Northern Region Coastal Zone Management Guidelines

Photo Credit: Samir Rosado

Coastal Zone Management Authority & Institute
2016

Cite as:
Coastal Zone Management Authority and Institute (CZMAI). 2016. *Northern Region Coastal Zone Management Guidelines.* Belize Integrated Coastal Zone Management Plan. CZMAI, Belize City.

ACKNOWLEDGEMENTS

The Belize Coastal Zone Management Authority and Institute (CZMAI) extends its sincere gratitude to all those individuals and organizations who participated in the development of the Northern Region Coastal Zone Management Guidelines. The process of developing management guidelines for the region began with the Northern Cayes Region Development Guidelines, which had a specific focus on development issues for the region's cayes. The cayes development guidelines were prepared by Development Solutions Limited, with assistance from the following agencies and individuals during 2003-2004:

Agencies:

Archives Department
Belize Audubon Society
Belize City Council
Belize Port Authority
Belize Tourist Board
Department of the Environment
Fisheries Department
Geology and Petroleum Department
Ministry of Economic Development

Individuals:

NAME	ORGANIZATION/AFFILIATION
Merlene Spain	Ambergris Caye Planning Authority
Alicia Eck	Bacalar Chico Marine Reserve
Tommy Fajardo	Bacalar Chico Marine Reserve
James Cobb	Bacalar Chico Marine Reserve
Isani Chan	Bacalar Chico Marine Reserve
Domingo Lewis	Belize Port Authority
Wilfredo Alamilla	Caribeña Cooperatives
Romeldo Catzim	Copper Bank Village
Freddy Ewens	Corozal Town Council
Ivis Chan	Forest Department
Robyn Jones	Green Reef
Steven Williams	Housing and Planning Department
Anthony Andrews	Housing and Planning Department
Miguel Alamilla	Hol Chan Marine Reserve
Genaro Barrera	Lands and Surveys Department
Allison Campbell	NACNW
Zak Jones	Protech Belize Dive Center
Gregor Hodgson	Reef Check
Nano Guerrero	San Pedro Tour Guide Association
Daniel Guerrero	San Pedro Tour Guide Association
Doug Campbell	VACNO
John McGill	
Peter Hancook	
Jose Luis Perez	
Florentina Gonzalez	
Ely Rivero	
Omero Graniel	

The Sarteneja Alliance for Conservation and Development (SACD) contributed valuable information contained within the Corozal Bay Wildlife Sanctuary Management Plan (2010-2014) to the process. CZMAI also especially acknowledges the Northern Region Coastal Advisory Committee (NRCAC), and other important interested individuals and stakeholder groups of the region for their time commitments during 2011-2012 in updating the cayes development guidelines that led to the preparation of the present coastal zone management guidelines. The individuals that participated in the process are namely:

Northern Region Coastal Advisory Committee Membership (2011-2012)

NAME	ORGANIZATION/AFFILIATION
Zoe Walker (Chairperson)	Wildtracks
Joel Verde (Vice Chairperson)	Sarteneja Alliance for Conservation and Development
Oscar Garcia (Treasurer/Fund Manager)	Corozal Town Board
Heron Moreno	Shipstern Nature Reserve/BTIA Corozal
Cesar Munoz	Sarteneja Fishermen Association
Graciliano Rivero	Sarteneja Tour Guide Association
Bernardino Cowoh	Corozal District Association of Village Councils
Raul Rosado	Corozal Junior College
Alfredo Ortega	Belize Sugar Cane Farmers Association
Olivia Avilez	Belize Sugar Cane Farmers Association
Chantalle Clarke	CZMAI
Maritza Canto	CZMAI
Samir Rosado	CZMAI

Northern Region Consultation Participants (2012):

NAME	ORGANIZATION/AFFILIATION
Carlos Arana	Consejo Village Council
Guillermo Rodriguez	Sarteneja Village Council
Romeo Gorosica	Copper Bank Village Council
Jose L. Reyes	Chunox Village Council
Nadia Bood	World Wildlife Fund
Elizabeth Villanueva	Balam Jungle
Rosita Mai	Corozal-Belize Tourism Industry Association
Elizabeth Fitzgerald	Consejo Yacht Club
Jim Malthias	Consejo Shores Limited
Efrain Teck	Corozal Town Council
Christobal Babb	Corozal Town Council
Jason Pearce	Consejo Yacht Club
W.H. Wildman	Consejo Shores Limited
Graham Sampson	Corozal Mangrove Park Project
Mae Klein	Corozal Mangrove Park Project
Craig Timmons	Corozal Mangrove Park Project

Art Higgins	Mayan Shores Limited
Christina Leuteman	Corozal Mangrove Park Project
Lorenzo Forbes	Consejo Shore Parks and Roads
Joel Diaz	Shipstern Nature Reserve
Rajon Escalante	Consejo Water Taxi
Darvin Torres	Consejo Water Taxi
Adam Lloyd	Wildtracks
Marcelo Cruz	Sarteneja Alliance for Conservation and Development
Hilmor Salazar	Sarteneja Alliance for Conservation and Development
Zelly Tzul	Belize Coalition to Save Our Natural Heritage
Isaias Majil	Belize Fisheries Department
Pilar Flores	World Wildlife Fund
John Bailey	Private Citizen
Lisa Castillo	Centro Escolar Mexico Junior College
Max Roesinger	Peace Corps Corozal Town
Melani Yama	Centro Escolar Mexico Junior College
Walder Casteneda	Centro Escolar Mexico Junior College
Esme Nicholson	Centro Escolar Mexico Junior College
Neily Pech	Centro Escolar Mexico Junior College
Yalizari Patt	Centro Escolar Mexico Junior College
Sayuri Tzul	Centro Escolar Mexico Junior College
Dalia Gongora	Centro Escolar Mexico Junior College
Ileanie Montalvo	Centro Escolar Mexico Junior College
Joycey Acosta	Centro Escolar Mexico Junior College
Argelie Sosa	Centro Escolar Mexico Junior College
Silverio Marin	Centro Escolar Mexico Junior College
Craig Timmons	Friends of Mangrove Park
Losita Lee	APAMO
Yvette Alonso	Private Citizen
Heron Moreno	Shipstern Nature Reserve/BTIA Corozal
Joel Verde	Sarteneja Alliance for Conservation and Development
Graciliano Rivero	Sarteneja Tour Guide Association
Zoe Walker	Wildracks
Raul Rosado	Corozal Junior College

CZMAI held a series of consultation meetings that were open to the general public during the mandatory 60-day public review period following the completion of the first comprehensive draft of the Belize Integrated Coastal Zone Management Plan document. The meeting for the Northern Region was held in Sarteneja Village on Thursday May 30, 2013, and had participation from the following individuals:

NAME	**ORGANIZATION/AFFILIATION**
Carlos Aldana	Sarteneja Tour Guide Association
Carlos Cruz	Sarteneja Village resident
Carolie Verde	Sarteneja Alliance for Conservation and Development
Darnel Cruz	Sarteneja Village Council
Diogenes Perez	Sarteneja Village Council
Gaspar Cantun	Sarteneja Village Council
Hector Lopez	Aqua Pura
Jemayel Verde	Sarteneja Village Council
Jennifer Chapman	Blue Ventures
Jessie Aldana	Sarteneja Village Council
Joel Verde	Sarteneja Alliance for Conservation and Development
Leomir Santoya	Sarteneja Fishermen Association
Lucio Guerrero	Sarteneja Village Council (Chairman)
Marcelo Cruz	Sarteneja Alliance for Conservation and Development
Roniel Durantes	Sarteneja Village resident
Zoe Walker	Wildtracks

A final round of consultations was held July 7th 2015-September 7th 2015 as-the re-constituted CZMA Board of 2014 directed a re-opening of the public comment period.

Table of Contents

LIST OF MAPS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

APAMO	Association of Protected Areas Management Organization
BTIA	Belize Tourism Industry Association
CAC	Coastal Advisory Committee
CBA	Central Building Authority
CBO	Community-based Organization
CBWS	Corozal Bay Wildlife Sanctuary
CZAC	Coastal Zone Advisory Council
CZM	Coastal Zone Management
CZMAI	Coastal Zone Management Authority and Institute
DOE	Department of the Environment
GOB	Government of Belize
HRA	Habitat Risk Assessment
InVEST	Integrated Valuation of Ecosystem Services and Trade-offs
ICZM	Integrated Coastal Zone Management
NGO	Non-governmental Organization
NRCAC	Northern Region Coastal Advisory Committee
SACD	Sarteneja Alliance for Conservation and Development
SIB	Statistical Institute of Belize
STP	National Sustainable Tourism Master Plan of Belize

GLOSSARY OF TERMS

Certain technical terms have been used in the text of these guidelines. The following represents an explanation of such terms where they have not provided within the text.

Artisanal/Subsistence Fishing *means traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amount of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption*

Building Height *means the recommended maximum building height allowed for each building to be measured from ground level to roof*

Building Setback *means the recommended minimum distance between buildings or between buildings and site boundaries*

Commerce *means the storage and retail of consumer goods*

Commercial Development *means land use involving the construction of a building or buildings that are used solely for commerce and business activities by the owners or others to the exclusion of all other uses within the density requirements of these guidelines*

Commercial Fishing *means the harvesting of fish, either in whole or in part, for sale, barter or trade*

Conservation *means the retention of the natural features but with allowance of limited non-disruptive development*

Conservation Area *means areas including the 66ft reserve and other reserves, canal buffers, water bodies, flood prone lands; areas with ecological significance such as mangrove wetlands*

Community Facilities *means spaces set aside in large residential or commercial subdivisions for public purposes. They may include facilities such as public parking lots, schools, cemeteries, churches, public sporting areas, youth centers, police stations or health facilities*

Coverage *means any building, including balconies and verandas, and expressed as a percentage of total lot size*

Density *means a level of development within a site, as measured by the number of lots per acre, number of dwelling units per acre, or maximum site coverage*

Development *means any activity which involves mining, engineering, building operations or change of use of land or building in, under, over or on land*

Dwelling Unit *means a living area consisting of contiguous rooms intended for convenient, long-term occupancy by one family and providing complete, independent facilities for living, eating, cooking, sleeping and sanitation*

Fish camp *means a building that is permanently or temporarily used for ancillary housing, trap-making and storage, boar repair and docking by full or part time commercial fishermen as licensed by the Fisheries Department*

Habitable Room *means any room except that used for a kitchen or bathroom*

Land *means all incorporeal hereditaments of every tenure or description that are either permanently or temporarily above the surface of the sea, whether through natural or man-made activity. The seabed, while not 'physical' land, is defined as National Land*

Liquid Waste *means grey water from bath, basin and sink and sewage waste that consist mainly from discharge of body waste*

Low-Density Development *means development of a site that does not exceed 20 dwelling units per acre, 6 lots per acre and a maximum site coverage of 50 percent*

Low-Impact Development *means an ecologically-friendly approach to site development and storm water management that mitigates development impacts to land, water and air; through conserving natural systems and hydrologic functions of the site. Site development includes residential dwelling units and community facilities and impervious surface cover is a maximum of 30 percent of total cover*

Marina *means a mooring facility for four or more recreational vessels*

Maximum Human Carrying Capacity *means the maximum population size of humans in an area that the local environment can sustain indefinitely, given accessibility to the food, habitat, water, and other necessities*

Maximum Number of Floors *means the recommended maximum number of floors a building will be allowed to have including attics or roof space designed for habitation*

Maximum Number of Lots *means the recommended maximum number of lots in which an acre of land can be subdivided and alienated*

Maximum Habitable Rooms *means the recommended maximum number of rooms to be allowed and measured per acre of land*

Maximum Building Coverage *means the recommended maximum ground coverage of any building including balconies and verandahs and expressed as a percentage of total lot size*

Maximum Site Clearance *means the recommended maximum amount of land that will be allowed to be cleared expressed as a percentage of the total site area*

Medium-Density Development *means development of a site that does not exceed 40 dwelling units per acre, 8 lots per acre and a maximum site coverage of 66 percent*

Medium-Impact Development *means an ecologically-friendly approach to site development and storm water management that mitigates development impacts to land, water and air; through conserving natural systems and hydrologic functions of the site. Site development includes a combination of residential dwelling units, community facilities and commercial activities, and impervious surface cover is a maximum of 50 percent of total cover*

Minimum Lot Size *means the recommended smallest size a parcel will be allowed to be alienated*

National Land *means all lands, including cayes and parts thereof not already located or granted, and any lands which have been, or may hereafter become, escheated to, leased by, or otherwise acquired by the Government*

Piers per Site *means the recommended number of piers that will be allowed to be constructed on any site*

Primary Land Use *means the recommended preferred use for the site*

Residential Development *means land use that involves the construction of a building or buildings that are used solely for permanent or temporary domiciles by the owners or others on a non-commercial basis to the exclusion of all other uses within the density requirements of these guidelines*

Resort *means a building, buildings or site which offers accommodation and general amenities to visitors with other uses such as bars, restaurants, general storage and repair facilities and docking*

Secondary Land *means the recommended next preferred use to be applied to the site either in conjunction with the primary land use or as an alternative to the primary land use if that is not applicable*

Solid Waste *means any unwanted material that is useless and thrown away or, discarded*

Swamp *means an area of very shallow lagoon with mud, savannah or very low vegetation*

Utility *means the service and infrastructure used for the supply of energy, water, communication and waste disposal*

PREAMBLE

The Belize Coastal Zone Management Authority and Institute (CZMAI), a statutory body established by the Coastal Zone Management (CZM) Act of 1998, is tasked with the broad responsibility of assisting with the development of policies, strategies and guidelines for the improved management and sustainable use of the country's coastal resources at a national level. In keeping with its mandate to prepare an integrated coastal zone management plan, CZMAI has developed regional coastal zone management guidelines to provide support for planned development and resource management along the coastline and offshore areas of the entire country. These guidelines have been prepared for nine (9) coastal planning regions (**Map 1**), which were demarcated based on commonalities, geographic definition and regional characteristics. The coastal zone management guidelines will help to integrate management efforts across the land-sea interface.

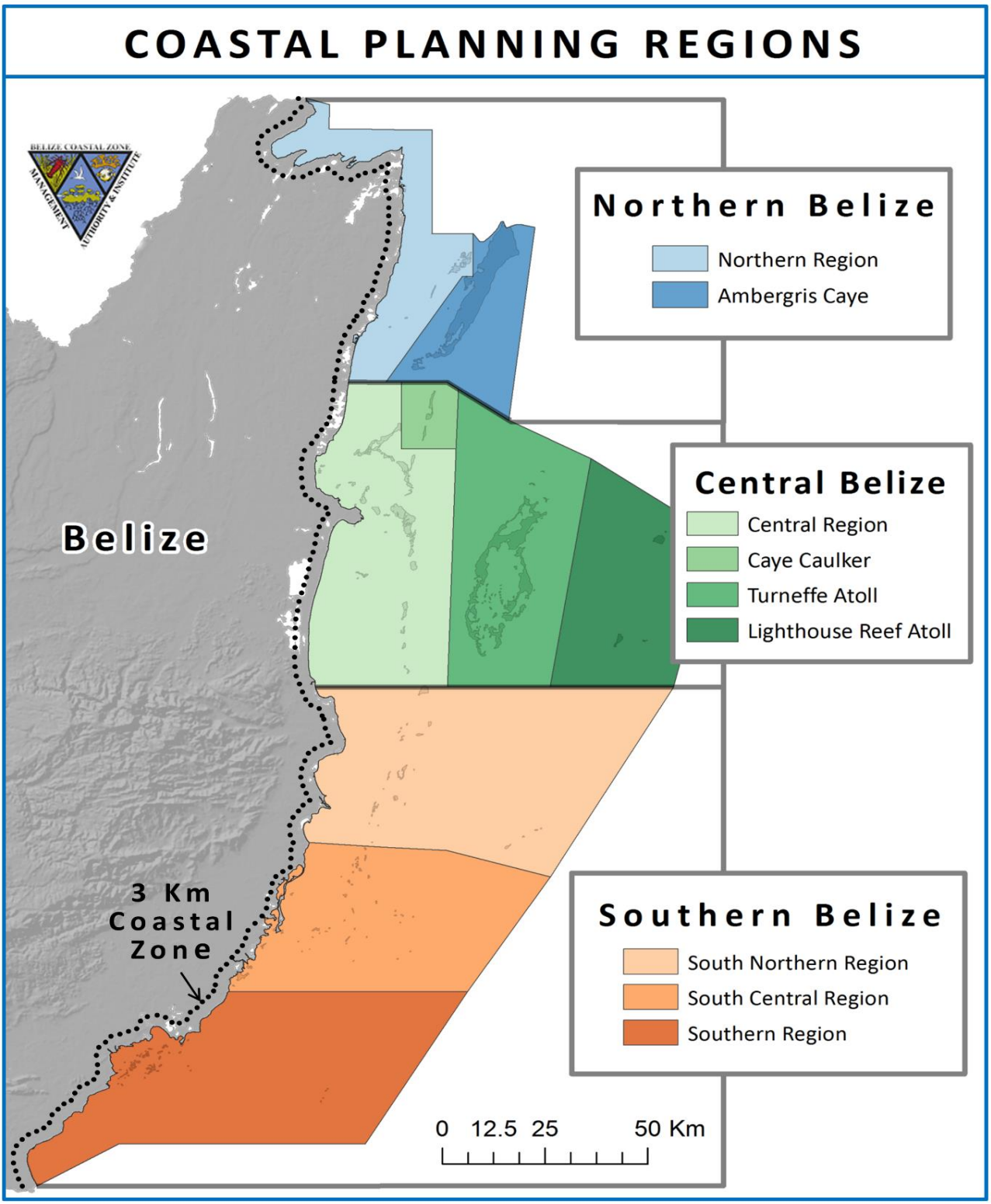
The Northern Region Coastal Zone Management Guidelines were developed in conjunction with the stakeholder communities within the region. The Northern Region; which includes the coastal communities of Corozal Town, Consejo Village, Sarteneja Village, Chunox Village and Copper Bank Village; is relatively undeveloped and known for its rich diverse flora and fauna as well as its sensitive and pristine ecosystems. Using the expert subjective information from stakeholders in addition to the best available objective data, CZMAI was able to produce this guideline with the following goals:

1. Encourage and promote the sustainable development of coastal and offshore areas within the Northern Region that will promote economic growth while simultaneously ensuring ecosystem stability and the efficient delivery of ecosystem services.

2. Protect and preserve the traditional way of life of the stakeholders within the Northern Region

3. Ensure sustainability of coastal resources by identifying areas in need of conservation and reducing user conflicts

These goals are culturally informed, and rooted, where possible, on sound science and local knowledge. These guidelines represent the views and recommendations of the stakeholders of the Northern Region. They are also a response towards addressing the management gaps identified by stakeholder communities through an extensive consultation process. The coastal zone management guidelines will ensure that human use of the coastal region occurs in consideration of the carrying capacity of the environment in addition to other ecological, cultural, social and economic development priorities of the region. These guidelines will aid policy development for integrated coastal zone management. They will be implemented by all those agencies that have legal mandates and/or permitting powers that impact resource utilization in the coastal zone of Belize, in partnership with this region's stakeholder groups.



Map 1: Coastal Planning Regions of Belize

1.0 INTRODUCTION

Situated in northeastern Belize, the Northern coastal planning region covers all that area encompassing the Corozal Bay Wildlife Sanctuary, portions of the Hol Chan expansion, in addition to nine (9) cayes that lie north of the Central coastal planning region, west of the Ambergris Caye planning region, and south of the international marine border with Mexico. There are also five (5) coastal communities that exist within the northern planning region. A list of the communities and cayes within the northern planning region is listed in **Table 1**. The Wildlife Sanctuary is world-recognized as a biodiversity hotspot and is considered critical for many species of conservation importance-including the endangered Antillean Manatee (*Trichechus manatus manatus*) that utilizes the waters. With an assemblage of diverse ecosystems and several thriving human communities situated around the Bay area, the region is also of great cultural and socio-economic value.

Table 1: Coastal Communities and Cayes within the Northern Planning Region

Coastal Communities:	
Copper Bank Village	Consejo Village
Sarteneja Village	Chunox Village
Corozal Town	
Cayes:	
Shipstern Caye	Deer Caye
Swab Caye	Blackadore Caye
Mosquito Caye	Savannah Caye
Round Caye/Little Iguana Caye	
Cayo Falso Cayes (pair of mangrove cayes)	

In addition to being a hotspot for species diversity, the Northern region also plays a key role in the provisioning of ecosystem services, such as coastal protection from storms, protective nurseries for many fish species, bird nesting sites and nutrient cycling. Over the past decades, the pressure on the Bay area resources has been very high. For instance, fishing pressure within the Bay is high, as the area is a premier destination for targeting tarpon, bonefish and as well as commercial fish species. The critically endangered sawfish that once aggregated in this area is now presumed to have been fished almost to extinction, although local reports suggest that a remnant population may still remain. Land use change and agricultural contaminant run-off in the watershed, and urbanization has also been identified as potentially having the greatest threats to the Bay area. Tourism activities are relatively low in intensity compared to the neighboring Ambergris Caye region, but the sector is growing. Habitat loss is also occurring at a fast rate. Reversing these trends will only be possible with an informed sustainable management strategy for the region.

Corozal Bay Wildlife Sanctuary was declared a protected area in 1998, but until very recently did not have any form of active management, and was a classic example of a "paper park". In 2008, the first steps were taken towards increasing management effectiveness of the protected area through the establishment of the Sarteneja Alliance for Conservation and Development (SACD), a registered community-based organization (CBO) with co-management agreement responsibility. SACD has been doing basic surveillance and enforcement and has been conducting patrols since January 2010 in liaison with the Forest and Fisheries Departments, and with active participation of the local fishermen.

The Sanctuary covers a significant portion of the planning region. In fact its 72,000 hectares is approximately equivalent to 69% percent of the total areal extent of the planning region. Thus, effective management of the Sanctuary has important implications for the maintenance of ecosystem integrity and functionality that will ensure continued ecosystem benefits to humans and the rich biodiversity within the entire planning region. A management plan for the Sanctuary is in existence, with a structured framework of management activities to assist with the implementation of effective conservation management. The coastal zone management guidelines will help to complement the Sanctuary's management plan and fill the important management gaps within the planning region not covered under the Sanctuary's management plan.

In February 2015 the Hol Chan Marine Reserve was expanded to include four additional areas. The largest of the four areas is Zone E referred to as the Bajos General Area. This zone borders the current boundaries of Hol Chan to the south and then runs along the western coast of Ambergris Caye to the Bacalar Chico Marine Reserve boundry. It then extends to the north west up to the mainland near the Bomba Village Lagoon entrance then northwards to the Corozal Bay Wildlife Sanctuary. This area accounts for a total of 330.6 square kilometers. Within this zone there are several special management zones established which are as follows: I – Bajos General Use Zone, II – Cayo Pajaro Conservation Zone , III- Bajos Conservation Zone, IV – Cayo Rosario Conservation Zone, V – Blackadore Conservation Zone and VI – Los Salones Conservation Zone.

2.0 REGION BOUNDARIES

Location and Geographic Definition

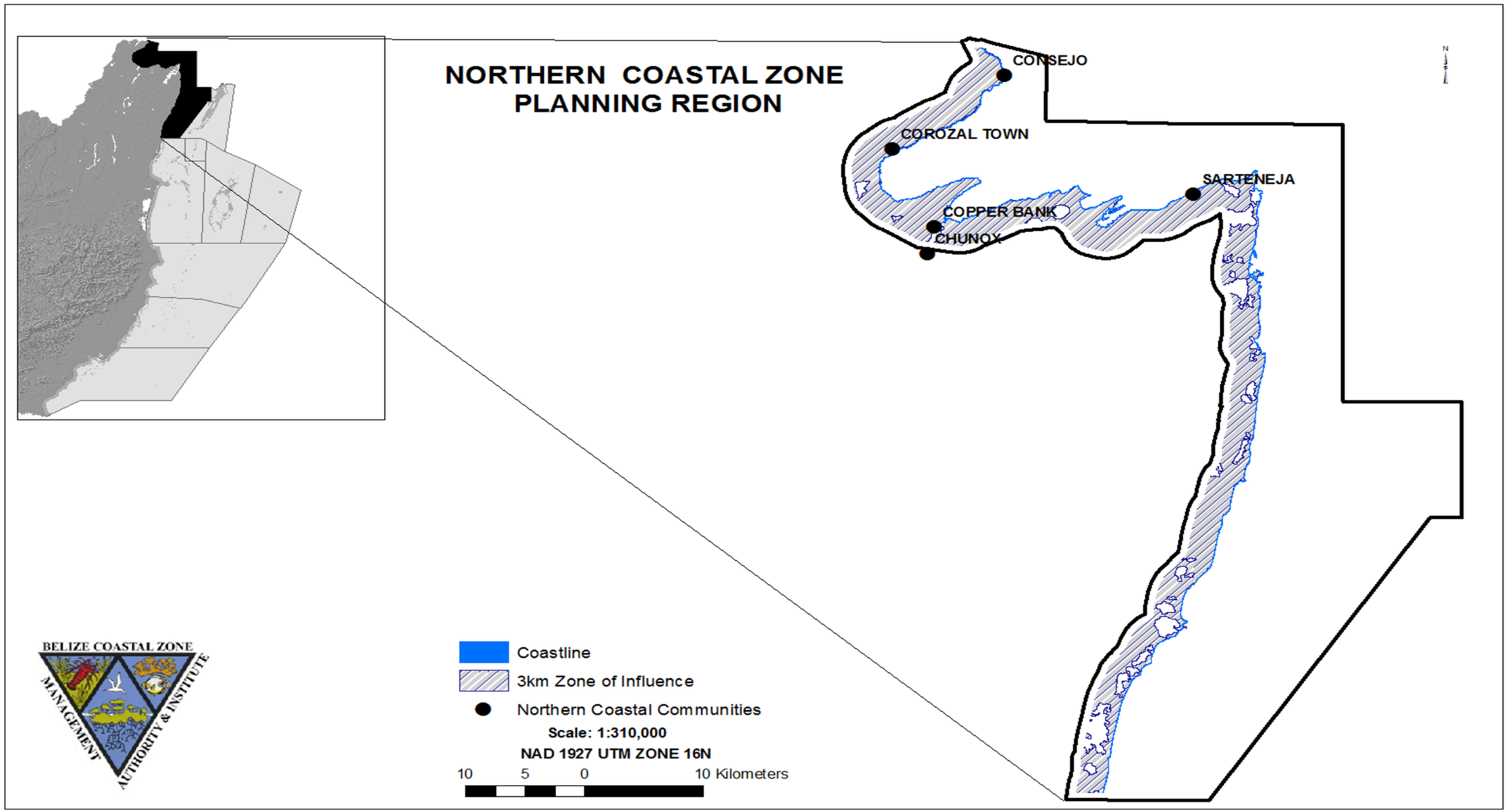
The Northern Region, for which these coastal zone management guidelines have been prepared, is one of nine regions into which the coastal zone has been demarcated (**Map 1**). It is comprised of all that area situated west of the Ambergris Cayes and Caye Caulker Regions and north of the Central Region containing 1425 square kilometers of land and sea, and enclosed by the lines joining points that have the following UTM 16 coordinates:

