Protected Areas Management Plan

FOR

SWALLOW CAYE WILDLIFE SANCTUARY

Manatee Heartland of Belize

Community-based protected area co-management organization:

FRIENDS OF SWALLOW CAYE

PACT
Protected Areas Conservation Trust

Friends of Swallow Caye Belize

Belize Forest Department

Contents

Executive Summary

The co-managers of Swallow Caye Wildlife Sanctuary (SCWS) are the Forest Department, Ministry of Natural Resources and the Environment (MNRE) of the Government of Belize (GOB) and Friends of Swallow Caye (FOSC) a volunteer, non-profit, non-governmental membership association incorporated under the company's act of Belize. The co-managers early in the life of the sanctuary agreed the necessity and priority importance of a management plan and this was so stated as Article # 4 and Article #5 in the Co-management contract signed by both parties in 2003.

Excerpt from Co-management Agreement

#4 The Government, through the Forest Department and the Association shall together formulate and implement detailed management plans for the development of SWALLOW CAYE WILDLIFE SANCTUARY to explicitly include goals, objectives, permitted activities, standards, methods of implementation, and control, priorities, budgets, personnel requirement, target dates and such other matters as shall be agreed. The management plan shall be formulated within one year of the date of this agreement.

#5The management plans shall also specify the assessment methods to monitor accomplishments and shall provide the necessary periodic evaluations and refinements. Such visitor usage, staffing, structures, monitoring, research and any other provisions as are appropriate to the National Park.

In 2011, the association finally finds itself with adequate resources to seriously undertake this comprehensive exercise. This plan is being produced with financial assistance from PACT and with technical input from the Forest Department, Coastal Zone Management Authority and Institute and with input from the public.

Integral to the development of this plan is the involvement of the staff of Friends of Swallow Caye who have designed the two new departments of Research Development and Community Outreach and more, have started to put many of these ideas into action. The formulation of this management plan was timely for the involvement of new staff to take ownership of the management responsibilities of this significant area of Belizean heritage.

The methodology involved qualitative and quantitative methods of primary and secondary research in the form of interviews, public consultations, and the review of previous research, reports and daily data logs. The involvement of the Board of Directors, Staff and consultant in more than a year of management training and development which produced a Strategic Plan, a Business Plan and other key documents was very instructive to this management plan. The Board of Directors had to do a lot of soul searching and skills improvement to emerge with a strong corporate vision and mission to successfully support Swallow Caye Wildlife Sanctuary. A radical change in Sanctuary Management priorities was evidenced to research development and community outreach from the previous 15 years focusing on enforcement and regulating visitor behaviour.

The process to produce this management plan met with great enthusiasm and collaboration from a wide range of colleagues and supporters who were unstinting in sharing their valuable experiences and advice on heritage and protected areas management.

Swallow Caye Wildlife Sanctuary is notable as a concentration place of manatees and as the only marine protected area for at least a 20 mile radius offshore Belize City. This Sanctuary has the distinction of being the only manatee sanctuary in the country that was brought into existence by tremendous grassroots lobby. At the beginning and presently, the membership of the support group, FOSC, is spread throughout the country of Belize, as well as, internationally.

One limitation was the minimal information originating from the management of Swallow Caye Wildlife Sanctuary itself since 2003 when co-management was achieved. However, this is mitigated by the corrective action taken by the FOSC Board of Directors since 2010 and the volumes of ongoing long-term studies on manatees worldwide. In the past decades, this includes Belize with the ongoing studies being conducted in Belizean waters many just outside the boundaries of Swallow Caye Wildlife Sanctuary and some including SCWS by respected marine researchers (Gibson 1995, Auil 1998, Self-Sullivan 2000, LaCommare 2012, Bacchus 2008, Cho-Ricketts 2005, Galvez 2012). Inferences can and must be drawn for SCWS for what is a continuous sea environment and a highly mobile species with a free range that, despite legislated boundaries, is without physical borders. Basic information was also gleaned from the daily data log observations kept by the FOSC Rangers since 2005. Except for the 2 first years processed by Maria Vega early on, this information had been filed and unused and the onerous task of organizing and processing to electronic file was assumed by 2011 staff persons, Andre Reneau and Briony Ysaguirre. In addition to research on manatees, the Government of Belize in the past decade has commissioned key studies on the wealth of biodiversity and natural heritage of the protected areas to guide the management of the National Protected Areas System. Additionally, the timing of the preparation of this document overlapped with the many assessments and evaluations underway by the Government of Belize on system level management of the protected areas of Belize with the change of ministerial portfolios in 2012 to streamline and unify the Fisheries and Forest Departments.

