBLIC USE						
PUP 1: Visitor Management	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Develop a structured Visitor Use /Public Use Plan, with integrated guidelines and safety measures based on risk assessment, with an integrated Limits of Acceptable Change framework						<ul style="list-style-type: none"> ▪ Visitor Use Plan <ul style="list-style-type: none"> ▪ Covid-19 precautionary protocols and infrastructure in place for arriving visitors ▪ Maintained access road and parking lot ▪ Maintained trail system ▪ Trail map ▪ Visitor Signage ▪ Bird species checklist ▪ Visitor Centre with bathroom facilities ▪ Research Facility ▪ Picnic / School group sheltered area ▪ Fire watchtower ▪ # local / overseas universities using the area ▪ # long term research projects established ▪ Agreement with IoA for cave research ▪ Meeting notes on discussion with IoA on opening a cave for visitation ▪ Emergency Response Plan ▪ # staff trained in implementing the Emergency Response Plan
<input type="checkbox"/> Over the next five years, establish the infrastructure maintained to support visitor access and activities, including: <ul style="list-style-type: none"> ▪ Covid-19 precautionary protocols and infrastructure in place for arriving visitors ▪ Maintained access road and parking lot ▪ Maintained trail system ▪ Trail map and Visitor Signage ▪ Bird species checklist ▪ Research Facility ▪ Visitor Centre with bathroom facilities ▪ Picnic / School group sheltered area ▪ Fire watchtower 						
<input type="checkbox"/> Engage local and overseas universities in establishment of long term research projects in the area focused on key research needs for informed management						
<input type="checkbox"/> Develop an agreement, guidance and workplan with the IoA for research of the cave systems						
<input type="checkbox"/> Investigate the potential for opening a cave to visitation in collaboration with IoA						
<input type="checkbox"/> Ensure effective emergency procedures are in place for visitor activities and sites (including caves if they are opened during this management cycle), and staff trained in implementation						

PUBLIC USE						
PUP 1: Visitor Management	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Provide relevant staff with training in hospitality / meet and greet, and basic facts about the protected area / introductory talk, to facilitate their interaction with visitors						<ul style="list-style-type: none"> ▪ # staff trained in hospitality / meet and greet ▪ Agreement with BTB ▪ List of best tourism practices for TMNR ▪ # of tour guides participating in development of best tourism practices ▪ TMNR research use policies and guidelines ▪ TMNR school group policies and guidelines ▪ TMNR youth conservation volunteer activity policies and guidelines ▪ # warnings given to / actions taken against tourism infractions ▪ Entrance fee / visitor user fee mechanism in place ▪ Monthly income from entrance fees / visitor user fees ▪ # visitors per month / quarter / year, segregated by type of visitor and type of use ▪ Annual report on visitor satisfaction from visitor surveys ▪ Limits of Acceptable Change monitoring program ▪ Annual report on review of LoAC program implementation
<input type="checkbox"/> Engage BTB through formal agreement for reporting / enforcement of tourism infractions by tour guides, tour operators and / or tourists						
<input type="checkbox"/> Ensure all NPAS Act visitor regulations are enforced, in collaboration with Forest Department / NBIO						
<input type="checkbox"/> Work with tour guides to identify and implement best tourism practices in Tapir Mountain						
<input type="checkbox"/> Establish research guidelines and policies for researchers and students using the area						
<input type="checkbox"/> Establish guidelines / policies for local school group use of the area						
<input type="checkbox"/> Establish guidelines and policies for youth conservation activities in the protected area						
<input type="checkbox"/> Ensure all researchers / research students have the relevant research permits and are provided with an orientation to the protected area, covering rules and regulations, health and safety						
<input type="checkbox"/> Explore the feasibility of charging entrance fees / visitor user fees with the Forest Department / NBIO						
<input type="checkbox"/> Ensure that data on research and tourism visitation, public use and visitor satisfaction is available to assist in management decisions						
<input type="checkbox"/> Develop and implement Limits of Acceptable Change monitoring for environmental and socio-economic impacts of tourism						

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PUBLIC USE						
PUP 2: Visitor Interpretation	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Develop interpretive information for installation at the Visitor Centre and update / change each year						<ul style="list-style-type: none"> ▪ Visitor Centre has interpretive information ▪ Visitor satisfaction with level of information and presentation (survey of tourists and school group students / teachers) ▪ Interpretive trail ▪ Self-guided booklet for interpretive trail ▪ Educational materials ▪ % of identified information signage that has been installed
<input type="checkbox"/> Provide updated information on wildlife sightings, especially birds						
<input type="checkbox"/> Establish interpretive trail with associated self-guided information						
<input type="checkbox"/> Develop educational materials and program for use with school groups						
<input type="checkbox"/> Informational signage installed as per the Visitor Use Plan						
PUP 3: Business Planning and Marketing	Timeframe					Measuring Success Indicators
<input type="checkbox"/> Develop and implement a business plan for the development of tourism as a financial sustainability mechanism for the protected area						<ul style="list-style-type: none"> ▪ Business plan ▪ Papers for business arm of Belize Karst ▪ Visitor fee system ▪ Annual income from fees ▪ Annual income from marketable goods (t-shirts etc.) ▪ # tour operators sending tours to TMNR ▪ # tour operators including TMNR in their marketing ▪ Website marketing tours to TMNR ▪ International marketing information
<input type="checkbox"/> Develop the legal framework for the tourism business						
<input type="checkbox"/> Provide marketable items for sale to visitors						
<input type="checkbox"/> Engage tour operators in using the protected area for day tours, with marketing in Belize						
<input type="checkbox"/> Establish web-based marketing for the tourism business						
<input type="checkbox"/> Market the protected area for its research and tourism values both in Belize and internationally, once facilities have been established						

3.4.5 INFRASTRUCTURE AND EQUIPMENT PROGRAM

PROGRAM OBJECTIVE

Ensure that Belize Karst Habitat Conservation has the infrastructure and equipment required for effective management of the protected area.

The Infrastructure Program covers future infrastructure and equipment.

INFRASTRUCTURE
<ul style="list-style-type: none"> ▪ <i>General Infrastructure</i> ▪ <i>Visitor Infrastructure</i> ▪ <i>Equipment</i>

INFRASTRUCTURE

Belize Karst has no infrastructure at the site, but has identified infrastructure needs for the next five years for the two scenarios – as a Nature Reserve, and as a National Park (Table 41 and 42)

YEAR	INFRASTRUCTURE DEVELOPMENT
YEAR 1	<ul style="list-style-type: none"> ▪ Ranger Station 1, with: <i>Solar / water collection / vehicle / radio communication / equipment tool shed</i>) ▪ Investigate feasibility for drilling well Improve access road ▪ Establish trail system ▪ Entrance gate ▪ Parking Lot ▪ Bathroom Facility ▪ Equip Programs ▪ Develop maintenance program ▪ Medivac Helicopter Landing Site
YEAR 2	<ul style="list-style-type: none"> ▪ Watchtower – fire surveillance and raptor migration
YEAR 3	<ul style="list-style-type: none"> ▪ Research Station Phase 1 (accommodation) ▪ Ranger Station 2 ▪ <i>Solar / water / vehicle / radio communication</i>
YEAR 4	<ul style="list-style-type: none"> ▪ Expansion of Research Station
YEAR 5	<ul style="list-style-type: none"> ▪ Expansion of Research Station