Point 1: (2044493 N, 359166 E)
Point 2: (2043011 N, 366151 E)
Point 3: (2036556 N, 366257 E)
Point 4: (2036132 N, 391233 E)
Point 5: (2009039 N, 391128 E)
Point 6: (2008933 N, 401182 E)
Point 7: (1997715 N, 401182 E)
Point 8: (1997609 N, 398642 E)
Point 9: (1970092 N, 380615 E)
Point 10: (1970092 N, 368056 E)

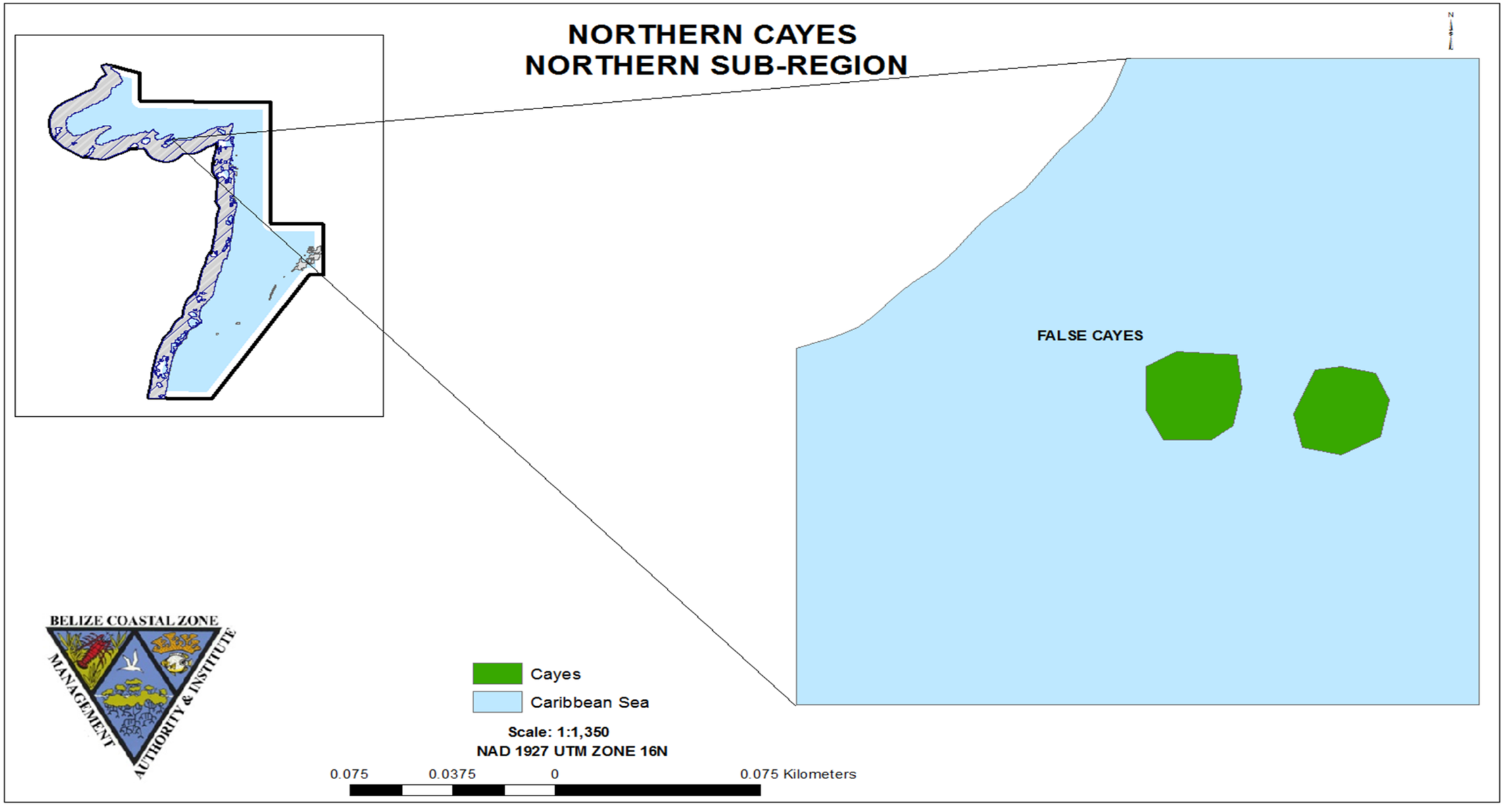
(**See Maps 2, 3, 4, 5**).

Regional Context

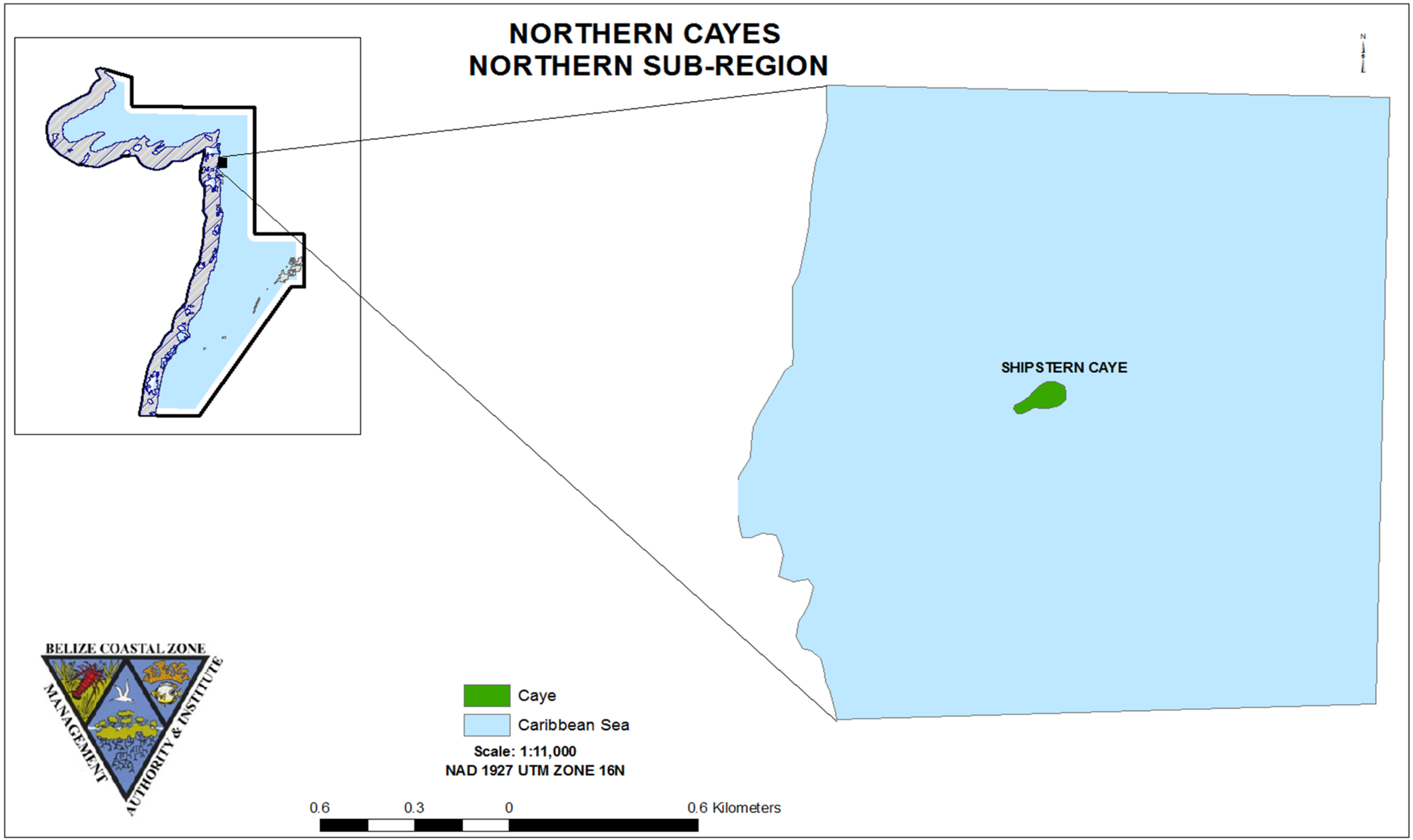
The Northern Region is made up of nine (9) cayes and comprises approximately 1054 square kilometers of terrestrial and aquatic environment of which 0.7% (7 square kilometers) is terrestrial and 99.3% (1047 square kilometers) is aquatic. The Northern Region covers all cayes that lie north of the Central Region, west of the Ambergris Caye Region and south of the international marine border with Mexico. Similar to the Southern Region, it shares its waters with an international neighbor. Although the waters of the region extend north-west into Corozal Bay, cayes are only found in the area between Ambergris Caye and the mainland. The mainland portion of this region includes five coastal communities (**Table 1**) that fall within three kilometres of the coastline from the mean high water mark. This area accounts for approximately 353 square kilometres.



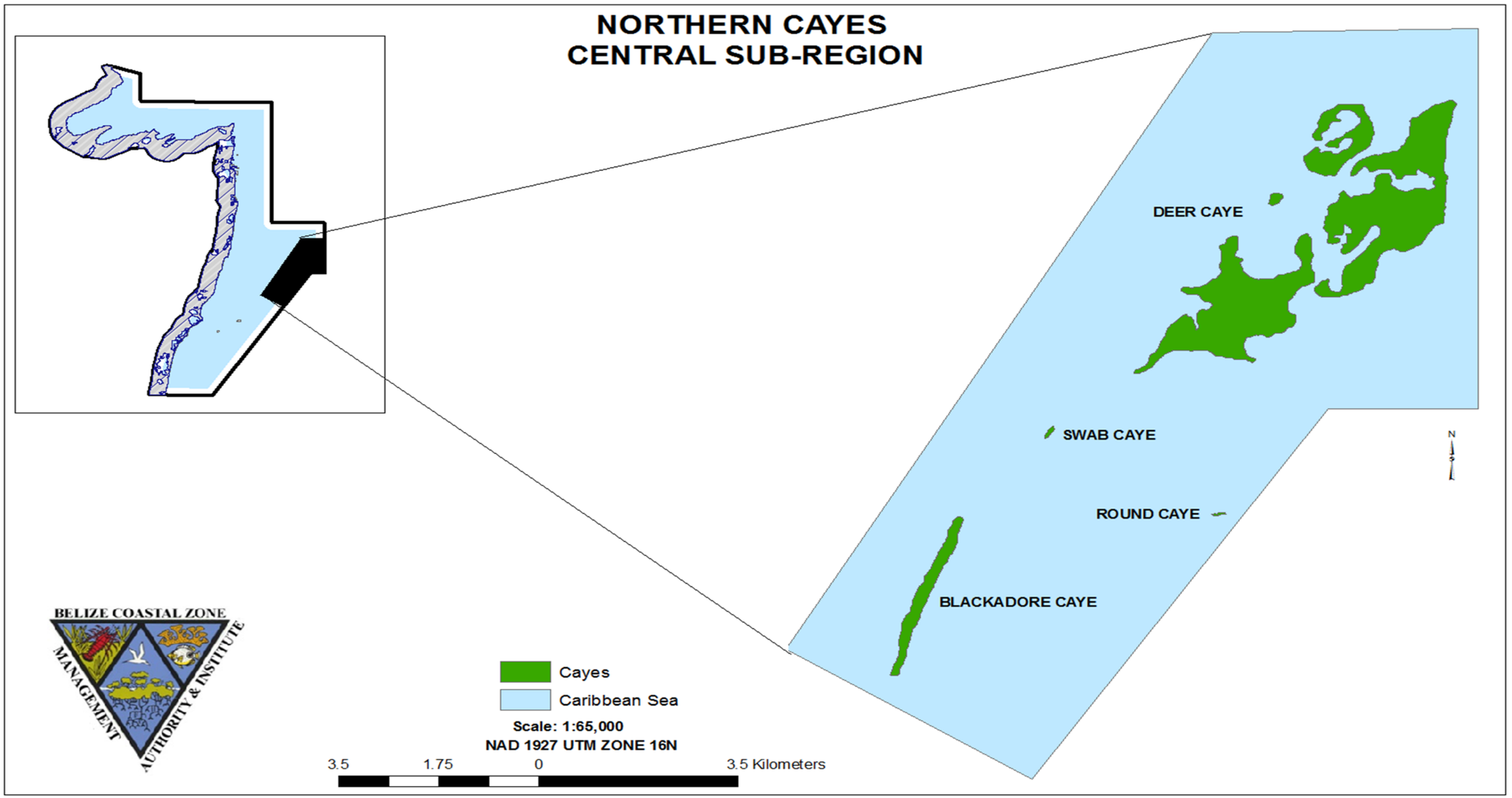
Map 2: Northern Coastal Zone Planning Region



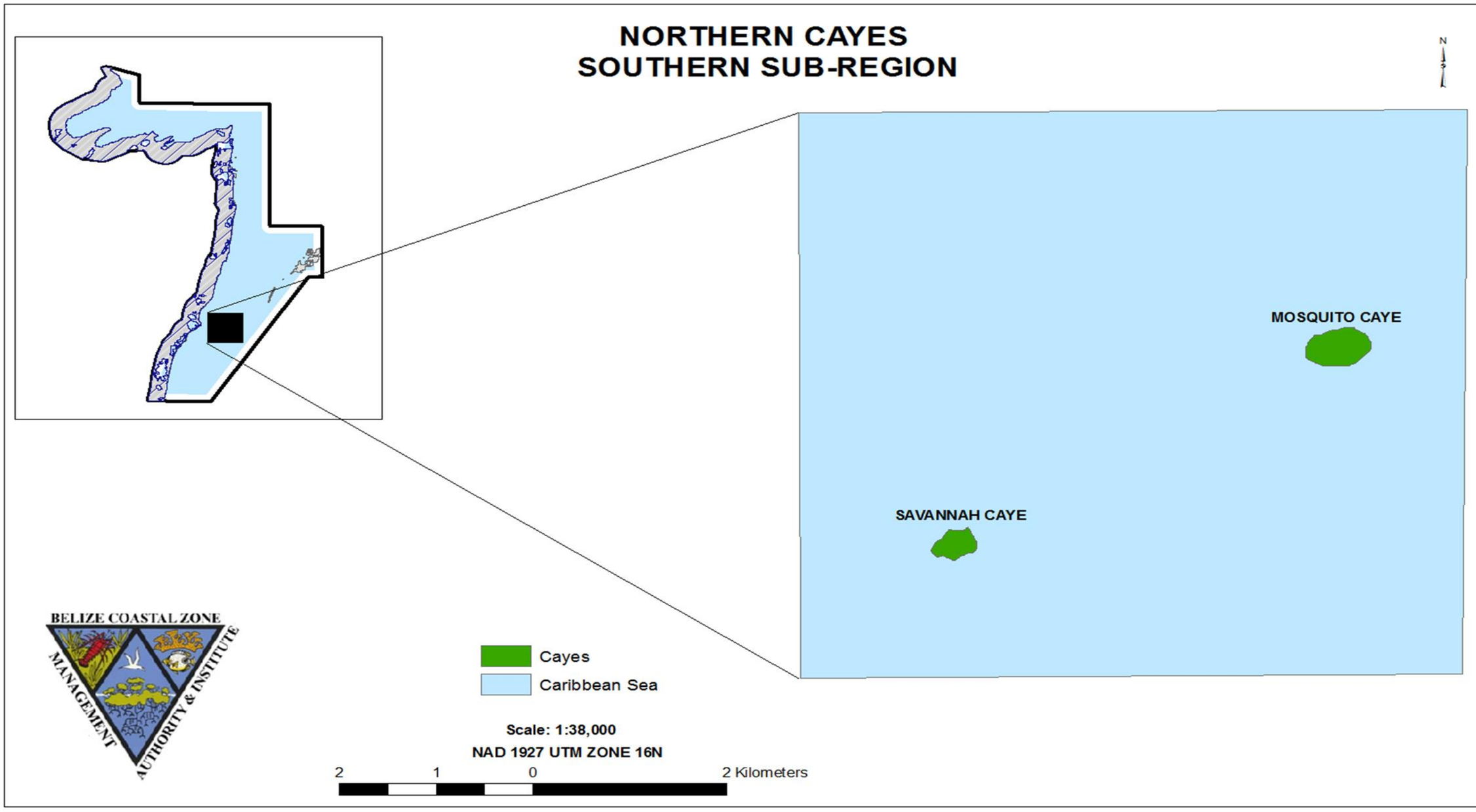
Map 3: Northern Region Cayes (Northern Sub-region)



Map 4: Northern Region Cayes (Northern Sub-region)



Map 5: Northern Region Cayes (Central Sub-region)



Map 6: Northern Cayes (Southern Sub-Region)

3.0 OBJECTIVES

The management of the Northern region's coastal zone must be linked to the goals and aspirations of the people of Belize, particularly the residents of coastal communities within the Corozal District. Consequently, it must be intrinsically tied to the socio-economic, cultural and other basic needs of the people of the south and of Belize, and their use and demand for land and marine resources. In order to ensure the continued protection of nationally significant species, biotic communities and physical features and the continued delivery of ecosystem services to the several thriving communities within the region, the objectives of these coastal zone management guidelines include:

1. Protecting the fishing resources and traditional fishing rights, especially for the fisherfolk from the communities of Sarteneja, Chunox, Consejo, Copper Bank, Corozal, and San Pedro

2. Promoting orderly and sustainable development, based on suitable land use planning, and with effective development guidelines that will meet the needs of current and future generations

3. Maintaining and protecting on going and future conservation, recreational and tourism areas and uses

4. Preventing inappropriate high-impact, unsustainable developments that are incompatible with community needs

5. Protecting and preserving significant national and international natural features and ecological biodiversity of special interest or uniqueness that define the character and scientific importance of the Northern coastal zone

6. Preserving the social and cultural values of the people and communities of the region that are connected to the environment

7. Representing trans-border cooperation to address territorial disputes and impacts to the region's natural resources originating beyond national borders

8. Fostering and supporting a continued partnership among stakeholders for managing the coastal resources

9. Establishing a framework for regulating the development and use of resource of the region through the continuation of CZMAI's coastal planning program activities and coastal advisory committee process

4.0 LEGISLATIVE AND INSTITUTIONAL FRAMEWORK FOR INTEGRATED COASTAL ZONE MANAGEMENT IN BELIZE

The Coastal Zone Management Act, hereinafter referred to as "the Act", was enacted in 1998 and has been described as reflective of the trend in legislation in Belize towards more accountability and transparency for government actions, and more direct participation by the public in decision making, particularly public resources. The intent of the Act is to promote the sustainable development of coastal and ocean areas through coordination of existing legislation affecting coastal resources and through building capacity and expertise to manage coastal resources. The main purpose of the Act is to:

- Provide for the improvement of coastal zone management in Belize through the establishment of a Coastal Zone Management Authority and a Coastal Zone Management Institute;

- Provide for the establishment of a Board of Directors to control and manage the affairs of the Authority;

- Provide for the preparation of a Coastal Zone Management (CZM) Plan;

- Provide for the establishment of mechanisms to improve monitoring of various activities within the coastal zone;

- Provide for the payment of fees and charges related to the use of the coastal zone and

- Provide for matters connected therewith and incidental thereto

The Coastal Zone Management Authority is the policy making and planning institution for coastal zone management. Its functions are primarily in the realm of planning, advising, cooperating, collaborating and monitoring. It is given no jurisdiction to permit or regulate activities which may affect the sustainable development of the coastal zone. The Coastal Zone Management Institute is the research and technical arm of the Authority. As is indicated above, the Coastal Zone Management Authority is mandated to develop a comprehensive Coastal Zone Management (CZM) Plan for Belize. The CZM Plan is to be developed by the Chief Executive Officer (CEO) of the Authority through consultation with all affected government agencies, non-governmental agencies, statutory bodies and the private sector. The Act mandates that the plan address certain areas. These include:

- Guidelines to be used in determining the suitability of particular development activities in the coastal zone;

- Guidelines for the general monitoring of the coastal zone, including its biological species, communities and habitats;

- Proposals, including existing proposals from Government agencies, relating to the coastal zone that deal with the following subjects:
    - Land use
    - Planning for the establishment of marine protected areas and for the conservation of threatened or potentially threatened or endangered species;
    - Preservation and management of the scenic, cultural and other natural resources;
    - Recreation and tourism;
    - Monitoring of the environment and natural resources, mineral extraction, living resources, human settlements, agriculture, aquaculture, and industry

- Proposals for the reservation of land or water in the coastal zone for certain uses, or for the prohibition of certain activities in certain areas of the coastal zone;

- Recommendation for the improvement of public education as well as public participation in the management of coastal resources;

- Recommendations for strengthening governmental policies and powers and the conduct of research for the purposes of coastal resources conservation and management

The process for approval of the CZM Plan is as follows: The Act requires the CEO of the Authority to submit the CZM Plan to the Board of the Authority, who has sixty days to make modifications. Thereafter, the Board is to notify the public of the availability of the CZM Plan by an order published in the Gazette. Any member of the public may submit comments within sixty days. Upon completion of the sixty days, the Board may approve the CZM Plan, subject to modifications, if they deem it fit in regard to the comments submitted, and then submit the same to the Minister for approval. The Minister, after approving the CZM Plan, shall table it in the House of Representatives for approval by the House by affirmative resolution. Subsequent to approval by the House, the CZM Plan must be published in three consecutive issues of the Gazette. The CZM Plan is to come into operation on the date of the last publication or such later date as may be specified therein. The Act requires the CZM Plan to be revised during the four year period after it comes into operation.

It was agreed by the CZMAI that the CZM Plan would be developed in phases, with the first phase being the development of an Integrated Coastal Zone Management Strategy

document, which underwent extensive public consultation. It was endorsed by the cabinet in 2003, and is an official policy document of CZMAI. The second phase involved the formulation of cayes development guidelines for eight of the nine coastal planning regions into which the coastal zone has been sub-divided by the CZMAI. This subdivision was based on geographical, biological, administrative and economic similarities. The Ambergris Caye Development Master Plan serves as a guide for regulating the use and development of land in the Ambergris Caye Planning Region. See **Map 1** for the definition of the nine coastal planning regions.

The development guidelines were formulated using the Cayes Development Policy (2001) as a framework. During 2010-2012, the cayes development guidelines were updated to include new information on the cayes, but also to include human use of the coastline and marine waters. As such, the development guidelines have been renamed the coastal zone management guidelines. Thus, the Integrated Coastal Zone Management Strategy (2003), together with the coastal zone management guidelines for the nine coastal planning regions, contributes to the development of the comprehensive Integrated Coastal Zone Management Plan.

5.0 GUIDING PRINCIPLES

It is important that the coastal zone management guidelines for the region be formulated as a part of a sustainable plan geared towards contributing to national, regional and local development policies, goals and aspirations. They must therefore be holistic and pragmatic, yet underpinned by certain fundamental principles. These can be detailed as follows:

Principle 1:- *Recognition that the Northern Region needs special protection and management because of its physical, economic, scientific, cultural and aesthetic attributes*

Principle 2:- *Recognition of the need to avoid placing undue strain on the terrestrial and aquatic environment of the region by ensuring that proposed development activities do not exceed the carrying capacity of the region*

Principle 3:- *Recognition of the rights and interests of traditional users and stakeholders while acknowledging the national development policy which promotes tourism and job creation*

Principle 4:- *Recognition that environmental concerns are best handled with the participation of all concerned stakeholders at all levels and from all sectors*

Principle 5:- *Recognition that planning guidelines represent a preventative and precautionary approach to environmental degradation and a tool for pursuing sustainable development of the region*

6.0 SECTORAL ISSUES AND POLICIES

These policies are organized into ten sectors that address current and potential issues within the Northern coastal zone, and provide recommendations from stakeholders. They include: Fishing, Marine Tourism and Recreation, Land-Use, Marine Dredging, Sensitive Habitats, Utilities, Pollution Control, Social Amenities, Conservation, and Research & Education. They were developed by the Northern Region Coastal Advisory in consultation with the communities of Sarteneja, Consejo, Corozal, and the Coastal Zone Management Authority and Institute.

6.1 Fishing

Fishing within the Corozal Bay of the Northern coastal planning region has been identified as a traditional resource-use activity, practiced from generation to generation, for generating an income for families, and providing an important protein source in several stakeholder communities. The extent of the fishing area in the Northern region is captured in **Map 6**. More recently, there has also been a focus on sport fishing, from Corozal, San Pedro and Sarteneja – an area of interest that is predicted to increase over the coming years, as Corozal Bay becomes better known for its permit, bonefish tarpon and snook populations. Since fishermen from these stakeholder communities have fished the area for many years, they are considered to have traditional rights to the fishing grounds in the area, though they are encouraged to develop sustainable fishing practices or alternative livelihoods. This activity is in contradiction with the National Parks System Act as wildlife sanctuaries are strictly non-extractive management zones. However, SACD recognizes the traditional use rights, and has lobbied for continued access for traditional fishermen. This is also supported by the recommendations of the National Protected Areas Rationalization Assessment (Wildtracks 2012).

The shallow bay provides a protected nursery habitat for a variety of fish and invertebrate species of conservation concern. The Goliath Grouper (*Epinephelus itajara*) and Small tooth Sawfish are among the critically endangered species while the Mutton Snapper (*Lutjanus analis)*, Cubera Snapper (*Lutjanus cyanopterus)* and Hogfish (*Lachnolaimus maximus)* have been identified as being vulnerable. The potential for a remnant population of sawfish in the coastal lagoons that feed into Corozal Bay is supported by continued reports from local fishermen. The region near Spanish Point and the complex of coastal lagoons to the north of this have been identified as important areas for fish recruitment.

Corozal Bay is also reported to have at least five shark species that can be found within the general area, with bull, blacktip, nurse and bonnethead sharks (*Carcharhinus leucas*, *Carcharhinus limbatus*, *Ginglymostoma cirratum* and *Sphyrna tiburo*) reported, particularly from the Bulkhead Shoals area to the southern end of the Wildlife Sanctuary, south of Deer Caye. The channels in this area and the shallow, sheltered waters of the Wildlife Sanctuary north of this are thought to be an important nursery area for these elasmobranchs. Corozal Bay is

known as a sport fishing area, with bonefish (*Albula vulpes*), permit (*Trachinotus falcatus*), tarpon (*Megalops atlanticus*), common snook (*Centropomus undecimalis*) and crevalle jack (*Caranx hippos*) all being targeted. Unregulated fishing, however, is thought to have severely reduced populations from former levels.

The spiny lobster (*Panulirus argus*) fishing area covers approximately 157 km^2 in the Northern Region. Based on stakeholder consultations, the fishing effort for lobster in this region has been reported to be close to zero. This is mainly because there are very few reports of lobster observation within the Corozal Bay Wildlife Sanctuary (Walker pers. com., 2013). Noteworthy, however, is the fact that this spatial area adjoins the Ambergris Caye planning region, a highly productive lobster fishing area (**Fig. 4, Appendix**). Thus, even though fishing effort within the Northern planning region is reportedly absent, lobster is still produced along the eastern fringes of the planning region. It is very plausible that the lobster produced is landed by fisherfolk that fish intensely in the Ambergris Caye region during the lobster season.