Belize City Cayes Region Development Guidelines 2003
SECTOR POLICIES[1]
7.04 Conservation

The only caye with protected status is Swallow Caye by virtue of Statutory Instrument No. 102 of 2002 but no management plan has been prepared for it. Notwithstanding, the other Belize City Cayes Region cayes has protective, socio-economic, scientific and cultural importance and to ensure the sustainability of these functions, and the continuity of conservation efforts for the entire region, the planning guidelines were formulated to:

- Provide the foundation for the expansion of the Swallow Caye Wildlife Sanctuary to include the Drowned Cayes through zoning provisions;
- Provide a foundation for any management plan which may be conceived for the region.
- Encourage stakeholders participation in the monitoring of the application of the planning guidelines

1 Draft Belize City Cayes Planning Guidelines CZMAI 2003

TABLE 1	*Swallow Caye Wildlife Sanctuary Data Sheet*	
Date	June 30, 2011	
Name of Protected Area	SWALLOW CAYE WILDLIFE SANCTUARY (SCWS)	
Location of Protected Area	3 miles due east of Belize City	
Date of establishment	Statutory Instrument #102 of 2002, 3pprox. September 7, 2002	
Size of Protected Area	Acres: 8,970.13 acres; Perimeter: 25.5 km	
Land Tenure	Swallow Caye 89 acres national land, Mapp's Caye 325 acre significant portion still in national ownership, Drowned Caye, 3pprox.. 1/5 of 3556 acres significant portion still in national ownership[1]	
Management Authority	Forest Department, Ministry of Forestry, Fisheries and Sustainable Development	
Affiliations / Partnerships with other organizations	Co-manager, Friends of Swallow Caye (FOSC) agreement signed April 15, 2003 with Ministry of Natural Resources	
Number of Staff	Permanent: 1	Temporary: 3
Annual Budget (Bz$) for management of protected area	$500,000 BZ	
Designation (Belize or IUCN category, World Heritage Site, RAMSAR etc.)	Wildlife Sanctuary and species protected by the Convention on International Trade of Endangered Species (CITES) IUCN Category IV	
Reasons for Designation	Species Protection – *Trichechus manatus manatus*	
Brief Details of Past Funding	Private donations Chocolate and friends, grant funds, entry fees, personal loans, community in-kind donations	
Brief Details of Present Funding	Personal loans, grant funds, in-kind donations, entry fees,	
Brief Details of Future Funding	Business centers, grant funds, entry fees, in-kind donations	
The two primary objectives are for Swallow Caye Wildlife Sanctuary are:		
To Protect and preserve Belizean Natural Heritage		
To Engage Belizeans as beneficiaries		
The top two most important threats to Swallow Caye Wildlife Sanctuary are:		
High Speed Boat Traffic – located at the Belize City Harbour and in the environs of the busiest traffic crossroads for freight, fishing and tourism;		
Habitat Destruction – location in proximity to Belize City, the Cayes of Belize District and the Belize Barrier Reef makes this area prime for fishing and tourism development;		
The top two critical management activities are:		
Research Development		
Community Outreach		