TABLE 41: NATURE RESERVE: TIMELINE FOR INFRASTRUCTURE DEVELOPMENT

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YEAR	INFRASTRUCTURE DEVELOPMENT
YEAR 1	<ul style="list-style-type: none"> ▪ Ranger Station 1, with: <i>Solar / water collection / vehicle / radio communication / equipment tool shed</i>) ▪ Investigate feasibility for drilling well Improve access road ▪ Establish trail system ▪ Map / plan of visitor facility development bearing in mind flooding / fire / security / visitor management ▪ Visitor signage ▪ Entrance gate ▪ Parking Lot ▪ Bathroom Facility ▪ Equip Programs ▪ Develop maintenance program ▪ Visitor Centre Pt 1 (60 x 25) with picnic tables ▪ Medivac Helicopter Landing Site
YEAR 2	<ul style="list-style-type: none"> ▪ Improve Visitor Centre Facilities ▪ Watchtower – fire surveillance and raptor migration
YEAR 3	<ul style="list-style-type: none"> ▪ Research Station Phase 1 (accommodation) ▪ Improve Visitor Centre Facilities ▪ Ranger Station 2 ▪ <i>Solar / water / vehicle / radio communication</i>
YEAR 4	<ul style="list-style-type: none"> ▪ Expansion of Research Station ▪ Improve Visitor Centre Facilities
YEAR 5	<ul style="list-style-type: none"> ▪ Expansion of Research Station ▪ Improve Visitor Centre Facilities

TABLE 42: NATIONAL PARK: TIMELINE FOR INFRASTRUCTURE DEVELOPMENT

EQUIPMENT

Belize Karst currently has very limited equipment, and will need to conduct an equipment needs assessment for each program area, prioritizing critical equipment for inclusion in funding applications, and equipment that can be bought at a later date when more resources are available.

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INFRASTRUCTURE AND EQUIPMENT						
I 1: General Infrastructure	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Develop an infrastructure development plan that takes into account access, flooding / fire / security / visitor management						<ul style="list-style-type: none"> ▪ Infrastructure Development Plan ▪ Annual needs assessment that identifies identifies essential facilities and equipment needed ▪ % of required boundary signs that are installed ▪ Report on feasibility of drilling well ▪ Working well ▪ % of time when TMNR is accessible by 2-wheel drive vehicles ▪ Entrance gate ▪ Parking Lot
<input type="checkbox"/> Construct 2 ranger stations						
<input type="checkbox"/> Investigate feasibility for drilling well						
<input type="checkbox"/> Improve access road						
<input type="checkbox"/> Conduct a needs assessment at the end of each year to identify essential facilities and equipment required for effective management of the conservation area for prioritization over the next years						
<input type="checkbox"/> Ensure signs are installed in key boundary areas						
I 2: Visitor Infrastructure	Timeframe					Measuring Success Indicators
<input type="checkbox"/> Establish visitor infrastructure following the infrastructure development plan						<ul style="list-style-type: none"> ▪ Visitor Infrastructure installed: <ul style="list-style-type: none"> ▪ Ranger Station 1 ▪ Establish trail system ▪ Visitor signage ▪ Trail Map ▪ Bathroom Facility ▪ Equip Programs ▪ Maintenance Plan ▪ Visitor Centre Pt 1 (60 x 25) with picnic tables ▪ Medivac Helicopter Landing Site
<input type="checkbox"/> Install signs on road from highway to direct visitors to TMNR						
<input type="checkbox"/> Establish trails and trail infrastructure – steps, bridges, benches etc. where needed based on the Visitor Use Plan / Infrastructure Plan and needs assessment						
<input type="checkbox"/> Develop and install trail map, with distances and level of difficulty, to guide visitors						
<input type="checkbox"/> Install signs and garbage bins to minimize visitor impacts at Visitor Centre						

INFRASTRUCTURE AND EQUIPMENT						
I 3: Equipment	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Assess and prioritize program equipment needs annually						<ul style="list-style-type: none"> ▪ Report on prioritized equipment needs assessment output per program area ▪ % of priority equipment that has been purchased per program area ▪ % non-priority equipment that has been purchased per program area ▪ Equipment inventory
<input type="checkbox"/> Ensure priority equipment is available for effective surveillance and enforcement (including logistical support)						
<input type="checkbox"/> Ensure priority equipment is available for monitoring and research activities and data management						
<input type="checkbox"/> Ensure priority equipment is available for effective outreach activities						
<input type="checkbox"/> Ensure priority equipment is available for tourism / public use management						
<input type="checkbox"/> Ensure priority equipment is available for effective administration						
<input type="checkbox"/> Keep up-to-date equipment inventory						
I 4: Maintenance	Timeframe					Measuring Success Indicators
<input type="checkbox"/> Ensure that all signs, facilities and infrastructure are well maintained following a pro-active maintenance schedule						<ul style="list-style-type: none"> ▪ Maintenance schedule <ul style="list-style-type: none"> ▪ Infrastructure ▪ Equipment ▪ % of time that road is passable ▪ Patrol reports with section on level of littering ▪ # garbage collections from TMNR
<input type="checkbox"/> Ensure that all equipment is well maintained						
<input type="checkbox"/> Ensure improved access through annual road maintenance						
<input type="checkbox"/> Ensure adequate planning for solid waste management at TMNR						

3.4.6 ADMINISTRATION PROGRAM

PROGRAM OBJECTIVE

To ensure that Belize Karst has the administrative structure and capacity to effectively manage the protected area.

The Administration Program is focused on ensuring that the necessary administrative structure is in place for the support of management activities for TMNR and associated program activities.

GOVERNANCE

The Forest Department, as the regulatory authority for the protected area, has well defined regulations and policies in place under its Protected Areas Program. Belize Karst, as the co-management organization is responsible for day-to-day management of the protected area, including organizational, financial and human resource administration. This is overseen by the Ministry of Sustainable Development via the NBIO and the Board of Directors, providing oversight and guidance in the planning and implementation of management for the protected area.

The Board is responsible for developing Belize Karst’s Strategic Plan, a document that will define the goals and objectives of the organization (as opposed to the protected area), laying out a road map for the coming three to five years (as a new organization, a three-year Strategic Plan may be a good option, focusing largely on organizational strengthening).

Whilst the Board works towards improving management of the protected area, it is recommended that an Advisory Committee be formed in the first year to provide an opportunity for representatives from key sectors (community leaders, tourism sector, education sector, organized community groups (including youths)) to be able to provide their perspectives, concerns and recommendations into management decisions. The Advisory Committee is an important mechanism for strengthening communication between Belize Karst and its stakeholders, facilitating dissemination of information on the protected area and its management, and establishing a two-way flow of information. The Advisory Committee mechanism is focused on ensuring the interests of the different stakeholders are represented in decision making, and provides external checks and balances for the management organization. The greatest challenge to an effective Advisory Committee is finding ways to improve the transmission of information from the sector representatives sitting on

ADMINISTRATION

- *Governance*
- *Operational and Administrative Framework*
- *Human Resources*
- *Financial Sustainability*

the Advisory Committee back to those people they represent, in an effective, timely and meaningful, way.

OPERATIONAL FRAMEWORK

Belize Karst needs to develop a standard Policy and Procedures Manual policies to assist in effective management of the organization, to strengthen governance and administration. This Manual lays out the expectations and requirements for proper Board and staff conduct and for compliance with all applicable laws, policies, rules and regulations, and should include well defined policies in the areas of Board functions and responsibilities, employment policies, financial management, standard operating procedures, health and safety, community relations, conflict resolution, and gender. The policies and procedures should also provide guidance on use of transport, human resource management incident management.