The results of the InVEST Spiny Lobster model for this region are based on the lobster area that adjoins a highly productive area. The model estimated lobster tail catch for the current (2010) zoning scheme to be 7583 lbs, and generating revenue of BZ$0.2 million (**Fig. 4, Appendix**). The modelled data aligns with the catch data reported by the Belize Fisheries Department, which were used to parameterize the model. The model predicts that under a Conservation Zoning Scheme, the harvestable biomass in the region would be 10,149 lbs, and generate an annual revenue for 2025 of BZ $0.27 million. A Development Zoning Scheme would decrease the harvestable biomass to 2,635 lbs; and generate revenue of only BZ $0.07 million for 2025. The results are indicating that in the proposed Informed Management Zoning Scheme, harvestable lobster biomass would be 7,302 lbs; and generate revenue of BZ $0.19 million for 2025.

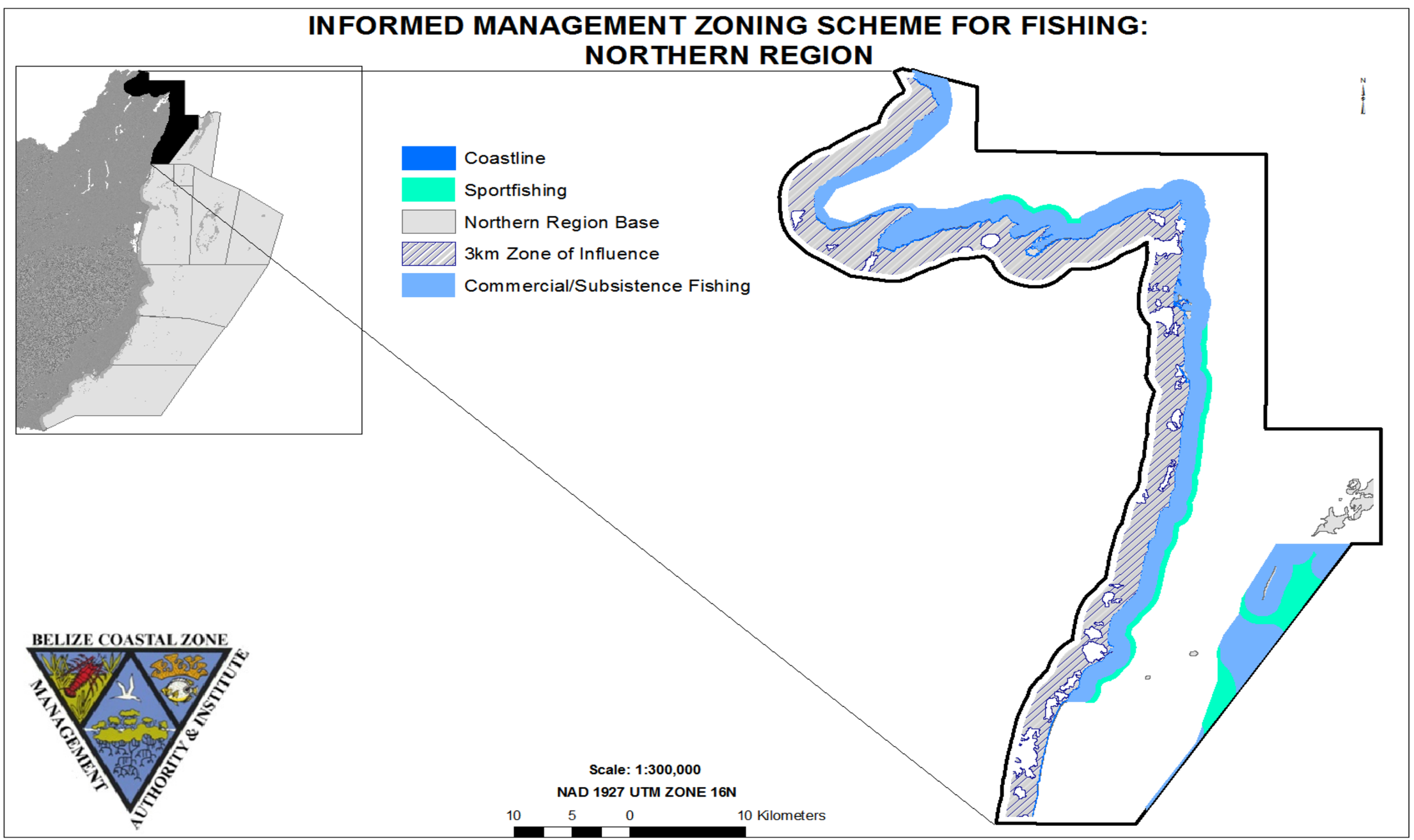
Compared to the Informed Management Zoning Scheme (**Map 6**), the Conservation Zoning Scheme is the better option for maintaining increased lobster catch and revenue through to 2025. This is mainly attributed to the fact that under the Conservation Zoning Scheme, habitats that support the lobster fishery are under relatively less stress from human activity than in the Informed Management scheme. However, while the zoning scheme under a Conservation Scenario is good for habitats and the provision of important ecosystem services, such as protein from lobster, significantly less human activities occur in this zoning scheme. Although there may be some loss to habitat quality and lobster production, the Informed Management zoning scheme represents a balance between managing the resources of the coastal zone and the continued allocation of areas for human use through to 2025.

In discussing the results of the InVEST ecosystem models, and in particular the lobster fishery model, there is the need to consider limitations of the model, which are highlighted below:

- Population growth parameters are nationwide, not region-specific
- Habitat dependencies are obligatory (e.g., habitat substitutability is not explicit represented).

- The population responds to change in habitat quantity (i.e., areal extent of mangrove, seagrass, and coral reef), not quality of those habitats.
- The fishery is assumed to take place at the start of the year, before natural mortality
- The model assumes near knife-edge selectivity in harvest function
- Harvest selectivity (and catchabilitiy) is invariant, such that technological improvements to gear or changes in fishing practices are not modeled.
- Market operations are fixed, such that they do not vary in response to amount of harvest, shifts in market or consumer preference, or technological changes.
- Climate change impacts are not directly accounted for in model

Additional information on how this model works can be found in **Appendix B.4** of the Belize Integrated Coastal Zone Management Plan.



Map 7: Informed Management Zoning Scheme for Fishing in the Northern Region

Table 2: Framework for Implementing Informed Fisheries Management in the Northern Region

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	**Compatible**	**Regulated**			
Fishing	Marine area defined for the extraction of fish for food and commercial trade, except for sport fishing which only involves the catch and release of fish	1.Sportfishing(bonefish, tarpon, permit); 2.Wild capture of commercial fish species using only permitted fishing gear 3. Subsistence fishing using traditional fishing gear 3. Wild capture of invasive species	Marine recreation and eco-tourism Passage/entry of fishing vessels Research and Education within marine reserves Establishment of fish pots and traps Seaweed culture	Sport fishing Commercial fishing Research and Education	1. Illegal extraction of catch and release species, endangered marine species and organisms under seasonal management regime; 2.Extraction within legally specified "no-take"/replenishment zones 3. Dredging 4. Use of prohibited fishing gear 5. Trawling 6. Shipping and navigation 7. Dumping of solid and liquid wastes 8. Oil exploration and extraction	Fisheries Act Coastal Zone Management Act	Fisheries Department Coastal Zone Management Authority

The Fisheries Act, administered under the Fisheries Department, is the principal governing legislation to regulate the fishing industry (**Table 2**), and is directly concerned with maintaining sustainable fish stocks and protecting the marine and freshwater environments. In order to protect the fisheries resources of the Corozal Bay area and the traditional fishing rights of fishing communities of the region, the following action steps are recommended, to complement the existing Fisheries regulations and to enhance regional management of the fisheries resources.

Recommended Actions:

1. Protect spawning aggregation sites, traditional fishing grounds and critical areas of the northern coastal zone including, but not limited to, no-take areas and bull-shark areas, through the clear identification and demarcation of these areas. The eastern coastal lagoons and waters from Spanish Point north are considered priority areas

2. Provision of effective enforcement mechanisms for the Belize Fisheries Act and its regulations, including the training of enforcement officers

3. Incorporate fishing areas into development planning for the region

4. Amend the Fisheries Regulations to include harsher penalties for non-compliance with fisheries management policies
5. Preserve mangrove areas important for the provision of fish nursery habitats

6. Disseminate information to the general public via public awareness campaigns on an ongoing basis on fisheries legislations, especially the protection of fish species of conservation and/or commercial significance

7. Identify traditional fishers who depend on the Corozal Bay Area resources for commercial, recreational, and/or subsistence fishing

8. Secure long-term alternative livelihood options for traditional fishers of the region

9. Limit dredging activities from areas within close proximity to important fishing grounds

10. Conduct research on the relationship between abiotic factors, (such as salinity, temperature) and fish stocks

11. Provide all local fishermen active in the Wildlife Sanctuary with ID permits for Corozal Bay, recognized by the Forest and Fisheries Departments

12. Conduct regular patrols along the east coast targeting non- fishermen and transboundary incursions–increasing use of night patrols, monitoring of creeks etc.

13. Establish protocol and collaborative agreements with Fisheries Department and Belize National Coast Guard for fast response to reports of transboundary incursions

14. Implement the recommended Informed Management zoning scheme for fishing for this region (**Map 6**)

6.2 Marine Tourism and Recreation

The recently prepared National Sustainable Tourism Master Plan of Belize 2030 charts a course of strategic actions that will result in the development of a dynamic, competitive and sustainable tourism industry by the year 2030. This 2030 vision is articulated in terms of desired tourist arrivals, markets, expenditures and destinations. In terms of the tourism development strategy for Northern Belize, which covers the northern planning region, the plan recommends the promotion of tourism growth. The Corozal Bay area is highlighted and particular recommendations are made about the communities of Corozal Town and Sarteneja Village, which are discussed in Section 6.3 "Land Use".

In 2009, tourism stakeholders in the Sarteneja community created a tourism development plan for their region, the vision of which is one of environmentally and financially sustainable tourism. The main objective of the Sarteneja Tourism Development Plan is to create alternative livelihood opportunities for the community, through the creation of employment prospects. Other stakeholder communities have also voiced their support for sustainable tourism activities in the entire region as the tourism revenue would benefit them.

The Ministry of Tourism, Culture and Civil Aviation recommends the following tourism activities for destinations within the Northern Region:

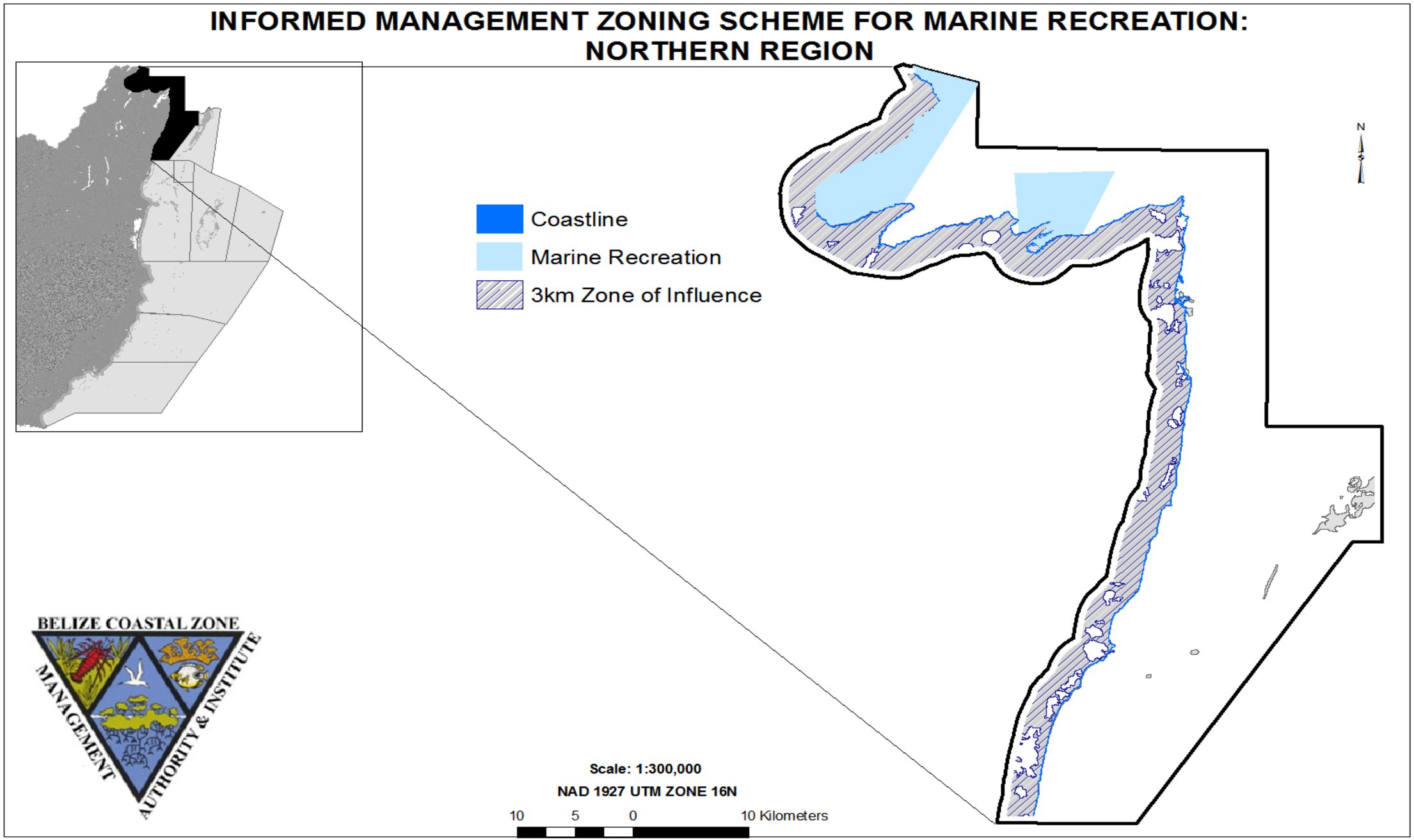
Consejo Shore – Retirement Tourism (Low Density)
Corozal Town – Low density tourism
River Delta of the Belize River (Chunox, Copperbank) – Low density tourism
Sarteneja – Low density tourism
Shipstern Reserve Areas – Very low density tourism

Although this region is not currently a highly frequented destination compared to other destinations in the country, InVEST Recreation and Tourism ecosystem service model results suggest this region may experience a peak in its tourist visitation by 2025 (**Fig. 5, Appendix**). The model results indicate that in 2010 approximately 228 thousand people visited this region, and generated an annual revenue of BZ $27 million (**Fig. 6, Appendix**). In a Conservation Zoning Scheme, InVEST Recreation model results indicate that there would be an increase in tourist visitation to approximately 267 thousand, generating revenue of BZ $30 million in 2025. In a Development Zoning Scheme, there would also be a significant increase in tourist visits to approximately 570 thousand, and the revenue generated for 2025 would be BZ $63 million. In the proposed Informed Management Zoning Scheme **(Map 7)** InVEST Recreation model results indicate that there would also be a likely increase in tourist visitation to approximately 687 thousand. Tourism expenditure for 2025 would be BZ $118 million. The supporting framework for implementing the Informed Management Zoning Scheme for marine recreation and tourism is outlined in **Table 3**.

In discussing the results of the InVEST ecosystem models, and in particular the recreation model, there is the need to consider limitations of the model, which are highlighted below:

- The model assumes that people will respond similarly in the future to the attributes that serve as predictors in the model. In other words, the assumption is that people in the future will continue to be drawn to or repelled by a given attributes to the same degree as currently.
- Some of the attributes that are used as predictors of visitation are representations of areas managed for particular human use (e.g. transportation). The model assumes that future management of the zones and the type of activities that they represent are similar to current.
- Since there are no fine-scale data on the distribution of visitors to Belize, we use photo-person-days as a proxy for the relative density of actual person-days of recreation across the coastal zone.
- Climate change impacts are not directly accounted for in model

Additional information on how this model works can be found in **Appendix B.3** of the Belize Integrated Coastal Zone Management Plan.



Map 8: Informed Management Zoning Scheme for Marine Recreation in the Northern Region

Table 3: Framework for Implementing Informed Marine Recreation in the Northern Region

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	Compatible	Regulated			
Marine Recreation	Marine areas especially suited to swimming, snorkeling, diving, kayaking, surfing, kite boarding, and other water sports	1. Swimming 2. Snorkeling 3. Diving 4.Kayaking 5. Surfing, 6. Kite boarding 7. Other water sports	Passage/entry of water taxis, tour boats, cruise vessels Research and education within marine protected areas Sport fishing	Research and Education Eco-tourism activities within marine protected areas Sport fishing	1. Commercial fishing 2. Establishment of fish pens/cages, mariculture 3. Oil exploration and extraction 4. Dredging 5. Passage of commercial fishing vessels 6. Shipping and navigation 7. Trawling 8. Dumping of solid and liquid wastes from ships and boats	Belize Tourism Board Act Fisheries Act Coastal Zone Management Act Hotel and Tourist Accommodation Act National Sustainable Tourism Master Plan	Belize Tourism Board Fisheries Department Coastal Zone Management Authority

Recommended Actions:

1. Encourage low-impact, low-density, sustainable tourism development

2. Implement maximum carrying capacity limits for areas that are impacted negatively from excessive human activity, such as mining, engineering and building or re-building operations

3. Improve infrastructure to facilitate increased access to sites and resources; This includes the pavement of roads, renovation of docking facilities for water taxis and installation of professional signage at critical junctions

4. All tourism facilities should meet BTB's minimum standards, including disaster preparedness and evacuation plans; and also meet the *"Tourism and Recreation Best Practices Guidelines for Coastal Areas in Belize"* produced by CZMAI

5. BTB and/or DOE should not recommend or approve tourism facilities that do not conform to these coastal zone management guidelines.

6. Engage communities for the development of responsible tourism practices

7. The recommendations of the National Sustainable Tourism Master Plan for this region are to be supported in order to encourage a long-tem sustainable tourism future

8. Implement the Recreation informed management zoning scheme for this region (**Map 7**)

9. To execute the planning and development of Tourism in this region utilizing a participatory, integrated and scientific based approach.

6.3 Land-Use

The land use component of these management guidelines for the Northern coastal zone are based on the carrying capacity of the terrestrial and aquatic environment, combined with the existing and projected types of land tenure patterns and use activities. The demand for land for current and future human settlement activities is a critical element of determining the land-use classification. The land use assignment of residential, commercial and conservation must then be based upon the development suitability assessment, the current development trends, existing land use and property rights, socio-economic and other data to facilitate development. It is important that these coastal zone management guidelines maintain some flexibility to enable a response to the ever changing socio-economic and physical environment.

Keeping in mind the high percentage of national lands, protected reserves, existing uses and ecological sensitivity of the region, it is recommended that conservation, commercial and residential use classes with associated performance standards be assigned to guide and regulate the development of the southern mainland in the agreed zones. These use classes are intended to accommodate existing resorts, residential homes, scientific research, ecological tourism and commercial development. For instance, residential land use includes permanent residences and vacation homes, whether to be used by the owner or rented out for certain periods or times of the year, and can be duplexes, semi-detached or detached units, and home industries. On the other hand commercial denotations are for purposes associated with hotels, resorts, motels and guesthouses, which have in addition to residential purposes shops, bars, offices, entertainment facilities, marinas, gas stations/pumps.

In the case of privately held undeveloped lands, the development standards presented within these guidelines presents the most sustainable and appropriate future land use. Although the CZMAI recognizes the right of the landowner to develop their land in any matter they see fit there must be measures in place to steer future development in order to ensure sustained ecosystem services. Therefore, in the case of these lands, if there is no development activity within the first five (5) years of the passage of this planning document then all future development activities, after the time period, **MUST** follow development standards as outlined within this coastal development guideline.

6.3.1 Coastal Development Standards

The existing standards for subdivision of land (Land Utilization Act, Chapter 188 of the Substantive Laws of Belize, Revised Edition 2000) did not anticipate the magnitude of urban expansion, tourism and other development that Belize has experienced over the past decade. In 2010, the National Guidelines for Subdivision and Consolidation of Land in Belize was revised

to address such issues and provide transparency and equitability to the process of subdividing and developing land. Although revised, the amendments made were general in scope and lacked the specificity needed for sensitive areas such as the cayes and atolls. Therefore CZMAI recommends the standards contained within the National subdivision guidelines only for developing the 3km **coastline** of the Northern Region. The framework for implementing the zoning scheme for the development of coastal lands is found in **Table 4.**

Table 4: Framework for Implementing Informed Coastal Development in the Northern Region

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	**Compatible**	**Regulated**			
Coastal Development	Residential settlements, infrastructure, commercial/economic activities on land above water within 3km buffer of the coastline and offshore cayes	1. Expansion of existing communities 2. Small-medium scale residential development 3.Small-medium scale commercial development 4. Community facilities 5. Supporting infrastructure	Small-scale, light industry Tourism facilities, such as small guest houses Subsistence agriculture production, and landscaping with decorative, native, non-invasive crops	Subdivision of land Establishment of small and medium-scale commercial and light-industrial development Establishment of residential expansion Solid and liquid waste management	1. Large-scale coastal agriculture production 2. Coastal aquaculture 3. Dumping of solid, toxic, hazardous waste and untreated liquid wastes, including grey water and sewage 4. Commercial or light-industrial development within residential zone 5. Residential development within commercial or light industrial development zone 6. Squatting/informal settling 7. Unregulated clearing of mangrove forest, including the conversion of mangrove areas into other uses 8. Oil exploration, extraction and establishment of oil refinery 9. Dredging and Mining	Belize Building Act Cayes Development Policy Coastal Zone Management Act Environmental Protection Act Forest Act Hotels and Tourist Accommodation Act Housing and Town Planning Act Land Utilization Act Mines and Minerals Act Solid Waste Management Authority Act Water and Sewerage Act	Central Building Authority Coastal Zone Management Authority Coastal Zone Management Authority Department of the Environment Forest Department Belize Tourism Board Ministry of Housing Land Utilization Authority Mining Unit, Ministry of Natural Resources Solid Waste Management Authority Belize Water Services Limited

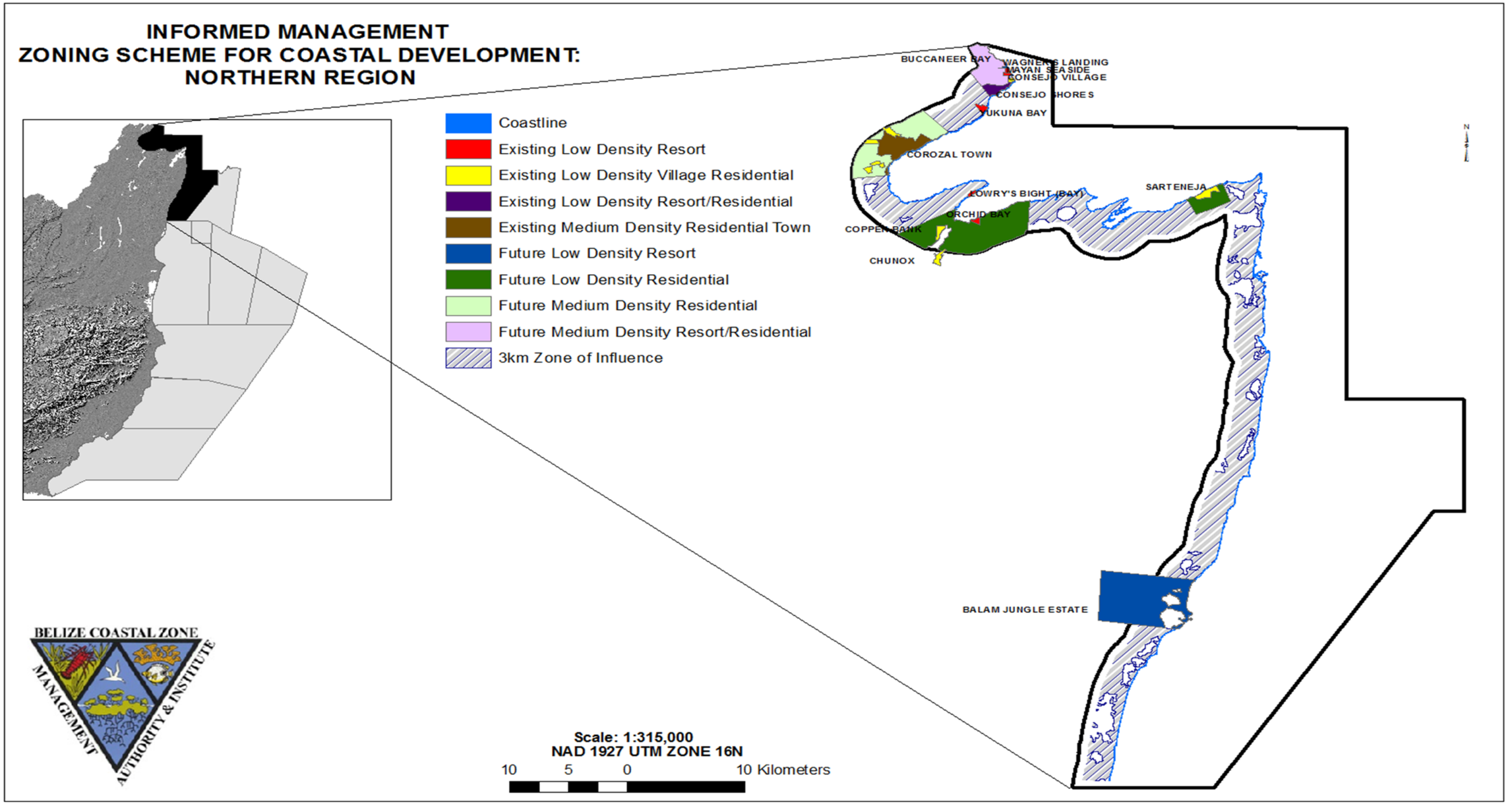
The National Sustainable Tourism Master Plan for Belize (STP) 2030 recommends a development model for the Northern region that encourages **moderate growth** with specific emphasis on improving waterfront recreation for Corozal Town, and infilling empty lands within the villages of Chunox and Sarteneja. Chunox and Sarteneja villages, as well as Orange Walk town, will be the key destinations for nature-based and diversified cultural heritage tourism activities with high involvement at the community level. Although mention is not made in the of the tourism master plan about the Consejo and Copper Bank communities, the model of development that seems most appropriate is the extension of the community edges since they are similar to Sarteneja and Chunox. The tourism master plan also recommends that tourism development occur in two phases; 512 new hotel rooms by 2020, followed by an extra 528 from 2021 to 2030. The density proposed for Chunox, Sarteneja, Corozal and Orange Walk is "**low density**", and allows for up to 20 units/acre-50 units/hectare. The same is recommended for the communities of Copper Bank and Consejo. Residential development standards are found in **Table 5**, and these correspond to the recommended Informed Management Zoning Scheme for Coastal Development (**Map 8**).

Residential Development: Land use in which housing predominates, as opposed to industrial and commercial areas.