Abbreviations

APAMO	Association of Protected Areas Managers Organization
BMMSN	Belize Marine Mammal Stranding Network
CBD	Convention on Biological Diversity
CZMA&I	Coastal Zone Management Authority and Institute
BERD	Biodiversity and Environmental Resources Data System of Belize
BTIA	Belize Tourism Industry Association
BTB	Belize Tourism Board
FD	Forest Department
FOSC	Friends of Swallow Caye
GoB	Government of Belize
IUCN	International Union for the Conservation of Nature
NMWG	National Manatee Working Group
NPAS	National Protected Areas System
PACT	Protected Areas Conservation Trust
SCWS	Swallow Caye Wildlife Sanctuary
SI	Sirenian International

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Acknowledgements

This Management Plan for Swallow Caye Wildlife Sanctuary is the result of the sustained interest, cooperation and hard work of many individuals and agencies. Notable among these is the Board of Directors and Members of Friends of Swallow Caye who recognized the need and secured the wherewithal to get the job done. Much appreciation to the employees of Friends of Swallow Caye who participated in this instructive exercise and used the opportunity to create new and important programs even if it meant longer hours of work.

The notable work of many who have gone before us was valuable to the effort including the Forest Department Conservation Unit, the Rapid Ecological Assessment previously completed by the students of the University of Belize under the guidance of Dr. Leandra Cho-Ricketts, the research of Coastal Zone Management Institute and Janet Gibson, Nicole Auil and Caryn Self-Sullivan in the Drowned Cayes area and the tremendous input received from users, Tour Operators and Tour Guides, and the general public.

The production of this Swallow Caye Wildlife Sanctuary Management Plan was supported by the Coastal Zone Management Institute and Authority, the Forest Department and the Protected Areas Conservation Trust. The work also benefitted from the initiatives of the Association of Protected Areas Management Organizations (APAMO) planning sessions with the Board of Directors of Friends of Swallow Caye throughout the year 2011. Thank you, to these agencies, especially, the team at PACT in constant contact through their highly competent Grants Officer, Joyce Tun.

Thank you for your commitment in protecting the Manatees of Belize.

1. Introduction

1. Introduction

1.1 Background and Context

This document provides the Swallow Caye Wildlife Sanctuary Management Plan utilizing the Management Plan Outline developed under the National Protected Areas Policy and System Plan and the Forest Department of the Ministry of Natural Resources and the Environment, to be adopted for the terrestrial and marine protected areas system of Belize, under the mandates of the Forest and Fisheries Departments.

The National Management Plan Framework lays out the format required by the Forest and Fisheries Departments, to assist management planning bodies in developing plans for protected areas in Belize. The preparation of this management plan takes place at the level for Friends of Swallow Caye:

Level One: Community-based protected area management organization

This plan is being developed as Level One utilizing the manual which has been developed for this level, to guide the management organization through the planning process.

General location and size of protected area

Swallow Caye Wildlife Sanctuary is three miles east of Belize City and includes marine and mangal habitats totaling 8,970.13 acres. See Map 1 – satellite image.

Protected area type

Swallow Caye Wildlife Sanctuary is established under the National Parks System Act Chapter 215 as a "wildlife sanctuary" meaning any area reserved as a nature conservation reserve in accordance with the provisions of Section 3 for the protection of nationally significant species, groups of species, biotic communities or physical features of the environment requiring specific human manipulation for their perpetuation. In this case, the flagship species for which the sanctuary was established to protect is the Antillean Manatee, *Trichechus manatus manatus*, a sub-species of the West Indian Manatee.

Section 3 further elaborates that a wildlife sanctuary is constituted and its size may be altered or it can cease to be by order of the Minister for the time being responsible for the National Parks System.

An essential feature according to the Act is 4. (d) no person shall hunt, shoot, kill or take

any wild animal, or take or destroy any egg of any bird or reptile or any nest of any bird , in any wildlife sanctuary.

5.(3) Restriction of entry – No person shall enter or remain within any wildlife sanctuary except under the authority and in accordance with the conditions of a permit issued by the prescribed officer on payment of the prescribed fee.

6. Speaks to prohibited acts in the Sanctuary including no hunting, no residential structures, no removal of any objects of cultural or natural value, no defacement or destruction, no introduction of pollutants, no land clearing, no livestock grazing, no arms nor hunting gear, no introduction of exotic species, no catching of fish by any means. Article 7 1 and 2 gives the Minister power to grant exemptions to these prohibitions.