POLICIES AND PROCEDURES

Belize Karst does not yet have in-house Policies and Procedures, which need to be developed for effective management, and integrated into the organizational Policies and Procedures Manual. These include:

Surveillance and Enforcement Policy: Belize Karst would benefit from a clear Enforcement Policy, with input from Forest Department/NBIO, to guide rangers through standardized procedures for approaching and apprehending people in contravention of the protected area regulations. The Forest Department / NBIO has strengthened its ability to assist co-management organizations with enforcement issues, and now offers Green Laws training in the relevant legislative background for rangers, to improve success at dealing with enforcement issues.

Financial Management Policies: Belize Karst would benefit from a clear Business and investment plan with input from NBIO. A key priority is to establish an effective financial management system and transparent accounting procedures across the organization, with annual audits as soon as Belize Karst has the financial resources to allocate to this, to ensure continued financial transparency as it evolves.

Staff and Volunteer Policies: Staff and volunteer policies should be developed, with clear guidelines to address health, safety, race and gender issues, as well as behavior, arbitration and work output, relevant to staff, local, national and international volunteers assisting Belize Karst with management activities associated with TMNR.

Gender Mainstreaming, Equality and Equity Policies: Belize Karst recognizes the need for gender-responsive conservation programs and strategies, and will be developing clearly stated policies to address this:

- **Gender mainstreaming policy:** that 'gives visibility and support to both women's and men's contributions individually, rather than assuming that both groups will benefit equally from gender-neutral development interventions' (PiP, 2006).
- **Gender equity policy:** that ensures fairness and equal opportunities for all, with measures in place to compensate for any historical and social disadvantages that prevent women and men from operating on an equal footing. If this is achieved, the result is gender equality.
- **Gender equality:** that states its equal treatment of women and men in policies, and equal access to the resources and services within families, communities and society at large, as well as assessing the implications for women and men in any strategies to be implemented.

Health and Safety Policies: A Health and Safety Policy should be developed, with staff trained in implementation, to address accidents and emergency situations – especially in relation to high risk areas such as caves. Staff should be trained and certified in emergency first aid, with an annual refresher course. Belize Karst also needs to have Covid-19 policies to keep staff and visitors safe and guide their interactions with each other.

PLANS

Plans are important in ensuring that activities are structured within a guiding framework with clear goals and objectives, and supported by identified measures of success through monitoring of selected indicators. A series of key plans also need to be developed for the relevant program areas, including:

- Annual Operational Plan / Work Plan
- Communication Plan
- Surveillance and Enforcement Plan
- Research and Monitoring Plan
- Community Engagement and Investment Plan
- Visitor Use Plan
- Financial Sustainability Plan
- Cultural Sustainable Use Plan
- Monitoring and Evaluation Plan
- Health and Safety Plan

While some of these are complex and will take time, expertise and funding to develop (such as the Financial Sustainability Plan), others are more simple, and require only a two to three page workplan in the first two to three years, before being further developed based on evaluation of outputs and lessons learnt.

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Annual Operational Plan: Perhaps the most important of the organizational plans, the Annual Operational Plan is developed towards the end of each year, based on review of the management plan, and previous years' operational plan, and informed by input from program areas (especially Natural Resource Management, Research and Monitoring, and Public Use). The AOP should provide a budgeted workplan for strategic fundraising for priority strategies. It is recommended that Belize Karst switch from project-based planning to annual operational planning as soon as possible, to ensure the projects are driven by the management plan and TMNR priorities rather than to meet donor areas of interest.

Communication Plan: Identifies the different stakeholders, their level of involvement and influence, and therefore the importance of ensuring communication – ranging from a one-way flow of information, keeping them informed, to full, two-way communication and involvement in management decisions. It should cover communication with Government authorities to communication with community leaders, tourism sector, schools and students, and defines the best mechanisms to be used, and frequency of contact. This may be as simple as forwarding the annual report once a year, to meeting community group leaders once a month or designing educational newsletters for student for dissemination once a quarter. It defines the key messages for each stakeholder sector and provides a calendar for structured communication activities.

Surveillance and Enforcement Plan: Addresses illegal use of the protected area through assessment of stakeholders causing the infractions, local information and georeferenced patrol information to provide guidance for the timing and routes of patrols. It also covers enforcement partnerships, roles and responsibilities, as well as procedures to guide rangers in approaching enforcement situations and steps for processing evidence to increase potential for successful prosecution. This should be developed in collaboration with the Forest Department / NBIO.

Community / Stakeholder Engagement Plan: Should be linked to the Communication Plan, but is expanded to identify TMNR stakeholders that need to be engaged, and defines the mechanisms to achieve this. This can also include community investment strategies. The Community Engagement Strategy should be targeted at contributing to the goal and objectives of the protected area, and integrate relevant management plan strategies to provide a structured plan that improves conservation outcomes, including cultural outcomes, for the protected area.

Visitor Use Plan / Public Use Plan (Following reclassification as a National Park): Is designed to manage visitor use using a variety of proactive planning strategies, infrastructure and tools to minimize impact whilst maximizing visitor experiences. It should include an analysis of visitors, how each type of visitor will use the protected area, their experiences, their impacts on resources, and the underlying causes of those impacts. The Plan should also identify tourism stakeholder and community capacity building needs for the support of tourism at TMNR, and

the promotion of private sector and community tourism-related enterprise, and should be linked to a Limits of Acceptable Change monitoring framework.

Financial Sustainability Plan: Will guide the organization in ensuring adequate funds are raised and available towards financial security, through identification of not only grant funding options, but also income generation opportunities – both standard tourism-related options (following re-designation) and innovative business opportunities, to provide a diversified portfolio of strategies for supporting Belize Karst’s management activities for TMNR. Identified business opportunities should be supported by business plans to ensure they are feasible and cost-effective, with the potential to provide profits that can be invested into management of the protected area.

Monitoring and Evaluation Plan: Will provide an institutionalized monitoring and evaluation framework for adaptive management that should be developed as early in the five-year management cycle as possible to strengthen Belize Karst’s ability to learn from its experiences and adapt its strategies as needed to a changing management context, in order to achieve its goals and objectives.

Evaluation of implementation success, outputs and outcomes of the management plan and annual operational plan feeds into adaptive management, with data collection and program monitoring and evaluation informing management decisions.

Disaster Risk Management Plan: Whilst hurricane impacts are lower in the TMNR area than in coastal Belize, a Hurricane Preparedness Plan should be in place to ensure protection of life and property during hurricane events. Any TMNR buildings, equipment, and files should be secured as well as possible, with guidance in place as to where, when and how this should happen.

HUMAN RESOURCES

Belize Karst currently (2020) has no paid staff, with a volunteer Executive Director as the leading force for the organizations, working under the oversight of the Board of Directors. This is not sufficient for effective management of the protected area, even with additional volunteer support. Young organizations need time to grow, but have basic critical human resource needs to be able to evolve effectively.