Table 5: Residential Development Standards for Sarteneja, Consejo, Copper Bank, Chunox Villages

Subdivision Criteria	Residential Development Standard
Primary Permitted Use	Single and Multi-Family Residential
Secondary Use	Commercial Low Density (convenience stores, small service shops, guest houses); Parks/Playgrounds, Community Facilities
Maximum Lot Size	0.167 acre (6 lots/acre)
Width/Length Ratio	1:2
Net Density (dwelling units per acre)	20 du/acre
Maximum # of Habitable Rooms per acre	120 guest beds/acre
Maximum Site Coverage	50%
Minimum Frontage	50 feet
Minimum Setbacks: Front Side Back	 6ft 6ft 12ft
Car Parking	1 per dwelling unit
Maximum Building Height	As per requirements/standards of the Central Building Authority
Maximum # of floors per building	As per requirements/standards of the Central Building Authority
Services	Water, Electricity, Telecommunications, Sewerage

	Treatment, Waste Disposal



Map 9: Informed Management Zoning Scheme for Coastal Development in the Northern Region

The vision articulated in the National Sustainable Tourism Master Plan is that by 2030, Northern Border – Free Zone will have an established mid-high end Leisure and Entertainment Center that will include a shopping center hosting restaurants, cafes, bars and entertainment facilities such as theatres and casinos. The recommended density proposed for Leisure and Entertainment Center in Northern Border – Free Zone is "**medium density**", which equates to 40 units/acre – 100 units/hectare. Development standards for this commercial development can be found in Table 6, and these correspond to the area zoned for this activity in the Informed Management Coastal Development Zoning Scheme (**Map 8**).

Commercial Development: Land use in which income is generated and commerce is predominant. Includes shops, stores, hotels, office buildings, and warehouses.

Table 6: Commercial Development Standards for Leisure and Entertainment Center at Northern Border- Free Zone

Subdivision Criteria	Commercial Development Standard
Primary Permitted Use	Commercial Medium Density (restaurants, cafes, bars, casino)
Secondary Use	None
Maximum Lot Size	0.125 acre (8 lots/acre)
Width/Length Ratio	1:2
Net Density (dwelling units per acre)	40 du/acre
Maximum Site Coverage	66%
Minimum Frontage	50 feet
Minimum Setbacks: Front Side Back	 6ft 6ft 12ft
Car Parking	1 per dwelling unit
Maximum Building Height	As per requirements/standards of the Central Building Authority
Maximum # of floors per building	As per requirements/standards of the Central Building Authority
Services	Water, Electricity, Telecommunications, Sewerage Treatment, Waste Disposal

Institutional Use and Community Facilities: Land use in which public services and social upliftment predominates. Includes schools, community centers, public health clinics, libraries, embassies, police stations, and other public agencies. Also additional spaces set aside in large

residential or commercial subdivisions for public purposes including public parking, cemeteries, churches, sporting areas, police stations, etc.

Table 7: Development Standards for Institutional Use and Community Facilities

Subdivision Criteria	Development Standard
Building Setbacks: Front: Side: Back:	 25 feet 12 feet 15 feet
Maximum Site Coverage	40%
Permitted Use	Education, Health, Religious, Community Centre etc.
Secondary Use	Conservation & Parks/Playground
Minimum Frontage	1/6 of Perimeter of Lot
Services	Water & Sewerage or Septic Tank, Electricity

6.3.2 Cayes Development Standards

Development on cayes and atolls require specific building standards since these areas are in close proximity to important sensitive habitats such as sea grass beds, mangroves and coral reefs. Ad hoc or uncontrolled development in these areas can have severe negative effects on surrounding ecosystems. For example the construction and proliferation of piers can cause destruction of the beach, sea grass bed and seabed and sedimentation, particularly if they are positioned on the windward side. Furthermore, the movement of debris during storms from buildings constructed on piers can be dangerous.

Sustainable development is crucial in maintaining our natural resources and the benefits that Belizeans receive from them. Proper planning is required for this to be achieved. In 2004, CZMAI produced a set of Cayes Development Guidelines for the cayes within each coastal planning region (**Map 1**). These development guidelines were produced in consultation with stakeholders from each planning region along with technical input from government relevant agencies. Within the document land use classes were developed along with accompanying standards for the varying degrees of development that can occur on a caye. Use classes were also assigned to each caye according to suitability. The use class categories developed include residential, commercial and conservation, representing the various degrees of development intensities allows on cayes.

Land tenure of the cayes within the Northern region is a combination of private and state ownership (See **Table 8:** Summary of Land Tenure of the Northern Region Cayes). Those lands which are nationally owned should remain as such as this state of affairs provides the opportunity for decision-makers to have greater input in land management concerns. Where land

is private property, the right to alienate and develop must be recognized, but regulated to ensure that the subdivision of land subscribes to guidelines which ensure that the resulting parcels can sustain the type of permitted development activity. The seabed is national land and thus any proposals to develop the seabed or to construct piers, marinas and seawalls within this region need to receive clearance from the Lands Department and Department of Environment. This action is particularly relevant in the case of the seabed within the Corozal Bay Wildlife Sanctuary (CBWS), which is managed under a non-extractive regime, under the Forest Department.

Table 8: Summary of Land Tenure of the Northern Region Cayes

Land Tenure and Ownership of the Cayes in the Northern Region							
	National		**Lease**		**Private Property**		**Total Size (acres)**
Name of Caye	**Size (acres)**	**%**	**Size (acres)**	**%**	**Size (acres)**	**%**	
Shipstern Caye	2.38	100	N/A	N/A	N/A	N/A	2.38
Deer Caye	1648.00	99	N/A	N/A	15.00	1	1663.00
Swab Caye	N/A	N/A	N/A	N/A	5.00	100	5.00
Round Caye	2.50	100	N/A	N/A	N/A	N/A	2.50
Blackadore Caye	0.25	0.10	23.00	21.90	79.75	78	103.00
Mosquito Caye	60.00	100	N/A	N/A	N/A	N/A	60.00
Savannah Caye	28.00	100	N/A	N/A	N/A	N/A	28.00
Cayo Falso	N/A	N/A	N/A	N/A	N/A	N/A	N/A

In general, the nine cayes within the Northern region are limited in their potential for development due to several factors. These factors include poorly flushed waters and the consequent high potential for pollution; generally shallow waters around the cayes and poor accessibility; development rights for property and leases; protected area status for the Corozal Bay; and the diminishing fishing grounds. All of these factors underpin the carrying capacity of the cayes and subsequently, their development suitability. In addition, it is also inevitable that the cayes will remain vulnerable to natural hazards, which when combined with increased human activities, can have disastrous effects both on human life and the environment. In assessing the development suitability of the cayes within the region, the following is recommended:

Shipstern Caye is surrounded by patches of corals and seagrass beds, and is reported by fishermen to be poor in marine life due to overfishing. It is low lying and characterized by soil of poor bearing capacity. It is also very small and lies within the Corozal Bay Wildlife

Sanctuary. The caye is a Crown Bird Reserve and historically it has been an important bird nesting colony caye for large numbers of Reddish Egrets, Tricoloured Herons and White Ibis. **Thus, it was determined to be not suitable for development**.

Deer Caye is the largest caye in the region. It is surrounded by corals and seagrass beds, with its near shore waters off the southwestern portion inhabited by shoals with numerous coral heads emerging as much as 3 feet above the water. There is constant murkiness of the water, which may be because of its sheltered location in the lee of Ambergris Caye. While there is much high land, **this caye's soil profile, surrounding sensitive environment and limited accessibility makes its suitability limited for any major development activity**. Therefore, any development of this cayes should be carried out via an integrated planning approach.

Mosquito and Savannah Cayes are both small cayes surrounded by lush seagrass meadows and muddy sea floors, the former having numerous coral patches. The soils are of poor bearing capacity, and the waters surrounding the islands are constantly murky. Thus, **these cayes were determined to be not suitable for development**.

Swab and Round Cayes are small cayes with similar environments and limited scope for development. Round Caye is considered to be a bird sanctuary, and the land tenure is uncertain for both of these cayes. They are both considered to be limited in scope for development. Any development of these cayes should be carried out via an integrated planning approach.

Blackadore Caye is the second largest caye within the region and is surrounded by lush seagrass meadows, and numerous coral heads. This caye has high land, which would suggest that it is suitabile for development. However, when considering the sensitivity of the environment and the problems associated with accessibility, **the development potential was determined to be limited**. However, any development of this cayes should be carried out via an integrated planning approach.

Cayo Falso includes two small mangrove cayes that lies west of Sarteneja Village. They are critical bird nesting cayes for Magnificent Frigatebirds, Brown Pelicans, White Ibis, Roseate Spoonbills, Boat-bulled Herons, Reddish Egrets, Great Egrets and cormorant species. These cayes have low, semi-emergent land dominated by mangrove. **Given the low lands of these mangrove cayes, and their importance for nesting bird colonies, these cayes are not suitable for development**.

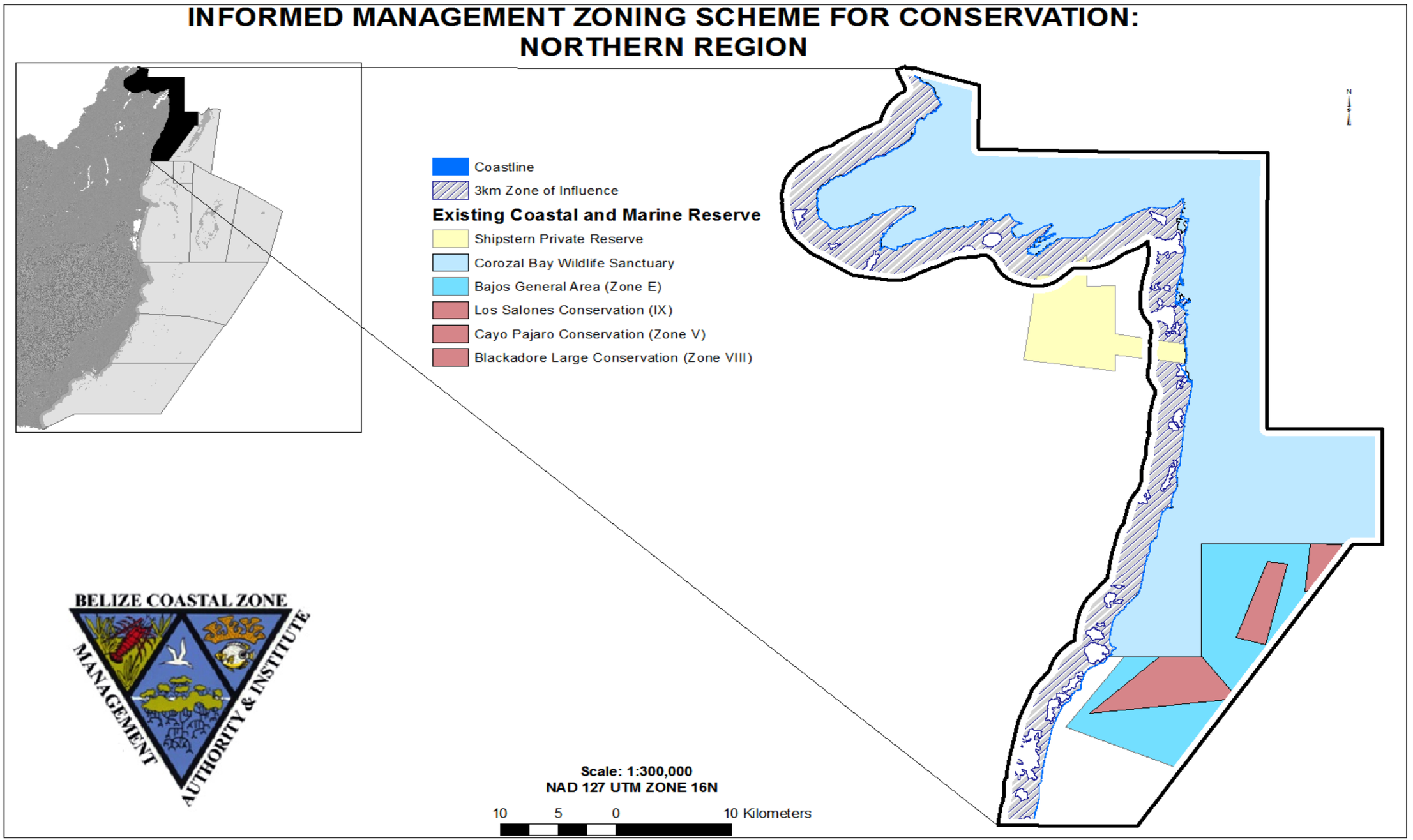
The development suitability assessment for each of the nine cayes within the region, together with current development trends, and drivers for future land demands, all point to minimal and very low intensity development in the near future. Consequently, it is recommended that the land use class of "Conservation" with associated standards to guide and regulate land use of the cayes. This land use class can accommodate scientific research,

ecological tourism activities, traditional use of fishermen camps and low density, low-impact residential development. This land use class designation also represents a precautionary approach to development, and includes two categories that provide for specific levels of development activities.

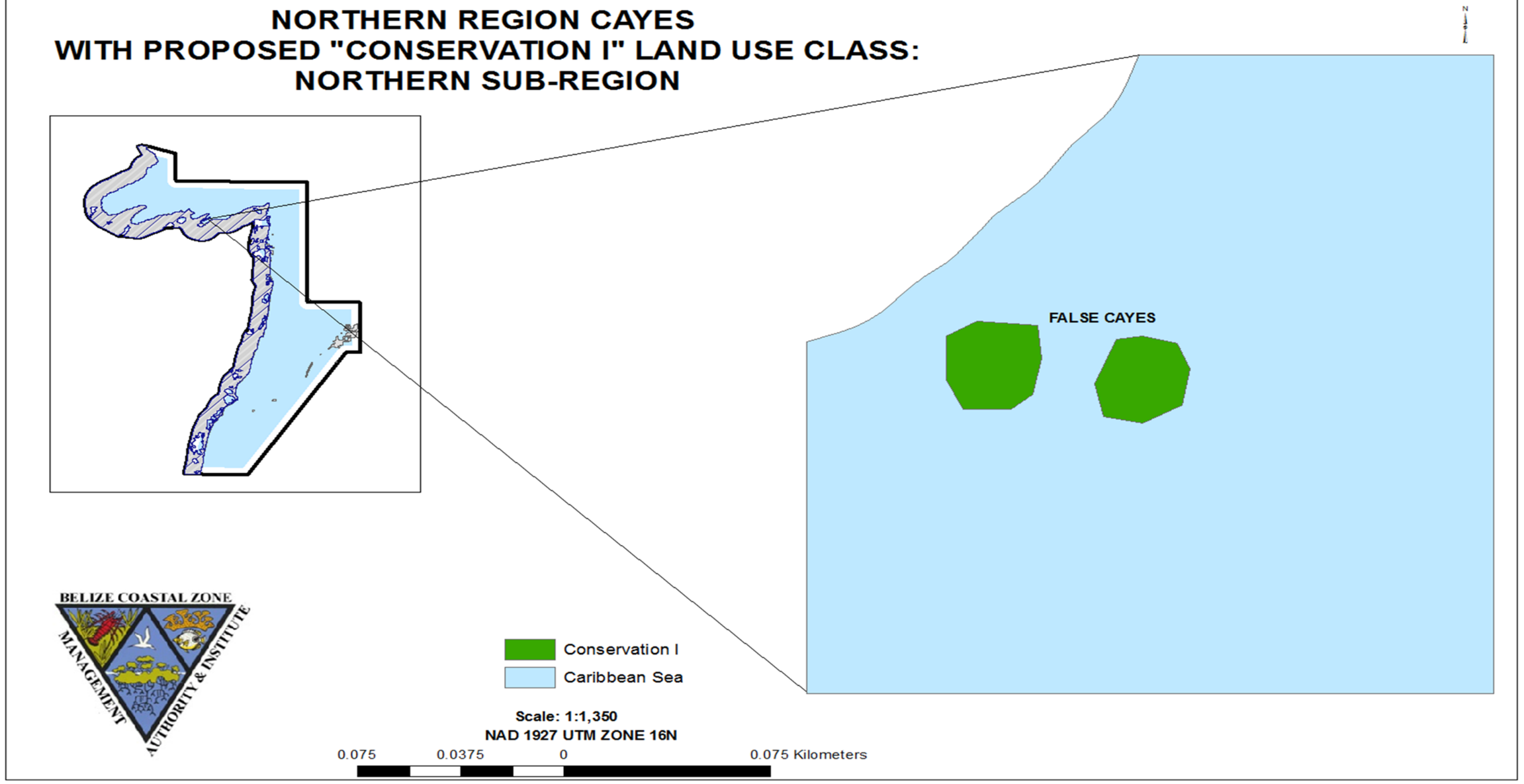
Cayes that have been assigned the "Conservation I" land use class include Shipstern, Mosquito, Savannah and the two mangrove cayes collectively referred to as Cayo Falso (**Map 9**). No development should be permitted on these cayes. However, basic infrastructure for research and low-impact ecological tourism can be permitted. Also fishermen camps can be allowed as a secondary use through leases for small areas with no option to purchase

Table 9: Development Standards for Northern Region Cayes with "Conservation I" Land Use Class

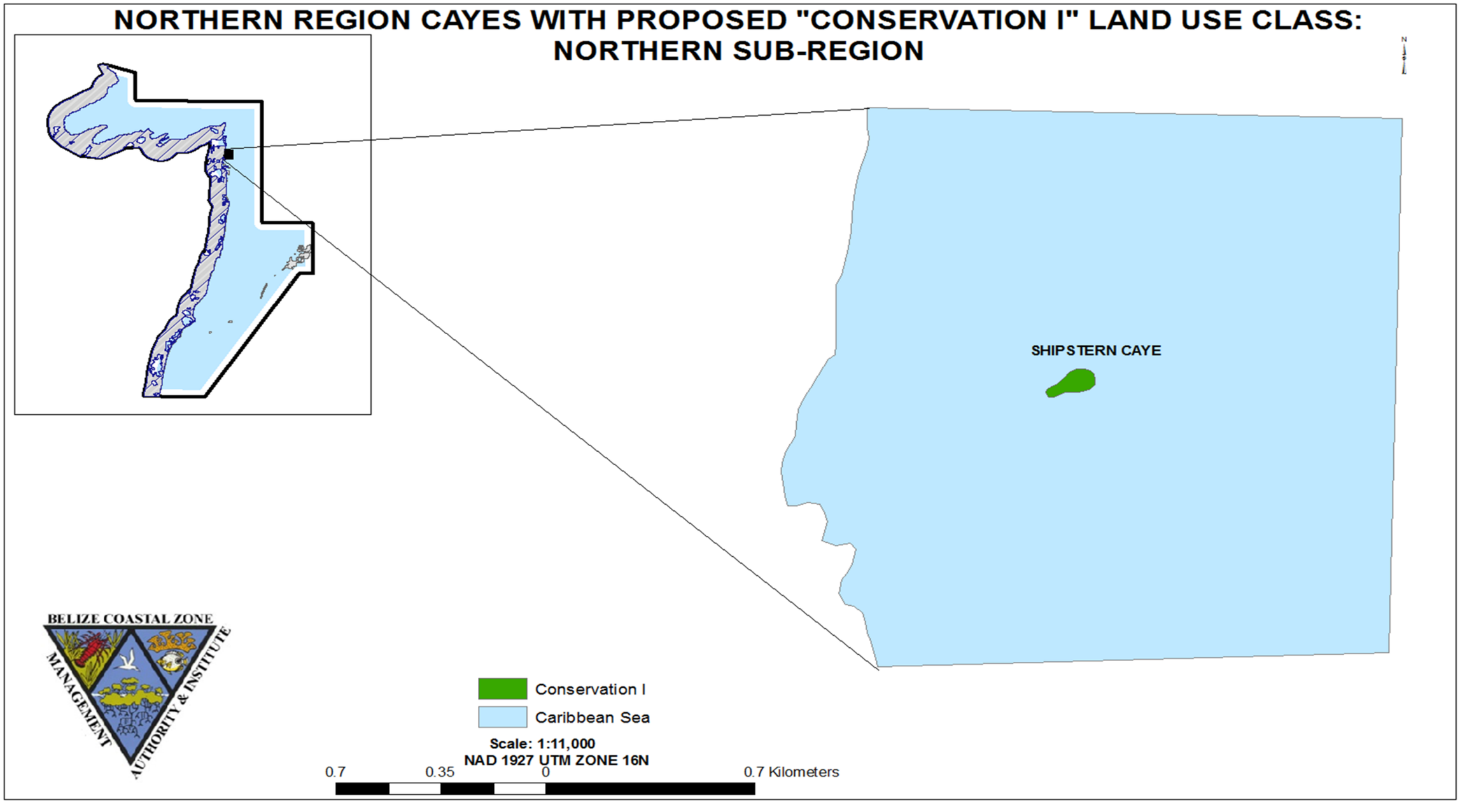
Subdivision Criteria	Development Standard
Primary Permitted Use	Conservation
Secondary Use	Fishermen Camp
Maximum Lot Size	1 acre
Distance Between Lots	20,000 ft
Net Density (dwelling units per acre)	2 du/acre
Maximum # of Habitable Rooms per acre	4
Maximum Site Coverage	4%
Maximum Site Clearance	50%
Minimum Setbacks Front Side Back	 50ft 25ft 30ft
Maximum Building Height	28ft
Maximum # of floors per building	2
# of Piers per site	1
Services	Water, Electricity, Telecommunications, Sewerage Treatment, Waste Disposal



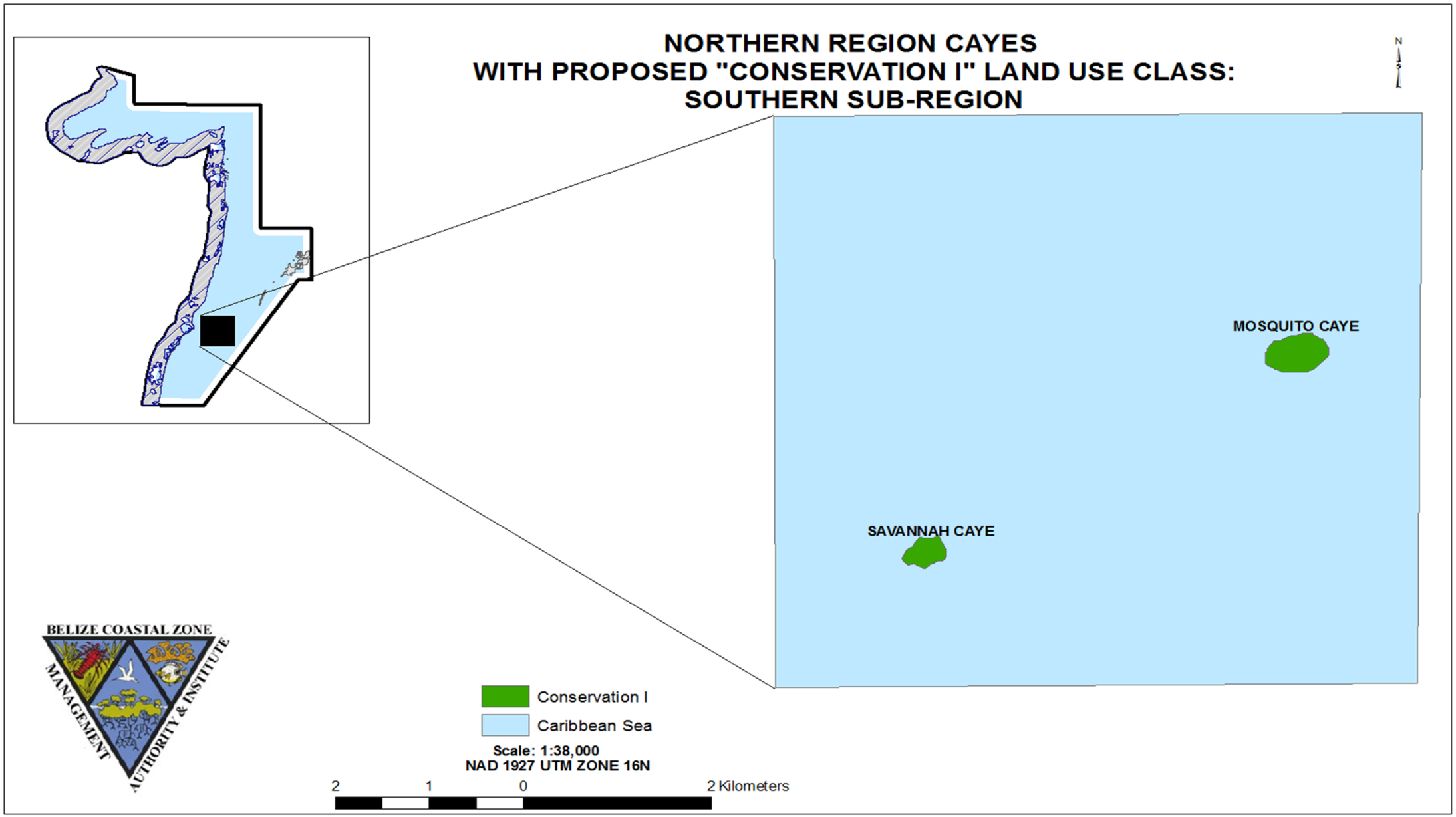
Map 10: Informed management conservation zoning scheme



Map 11: Northern Region Cayes with Proposed "Conservation I" Land Use Class



Map 12: Northern Region Cayes with Proposed "Conservation I" Land Use Class

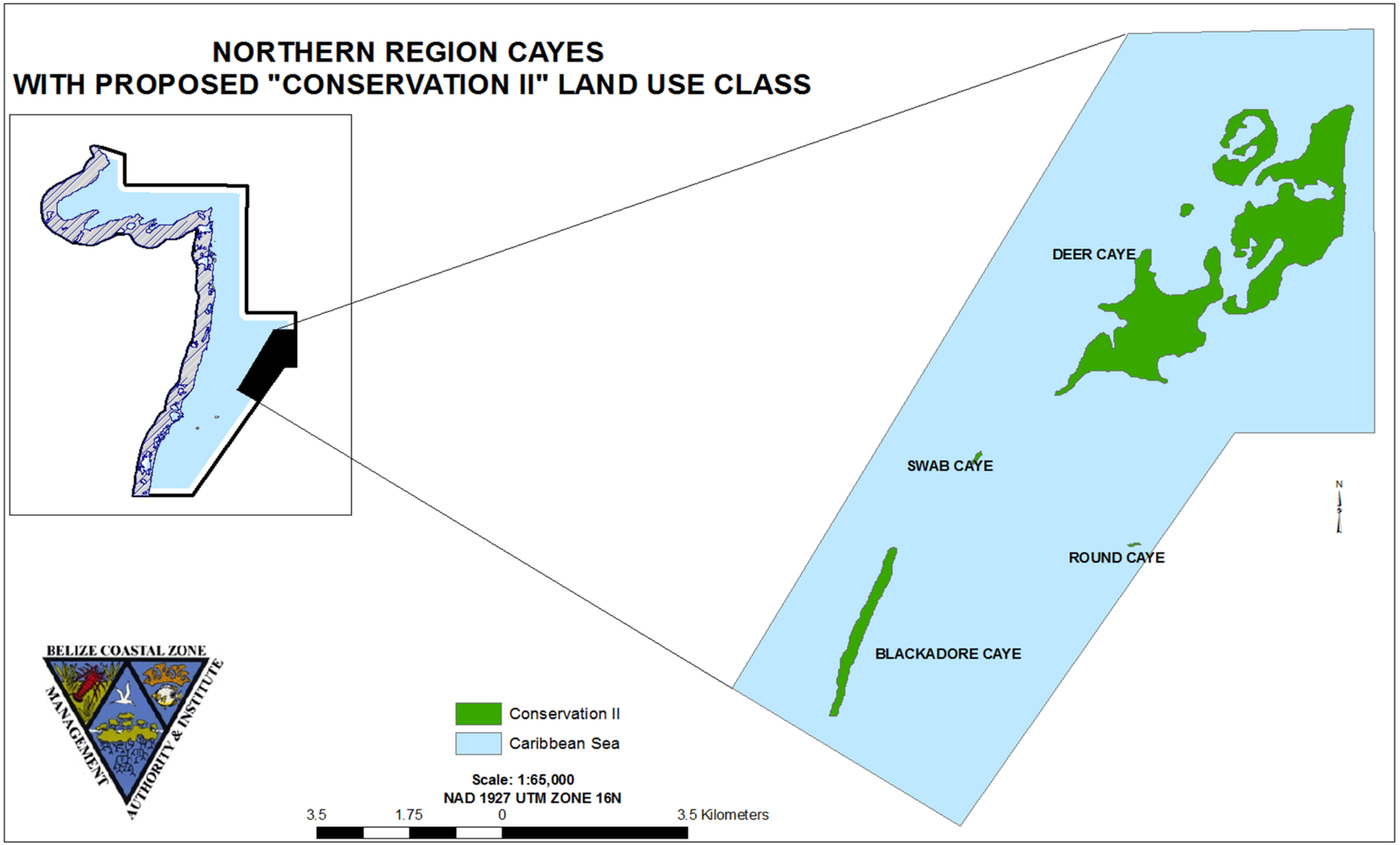


Map 13: Northern Region Cayes with Proposed "Conservation I" Land Use Class

Cayes that have been assigned the "Conservation II" land use class includes Deer, Swab, Round, and Blackadore (**Map 10**). Limited development should be permitted in these areas. This land use class assignment allows for very low-intensity traditional uses, such as residential/vacation houses as well as fishermen camps. Basic infrastructure for research and low-impact ecological tourism is also recommended. Low-intensity residential camps can be permitted as secondary use through leases for small areas with no option to purchase. Permits that allow for temporary to semi-permanent structures, minimal site clearance, minimum distances, etc as per **Table 10**, can also be permitted