IUCN management category

SCWS can be classified under International Union for the Conservation of Nature (IUCN) Category IV – Habitat Species management area. See Appendix 1.

Historical background of protected area – purpose for which protected area was established

Business Name Act CAP. 247	17 June 2002
Swallow Caye Wildlife Sanctuary Established	7 September, 2002
Companies Act CAP. 250 Sec. 17	
Incorporation Certificate of Compliance	20 December, 2002
Co-management Agreement	15 September, 2003
Companies Act CAP. 250	
Certificate of Incorporation	31 August, 2004
NGO Registration	27 September, 2004
Social Security Registered	January 15, 2005
License Caye Caulker Beach Easement	August 2005

The establishment of Swallow Caye Wildlife Sanctuary is the sum total of the efforts of many persons and many organizations but the first, the greatest and most tireless of all is Lionel Chocolate Heredia. He is Manatee Champion par excellence of recent generations and still going strong at eighty-two years of age in 2012. A native of San Pedro Ambergris Caye, he moved to Caye Caulker in the early 1970's to pursue a water taxi business and in due course self-trained to specialize in Manatee Tour Guiding. This career path started with a visit to Swallow Caye in the company of Mr. Richard Foster who took Chocolate diving one day to this undiscovered place where Mr. Foster knew manatees could always be seen and suggested Chocolate start bringing people to this place to see the manatees. [2]

At the start, Chocolate almost singlehandedly carried the cause to protect the manatees in this Belize City area. His personal crusade started in the 1980's but gained momentum and eventual success with the organization of the association, Friends of Swallow Caye, in 2002. Prerequisites to the Sanctuary was the need for Mr. Heredia to obtain proof of broad based support for the idea and this he did by organizing the association, Friends of Swallow Caye. Furthermore, scientific information justifying the need was required and the timing was right as, in the 1990's Ms. Janet Gibson had been conducting her doctoral thesis on Manatees of the area and Coastal Zone Management Institute with Ms. Gibson at the helm was focusing on a complete manatee research program in the last half of that decade. "The

UNDP/GEF CZMP Manatee programme began in August 1996 and was carried out to examine the status of the manatee for the first time on a countrywide and relatively long-term basis." (UNDP/CZM December 3, 1998 Seminar on the West Indian Manatee in Belize)

2 page 20 Kelly, Leah West Indisn Manatees and Ecotourism, Caye Caulker, Belize 1996

A personal verbal report from A. Seashore Heredia to author is that she has on file the original list of the 775 signatories that petitioned for the establishment of the Sanctuary. The area presently known as Belize City and its attendant Belize City cayes identified by Coastal Zone Management as those in a semi-circle from Frances Cayes in the northwest to Colson Cayes in the south share a most intriguing and lengthy history through geological time, to the rise of the Maya Civilization, the colonial era and now in present day modern independent Belize.

These cayes are in the middle of what were the Mayan trade routes for millenia, colonial shipping routes for centuries, fishing and now accelerated tourism, shipping, industry and population growth of an independent Belize. It must be noted that alongside the last couple decades of growth, is also the rise in environmental protection and conservation trends, including the establishment of several marine protected areas. Swallow Caye, a small island located directly in front of Belize City not only bears witness to this long history but has been a key player providing protection to Belize City, providing seafood, and a safe and handy anchorage to shipping. The theory is that Swallow Caye was named after the HMS Swallow. According to E. O. Winzerling, Captain Samuel Axe who was Captain of the Swallow used this caye as his favourite anchorage because of its proximity both to Belize City for the access to products coming downriver and because of its proximity to Turneffe where he could tend his tobacco crop. In various ships and jobs, Captain Axe plied the seas between 1629-1645 as an English privateer sometimes working with the Dutch. The Royal Navy has had about 32 ships named Swallow after the bird; the Sanctuary, in turn, is named after Swallow Caye.