This includes (Figure 15):

- an Executive Director with capacity for organization and operational planning, basic financial management and reporting to lead the organization full time, and be responsible for implementing of the management plan. In the early stages, the

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Executive Director will need to take on the responsibility for implementation of activities under several of the program areas

- three rangers on rotation, to ensure that two rangers can be present in the protected area at any one time. In the early stages, these rangers will also need to take on other roles during the early stages of organizational development, including basic indicator monitoring, trail and facility maintenance and visitor management
- a Development Officer, with skills in communication (and the responsibility for developing the Communication Plan), engaging funders, knowledge of the funding community and development of funding proposals through a consultative process, to meet operational needs
- a part time administrator to assist with project / activity administration, financial management and reporting

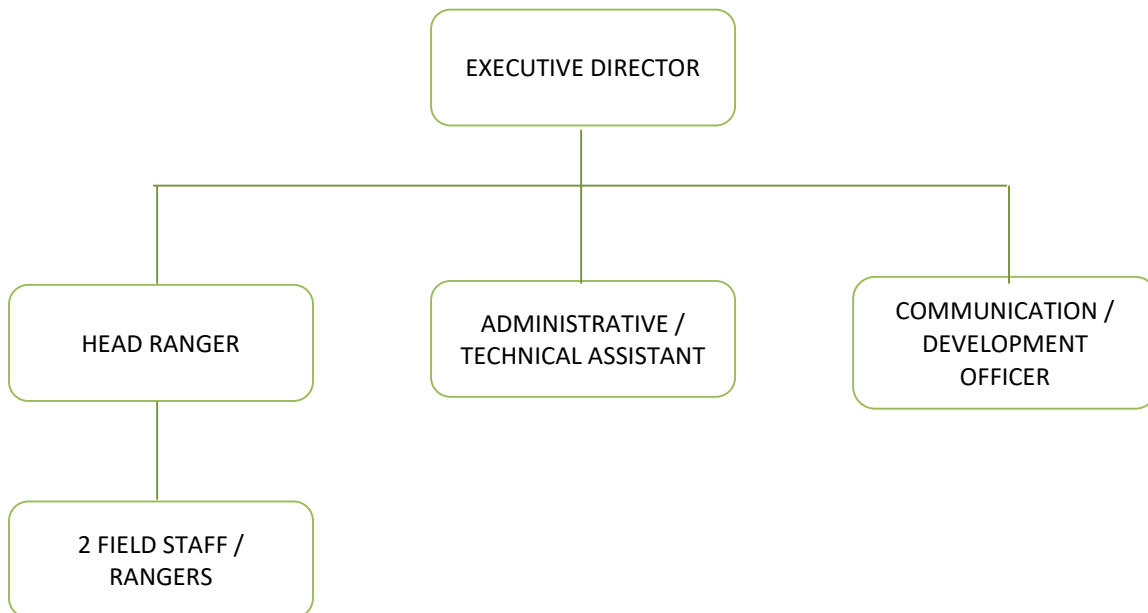


FIGURE 15: EARLY PHASE TMNR ORGANOGRAM

Developing joint enforcement partnerships with the Forest Department, Belize Defence Force and the Police Department will provide cost-effective mechanisms for strengthening critical surveillance and enforcement activities. The organization can also be supported by volunteers from the communities, but there is limited sustainability in basing long-term positions on volunteers, as eventually they will need to leave for paid positions. Youth group volunteers can be highly effective in filling gaps for activities such as trail maintenance and biodiversity monitoring, but are generally only available on weekends. Building a cohort of post-school youths and women trained as Community Researchers, based on stipend payments per activity, has been used successfully to ensure monitoring activities have the personnel needed, to improve engagement of youths in the communities and to also provide extra hands for

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education and outreach activities. However, it still requires an organizational framework with sufficient staff to coordinate volunteers and activities.

As the organization develops, it will need to engage a community liaison / education officer for implementation of the Communication Plan and start implementation of activities in the schools and communities, to ensure effective, consistent engagement of, and communication with, TMNR's stakeholders. Beyond that, the organization staff themselves may see their roles changing depending on their capacities.

The next logical step is the engagement of a Natural Resource Manager to oversee implementation of both the Natural Resource Management Program and Research and Monitoring activities as a sub-program (Figure 16).

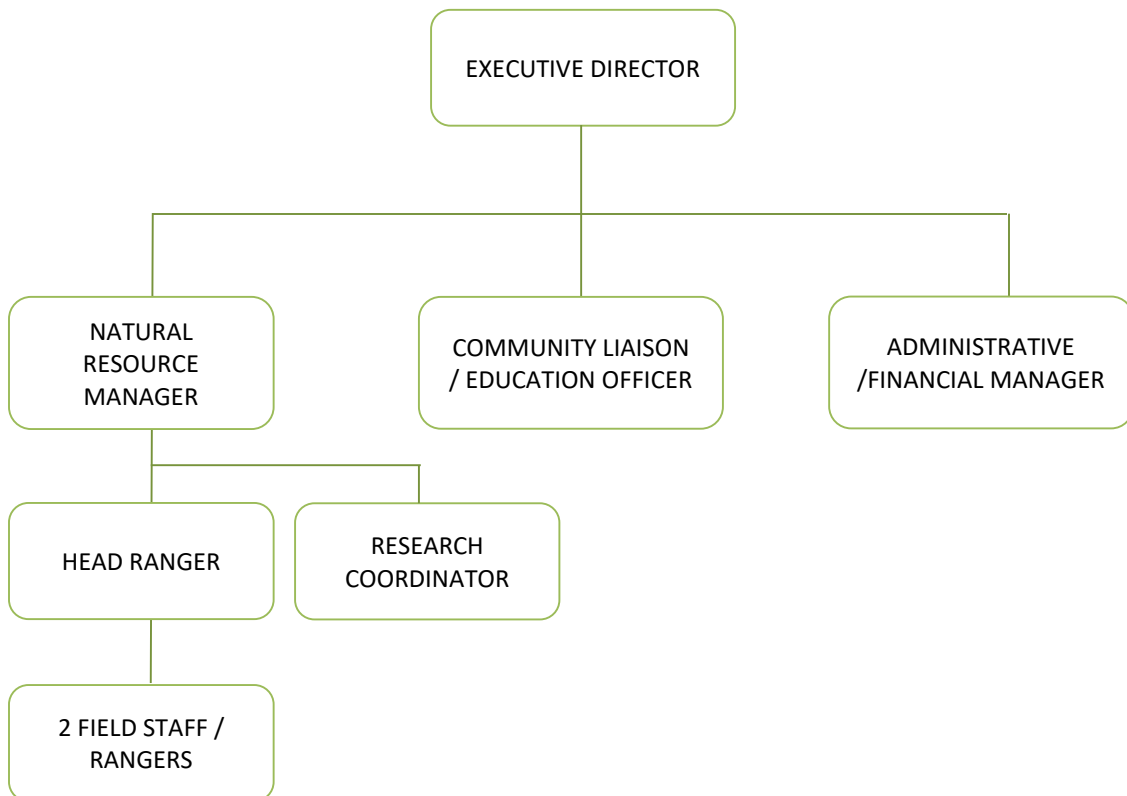


FIGURE 16: SECOND PHASE TMNR ORGANOGRAM

The ability to expand and evolve over time, however, is largely dependent on the strengths of the Executive Director and the Development Officer.

An annual human resource assessment should identify the staff positions most critical needed within the organization, and individual staff evaluations, linked to their terms of reference,

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should identify and guide investment in trainings to build capacity within the organization where it is needed. A preliminary time frame has been drafted (Table 43), though this will need amending dependent on the financial resources available.

YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Site manager Rangers (3) (also visitor management / communication skills) Administrator / Communication	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (3) (also visitor management / communication skills) ▪ Administrator / Communication 	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (6) ▪ Administrator / Communicators ▪ Research Coordinator ▪ Part-time cook / housekeeping 	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (6) ▪ Administrator ▪ Research Coordinator ▪ Education person? ▪ Part-time cook / housekeeping 	<ul style="list-style-type: none"> ▪ Site manager ▪ Rangers (6) ▪ Administrator ▪ Research Coordinator ▪ Education person? ▪ Part-time cook / housekeeping

**TABLE 43: TMNR HUMAN RESOURCE DEVELOPMENT OVER FIVE YEARS
FINANCIAL SUSTAINABILITY**

Financial sustainability is one of the key challenges for protected area managers, especially for start-up organizations. However committed staff are, eventually they need to be able to support themselves, with realistic salaries that can only be met through effective location of funds – challenges in continuity of funding during the first three years to support key positions is probably the one key factor that causes co-management organizations to collapse. Belize Karst has significant strengths in the tourism business, and plans to bring this to the front in its strategies towards financial sustainability.