Table 10: Development Standards for Northern Region Cayes with "Conservation II" Land Use Class

Subdivision Use Criteria	Development Standard
Primary Permitted Use	Conservation
Secondary Use	Residential
Maximum Lot Size	1 acre
Distance Between Lots	10,000 ft
Net Density (dwelling units per acre)	2 du/acre
Maximum # of Habitable Rooms per acre	4
Maximum Site Coverage	6%
Maximum Site Clearance	50%
Minimum Setbacks: Front Side Back	 50ft 25ft 30ft
Maximum Building Height	28ft
Maximum # of floors per building	2
# of Piers per site	1
Services	Water, Electricity, Telecommunications, Sewerage Treatment, Waste Disposal



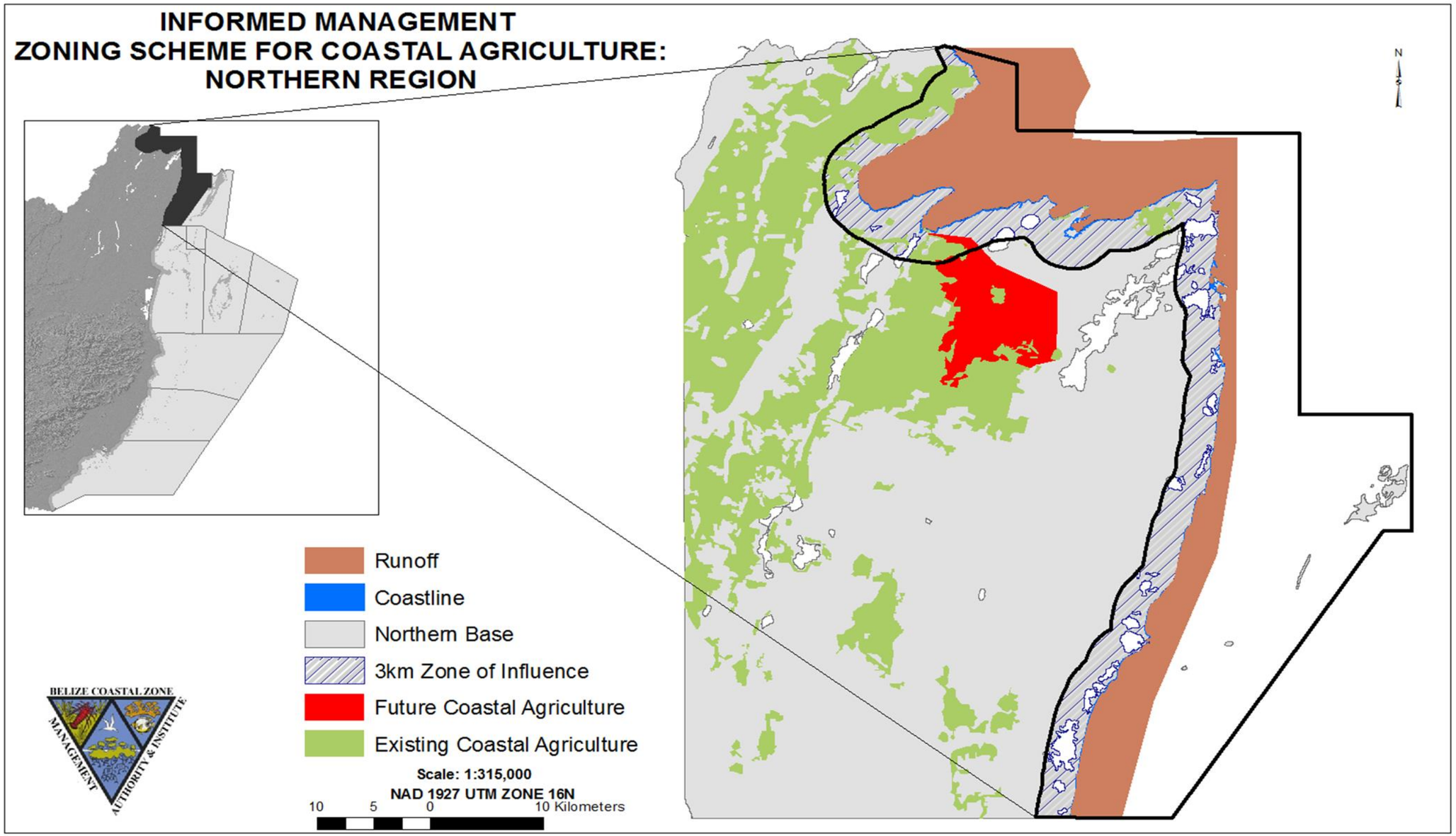
Map 14: Northern Region Cayes with Proposed "Conservation II" Land Use Class

6.3.3 Coastal Agriculture Development

In addition to residential and commercial development, coastal agriculture has been identified as a potential use of lands within the 3km coastline of the Northern region (**Map 11**). This type of development includes land use in which the production of food, feed, livestock and poultry, fruits and vegetables, and horticultural crops are raised, grown, or produced for commercial purposes. Development standards for coastal agriculture are found in **Table 11**. The framework for implementing the zoning scheme for the development of coastal lands for agriculture production can be found below in **Table 12.**

Table 11: Development Standards for Coastal Agriculture

Subdivision Criteria	Development Standards	
Density	Low Density	Medium Density
Minimum Size	25 acres	6-24 acres
Permitted Use	Crop Growing and Harvesting	Crop Growing and Harvesting
Secondary Use	Light Industry, Conservation, Parks/Playground, R1, C1, Institution	Light Industry, Conservation, Parks/Playground, R1, C1, Institution
Width/Length Ratio	1:8	1:6
Services	Water & Sewerage or Septic Tank, Electricity	Water & Sewerage or Septic Tank, Electricity



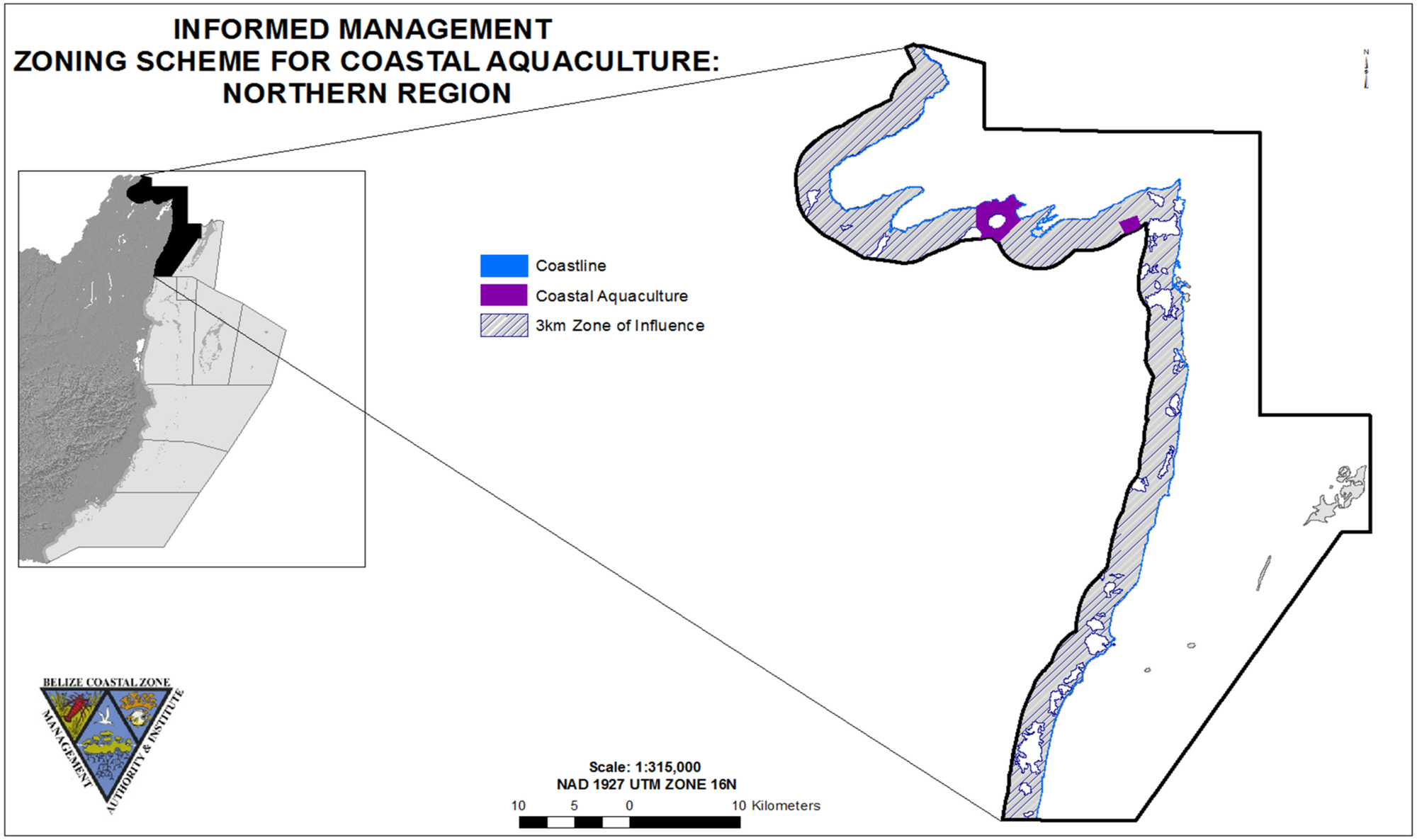
Map 15: Informed Management Zoning Scheme for Coastal Agriculture in the Northern Region

Table 12: Framework for Implementing Informed Coastal Agriculture in the Northern Region

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	**Compatible**	**Regulated**			
Coastal Agriculture	Coastal lands with fertile, irrigable soil especially suited for agricultural production of crops, and rearing of livestock for local consumption and export revenue. Note that within this region there is difficulty with livestock and meat production due to drier soils and lower rainfall.	1. Production of crops such as banana, citrus, papaya, sugar cane, etc 2. Production of meat and livestock	Living quarters for employees and/or owners of agricultural company Research and education	Subdivision of land for agricultural purposes Application of agrochemicals	1. Use of unregistered agrochemicals (pesticides and fertilizers) 2. Use of registered agrochemicals (pesticides and fertilizers) outside of the legally prescribed limit 3. Oil exploration, extraction and establishment of oil refinery 4. Mining and dredging 5. Disposal of hazardous and toxic chemicals, solid wastes, untreated liquid wastes 6. Squatting/informal settling 7. Unregulated land clearing, 8. Fish farming, coastal aquaculture	Banana Industry Act Belize Agricultural Health Authority Act Citrus (Processing and Production) Act Environmental Protection Act Land Utilization Act Meat and Livestock Act Papaya Growers Association Act Pesticides Control Bard Act Sugar Cane Industry (Control) Act	Banana Control Board Ministry of Agriculture Belize Agricultural Health Authority Citrus Control Board Ministry of Agriculture Department of the Environment Land Utilization Authority Ministry of Agriculture Ministry of Agriculture Pesticides Control Board Ministry of Agriculture

6.3.4 Coastal Aquaculture Development

The coastal lands within the Northern coastal zone that have been zoned for land-based aquaculture (**Map 12**) fall within Zone 1 of the National Aquaculture Policy (2005). Zone 1 areas represent inland areas available for aquaculture development that are classified as "highly suited" to food production by aquaculture by virtue of having "high quality fresh and marine water resources suited to land-based and pond systems". The aquaculture policy recommends small to medium scale aquaculture production facilities in this region, involving the **maximum** cultivation of 75 hectares of land, equivalent to an annual production of less than 200 tons per annum. Surface water requirement is between 40-400 cubic meters per minute. The framework for implementing the zoning scheme for the development of coastal lands for aquaculture production can be found below in **Table 13.**



Map 16: Informed Management Zoning Scheme for Coastal Aquaculture in the Northern Region

Table 13: Framework for Implementing Informed Coastal Aquaculture in the Northern Region

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	Compatible	Regulated			
Coastal Aquaculture	Coastal lands especially suited for the culture of farm-raised fish via land-based pond systems	1. Construction of land-based pond systems for farming of non-invasive species	1. Office spaces, living quarters for employees and/or owners of aquaculture farms 2. Supporting facilities for culturing of species, such as hatcheries and nurseries 3. Mangrove planting	Subdivision of land for aquaculture purposes Fishpond operations	1. Use of unregistered chemicals and biological materials, such as antibiotics 2. Use of registered chemicals and antibiotics outside of the legally prescribed limit 3. Oil exploration, extraction and establishment of oil refinery 4. Mining and dredging 5. Disposal of hazardous and biological wastes 6. Release of untreated liquid wastes 6. Squatting/informal settling 7. Unregulated land clearing, and alteration of mangrove forests	Environmental Protection Act Fisheries Act National Aquaculture Policy (Draft)	Department of the Environment Fisheries Department Aquaculture Unit, Ministry of Agriculture

Recommended Actions:

1. Maintain the 66 feet reserve, and ensure that minimum setbacks from property lines and beaches, and minimum distances between buildings are enforced

2. Encourage "soft" and permeable coastal defense structures such as the planting of mangrove to avoid related erosion, the acceleration of off-shore currents, and impediments to wildlife. Should "hard" coastal defense structures become necessary, the construction of such structures will follow due process by the relevant permitting agency

3. Discourage heavy and unregulated use of herbicides, pesticides and fertilizers

4. Implement landscape design awareness that would facilitate the preservation of mangroves for shoreline protection

5. Identify and zoning priority areas for the development of parks and other recreational facilities

6. Support the institution of a system of restrictive code of covenants between land owners and developers that favor integrated development planning

7. Educate developers, contractors and real estate agents on the existence of all applicable legislation, processes and procedures pertaining to land development

8. Ensure the standards and engineering approval process established by the Central Building Authority for building construction are adhered to

9. Provide for low-density development with the least possible site clearance to maintain the characteristics of the natural environment as much as possible

10. Preserve remaining crown or government-owned lands in the region

11. Require that developers who remove habitats must finance their restoration

6.4 Marine Dredging and Mineral Extraction

Dredging and sand mining can have disastrous effects on the habitats of particular species and on other economic and recreational use of the region. Most instances of dredging and/or sand mining activity observed in the region was to increase land mass or land rehabilitation, particularly post-storm disruption. The Forest Department has not supported dredging within the marine protected area. To avoid or minimize disruption of the marine environment and the negative impacts, which may occur on either the terrestrial or aquatic ecology, limited marine dredging activity has been recommended for this region. Through these guidelines, unsuitable development sites are avoided, including sensitive areas, and areas of poor access. The conversion of swamp, wetlands, mangrove forests or sea for resort and/or residential use would only be detrimental to the environment, create land unsuitable for effective liquid waste disposal, distort land/swamp values, and set a harmful precedent for future development. In addition to the recommended actions below, implementation of the framework for enforcing low-impact marine dredging activities in the region (**Table 14**) is strongly recommended.

Recommended Actions:

1. Require developers to finance and undertake replanting of seagrass and mangroves in areas that have been dredged

2. Maintain the Corozal Bay Wildlife Sanctuary and the adjacent coastal lagoons, particularly the Spanish Point and High Bluff lagoon systems, as non/minimal dredging areas in recognition of the fragility of the ecosystems, and importance as commercial fish species nursery areas

3. Discourage dredging in the Bulkhead Shoals area, in recognition of its critical role in settling the turbidity and contaminants of Corozal Bay estuarine system before entry into the Belize Barrier Reef, to maintain water clarity in high tourism areas such as Hol Chan Marine Reserve

Table 14: Framework for Implementing Informed Marine Dredging in the Northern Region

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	Compatible	Regulated			
Dredging	Areas for the excavation of bottom sediments for the maintenance of navigable waterways and ports of entry	1. Excavation of bottom sediments for the maintenance of navigational lanes and ports of entry	1. Shipping and navigation; passage/entry of commercial vessels	Sediment extraction	1. Aquaculture 2. Disposal of solid and liquid wastes 3. Disturbance and destruction marine ecosystems, including but not limited to, coral reef system, seagrass beds, etc 4. Marine recreation 5. Fishing 6. Extraction of petroleum 7. Extraction of water from natural saltpans	Environmental Protection Act Mines and Minerals Act Marine Dredging Policy (Draft) Land Utilization Act	Department of the Environment Mining Unit, Ministry of Natural Resources Land Utilization Authority

6.5 Sensitive Habitats

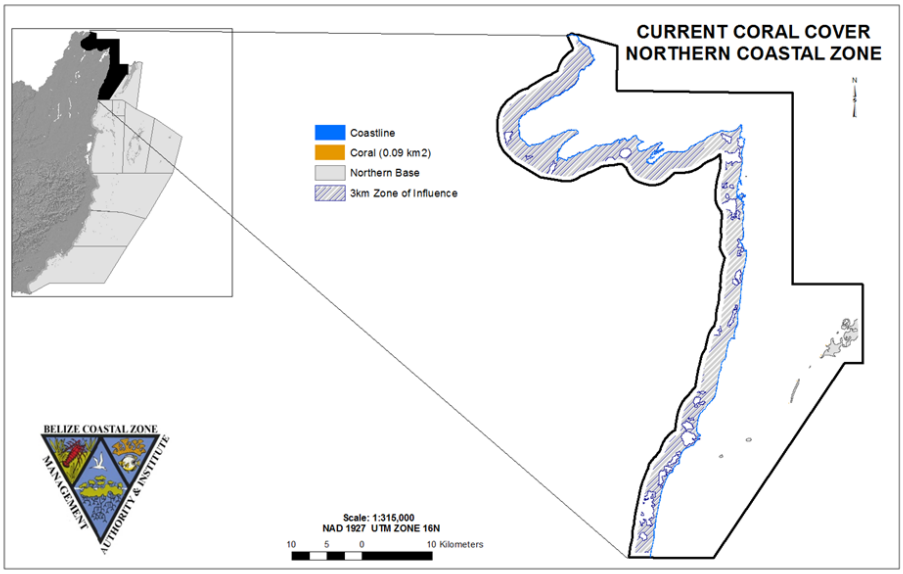
All habitats within the Northern coastal planning region are characterized as low-lying and saline, and fall primarily within five categories:

- Mixed mangrove scrub
- Dwarf mangrove scrub
- Marine salt marsh with succulent species
- Tropical littoral forest and beach communities
- Coastal fringe Rhizophora mangle-dominated forest

However one unique habitat within this region are the stromatolites which are found near the Belize – Mexico border. Stromatolites are reef-like structures formed from millions of microorganisms including bacteria over time. They are extremely rare and provide ancient records of life on Earth through remains which might date back to over 3.5 billion years. This habitats here in Belize add to the already great biodiversity but also lends to the global understanding of the history of the earth. Considering this, attention should be paid to ensuring this habitat is protected from nearby threats in the near future.

6.5.1 Corals

Coral cover in the region is 0.09 square kilometers (**Map 14**), and consists of many coral patches, strands and heads, the latter emerging as much as 3 feet above the surface of the water in some areas, while much of the strands have been reduced in height.



Map 17: Coral Cover in the Northern Coastal Zone

Results of the InVEST Habitat Risk Assessment (HRA) model suggest that currently 54% of the region's mangroves are at low risk, 46% at medium risk, and 0% at high risk (**Fig. 1**).

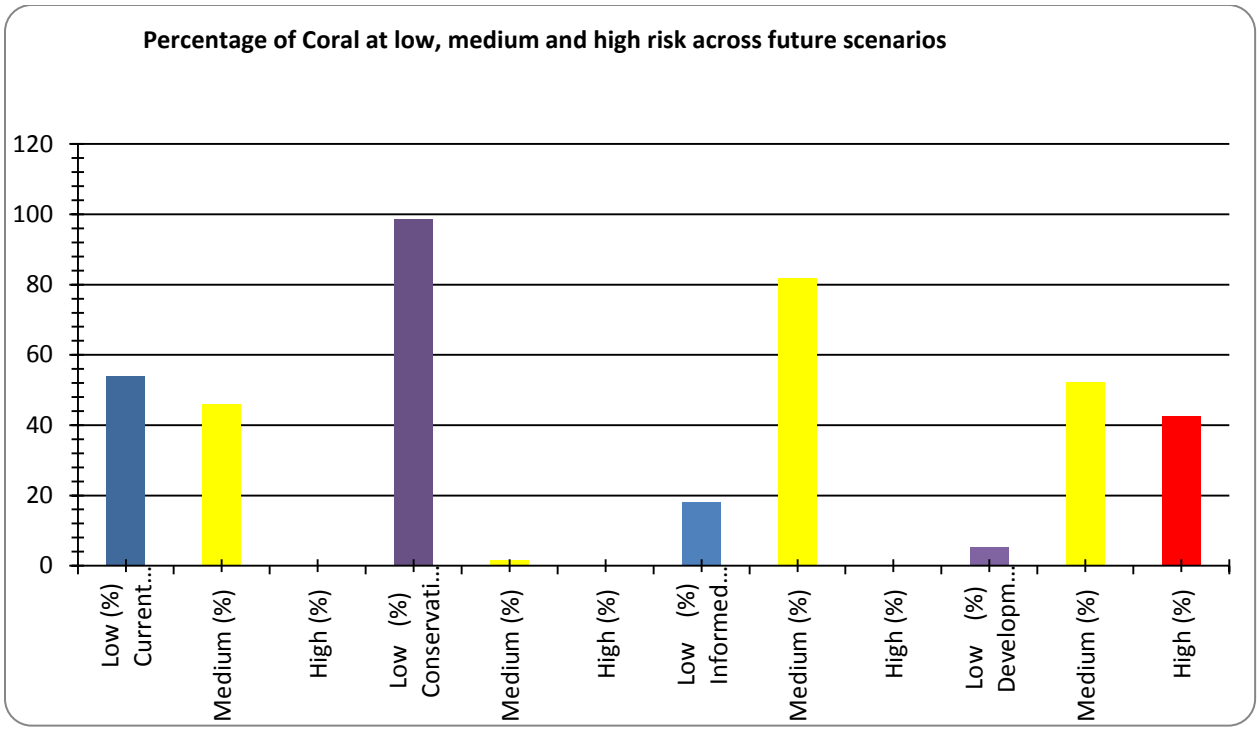


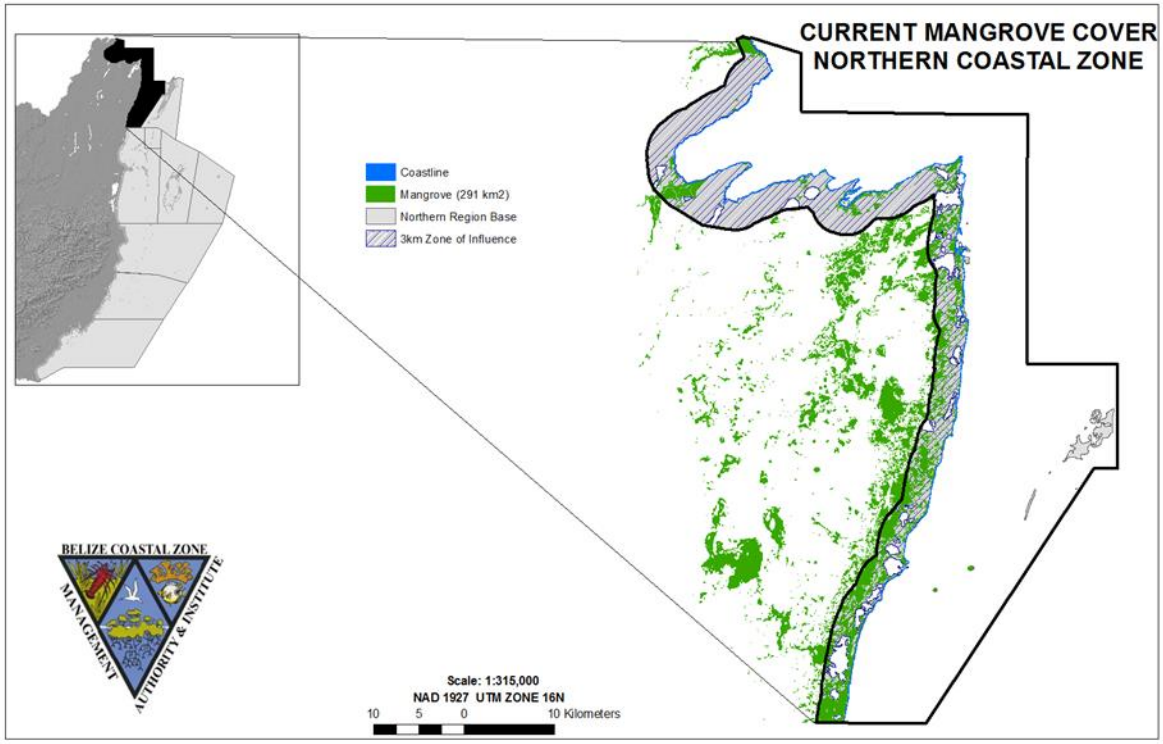
Figure 1: Risks to Corals in Northern Region by Scenario

The results also suggest that in a Conservation Zoning Scheme no corals would be at high risk. There would also be proportionately less corals at medium risk than in the current. According to HRA model results, 45% of corals that were formerly at medium risk in the current scenario would be at low risk in a future Conservation Zoning Scheme, making the total percentage of corals at low risk in this scenario 99% (**Fig. 1**). In a Development Zoning Scheme, HRA model results suggest that the threat to corals would become increasingly higher. Only 5% of corals would be at low risk whereas 52% and 43% of present mangrove would be at medium and high risk, respectively (**Fig. 1**). In the proposed Informed Management Zoning Scheme, HRA results are indicating that no corals would be at high risk, 18% of present corals would be at low risk, and 82% at medium risk (**Fig. 1**).