Map 1 Satellite Imagery Belize City and Swallow Caye Source: BING 2010

Background of Friends of Swallow Caye and Forest Department and Legislation

SCWS is co-managed since 2003 by the Forest Department of the Ministry of Natural Resources and the Environment of the Government of Belize and Friends of Swallow Caye. Despite the co-management contract having expired in 2008, both parties continue de facto in the same arrangement with no official renewal. Co-management letter at Appendix 2.

Swallow Caye Wildlife Sanctuary was established as a result of a groundswell from the community led by Chocolate. Research supporting the importance of the area was available through the Coastal Zone Management Authority and Institute Manatee Research Program and from a few other sources. Chocolate struggled for many years in his pursuit and finally acknowledged the need to unite with stakeholders, communities, politicians, academia and government agencies to succeed.

With this realization, the business name Friends of Swallow Caye was registered on 17th June, 2002 by Mr. Billy Leslie, Mr. Robert Blease and Mr. Carlos Miller. Shortly after, success came with Swallow Caye Wildlife Sanctuary being established on September 7, 2002 by Statutory Instrument (S.I.) #102 of 2002.

Friends of Swallow Caye is a non- profit, non-governmental, membership organization limited by guarantee under the Company's Act of Belize. It is managed by a volunteer Board of Directors which includes a President, Vice President, Treasurer, Secretary, and two Directors. The members of the Board of Directors serve for life but may change responsibilities at annual meetings.

On September 4, 2011, FOSC held its first annual general membership meeting.

In the interim, GoB had implemented a moratorium on issuance of new or renewal of co-management agreements until co-management for the country is better defined in the contract terms. Hence, over the last few years both parties have been involved along with other interested parties in rounds of meetings to arrive at an acceptable definition and improved contract terms. The latest draft of contract terms is attached. See Appendix 2.

Friends of Swallow Caye (FOSC) is comprised of volunteers agreed to support Swallow Caye Wildlife Sanctuary for the protection of the West Indian Manatee. Chocolate personally approached many persons and asked them to become members of this new organization to lobby for and support a Sanctuary at Swallow Caye.

Several meetings were held and FOSC entered into a five (5) year co-management agreement with Government of Belize from April 15, 2003 to 2008. Friends of Swallow Caye is still desirous of renewing a long-term co-management contract with the Government ofBelize.

Friends of Swallow Caye has a Board of Directors headed by a President who is chairman of the Board and the offices of Vice President, Treasurer, Secretary and two Directors. In consultation with the Forest Department, this FOSC BoD conducts the day to day running of the Sanctuary including the management, financial, personnel and other needs. The members of the Board of Directors as of September 4th, 2011 are:

President Lionel Chocolate Heredia
Vice President Albert Pacheco
Treasurer Ann Seashore Heredia
Secretary Nicole Auil

Director Cassian Aguet Director Marcial Alamina

The Staff members during 2011 are:

1 Community Outreach Officer full time;
1 Research Officer full time 2 Ranger positions part time;
1 Project Manager part time;

1.2 Purpose and Scope of Plan

The raison d'etre for Swallow Caye Wildlife Sanctuary is to protect manatees in their natural habitat as a major species in Belizean biodiversity and natural heritage. Therefore, the health and safety of the manatees and the critical resources on which they depend are paramount. Even prior to the declaration of Swallow Caye Wildlife Sanctuary, the Forest Department, in response to public lobby, enacted the following basic regulations for the general area. Except for the recent addition of the aerial boundary caution, the regulations being used today are the very same.

REGULATIONS

The following regulations are to ensure efficient management of the Swallow Caye Wildlife Sanctuary while maintaining its biological and ecosystems integrity for generations to come.