The focus in the first year is therefore to establish an effective presence on the ground, and to engage a Development Officer to provide a framework for financial sustainability. The latter needs to be at two scales – ensuring the organization has the capacity to locate immediate, short term funding through locating project grants for the first three years for implementation of the TMNR annual workplans, while also developing a Financial Sustainability Plan to guide the organization in developing a range of diverse funding streams for the medium to long term. The primary focus of Belize Karst’s financial sustainability planning will be based on tourism, to provide a model for other protected areas seeking to improve financial sustainability through tourism, but should also include mechanisms that are not all tourism based, to provide alternatives should another crisis occur that significantly impacts the tourism sector.

Although entrance fees can theoretically be applied, they are not currently collected. As a Nature Reserve, TMNR is not open to tourism visitation. However, once the designation has been changed, there will be the potential to be able to charge an entrance fee if it can be justified within the management and financial sustainability /business plans and is supported by Statutory Instrument. Visitor user fees for access to specific activities or locations may also be feasible and may not require the lengthy process of developing a Statutory Instrument.

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ADMINISTRATION						
A 1: Governance	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Maintain a fully functional Board of Directors with appropriate commitment and skills base for direction and oversight of Belize Karst						<ul style="list-style-type: none"> ▪ List of Board of Directors ▪ Minutes from Board meetings ▪ # Board member participating in BoD training ▪ ToRs for Board and Board positions ▪ List of Advisory Committee members ▪ ToR for Advisory Committee ▪ Minutes from Advisory Committee meetings ▪ # concerns voiced by Advisory Committee / stakeholders about transparency and accountability (in meeting minutes) ▪ Updated Itzamna Society Strategic Plan
<input type="checkbox"/> Build capacity of the Board members for effective oversight of TMNR management – Board training in roles and responsibilities, decision making						
<input type="checkbox"/> Develop ToRs for Board and staff, with effective organizational structure and management						
<input type="checkbox"/> Hold quarterly Board meetings or as needed						
<input type="checkbox"/> Establish a TMNR Advisory Committee with representatives from the stakeholder sectors (including community groups, youth, women, farmers tourism sector) and Forest Department/NBIO), with clear roles and responsibilities						
<input type="checkbox"/> Ensure transparency and accountability throughout the organization						
<input type="checkbox"/> Strengthen the organizational foundation through developing a Strategic Plan for Belize Karst, identifying long term goals and objectives of the organization						
A 2: Operational Framework	Timeframe					Measuring Success Indicators
<input type="checkbox"/> Develop the Annual Operational Plan each November for forthcoming year, based on review of the management plan strategies and previous years operational plan, and informed by input from program areas						<ul style="list-style-type: none"> ▪ Prioritized list and timeline for development of organizational plans ▪ Annual Operational Plan (with indicators) ▪ Daily logs, monthly reports per program
<input type="checkbox"/> Keep daily log of activities for each program, and prepare monthly reports on program activities, challenges etc.						

ADMINISTRATION						
A 2: Operational Framework	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Develop Program Plans as required: <ul style="list-style-type: none"> ▪ Communication Plan ▪ Surveillance and Enforcement Plan ▪ Research and Monitoring Plan ▪ Community Engagement and Investment Plan ▪ Visitor Use Plan (following reclassification) ▪ Financial Sustainability Plan ▪ Cultural Resource Sustainable Use Plan ▪ Monitoring and Evaluation Plan ▪ Disaster Risk Management Plan 						<ul style="list-style-type: none"> ▪ Organizational plans <ul style="list-style-type: none"> ▪ Communication Plan ▪ Surveillance and Enforcement Plan ▪ Research and Monitoring Plan ▪ Community Engagement / Investment Plan ▪ Visitor Use Plan ▪ Financial Sustainability Plan ▪ Cultural Resource Sustainable Use Plan ▪ Monitoring and Evaluation Plan ▪ Disaster Risk Management Plan
<input type="checkbox"/> Ensure fulfilment of reporting procedures required under updated co-management agreement						<ul style="list-style-type: none"> ▪ % of reporting commitments to Forest Department / NBIO that have been met
<input type="checkbox"/> Ensure effective record keeping and accounting, with timely financial management and annual financial report						<ul style="list-style-type: none"> ▪ Accounts ▪ Annual financial report
<input type="checkbox"/> Ensure all NGO commitments are met, including annual audits						<ul style="list-style-type: none"> ▪ Annual audit
<input type="checkbox"/> Prepare financial and progress reports as needed for funding agencies and the authorities						<ul style="list-style-type: none"> ▪ FIU certificate ▪ Certificate of good standing
<input type="checkbox"/> Ensure effective monitoring and evaluation is being implemented – completion of monitoring and evaluation templates for workplan and management plan, with recommendations for the coming year						<ul style="list-style-type: none"> ▪ Project reports ▪ Annual monitoring and evaluation report with recommendations
<input type="checkbox"/> Review management plan after 2½ years – success of implementation, outputs and outcomes						<ul style="list-style-type: none"> ▪ Report on mid-term review of management plan and list of recommendations
<input type="checkbox"/> Re-evaluate and revise management plan after 5 years						<ul style="list-style-type: none"> ▪ Report on end-term review of management plan and list of recommendations ▪ Revised management plan

ADMINISTRATION						
A 3: Human Resources	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Contract an Executive Director with the capacity to lead the implementation of the management plan and annual operational plans						<ul style="list-style-type: none"> ▪ ToR and Contract for Executive Director ▪ ToR and contract for Development Officer ▪ Belize Karst organogram
<input type="checkbox"/> Employ a Development Officer focused on engaging grant funding and developing financial sustainability mechanisms over a 3 year timeframe						<ul style="list-style-type: none"> ▪ % of posts considered critical that have been filled ▪ Staff evaluation report per staff member, linked to ToR, with recommendations for capacity building needs
<input type="checkbox"/> Develop organogram with identified priority staffing requirements and locate funding and qualified personnel to fill gaps						<ul style="list-style-type: none"> ▪ Employee Handbook ▪ Staff records
<input type="checkbox"/> Identify priority capacity building requirements for staff based on annual capacity building needs assessment integrated into staff review / appraisal process, and linked to incentives to ensure staff retention						<ul style="list-style-type: none"> ▪ ToR and staff skills and training record ▪ Annual staff evaluation ▪ % staff that have completed First Aid training
<input type="checkbox"/> Develop an Employee Handbook with those policies and procedures most relevant to the staff - expected behavior and job duties, and employee policies such as race and gender issues, health and safety and conflict resolution are included in operational policies and gender equality						<ul style="list-style-type: none"> ▪ % rangers that have conflict resolution training
<input type="checkbox"/> Ensure accurate staff records are maintained						
<input type="checkbox"/> Ensure all staff are trained for their roles						
<input type="checkbox"/> Ensure all staff have completed annual First Aid training / refresher course						
<input type="checkbox"/> Ensure conflict resolution training is provided for surveillance and enforcement personnel						

ADMINISTRATION						
A 4: Financial Sustainability	Timeframe					Measuring Success Indicators
	1	2	3	4	5	
<input type="checkbox"/> Develop financial sustainability plan for TMNR for next five years with Identification of diversified financial sustainability mechanisms for long term funding						<ul style="list-style-type: none"> ▪ Financial Sustainability Plan ▪ % of Annual Operational Plan that is funded by end of the year ▪ % of Annual Operational Plan that is completed by end of the year ▪ Tourism focused business plan ▪ Non-tourism focused business Plan ▪ Fee collection framework approved by Forest Department / NBIO
<input type="checkbox"/> Use the Operational Plan and annual needs assessments to guide fundraising to secure appropriate short term and medium term grant funding for the effective management of the TMNR						
<input type="checkbox"/> Establish a framework for fee collection						
<input type="checkbox"/> Develop a business model for tourism as a financial sustainability mechanism for TMNR						
<input type="checkbox"/> Establish at least one non-tourism based financial sustainability mechanism, based on an appropriate business model						

3.5 FINANCIAL MANAGEMENT

Belize Karst Habitat Conservation is currently managing TMNR on project-based funding. It benefits from a Board of Directors skilled in business management and financial administration, but will need to focus on building its internal capacity for non-profit financial planning and management, annual budget development, financial policies and procedures, and proposal writing. It should also develop a Financial Sustainability Plan that identifies short, medium and long term financial sustainability mechanisms to address these costs.