6.5.2 Mangroves

Mangroves are important in this region as they support a diverse range of coastal birds, mammals, fish and crustaceans. Their role is multi-functional in maintaining the integrity of coastal and marine ecosystems; they form the basis of a complex marine food web, create breading habitat, stabilize bottom sediments and protect the shoreline from erosion. However, with the high market value of waterfront properties, mangroves are being cleared at a rapid rate,

despite a moratorium on mangrove clearance. In this region, the total mangrove cover is approximately 105 square kilometers (**Map 15**).



Map 18: Mangrove Cover in the Northern Coastal Zone

Results of the InVEST Habitat Risk Assessment (HRA) model suggest that currently 75% of the region's mangroves are at low risk, 24% at medium risk, and 1% at high risk (**Fig. 2**).

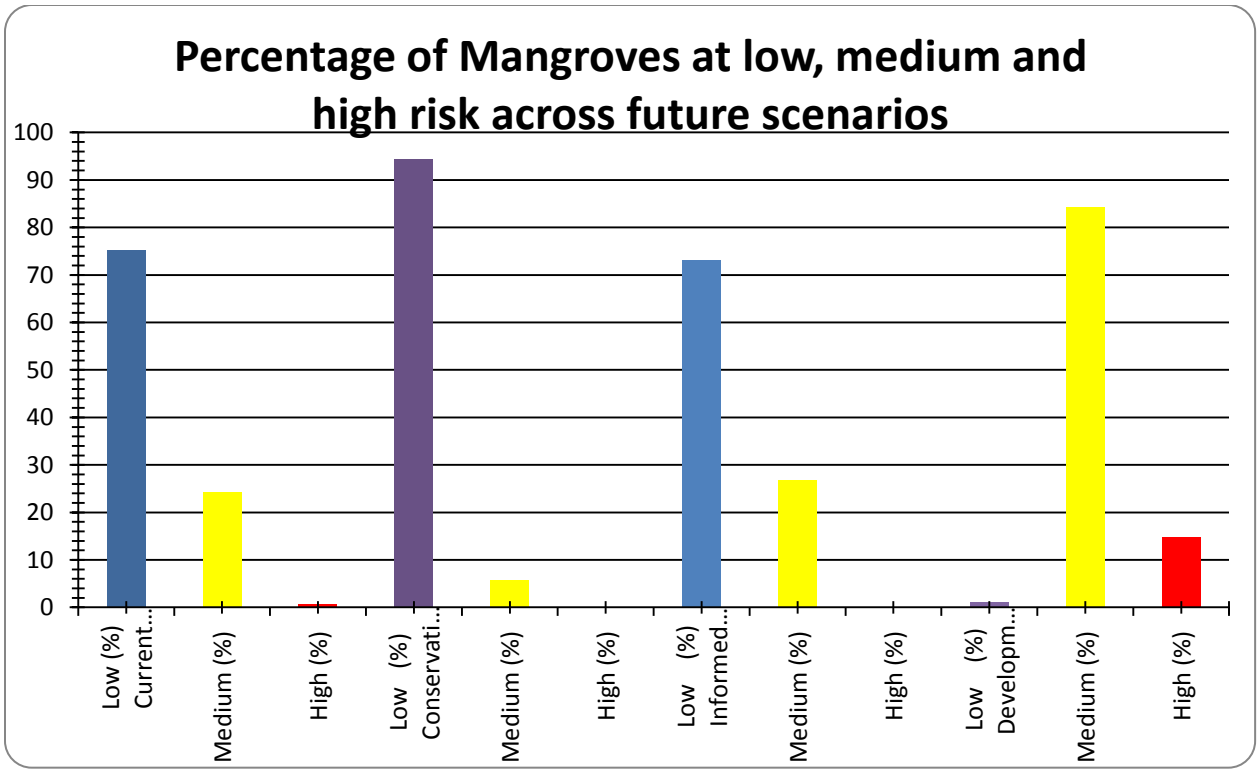
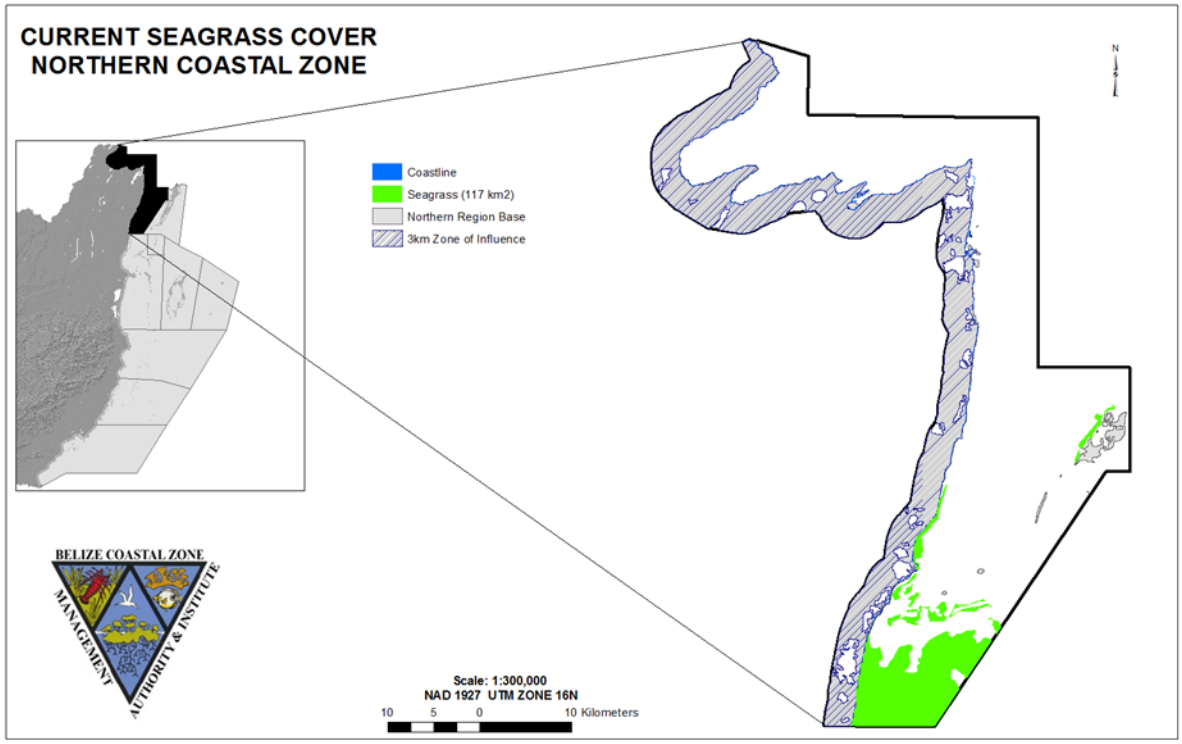


Figure 2: Risks to Mangroves in Northern Region by Scenario

The results also suggest that in a Conservation Zoning Scheme no mangroves would be at high risk. There would also be proportionately less mangrove at medium risk than in the current. According to HRA model results, 18% of mangroves that were formerly at medium risk in the current would be at low risk in a future Conservation Zoning Scheme, making the total percentage of mangroves at low risk in this scenario 94% (**Fig. 2**). In a Development Zoning Scheme, HRA model results suggest that the threat to mangroves would become increasingly higher. Only 1% of mangroves would be at low risk whereas 84% and 15% of present mangrove would be at medium and high risk, respectively (**Fig. 2**). In the proposed Informed Management Zoning Scheme, HRA results are indicating that no mangroves would be at high risk, 73% of present mangroves would be at low risk, and 27% of medium risk (**Fig.2**).

6.5.3 Seagrass

Seagrass is also an important component of marine flora within this region. Seagrass meadows are essential for the maintenance of ecosystem health through nutrient cycling and sediment stabilization. They also form a critical ecosystem for many fish and marine invertebrate species, and the endangered West Indian manatee population. Unfortunately, extensive information on seagrass beds in the region does not exist. Current efforts include efforts are being made by SeagrassNet and Wildtracks to collect baseline data. The total seagrass cover in this region is approximately 117 square kilometers (**Map 16**).



Map 19: Seagrass Cover in the Northern Coastal Zone

Results of the InVEST Habitat Risk Assessment (HRA) model suggests that currently 3% of the region's seagrass are at low risk, 96% at medium risk, and 1% at high risk (**Fig. 3**).

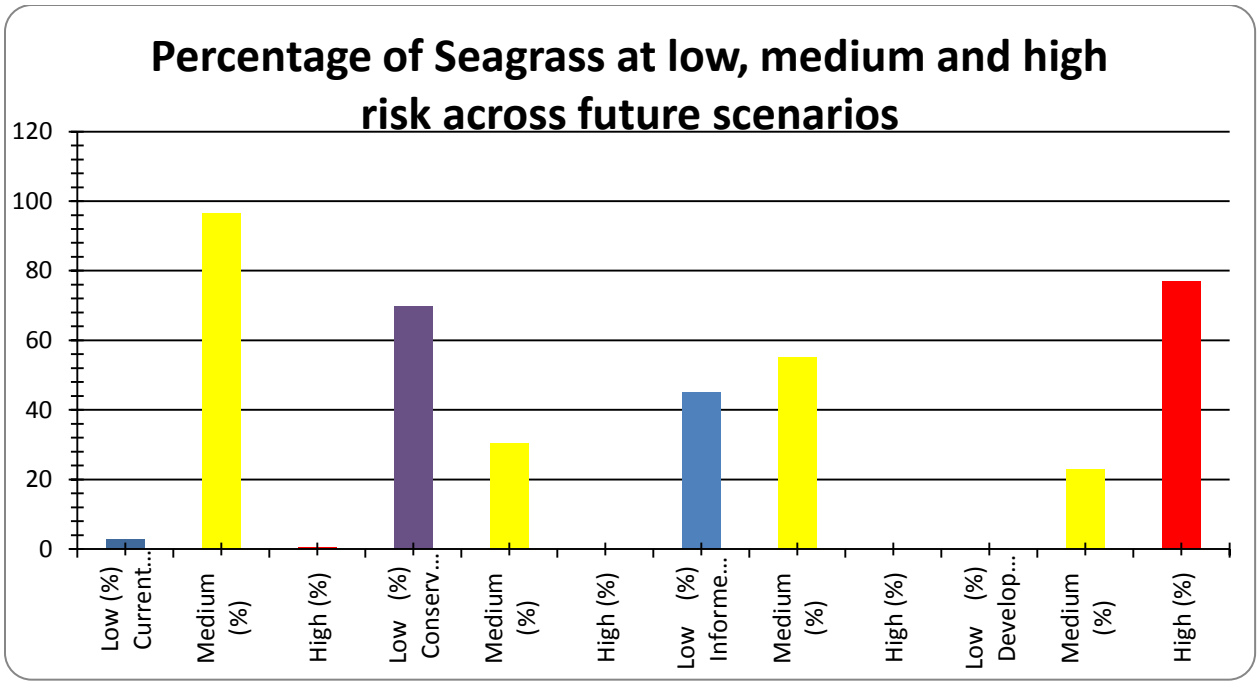


Figure 3: Risk to Seagrass in Northern Region by Scenario

In a Conservation Zoning Scheme, HRA model results suggest a dramatic reversal of the level of risk to current seagrass in this region whereby no seagrass would be at high risk, 70% of seagrass would be at low risk and 30% at medium risk in 2025 (**Fig. 3**). In a Development Zoning Scheme, model results suggest that 77% of present seagrass would be at high risk. This zoning scheme also represents the only scenario in which seagrass are at high risk. The results also suggest that in the Development Zoning Scheme, 23% of seagrass would be at medium risk and 0% at low risk in 2025 (**Fig. 3**). In the proposed Informed Management Zoning Scheme, the HRA model results suggest an improvement in the amount of seagrass that are currently at risk. Under this zoning scheme, 55% of present seagrass would be at medium risk. This represents a 41% reduction in medium risk posed to seagrass in the current. Additionally, the model results reveal that under this zoning scheme, 44% of present seagrass would be at low risk and 0% at high risk in 2025 (**Fig. 3**).

In discussing the results of the InVEST ecosystem models, and in particular the habitat risk assessment model, there is the need to consider limitations of the model, which are highlighted below:

- Results are should be interpreted on a relative scale within a study region and across habitats and stressors, but not to results from separate analyses.
- Results do not reflect the effects of past human activities.
- Results are based on equal weighting of criteria unless the user weights the criteria by importance or data quality.
- Cumulative risk is additive (rather than synergistic or antagonistic)

- Climate change impacts are not directly accounted for in model

Additional information on how this model works can be found in **Appendix B.1** of the Belize Integrated Coastal Zone Management Plan.

Recommended Actions:

1. Implement recommendations in the Corozal Bay Wildlife Sanctuary Management Plan (2010-2014) for the management of human-based threats on critical habitats

2. Analyze current human impacts on habitats in order to prioritize areas requiring immediate management intervention

3. Enhance collaboration among management and permitting agencies to ensure impacts to critical habitats are reduced and controlled

4. Raise awareness and outreach in community stakeholders about the importance of reducing impacts to habitats

5. Implement the Informed Management Zoning Scheme that will support multiple human activities in the region while limiting activities in specific areas in order to reduce impacts to critical and sensitive habitats and to maintaining their integrity

6.6 Utilities

6.6.1 Energy

Energy supply for the most part is dependent upon the type and intensity of development activity. The only source of energy supply that may potentially threaten the environment is the use of gasoline and/or diesel generators because of the noise and air pollution, the transportation and improper disposal of used lubrication oil, and the transportation and handling of fuel, which can result in spills. The latter two can be mitigated against by proper handling and storage, and subsequent transportation of used oils back to the mainland. Solar and wind energy are environmentally friendly and are recommended for use by residences, eco-resorts and research stations. Cost effectiveness of this option may be a factor. However, this can be combined with the use of the generator as a constant source.

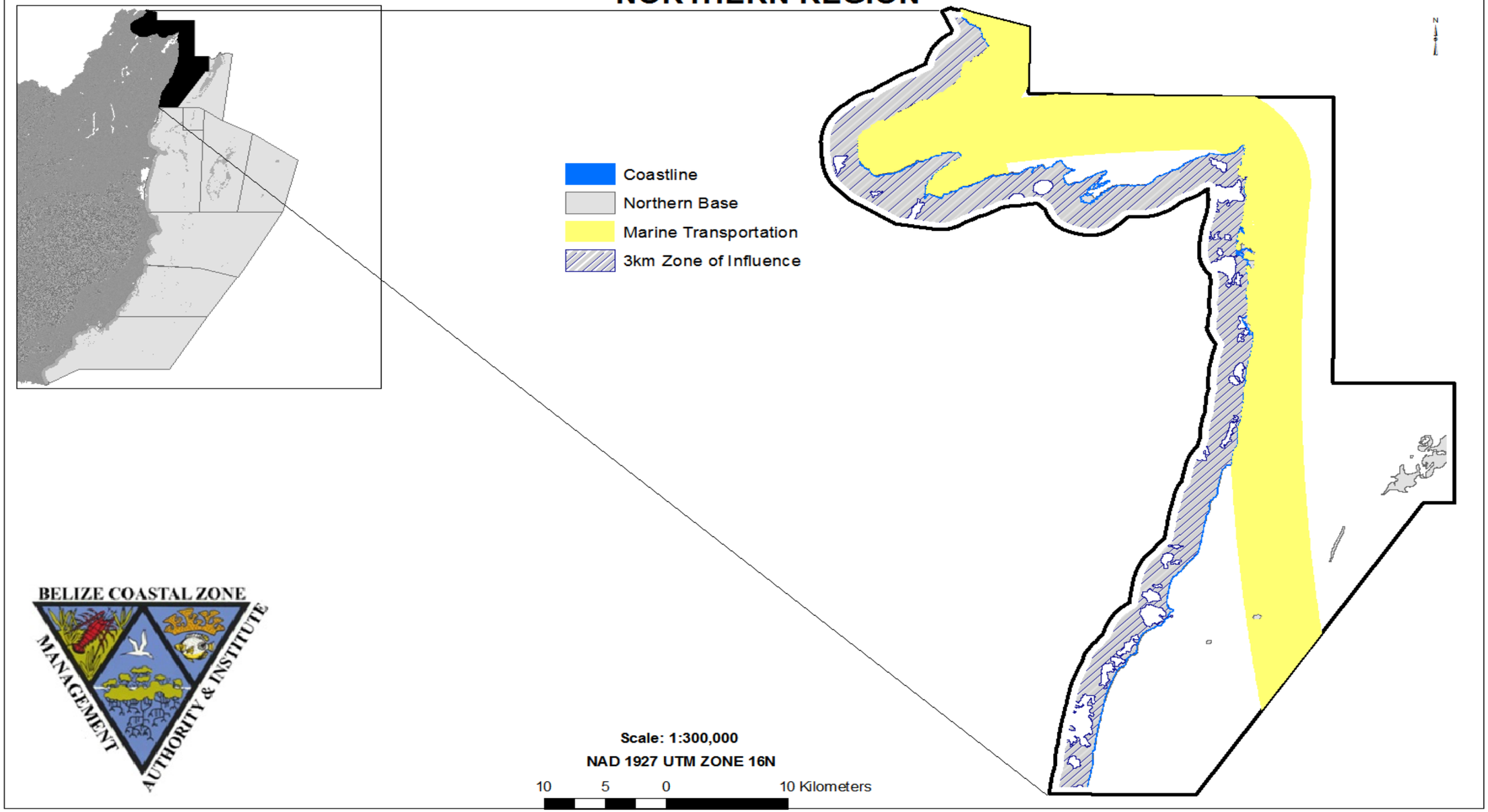
6.6.2 Water

Water is essential to life and the supply of water for various human purposes cannot be understated. Where water is demanded in large quantities, this can be particularly problematic and impact on the development capability of the region, especially in the case of large developments. Dependence on the public water supply system and reverse osmosis could be an alternative. However, reverse osmosis requires a consistent energy source, and will require a waste disposal plan for waste products produced, such as brine.

6.6.3 Transportation

Even though development in the region is envisaged to be low intensity, it is important that infrastructure, such as roads, are improved to facilitate improved accessibility to the region by land for both community development and safety. In terms of the marine environment, lighthouses, buoys and markers should be placed in the sea to direct vessels and humans away from fragile and sensitive ecosystems. As such, the coastal zone management guidelines were formulated to attach as conditions to development approvals for the placement of walkways, lighthouses, buoys, and markers on sea and land. These guidelines recognize existing marine transportation routes in the region, which have been captured in the Informed Management spatial zoning scheme (**Map 17**). In addition to the recommended zoning scheme for marine transportation, the framework for implanting the recommended transportation routes for this region is found in **Table 15**.

INFORMED MANAGEMENT ZONING SCHEME FOR MARINE TRANSPORTATION: NORTHERN REGION



Map 20: Informed Management Zoning Scheme for Marine Transportation in the Northern Region

Table 15: Framework for Implementing Informed Marine Transportation in the Northern Region

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	**Compatible**	**Regulated**			
Marine Transportation	Marine area delineated for the use of watercraft, such as water taxis, cruise ships, etc, to transport people, goods and cargo between multiple destinations	1.Shipping operation activities 2. Port development and operation 3. Vessel traffic use	Dredging for the maintenance of navigational lanes and ports of entry	Passage/entry of vessels Operation and construction of ports	1. Fishing 2. Marine recreational activities 3. Anchoring that leads to disturbance and destruction marine habitats, including but not limited to, coral reef system, seagrass beds, etc 4. Exploration and extraction of petroleum 5. Construction of any illegal structure that would obstruct shipping and navigation 6. Disposal of solid and liquid wastes from boats and ships 7. Transportation of illegal goods, such as drugs and weapons, and human trafficking	Belize Port Authority Act Belize National Coast Guard Service Act Customs Regulation Act Defence Act Environmental Protection Act Harbours and Merchant Shipping Act Immigration Act Maritime Areas Act Marine Dredging Policy (Draft) Mines and Minerals Act	Belize Port Authority Belize National Coast Guard Customs Department Belize Defence Force Department of the Environment Belize Port Authority Immigration Department Ministry of Foreign Affairs Mining Unit, Ministry of Natural Resources Geology and Petroleum Department

Recommended Actions:

1. Develop proper handling, transportation, storage and waste disposal practices of spent oils used for energy generation

2. Close collaboration with relevant agencies to ensure that water and energy supply, and infrastructure in the region are provided though environmentally friendly and cost effective means

3. Close collaboration with relevant agencies in the placement and maintenance of buoys, lighthouses and protected area boundary markers in the sea

4. Upgrade existing power network to accommodate certain increased energy needs as the area develops and expands

5. Extend and upgrade existing water supplies in order to meet future demand

6. Encourage the use of solar and wind power in the case of resorts and any residential development, as they are unlikely to cause the environmental problems (spillage, fumes, noise) associated with diesel generators

7. Allow the use of generators as a secondary power source only during daylight hours for the recharging of solar or wind-driven power sources

8. Take all precautions to avoidance of pollution and noise generation in accordance with the Pollution Regulations, 1996 of the Department of the Environment

9. Store and dispose of batteries at the appropriate sites on the mainland

10. Import potable water for the cayes from sources on the mainland

6.7 Pollution Control

Degrading water quality and pollution associated with urbanization is one of the greatest threats in the Northern region. Chetumal discharges 200 cubic meters of untreated sewage into the bay each day and approximately 2,500 gallons of liquid wastes are reportedly being discharged annually from sugar refining and rum distilling operations on the New River in Belize (Corozal Bay Wildlife Sanctuary Management Plan 2009). Corozal's series of open drains emptying into the Bay are also cause for concern. Pollution from sewage and agricultural land wastes, and increased boat traffic have also been identified as having a high impact on the health of the biodiversity and coastal and marine environment in the Northern region (Corozal Bay Wildlife Sanctuary Management Plan 2009).

When wastewater is disposed of directly into the sea with little or no treatment, the bacteria present immediately begin to work to decompose the solids using oxygen in the process. The higher the quantity and quality of waste, the more oxygen is required for its decomposition. The oxygen demand by the bacteria usually creates depletion for use by other species if it is not replenished quickly. Prolonged oxygen deprivation usually results in the demise of aquatic leads to their demise. One way of preventing oxygen depletion is to ensure that sufficient oxygen is present in the water at all times for the species to strive. It can be done by two methods:- ensuring wastewater is pre-treated, and by reducing the strength of wastewater so that its impacts will not be detrimental when disposed of into receiving waters.

Improper solid waste disposal also contributes towards significant environmental and ecological degradation that can lead to serious public health problems. For example, solid waste that is indiscriminately disposed of can pollute the air when waste is inadequately incinerated, and smoke and odor can become a problem. In addition, the leaching of liquid from the garbage contaminates soil, surface and ground water. This increase in bacterial action may significantly deplete the oxygen present, which could be detrimental to other life forms present in the soil. Furthermore, from a public health standpoint, uncontrolled and inadequate disposal of solid waste attracts flies, insects and rodents. These may act as vectors of infectious diseases that affect humans. Solid waste that is improperly disposed of is also an eyesore.

Soak-a-ways and Septic Tanks on Coastal Mainlands

The Central Building Authority (CBA) is the agency mandated by the Belize Building Act 2003 to control building operations in the interest of public safety and health. In 2010, CBA produced detailed specifications for the construction of soak-aways and septic tanks for residential and other low impact buildings. Detailed diagrams can be found in **Figure 10** of the Appendix of this document. A summary of required specifications for septic tanks servicing residential and other low impact buildings can be seen in **Table 16**. The CZMAI recommends that these standards be used for construction of septic tanks and soak-aways on the **coastal mainland**.

Table 16: Specifications for Residential and Low-Impact Septic Tanks and Soakaways

Max # of persons served	Liquid capacity of tank		Internal dimensions							
			Length (l)		Width (w)		Liquid depth (ld)		Total depth (h)	
	Gallons (approx.)	Cubic ft.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
4	500	67	6	0	3	0	4	0	5	2
6	600	81	7	0	3	0	4	0	5	2
8	750	101	7	0	3	6	4	0	5	2
10	900	121	7	6	3	6	4	6	5	8
12	1100	148	8	6	4	0	4	6	5	8
14	1300	174	10	0	4	0	4	6	5	8
16	1500	201	10	0	4	6	4	6	5	8

Treatment of Wastes on Cayes

Due to the fragile nature of the cayes and atolls septic tanks and soakaways are not recommended as a means of handling household waste. Also, since there are no established solid waste management guidelines for the cayes, CZMAI recommends the following based on the Long Caye Eco-Guidelines produced by Pleasure Island Limited for the handling of waste on Long Caye, Lighthouse Reef Atoll**:**

- Human waste must be treated with composting toilets. Septic tanks, cesspools and sewers should be prohibited.
- Gray water must be treated, and all dwellings and buildings must have a gray water treatment system approved by DOE before construction.
- Organic wastes must be collected and disposed of in composting bins.
- Recycling and garbage separation is encouraged.
- Frequent removal of solid waste from the cayes for treatment and proper disposal on the mainland

Recommended Actions:

1. Improve water quality by addressing transboundary pollution originating from Chetumal through collaborative water quality monitoring activities, and support of transboundary clean-water initiatives, including the management of in-country river based watershed pollution

2. Ensure that new and existing development applications include a Solid Waste Management Plan that is closely guided by the management recommendations from the National Solid Waste Management Plan. Opportunities for recycling of solid wastes should be explored

3. Treat the waste water in a cost-effective manner to meet environmental standards. The type of treatment system will depend on the type and quantity of waste to be treated, land area and resources available (i.e. technological, human and financial)

4. Collaborate with small scale farmers and the sugar industry to reduce the waste load that enters the watersheds in the region, namely the Rio Hondo and New Rivers. Additionally, other large scale producers must be targeted including rice growers and cattle farmers in the region.

6.8 Social Amenities and Recreation

At the Northern region coastal planning workshop held in Consejo Village in 2011, stakeholders present mentioned the need for development planning that is not only focused on economic returns but focused also on meeting social needs that are compatible with stakeholder communities. One primary need identified by stakeholders was the designation of green spaces to serve as recreational areas. There was also concern that community beach areas should be designated for public use as there are issues with accessing prime beach areas connected to private lands. Priority also needs to be given to the provision of amenities to the communities in the region, such as additional educational institutions and medical facilities.

Recommended Action:

1. Designate areas for local recreational needs in development plans across the region

6.9 Conservation

This region is home to the Corozal Bay Wildlife Sanctuary (CBWS), a high priority transboundary biodiversity area that was designated in 1998 under the Belize National Protected Areas System. The 72,000 hectare protected area provides protection for the West Indian manatee (*Trichechus manatus*), as well as nursery habitat for a variety of threatened fish and invertebrate species. The Rio Hondo and New Rivers are particularly important areas for the manatee. The region is also known to be home to rare stromatolites, and should be preserved. The boundaries of CBWS are contiguous the Sanctuario del Manati of Mexico to the north, and Bacalar Chico Marine Reserve of Ambergris Caye to the east. The Sarteneja Alliance for Conservation and Development (SACD) is the provisional co-management agency for the management of the Sanctuary.

It is important that this protected area, as well as the cayes of the region retain their scientific, socio-economic and cultural significance. No development should be permitted in Shipstern, Savannah, Iguano and Mosquito Cayes, while limited development should be permitted in Swab, Blackadore and Deer Cayes. To ensure the sustainability of these functions, and the continuity of conservation efforts for the entire region, it is envisioned that these coastal zone management guidelines will compliment all management plans for existing protected areas, such as the Corozal Bay Wildlife Sanctuary Management Plan 2010-2014 implemented by SACD. In an effort to support continued national efforts to conserve biological diversity and reduce the pressures impacting them to ensure their long-term ecological integrity, the CZMAI has recommended areas that could benefit from conservation (**Map 18**) on the basis of the sensitivity of habitats and future threats from human activities. The framework for implementing the Informed Management Zoning Scheme for Conservation in the Northern Region is found in **Table 17**.

Cultural Heritage conservation management is important in consideration of Mayan archaeological sites including Cerros and Santa Rita, which contribute greatly to the economic and cultural development of this region. Additionally, there are sites that are not opened to the public which includes an area south of Shipstern.

Recommended Actions:

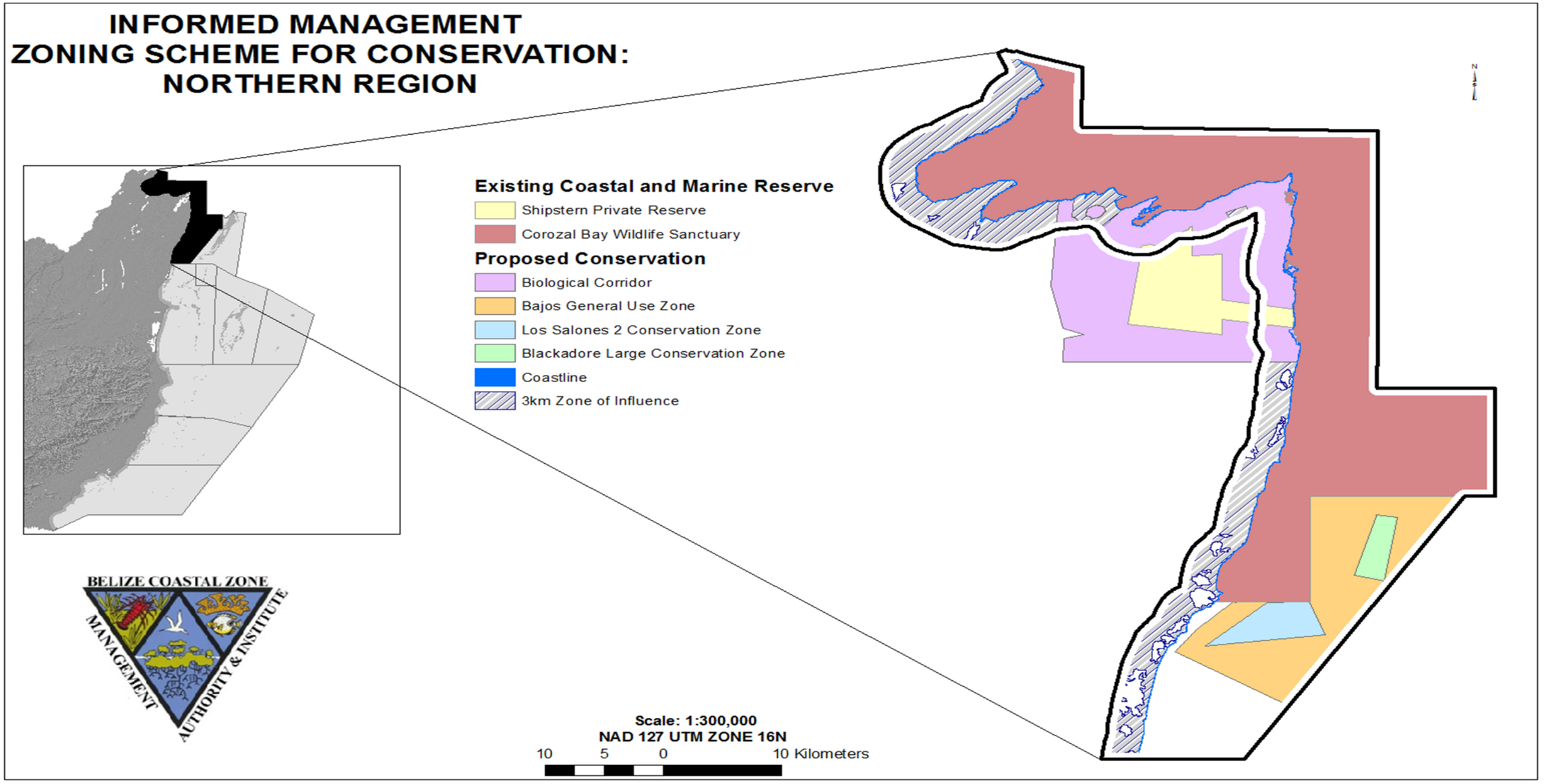
1. Strengthen management effectiveness for the Corozal Bay Wildlife Sanctuary, and the adjacent protected areas: Bacalar Chico National Park, Hol Chan Expansion and the Sanctuario del Manati through implementation of the river to reef, system level Northern Belize Coastal Complex Plan

2. Maintain existing coastal and marine protected areas, and extend protection to sites with ecosystems of conservation importance in Informed Management Zoning Scheme for protected areas

3. Preserve areas containing stromatolites

4. Implement management recommendations in Corozal Bay Wildlife Sanctuary Management Plan (2010-2014)

5. All development within this region will reference the National Institute of Culture and History Act, where it relates to the protection and safeguarding of archaeological assets.



Map 21: Informed Management Zoning Scheme for Conservation in the Northern Region

Table 17: Framework for Implementing Informed Conservation Management in the Northern Region

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	Compatible	Regulated			
Marine Conservation	Coastal and marine areas delineated for the retention of critical habitats and ecosystems for a diversity of marine life, fish spawning aggregation sites, replenishment zones, biodiversity areas	1. Coastal and marine reserves 2. Breeding, spawning, feeding area for marine life 3. Replenishment zones 4. Seagrass rehabilitation 5. Mangrove planting 6. Foraging area for manatees, dolphins, crocodiles 7. Nesting beaches for sea turtles 8. Unique Ecosystems (stromatolites)	1.Research and education 2. Marine Recreation and Tourism	Tourism and recreation (snorkeling and diving) Research and education Establishment of new reserves	1. Fishing within "no-take"/replenishment zones, and spawning aggregation sites 2. Development of shoals 3. Anchoring that leads to disturbance and destruction marine habitats, including but not limited to, coral reef system, seagrass beds, mangrove forests, etc 4. Exploration and extraction of petroleum 6. Disposal of solid and liquid wastes from boats and ships 7. Shipping	Belize Port Authority Act Belize National Coast Guard Service Act Customs Regulation Act Defence Act Environmental Protection Act Harbours and Merchant Shipping Act Immigration Act Maritime Areas Act Marine Dredging Policy (Draft) Mines and Minerals Act	Belize Port Authority Belize National Coast Guard Customs Department Belize Defence Force Department of the Environment Belize Port Authority Immigration Department Ministry of Foreign Affairs Mining Unit, Ministry of Natural Resources Geology and Petroleum Department

6.10 Scientific Research and Education

The Corozal Bay Wildlife Sanctuary (CBWS) Management Plan 2010-2014 calls for an integrated research and monitoring programme for the region as a strategy to maintain the long-term ecological integrity of biological diversity and sustainable resource use by dependent communities. The management plan and CBWS Research and Monitoring Plan outlines a framework for effective integrated research and monitoring of conservation targets, the development of a data management facility and the incorporation of community involvement from the buffer communities. Of significant importance is the need to strengthen ties with ongoing research activities in Mexico since collaboration on transboundary management issues is essential for ensuring an effective research plan.

Recommended Actions:

1. Implement the recommended research and educational activities for the region as outlined in the CBWS Management Plan and CBWS Research and Monitoring Plan.

7.0 IMPLEMENTATION STRATEGY

The Northern Region Coastal Zone Management Guidelines form a part of the Belize Integrated Coastal Zone Management Plan being developed by the CZMAI. After approval of the Plan by CZMAI's Board of Directors, it will be offered to the House of Representatives for endorsement. Implementation of these coastal management guidelines will be undertaken through two mechanisms: (a) centralized statutory control through the various Government departments, and (b) localized community and stakeholder participation. Following the mechanism of centralized statutory control, the regulatory and permitting agencies with management mandates for the coastal zone will implement the specific policy actions and informed management spatial zoning scheme that are recommended in the Plan.

While the government agencies have the authority of the law to back up its procedures, it is constrained by limited resources. In several instances, however, local NGOs and community-based stakeholder organizations have greater access to, and knowledge of, local conditions and activities, though they have no statutory powers to either assist or control development beyond those available through the Village Councils and Towns Councils Acts. For this reason, it is recommended that localized community and stakeholder participation complement the management efforts of centralized government and statutory agencies in implementing integrated coastal zone management. The Northern Region Coastal Advisory Committee (NRCAC), and other interested stakeholders of this region, will work closely with the Coastal Zone Advisory Council (CZAC) regarding monitoring and implementation of the guidelines.

Objectives of the Northern Region CAC include, *inter alia*, contributing to the drafting of the coastal zone management guidelines for their coastal region, supporting their initial approval, and monitoring and reporting to the Coastal Zone Advisory Council (CZAC) on the implementation of the guidelines. This means that the Committee will be expected to undertake the following tasks:

1. Develop, assess and approve the draft guidelines;
2. Forward the approved draft guidelines to CZMAI for approval;
3. Monitor the implementation and effectiveness of the guidelines;
4. Identify the appropriate time for a review of all or part of the guidelines;
5. Review and update the guidelines.

Planning is a continual process of recommendation, participation, implementation and review. These guidelines shall be monitored on a continual basis in order to establish its strengths and weaknesses. Through a management planning mechanism, the NRCAC, along with CZMAI, will regularly update the guidelines, which will hopefully set a good example of representative, cooperative and adaptive management that is environmentally sound, rational and equitable.

Additional studies are needed in liaison with the relevant authorities and region's stakeholders. Such studies should reveal information which may help to further support sustainable development and to address the social, cultural and economic human use of the region and its resources.

8.0 CONCLUSIONS

The coastal zone management guidelines recommended for the Northern Region are not intended to be rigid, as changing socio-economic, cultural and environmental conditions may necessitate modifications. Noteworthy, however, these guidelines and Informed Management spatial zoning scheme have identified sites for specific human uses of the coastal zone, and the disqualification of sites for not conducive to sustainable development. It is hopeful that the objectives outlined at the beginning can be realized through the recommended sector policies guidelines and spatially-explicit zoning scheme as they will ensure the sustainable use and development of the Northern Region.

9.0 REFERENCES

Belize Tourism Board. 2008. Travel and Tourism Statistics. Belize City, Belize.

Belize Tourism Board. 2011. *National Sustainable Tourism Master Plan for Belize 2030*. Available from http://www.sustainabletourismbz.org/dmdocfree/final_compiled_plan.pdf (accessed June 2012)

Cho, L. 2005. Marine Protected Areas: A tool for integrated coastal management in Belize. Ocean and Coastal Management 48: 932-947.

Coastal Zone Management Authority and Institute (CZMAI). 2001. *Cayes Development Policy*

Coastal Zone Management Authority and Institute. 2003. *The National Integrated Coastal Zone Management Strategy for Belize*. Prepared by Halcrow Group. 94p. Available from http://www.coastalzonebelize.org/wp-content/uploads/2010/04/national_integrated_CZM_strategy.pdf (accessed October 2012).

Cooper, E., Burke, L., Bood, N., 2009. Coastal Capital Belize: The economic contribution of Belize's coral reefs and mangroves. WRI working paper, World Resources Institute, Washington D.C. 53 p. Available from http://pdf.wri.org/working_papers/coastal_capital_belize_wp.pdf

Coastal Zone Management Authority and Institute (CZMAI). 2004. *Northern Cayes Region Development Guidelines*.

Gibson, J. (Ed.) 1989. Proceedings of the International Coastal Resources Management Workshop. San Pedro, Ambergris Caye, Belize, 23 -25 August, 1989. Wildlife Conservation International, Belize. 193p

Government of Belize. 2000. *Belize Coastal Zone Management Act*, Chapter 329, Laws of Belize, Revised Edition, 2000.

Grimshaw, T. 2003. *Draft National Aquaculture Zoning Plan*. Tunich-Nah Consultants & Engineering, ECOWORKS. Belize City, Belize.

Lands and Surveys Department. 2012. *Draft National Guidelines for Subdivision and Consolidation of Land in Belize*. Ministry of Natural Resources and Agriculture, Belmopan, Belize.

Statistical Institute of Belize. 2010. Belize Population and Housing Census 2010.

Wildtracks. 2009. *Corozal Bay Wildlife Sanctuary Management Plan 2010-2014*.

Wildtracks. 2012. *Draft Rationalization Exercise of the Belize National Protected Areas System*.

10.0 APPENDICES

10.1 Background

The coastal zone is one of Belize's greatest assets and its magnificent Barrier Reef Reserve System is a renowned World Heritage Site. It is the longest barrier reef in the Western Hemisphere, extending approximately 280 km from the northern to southern borders of the country (Cooper et al. 2009). Belize's coastal zone has complex and dynamic marine ecosystems that support innumerable ecological processes and a vast array of marine life and habitats. In addition to its important ecosystem functions, the coastal zone is vital to the Belizean way of life. The highly productive coastal zone is the resource base for a broad range of economic activities. In fact, approximately thirty-percent of the country's gross domestic product is directly linked to these commercial activities that take place within the coastal zone (Cho 2005). The coastal zone also has important social and cultural values to the Belizean people, especially to approximately 40% of the population that reside on the coast and in offshore areas (SIB 2010).

Over the past decades, rapid economic development and population growth have taken place in the coastal zone and inland areas of Belize. World-renowned snorkeling and diving draw over 800,000 tourists to the region annually, driving the construction of new development (BTB 2008). These occurrences have led to increasing pressures on coastal and marine resources, with implications to the livelihoods of those that depend upon them. These anthropogenic threats stem from various developmental activities associated with tourism and recreational facilities, population growth and expansion, utility supply, dredging and mineral extraction, land clearance, pollution, waste disposal, fisheries and aquaculture. These threats are compounded by natural hazards, global warming, rising sea levels, and the vulnerability of sensitive ecological systems to climate change. Thus, it is imperative now more than ever to ensure that the coastal zone is utilized in a manner that will continue to support important ecological functions, as well as social, cultural and economic prosperity for current and future generations.

For many years, and even today, management of the Belizean coastal zone has been under the regime of sectoral planning. However, The need for an integrated approach to optimally manage Belize's coastal resources was made resoundingly clear at a historic meeting in 1989 when a wide cross-section of stakeholders from various sectors, including scientists, marine managers, private sector, and coastal communities converged in San Pedro, Ambergris Caye (Gibson 1989). Integrated coastal zone management (ICZM) brings together all decision-making agencies to ensure integration among their policies and management plans, to ultimately improve and maintain the quality of coastal and marine ecosystems. A defining feature of Belize's ICZM plan is balancing national economic development needs with conservation priorities within a spatially defined area over a specified timeframe. The development of site-specific coastal zone management guidelines, as a component of the Belize ICZM Plan, serves as a means to guide management decisions and to form the basis on which decisions are made to regulate the development and use of coastal and marine resources within the coastal zone.

10.2 Summary of Enabling Legislation And Implementing Agencies For Enforcement of the Informed Management Zoning Scheme

The various governmental organizations and agencies with management mandates for the coastal zone that are needed to implement these guidelines, to synchronize the efforts of the CZMAI via the Belize Integrated Coastal Zone Management Plan, and to strengthen inter-agency coordination for integrated coastal zone management include:

Banana Control Board – The Banana Industry Act requires applications for the cultivation of designated areas for banana production for the region. The Northern Region CAC should be included in any discussion on policy formulation on banana production as it affects the region.

Belize Agricultural Health Authority – The Belize Agricultural Health Authority Act requires applications for licenses, permits or certificates to import and export animal products, animal feed, and plant products into and out of Belize following inspection as it affects the region. The Northern Region CAC should be included in any discussion on policy formulation on agricultural import and export as it affects the region.

Belize Port Authority – The Belize Port Authority Act requires applications for boat and captain licenses and for the construction and operation of private ports for the region. Also, The Harbors and Merchant Shipping Act requires the Authority to regulate the passage of vessels in and out of Belizean waters as well as the maintenance and delineation of vessel routes, lighthouses and wharfs. The Northern Region CAC should be included in any discussion on policy formulation on vessel licencing and shipping as it affects the region

Belize Tourist Board – The Belize Tourist Board Act requires applications for hotel licenses for the region. The Northern Region CAC should be included in any discussion on policy formulation on hotel development as it affects the region.

Belize Trade and Investment Development Service (BELTRAIDE) – The Belize Trade and Investment Development Service Act requires that foreign trade and investment be liaised through the BELTRAIDE organization. The Northern Region CAC should be included in any discussion on policy formulation on major developments as it affects the region.

Central Building Authority – The Housing and Town Planning Act provides for the regulation of the use and development of land through qualitative measures that is, building densities, land use class assignments etc. However, it does not address the structural integrity of buildings, a component of the development. The Central Building Authority, by way of the Belize Building Act, is legislated specifically to address this, and provides for the appointment of Local Building

Authorities to administrate the Act. Thus, the Northern Region CAC can be appointed as the Local Building Authority for the Northern Region. However, this may require strengthening the Northern Region CAC with technical expertise to do this. The alternative is to coordinate this function with the Corozal Town Council and Village Councils of Consejo, Sarteneja, Chunox and Copper Bank.

Corozal Town Council – The Town Councils Act requires applications for liquor licenses for the region. The Northern Region CAC should be included in any discussion on policy formulation on issuing of liquor licenses as it affects the region.

Department of Environment – The Environmental Protection Act requires applications for environmental clearance for the region. The Northern Region CAC should be included in any discussion on policy formulation on environmental protection as it affects the region.

Fisheries Department – The Fisheries Act requires applications for fishing license for the region. The Northern Region CAC should be included in any discussion on policy formulation on fisheries as it affects the region.

Forest Department – The Forest Act requires applications for the removal of mangroves in coastal areas for the region. The National Parks System Act requires the establishment of National Parks, Nature Reserves, Wildlife Sanctuaries, and Natural Monuments to preserve ecologically important and sensitive areas. The Wildlife Protection Act empowers the Forest Department to determine species to be prohibited from hunting practices as it sees fit. The Northern Region CAC should be included in any discussion on policy formulation on mangrove removal and designation of protective status to sensitive areas and species as it affects the region.

Geology & Petroleum Department – The Petroleum Act requires applications for oil exploration and issuing of parcel contracts for the region. The Northern Region CAC should be included in any discussion on policy formulation on petroleum activities as it affects the region.

Hydrology Unit, Ministry of Natural Resources - The Water Industry Act requires all entities to apply for a Water Abstraction License where the water source is limited to a natural water body: surface or groundwater. The Northern Region CAC should be included in any discussion on policy formulation on water use as it affects the region.

Lands and Surveys Department - The Land Utilization Act requires applications for subdivisions for the region, any demarcation of special development areas, any allocation of land in the coastal region, this includes any construction on seabed. The Northern Region CAC should be included in any discussion on policy formulation on land as it affects the region.

Meat and Livestock Commission – The Meat and Livestock Act requires applications for the rearing, breeding, sale and exportation of meat and livestock for the region. The Northern Region CAC should be included in any discussion on policy formulation on the sale of meat and livestock as it affects the region.

Mining Unit, Ministry of Natural Resources & Agriculture – The Mines and Minerals Act requires applications for dredging, oil exploration and sand mining permits for the region. The Northern Region CAC should be included in any discussion on policy formulation on dredging and oil exploration as it affects the region.

Ministry of Health – The Public Health Act requires the Director of Health to make arrangements for health inspectors to enforce building and health standards for the region. The Northern Region CAC should be included in any discussion on policy formulation on public safety as it affects the region.

Ministry of Housing– The Ministry of Housing formulates policy for housing and human settlements. Its added function is to assist with the alleviation of poverty due to urban growth. The Ministry coordinates planning and development control functions through municipal bodies. The Ministry also provides the services of Planners, Building inspectors and Engineers to provide the required necessary assistance. In accordance with Section 6 of the Act, the Northern Region CAC can be delegated the powers and duties of the Central Housing and Planning Authority (CHPA) with regard to approving, with or without conditions, and prohibiting further development in the region as well as powers to serve prohibition notices. This delegation should be supported by the Solicitor General's Office or an Attorney at Law for the enforcement of the provisions of the Act.

National Emergency Management Organization – The National Emergency Management Act requires that sites be declared as vulnerable areas for the region and policy formulation on disaster management be effectuated. The Northern Region CAC should be included in any discussion on policy formulation on issues of national preparedness as it affects the region.

Pesticide Control Board – The Pesticide Control Act requires applications for the importation, manufacturing, sale and storage of restricted pesticides for the region. The Northern Region CAC should be included in any discussion on policy formulation on pesticide use as it affects the region.

Solid Waste Management Authority – The Solid Waste Management Act requires the Solid Waste Management Authority to make arrangements for garbage collection or the engagement of contractors for the region. The Northern Region CAC should be included in any discussion on policy formulation on garbage collection as it affects the region.

10.3 Checklist For Human Use/Development Of The Coastal Zone

DEVELOPMENT ACTIVITY/HUMAN USE	PONSIBLE AGENCIES
1. Coastal Agriculture **Governing Legislation/Policy:**	
Banana Industry Act	○ Banana Control Board ○ Banana Growers Association ○ Ministry of Agriculture
Belize Agricultural Health Authority Act	○ Belize Agricultural Health Authority
Citrus (Processing and Production) Act	○ Citrus Control Board ○ Citrus Growers Association ○ Ministry of Agriculture ○ Department of the Environment
Environmental Protection Act Land Utilization Act	○ Land Utilization Authority ○ Ministry of Natural Resources
Meat and Livestock Act	○ Belize Livestock Producers Association ○ Belize Agricultural Health Authority ○ Ministry of Agriculture
Papaya Growers Association Act	○ Papaya Growers Association ○ Ministry of Agriculture
Pesticide Control Act	○ Pesticide Control Board ○ Ministry of Agriculture
Sugar Cane Industry (Control) Act Sugar Cane Famers Association Act	○ Belize Sugar Cane Board ○ Belize Sugar Cane Famers Association ○ Ministry of Agriculture

DEVELOPMENT ACTIVITY/HUMAN USE	RESPONSIBLE AGENCIES
2. Coastal Aquaculture **Governing Legislation/Policy:**	
Fisheries Act National Aquaculture Policy (Draft)	○ Fisheries Department ○ Aquaculture Unit, Ministry of Agriculture
Environmental Protection Act	○ Department of the Environment
Belize Trade and Investment Promotion Service Act	○ Belize Trade and Investment

DEVELOPMENT ACTIVITY/HUMAN USE	RESPONSIBLE AGENCIES
3. Coastal Development **Governing Legislation/Policy:**	
Belize Building Act	○ Central Building Authority
Belize City Council Act	○ Belize City Council
Belize Trade and Investment Promotion Service Act	○ Belize Trade and Investment Development Services
Cayes Development Policy Coastal Zone Management Act	○ Coastal Zone Management Authority
Disaster Preparedness and Response Act	○ National Emergency Management Organization
Electricity Act	○ Belize Electricity Limited
Environmental Protection Act	○ Department of the Environment
Forest Subsidiary Act	○ Forest Department
Hotels and Tourist Accommodation Act	○ Belize Tourism Board
Housing and Town Planning Act	○ Ministry of Housing
Land Utilization Act	○ Land Utilization Authority
Mines and Minerals Act	○ Mining Unit, Ministry of Natural Resources

Private Works Construction Act	○ Ministry of Works and Transport
Public Health Act	○ Ministry of Health
Public Utilities Commission Act	○ Public Utilities Commission
Solid Waste Management Authority Act	○ Solid Waste Management Authority
Telecommunications Act	○ Belize Telemedia Limited
Town Councils Act	○ Town Councils
Trade Licensing Act	○ City/Town Councils
Water and Sewerage Act	○ Belize Water Services Limited
Water Industry Act	○ Hydrology Unit, Ministry of Natural Resources

DEVELOPMENT ACTIVITY/HUMAN USE	RESPONSIBLE AGENCIES
4. Conservation **Governing Legislation/Policy:** Fisheries Act	○ Fisheries Department
Forest Act	○ Forest Department
Private Forests (Conservation) Act	○ Forest Department
National Parks System Act	○ Ministry of Agriculture, Fisheries, Forestry, the Environment and Sustainable Development
National Protected Areas Policy and System Plan	○ National Protected Areas Secretariat
Wildlife Protection Act	○ Forest Department
Coastal Zone Management Act	○ Coastal Zone Management Authority

DEVELOPMENT ACTIVITY/HUMAN USE	RESPONSIBLE AGENCIES
5. Marine Dredging **Governing Legislation/Policy:**	
Mines and Minerals Act	○ Mining Unit, Ministry of Natural Resources
Dredging Policy	○ Mining Unit
Environmental Protection Act	○ Department of the Environment
DEVELOPMENT ACTIVITY/HUMAN USE	**RESPONSIBLE AGENCIES**
6. Fishing **Governing Legislation/Policy:**	
Fisheries Act	○ Fisheries Department
Coastal Zone Management Act	○ Coastal Zone Management Authority
DEVELOPMENT ACTIVITY/HUMAN USE	**RESPONSIBLE AGENCIES**
7. Marine Transportation **Governing Legislation/Policy:**	
Belize Port Authority Act Harbours and Merchant Shipping Act	○ Belize Port Authority
Private Works Construction Act	○ Ministry of Works and Transport
Customs Regulation Act	○ Belize Customs Department
Maritime Areas Act	○ Ministry of Foreign Affairs
Defence Act	○ Belize Defence Force
Immigration Act	○ Immigration Department
Dredging Policy	○ Mining Unit, Ministry of Natural Resources
Environmental Protection Act	○ Department of the Environment
DEVELOPMENT ACTIVITY/HUMAN USE	**RESPONSIBLE AGENCIES**
8. Marine Recreation **Governing Legislation/Policy:**	
Fisheries Act	○ Fisheries Department
Ancient Monuments and Antiquities Act	○ Archaeology Department
National Institute of Culture and History Act	○ National Institute of Culture and History
Belize Tourism Board Act	○ Belize Tourism Board
Public Health Act	○ Ministry of Health

DEVELOPMENT ACTIVITY/HUMAN USE	RESPONSIBLE AGENCIES
9. Oil Exploration **Governing Legislation/Policy:** Environmental Protection Act Petroleum Act	○ Department of the Environment ○ Geology and Petroleum Department