In the short term, Belize Karst will need to build its profile as a respectable, transparent organization with strong financial management policies and practices in place, and good financial management and transparency through short term projects. Whilst the annual operational budget should be developed from the annual operational plan / workplan, meeting this budget from project funding alone needs to be strategic, working on the strengths of the organization and identifying funding opportunities that are aligned to these strengths, rather than being reactive to funding opportunities. A key priority to achieve this would be the engagement of a Development Officer with the skills to put together grant applications.

Cost sharing mechanisms: Belize Karst should explore possibilities of sharing costs through collaborative agreements with the protected areas authorities, enforcement agencies, and other co-management agencies in the landscape for surveillance and enforcement, fire monitoring and education and outreach activities. Potential NGO partners would include FCD and Itzamna Society.

Financial Sustainability Plan: In the medium to long term, Belize Karst needs to identify financial sustainability mechanisms that can generate income from a variety of funding sources towards management of the protected area, reducing dependence on grant funding. This should be through an effective financial planning process, with the development of business plans to implement the selected priority strategies. The key focus will be on the development of tourism-based income, with the establishment of a business arm of the organization, with profits being reinvested in the management of the protected area. However, there should also be the identification of at least one non-tourism related opportunity, to ensure that, should tourism be impacted by a similar global crisis to Covid-19 in the future, the organization has some resilience to economic challenges.

3.6 MONITORING AND REVIEW

Monitoring and review of the management plan, annual operational plan and project plans is essential in order to ensure that management is effective in achieving its objectives. This can be achieved through use of a 'Measures of Success' framework. An annual rapid assessment of

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management effectiveness should be conducted, and measured against the baseline, established in October, 2020, just before the first year of management plan implementation, using the national indicators for management effectiveness (Young et al., 2005; revised Walker and Walker, 2019).

A Monitoring and Evaluation Framework has been developed for the management plan, composed of four tracking matrices templates (Tables 40, 41, 42, and 43), to be used for tracking implementation, outputs, outcomes and national / global impacts of the management program activities. These matrices have been developed to facilitate the annual review process. Time should be taken to complete each one fully and as accurately as possible at the end of each year, and gaps / further actions identified to improve success. Then the outputs integrated into the next year's operational plan, along with information from the different program areas. If this is maintained on an annual basis, it will feed directly into the development of Operational Plans and greatly facilitate any management staff transition handover.

Four matrices are used to facilitate this process:

- **Status** tracking – recording progress against the 2020 baseline (Table 44)
- the Measures of Success of **Implementation** (whether the actions have been implemented successfully) (Table 45)
- the Measures of Success of **Outputs** (whether the actions have achieved the required direct outputs...for example, number of rangers trained) (Table 46)
- The Measure of Success of **Outcomes** (whether the actions, following implementation, have positively altered the status of the situation – e.g. an increase in game species abundance) (Table 47)
- The Measure of Success of **Impacts** (whether the actions, following implementation, have positively impacted NBSAP Targets – e.g. contributing to Target C3. (Table 48).

These templates can also be used in monitoring and evaluating the Annual Operational Plan and other organizational plans.

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TABLE 44: NATURAL RESOURCE MANAGEMENT PROGRAM - STATUS							
Measure of Success - Status							
It is important to document clearly the status of each activity whilst developing Annual Operation Plans, as this allows highlighting of areas that need prioritization							
Management Activities	Baseline Status (2020)	Status (2021)	Status (2022)	Status (2023)	Status (2024)	Status (2025)	Desired Status
Activity							
NRM 1: Surveillance and Enforcement							
Establish Surveillance and Enforcement Plan (policies and protocols) to guide surveillance and enforcement in the field	TMNR doesn't have a surveillance and enforcement plan						TMNR has a surveillance and enforcement plan and is implementing it
Ensure surveillance activities are strategic and effective, based on TM enforcement data, incidence mapping and identification of hotspots, key times, and with integration of SMART technology	Surveillance activities are limited in scope, not guided by a surveillance and enforcement plan, and not supported by SMART technology						Surveillance activities are guided by information from patrols, with incidence mapping and identification of hotspots, key times, and with integration of SMART technology
Ensure Tapir Mountain staff have the equipment they need for effective surveillance and enforcement	TMNR has no paid rangers. Patrols are not well equipped						TMNR has sufficient rangers, with well-equipped patrols
Enforce national protected area and wildlife regulations	Surveillance and enforcement activities are limited in scope, with no paid rangers						A fully functional ranger team is effective in reducing illegal logging and hunting in TMNR

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TABLE 45: NATURAL RESOURCE MANAGEMENT PROGRAM - IMPLEMENTATION

Measure of Success of Implementation							
N.B. The numerical values ascribed to the measures of success are indicators of the stage of implementation	1 No improvement on present status					Comments: Justification for Measure of Success score. Problems, concerns. Notes for inclusion in updated Management Plan	
	2 Planning has started, but no implementation						
	3 Planning is completed, but no implementation						
	4 Implementation is started, but not yet completed						
	5 Implementation is completed or ongoing (continuous activities), activity has succeeded						
Management Activities	Measure of Success					Comments: Justification for Measure of Success score. Problems, concerns. Notes for inclusion in updated Management Plan	
	<i>Year</i>						
Activity	2021	2022	2023	2024	2025		Desired Status
NRM 1: Surveillance and Enforcement							
Establish Surveillance and Enforcement Plan (policies and protocols) to guide surveillance and enforcement in the field						TMNR has a surveillance and enforcement plan and is implementing it	2020 Baseline: TMNR has no Surveillance and Enforcement Plan Recommendation: Work with FD / NBIO to develop a Surveillance and Enforcement Plan for TMNR
Ensure surveillance activities are strategic and effective, based on TM enforcement data, incidence mapping and identification of hotspots, key times, and with integration of SMART technology						Surveillance activities are guided by information from patrols, with incidence mapping and identification of hotspots, key times, and with integration of SMART technology	2020 Baseline: Belize Karst has no paid rangers. Information from patrols is limited, but is guiding future patrols Recommendation: Locate funding for a full ranger team with the training and equipment for effective, information-based patrols
Ensure Tapir Mountain staff have the equipment they need for effective surveillance and enforcement						TMNR has sufficient rangers, with well-equipped patrols	2020 Baseline: Belize Karst has no paid rangers or patrol equipment. Recommendation: Locate funding for three rangers and equipment to enable an effective surveillance and enforcement presence