10.4 Figures

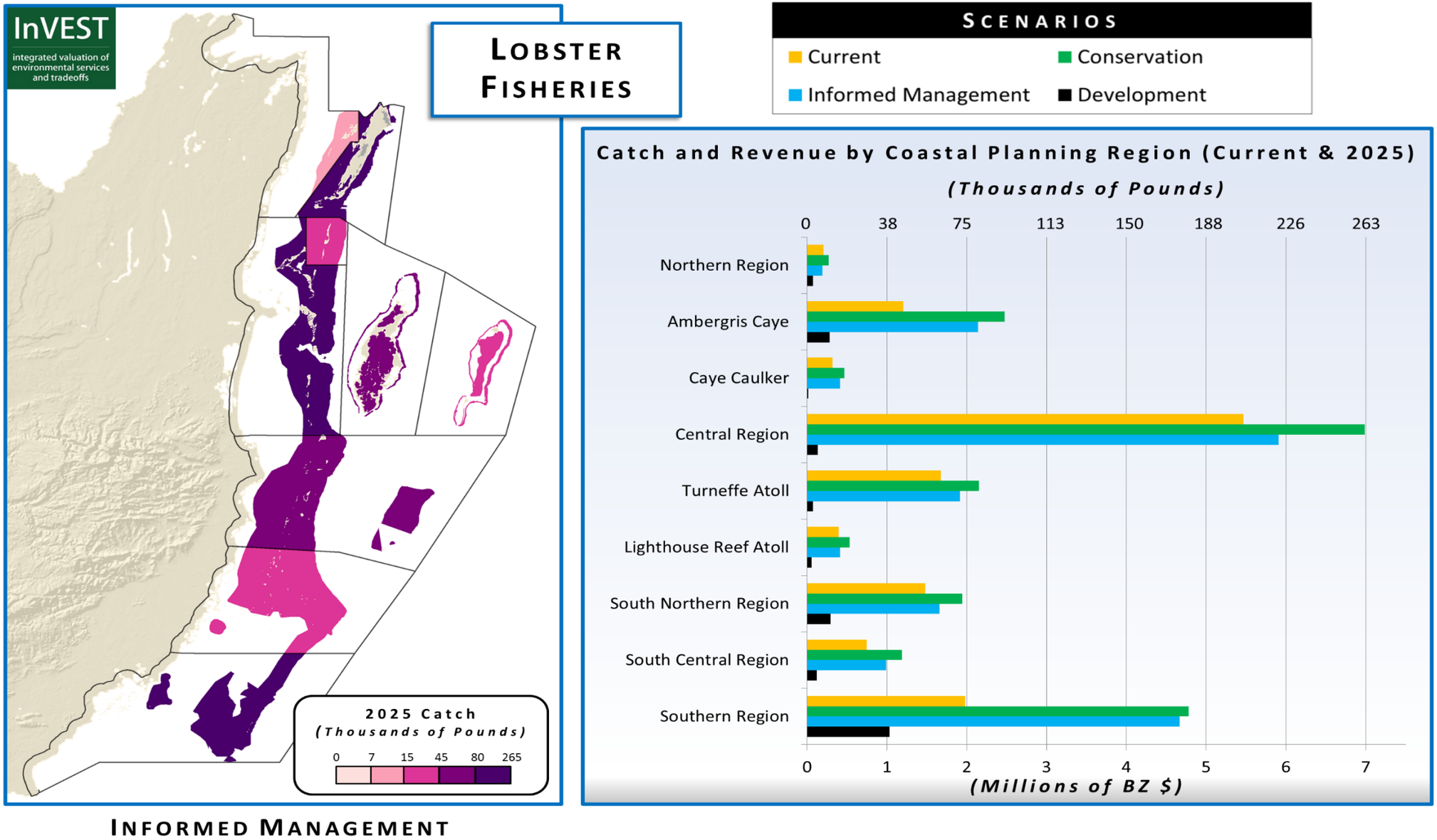


Figure 4: Lobster Fisheries Catch and Revenue by Scenario

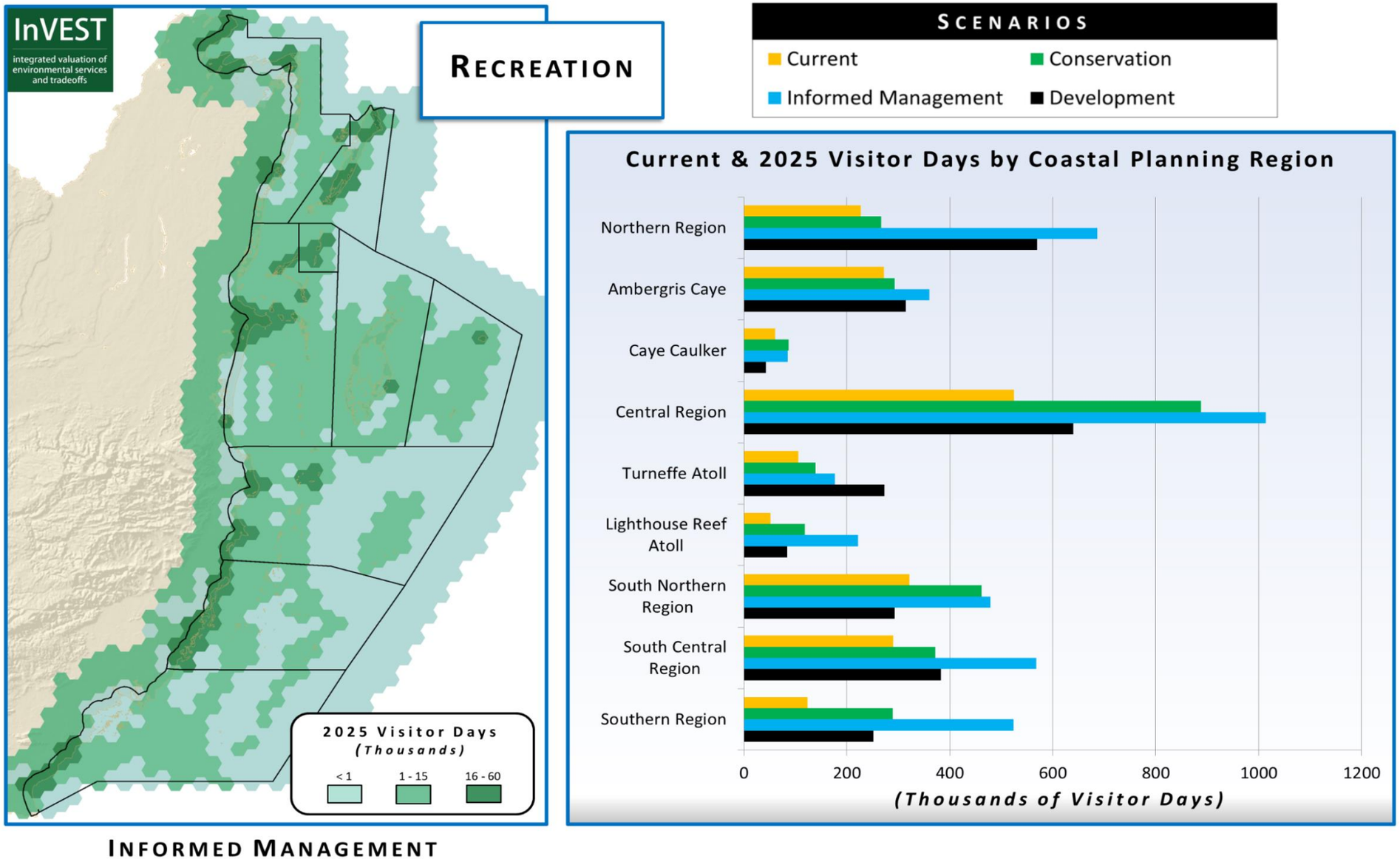


Figure 5: Annual Visitation for Marine Tourism and Recreation by Scenario

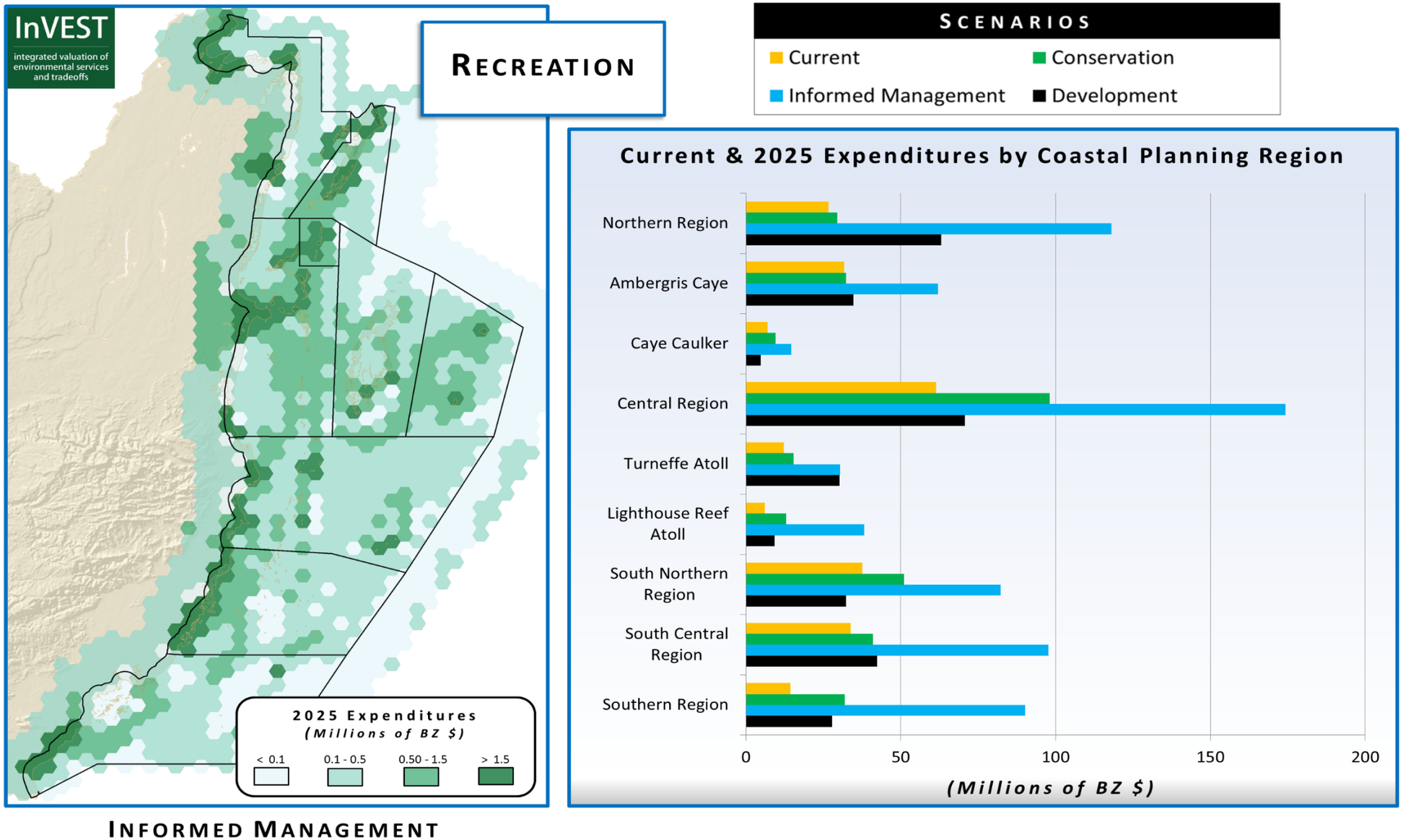


Figure 6: Annual Expenditures for Marine Tourism and Recreation by Scenario

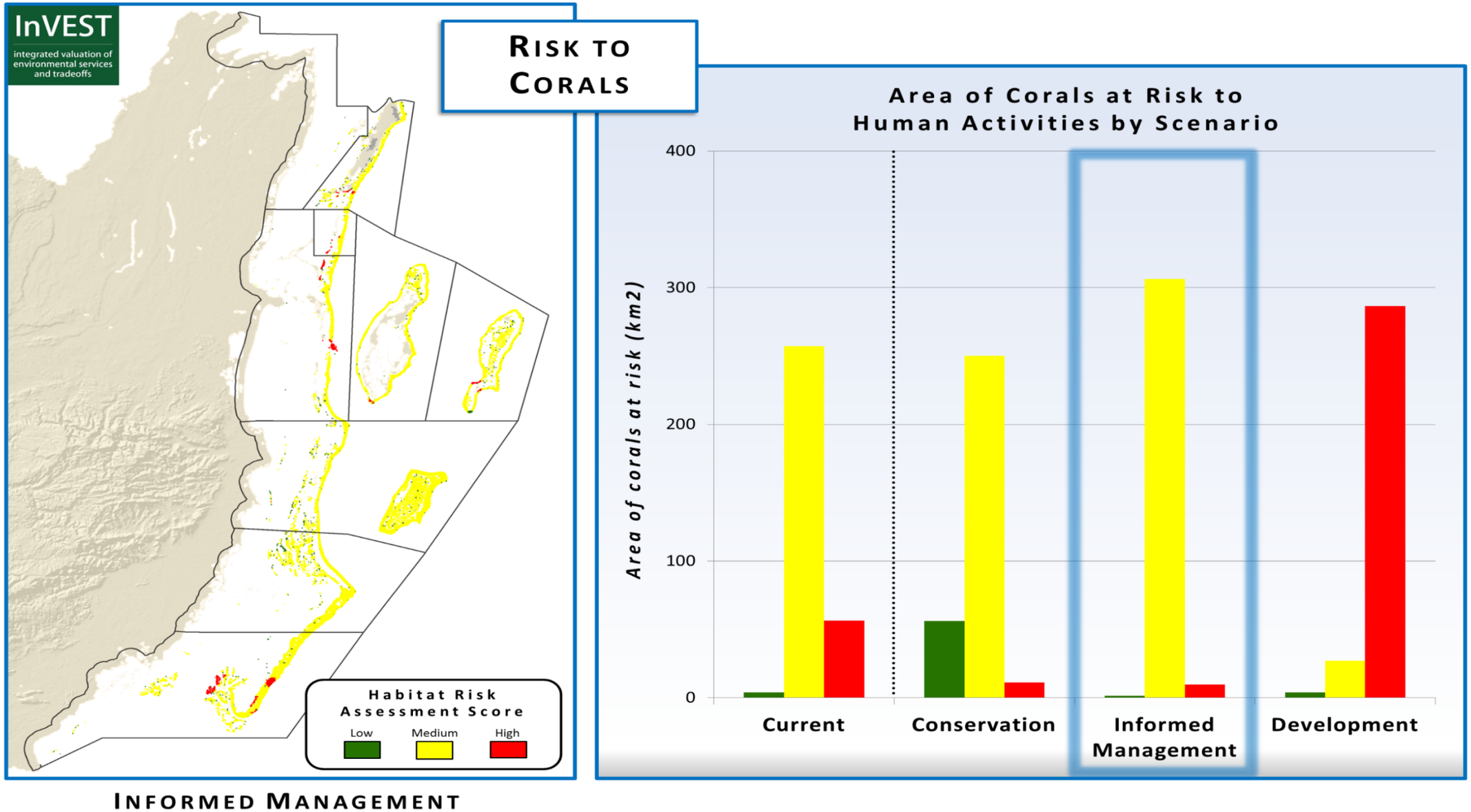


Figure 7: Area of Corals at Risk from Human Activities by Scenario

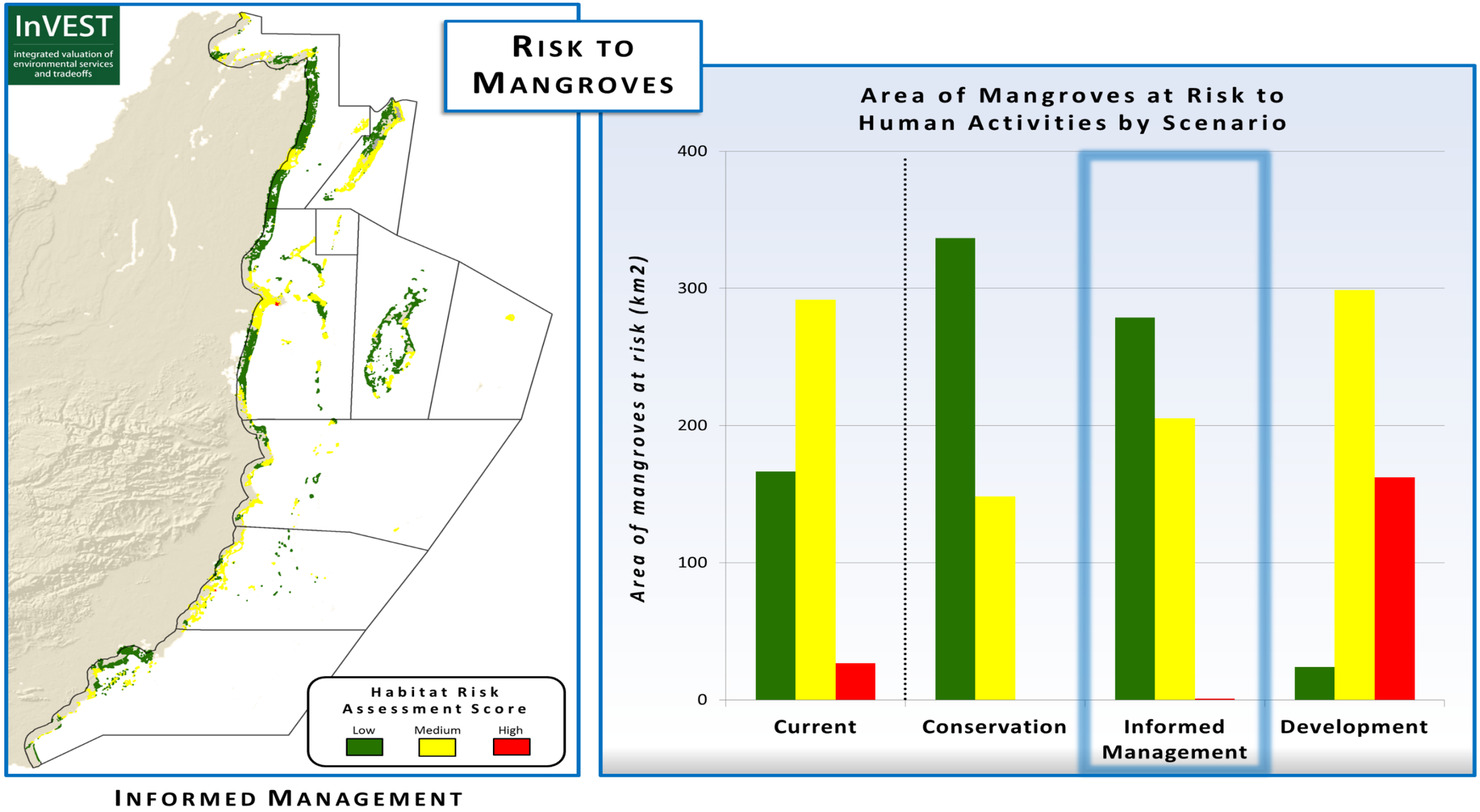


Figure 8: Area of Mangroves at Risk from Human Activities by Scenario

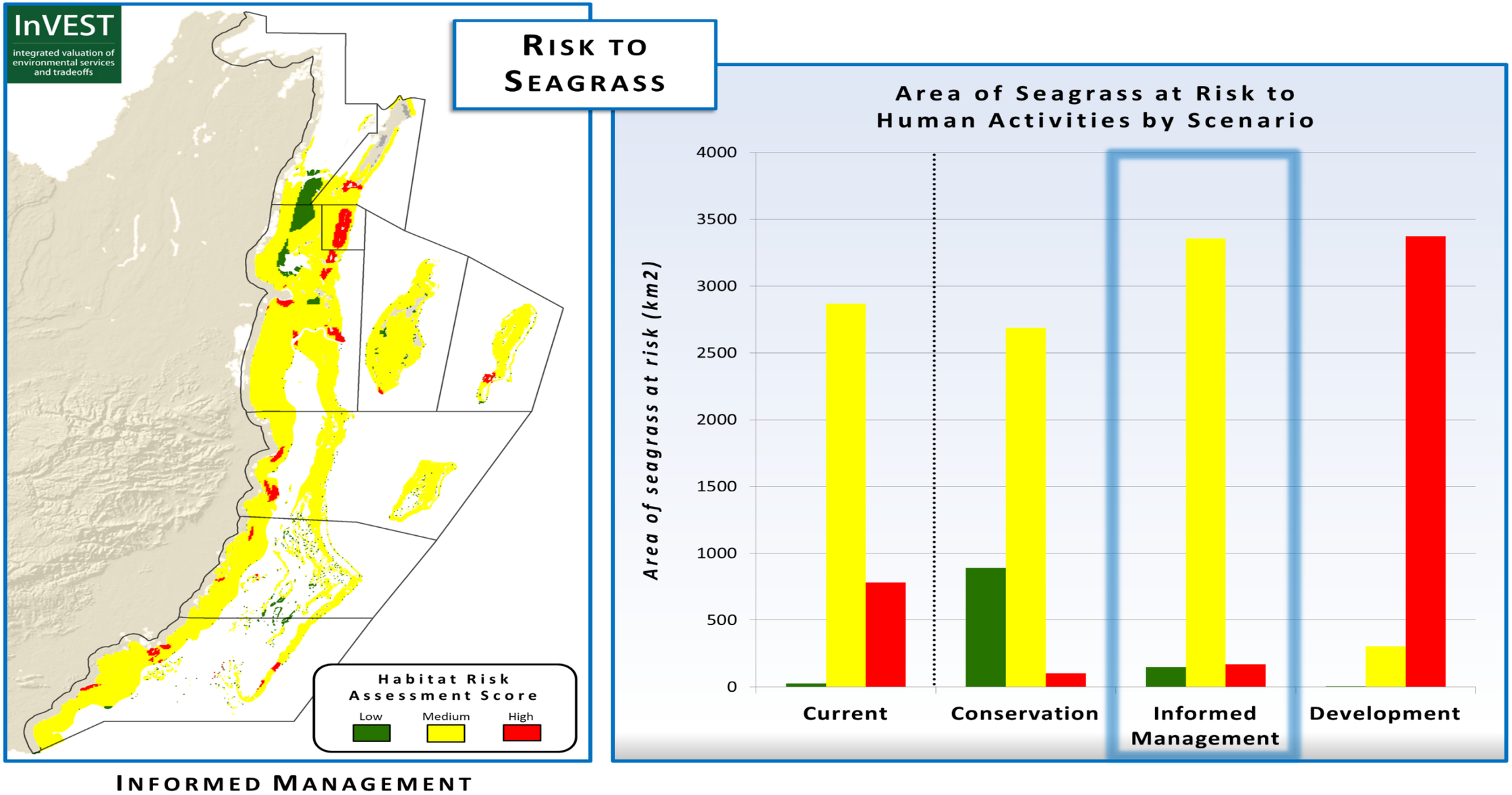
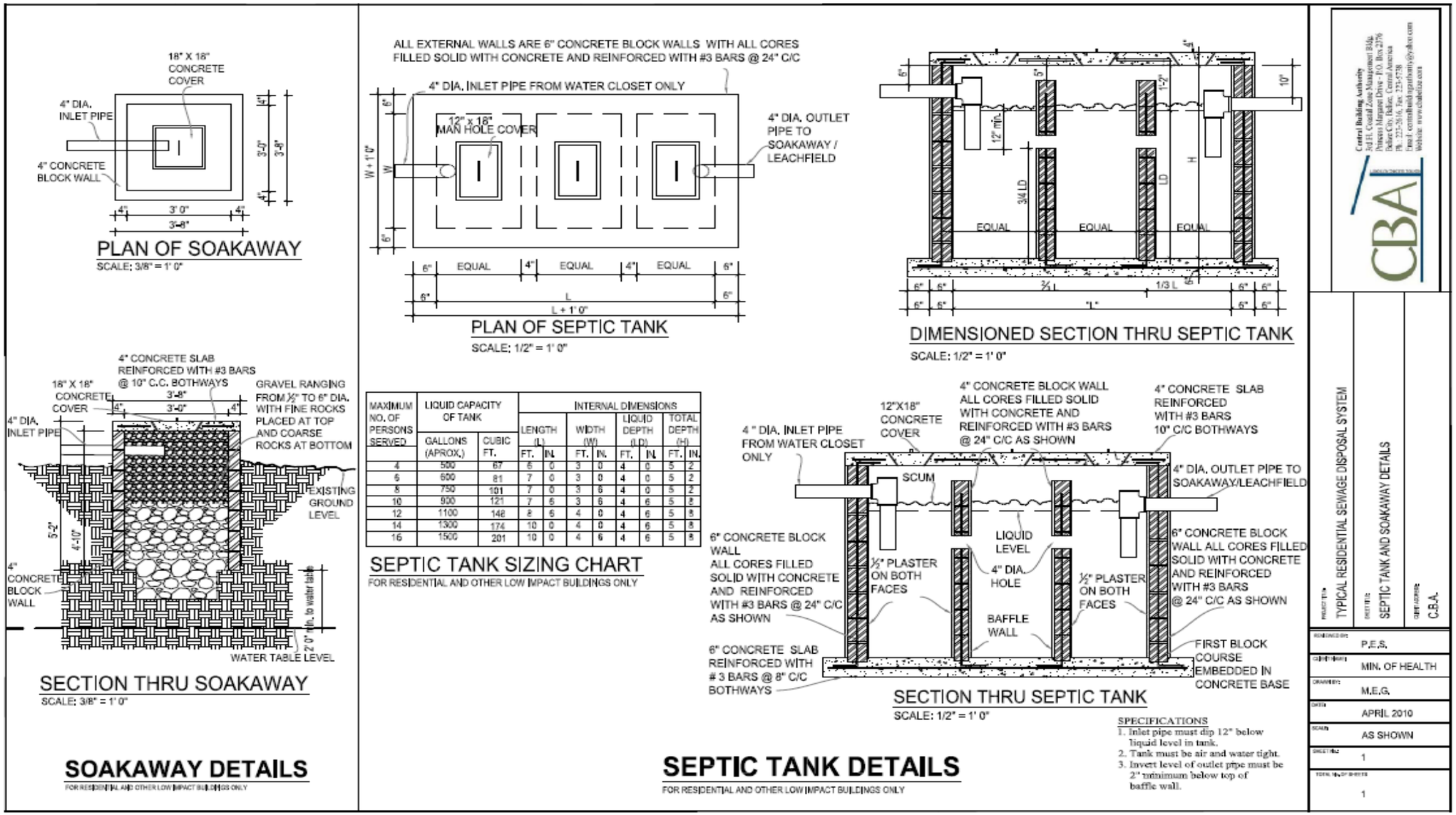


Figure 9: Area of Seagrass at Risk from Human Activities by Scenario



MAXIMUM NO. OF PERSONS SERVED	LIQUID CAPACITY OF TANK		INTERNAL DIMENSIONS							
			LENGTH (L)		WIDTH (W)		LIQUID DEPTH (LD)		TOTAL DEPTH (H)	
	GALLONS (APROX.)	CUBIC FT.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.
4	500	67	6	0	3	0	4	0	5	2
6	600	81	7	0	3	0	4	0	5	2
8	750	101	7	0	3	6	4	0	5	2
10	900	121	7	6	3	6	4	6	5	8
12	1100	148	8	6	4	0	4	6	5	8
14	1300	174	10	0	4	0	4	6	5	8
16	1500	201	10	0	4	6	4	6	5	8

Figure 10: Septic Tank and Soakaway Details for Residential and Low-Impact Buildings