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TABLE 46: NATURAL RESOURCE MANAGEMENT PROGRAM - OUTPUTS

Measure of Success of Outputs								
	1 0 – 25% achieved							
	2 26 – 50% achieved							
	3 51 – 75% achieved							
	4 76 – 99% achieved							
	5 100% achieved							
Management Activities	Measure of Success					Comments: Justification for Measure of Success score. Problems, concerns. Notes for inclusion in updated Management Plan		
	Year							
Activity	2021	2022	2023	2024	2025			Desired Status
NRM 2: Surveillance and Enforcement								
Establish Surveillance and Enforcement Plan (policies and protocols) to guide surveillance and enforcement in the field						TMNR has a surveillance and enforcement plan and is implementing it	2020 Baseline: TMNR has no Surveillance and Enforcement Plan Score: 1	
Ensure surveillance activities are strategic and effective, based on TM enforcement data, incidence mapping and identification of hotspots, key times, and with integration of SMART technology						Surveillance activities are guided by information from patrols, with incidence mapping and identification of hotspots, key times, and with integration of SMART technology	2020 Baseline: Belize Karst has no paid rangers. Information from patrols is limited, but is guiding future patrols and contributing towards a baseline Score: 1	
Ensure Tapir Mountain staff have the equipment they need for effective surveillance and enforcement						TMNR has sufficient rangers, with well-equipped patrols	2020 Baseline: Belize Karst has no paid rangers or patrol equipment. Score: 1	

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TABLE 47: NATURAL RESOURCE MANAGEMENT PROGRAM - OUTCOMES							
Measure of Success of Outcomes							
Management Activities		Measure of Success					Comments: Justification for Measure of Success score. Problems, concerns. Notes for inclusion in updated Management Plan
		<i>Year</i>					
Activity	Desired Outcome	2021	2022	2023	2024	2025	
NRM 1: Surveillance and Enforcement							
Establish Surveillance and Enforcement Plan (policies and protocols) to guide surveillance and enforcement in the field	Overall Conservation Target Rating: GOOD Game Species: GOOD C.A. Tapir: GOOD						2020 Baseline: Conservation Targets Overall Rating: GOOD Game Species: FAIR C.A. Tapir: FAIR Recommendations:
Ensure surveillance activities are strategic and effective, based on TM enforcement data, incidence mapping and identification of hotspots, key times, and with integration of SMART technology							
Ensure Tapir Mountain staff have the equipment they need for effective surveillance and enforcement							

TABLE 48: NATURAL RESOURCE MANAGEMENT PROGRAM - IMPACTS

Measure of Success of Impacts							
	1 No contribution to national NBSAP Targets 2 A small contribution to national NBSAP Targets 3 A medium-level contribution to national NBSAP Targets 4 contribution to national NBSAP Targets 5 A significant contribution to national NBSAP Targets						
Management Activities		Measure of Success					Comments: Justification for Measure of Success score. Problems, concerns. Notes for inclusion in updated Management Plan
		<i>Year</i>					
Activity	Desired Outcome	2021	2022	2023	2024	2025	
NRM 2: Surveillance and Enforcement							
Establish Surveillance and Enforcement Plan (policies and protocols) to guide surveillance and enforcement in the field	TARGET C3: Between 2016 and 2030, no species will become functionally extinct in Belize. National Critically EN species of TMNR: Orange-breasted Falcon Ocellated Turkey Solitary Eagle EN Species: Great Curassow Crested guan Yucatan Black howler monkey C.A. spider monkey						
Ensure surveillance activities are strategic and effective, based on TM enforcement data, incidence mapping and identification of hotspots, key times, and with integration of SMART technology							
Ensure Tapir Mountain staff have the equipment they need for effective surveillance and enforcement							

3.7 TIMELINE

The five-year timeline provides guidance for implementation of the management plan, but should be considered adaptable, as the management context changes over the years, with some strategies brought forward, and other postponed. The timeline also provides a framework against which implementation effectiveness can be measured, to ensure orderly and planned implementation of activities throughout the management plan period (Table 49: Timeline Example). This should be developed at the start of management plan implementation.

The annual operational plan /workplan and budget is developed from the timeline at the end of each year, a collaborative process that should involve all the program managers and staff, to ensure that cross-cutting strategies such as Environmental Education and Sustainable Development are aligned with and support the site-specific management activities for TMNR.

Management Actions	Desired Status	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year
Establish Surveillance and Enforcement Plan (policies and protocols) to guide surveillance and enforcement in the field	TMNR has a surveillance and enforcement plan and is implementing it					
Ensure surveillance activities are strategic and effective, based on TM enforcement data, incidence mapping and identification of hotspots, key times, and with integration of SMART technology	Surveillance activities are guided by information from patrols, with incidence mapping and identification of hotspots, key times, and with integration of SMART technology					
Ensure Tapir Mountain staff have the equipment they need for effective surveillance and enforcement	TMNR has sufficient rangers, with well-equipped patrols					

TABLE 49: TIMELINE (EXAMPLE), BASED ON ‘YEAR’ COLUMN OF MANAGEMENT PROGRAMS

4. IMPLEMENTING THE PLAN

The following outline presents the first steps towards implementing the management plan.

At the Start of the Management Plan Period

1. Develop the timeline for all program areas and activities (Table 45)
2. Develop the four Measures of Success tables for all program areas and activities, identifying relevant indicators, to provide a baseline (Tables 40 to 44)
3. Identify those activities scheduled for implementation in the first year and develop the first annual workplan
4. Implement the Annual Workplan

At the End of the First Year...

1. Update the M+E Framework tables for all program areas and activities, and develop a summary report of results and recommendations for integration into the next Annual Workplan and / or adaptation of the management plan
2. Review the workplan, and identify challenges and adaptive strategies, for inclusion in the next workplan (this should be a participatory exercise with the Board, staff and Advisory Committee)
3. Update the status of the indicators and develop a report on the outputs, to be integrated into the Annual Report
4. Identify those activities scheduled for implementation in the second year and develop the second annual workplan, also incorporating adaptive strategies from the workplan review
5. Implement the second Annual Workplan

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BELIZE

THE NATIONAL PROTECTED AREAS SYSTEM ACT

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INTERIM CO-MANAGEMENT AGREEMENT

between

THE GOVERNMENT OF BELIZE AS REPRESENTED BY THE FOREST DEPARTMENT

AND

BELIZE KARST HABITAT CONSERVATION PROJECT
a body corporate pursuant to the Laws of Belize

—————

January 2019

BELIZE

THIS PROVISIONAL CO-MANAGEMENT AGREEMENT is made the 25th day of January 2019 between the FOREST DEPARTMENT (hereinafter called “the Forest Department”) of the one part and the Belize Karst Habitat Conservation Project, an organization duly formed and existing under the Laws of Belize with registered office at Hopkins Village, Stann Creek District (hereinafter called “the BKHCP”) of the other part.

WHEREAS the National Protected Areas System Act, Statutory Instrument 79 of 2019 of the Laws of Belize Revised Edition 2011 provides for the designation of any specified area of land in Belize as a National Park, Nature Reserve, Wildlife Sanctuary or Natural Monument; AND WHEREAS the Forest Department is desirous of entering into an interim co-management arrangement with the BKHCP for the management of the Tapir Mountain Nature Reserve (TMNR) and in order that the parties may continue the work of cooperating in the development and management of areas declared under the National Protected Areas System Act;

NOW THEREFORE IT IS HEREBY AGREED as follows:

1. The Forest Department and the BKHCP with the assistance of other government ministries, departments, or authorities, as may be considered appropriate by the Forest Department in consultation with BKHCP, shall jointly develop and manage the areas listed in the Schedule hereto;
2. This Agreement shall continue in effect for five (5) years commencing on the Effective Signing Date.
3. Such joint development and management shall be exercised by the parties, in keeping with the provisions of this provisional agreement, the National Protected Areas System Act, and other relevant legislation, regulations and policies;
4. Development of a Management Plan that provides for the protection of the natural and cultural resources of the Tapir Mountain Nature Reserve.

Activities may include, *inter alia*:

- Develop the ToR and publish the consultancy for the development of the Tapir Mountain Nature Reserve management plan.
- Develop, within 18 months after the approval of this agreement, a Management Plan for the Tapir Mountain Nature Reserve, with the participation and approval of the Forest Department.
- The Management Plan shall include or address goals, objectives, standards or rules to be observed by visitors and other users of the Protected Areas, recreational activities that will be permitted in the Protected Areas, monitoring of visitors and users, priorities, budget, a financial strategy, personnel or staffing requirements, target dates, infrastructure, research, the contribution of neighboring communities to the development and management of the Protected Areas, the relationship of the TMNR to adjacent protected areas and such other matters as shall be agreed upon by the Forest Department.
- In the formulation of the development and management plans, the Forest Department and the BKHCP shall consult with relevant communities and stakeholders.
- Coordinate implementation of the plans, which shall also include provisions for assessment of management effectiveness on a periodic basis and refinements to the plans.
- Put into effect the Management Plan for a period of five years.
- Collaborate with the Forest Department, as well as other government agencies, NICH, and NGOs responsible for management or co-management of adjacent public protected areas in order to improve overall management and administration of this block of PAs in an integrated manner.
- Development of a financial and human resource administrative system that will be responsible for orienting and implementing the management plan work program.

- In the absence of a management plan, BKHCP will establish an operational program during the first 12 months with the participation and approval of the Forest Department;
5. Institution of a Protection Program for the conservation of the ecosystems and species in the Tapir Mountain Nature Reserve.

Activities may include, *inter alia*:

- Recruit and train the necessary staff, volunteers, and collaborating staff from other institutions to manage the operations within the Nature Reserve.
 - Institute law enforcement activities within the Nature Reserve with the assistance of the Forest Department and other government authorities.
 - Construct and maintain basic park infrastructure including, but not limited to, access trails, ranger posts, basic tourism infrastructure, boundary demarcation, signage, entry and exit posts, and radio equipment with assistance from the Forest Department. The BKHCP shall share the responsibility of providing and maintaining infrastructure to house its field personnel.
 - Provide the necessary equipment for the staff to conduct their duty in the Tapir Mountain Nature Reserve.
6. Development of a Research and Monitoring Program to conserve the park's critical biodiversity.

Activities may include, *inter alia*:

- Liaising with Institute of Archaeology and coordinating research to better understand the biodiversity and identify conservation needs for the Tapir Mountain Nature Reserve;
 - Training field staff to gather data and interpret the information;
 - Demarcating the protected area primarily in hotspot areas;
 - Monitoring and patrolling the Tapir Mountain Nature Reserve to protect its environmental integrity;
 - Stimulating cross exchanges with other research stations and building on the existing database.
 - Aid in monitoring activities to include permits, agreements and concessions provided by the Forest Department in the Tapir Mountain Nature Reserve.
 - Promote the development of a research strategy for the Tapir Mountain Nature Reserve where priority is given to research for management purposes.
 - Coordinate and work closely with the FD to institute an effective program of vigilance and control at the entry point of the Tapir Mountain Nature Reserve.
7. Implementation of a Public Awareness Campaign that promotes the importance of the Tapir Mountain Nature Reserve

Activities may include, *inter alia*:

- Development of a site assessment and project plan which can guide the public awareness program;
- Creation and publishing of didactic materials for dissemination in the target communities;
- Implementing a community awareness campaign in buffer communities;
- Generating support from local communities for the protection of the Tapir Mountain Nature Reserve;

8. Launching of a Tapir Mountain Nature Reserve financial sustainability plan to enable effective long-term management.

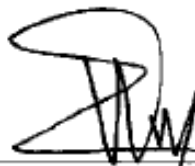
Activities may include, *inter alia*:

- Fundraising to enable effective management of the Tapir Mountain Nature Reserve. Any endowment, trust fund, grant, loan, subsidy or any monies whatever obtained by BKHCP for the management of the Tapir Mountain Nature Reserve during the management period shall be used by BKHCP solely for the management of the Tapir Mountain Nature Reserve. Full details of any donations, grants, trust funds or endowment money received by the BKHCP must also be provided to the Forest Department. In addition, copies of all funding proposals as developed and financial reports on a quarterly basis will be provided to the Forest Department.
 - Fundraising activities would be endorsed and supported with letters of recommendations provided by the Forest Department;
 - Establish strategic partnerships with NGOs, academic institutions, and other donor organizations to enhance the process of securing the Tapir Mountain Nature Reserve's financial sustainability. Details of any formal institutional arrangements or partnerships between BKHCP and other entities in promoting sustainable management of the Tapir Mountain Nature Reserve must be done in consultation with the Forest Department.
 - Develop and institute a fee collection system based on the multiple users of the Tapir Mountain Nature Reserve along with the Forest Department which can help sustain the management of the Tapir Mountain Nature Reserve.
 - Develop a Business Plan for the Tapir Mountain Nature Reserve which shall include a marketing plan and a financial plan based on a market assessment.
8. Where at any time the Forest Department wishes to resume sole responsibility for the development and management of the Tapir Mountain Nature Reserve, the parties hereto shall agree on a transition period not less than six months and not exceeding two (2) years during which time the BKHCP shall cooperate fully to accomplish an effective and expeditious transition.
9. In the event of non-observance of any of the terms of this Agreement by a party, the other party may make a complaint to that party and the parties shall then use their best efforts to resolve the matter within four (4) months of the date of the complaint.
10. If no satisfactory resolution is reached after the expiration of the period referred to above, the complaining party may by further notice of at least thirty (30) days terminate this Agreement.
11. The BKHCP may after prior consultation with the Forest Department, in respect of any of the Protected Areas, withdraw from the co-management of the Protected Area. The BKHCP shall give to the Forest Department, notice of the intention to withdraw at least three (3) months before the withdrawal is to take effect and thereafter the BKHCP and the Department shall begin the consultation on the process of handing over.
12. The Forest Department may after prior consultation with the BKHCP, withdraw from the co-management of the Protected Area. The Forest Department shall give to the BKHCP, notice of the intention to withdraw at least three (3) months before the withdrawal is to take effect and thereafter the Forest Department and BKHCP shall begin the consultation on the process of handing over.
13. The Forest Department shall seek the recommendations of the BKHCP prior to recommending the variation of the Tapir Mountain Nature Reserve boundaries or the de-reservation thereof or permits and concessions being requested to be conducted in the Tapir Mountain Nature Reserve and provide copies to BKHCP in advance for its own records, review and monitoring.
14. The parties may alter the provisions set forth in this Agreement for the joint development and management of the Tapir Mountain Nature Reserve and such alteration shall be recorded in writing and signed by both parties in order to take effect.

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15. This is a provisional Agreement. The parties agree to revisit this Agreement once the national revision and restructuring of co-management agreements is completed and recommendations arising there have been presented to the authorities.
16. For the avoidance of doubt, this arrangement is entered into by the Forest Department with the BKHCP to encourage non-governmental and community voluntary participation in the development and management of Belize's national parks system. Without prejudice to any legal action to recover monies collected by the BKHCP under this arrangement, it is not intended that this Agreement create any legal relationship between the parties beyond the scope of this agreement.
17. The Chief Forest Officer or his representative will be the Department's representative liaising with BKHCP.

Signed by:



Wilber Sabido
Chief Forest Officer
Forest Department

Ministry of Agriculture, **Fisheries, Forestry, the Environment,**
Sustainable Development and Immigration



Mr. Aaron Juan
Executive Director
Belize Karst Habitat Conservation Project