1. Directional, educational and other necessary signs are erected at strategic locations within the area;

2. From designated Sanctuary boundaries, all boat operators shall reduce speed and at designated points shall turn off their engines and pole their way into the main area;

3. Zone 1 is the main hole. Once in the area of the main hole, all boats shall plant pole and tie up;

4. There shall be specific and clearly marked Entrance and Exit points. These shall be variable depending on prevailing winds to enable boats to drift with the wind;

5. Noise pollution, including the playing of loud music, is banned within the SCWS;

6. Only a maximum of six boats shall inhabit the main hole at any one time, for a time frame not exceeding 30 minutes;

7. Only boats with a maximum length of 36 feet shall be allowed within Zone 1 - the main hole area;

8. All vessels of lengths exceeding 36 ft. shall remain outside the main hole in the turtle grass and secondary hole areas;

9. No inboard/outboard diesel engine boats shall be allowed in the main hole;

10. Boat operators and tour guides shall ensure that their passengers maintain good behavioural conduct while in the area;

11. Molestation of the animals is prohibited. This includes petting, feeding and swimming with the animals;

12. All tour and boat operators shall meet the BTB's and Ports and Harbours Regulations for passenger/guide ratio and other safety regulations;

13. No littering in the Sanctuary.

14. The hovering of any flying aircraft that infringes or in any way affects the natural behaviour of the manatees within or in the proximity of the Sanctuary is prohibited.

It is planned that management of Swallow Caye Wildlife Sanctuary should encourage the same or a higher level of public participation and support as it enjoyed at the outset. Therefore, Friends of Swallow Caye and the Forest Department look to providing ample avenues for participation by the publics. It is the intention that Belizeans will appreciate and benefit spiritually and economically from this, their birthright.

Crucial to this management, is a strong institution with qualified personnel able to make well-informed decisions and with adequate resources to implement these decisions.

Ideally, adequate staffing

levels would be needed in management, research, community outreach and enforcement. The Board of Directors would further develop their role in policy, planning, program identification and clout to fundraising.

Formulation of this management plan with community participation

The process for the management plan was indicated by the Board of Directors of Friends of Swallow Caye in the project, "Research, Management and Communications Development at Swallow Caye Wildlife Sanctuary". This PACT/MARFUND funded project calls for the formulation of a management plan for Swallow Caye Wildlife Sanctuary including primary and secondary research for qualitative and quantitative data collection.

Primary Research

A survey is to be developed and applied in group and individual sessions.

At the minimum, meetings with stakeholders were to be held in at least three public meetings One in each of three different stakeholder communities and individual meetings with at least ten pertinent persons in interviews.

The survey questionnaire was developed and applied both in group and individual sessions. Individual interviews were conducted with fourteen persons and six public meetings were held for a total contact with one hundred and fifty persons . Public Consultations were held as follows:
3 Caye Caulker,
1 Belize City,
1 San Pedro.
A sixth public consultation was as part of the Agenda in the Friends of Swallow Caye Annual General Meeting held September 4, 2011.

Data logs collected over time by the FOSC Rangers on duty were also processed by FOSC staff for utilization in this planning exercise. Other FOSC in-house data collection including videography, sampling, and other observations were very informative.

The consultant also visited the Sanctuary for data gathering at various scan points for mangrove, sea grass, manatee, visitation and traffic.

The collaborating agencies are Friends of Swallow Caye, Forest Department, Coastal Zone Management Authority and Institute and the Protected Areas Conservation Trust.

Secondary Research

The findings of the Rapid Ecological Assessment (REA) conducted by Dr. L. Cho-Ricketts et al. is to be utilized as a reference point. This, in addition to studies published by Janet

Gibson, Nicole Auil, Caryn Self-Sullivan, Buddy Powell and others in the adjacent and adjoining waters of Swallow Caye Wildlife Sanctuary, Belize were reviewed.

Purpose and scope of plan

This plan is to invite and facilitate public participation and to provide some guidance for the improved management of Swallow Caye Wildlife Sanctuary for a period of three years 2011 to 2013. It is to garner, on an ongoing basis, reliable information about manatees in their natural habitat, about the user groups and supporters and about ways of successfully balancing for co-existence.

The purpose in 2011, was to assist the introduction of new ideas at SCWS, primarily, the move to a scientific research component in-house by FOSC personnel. The aim also was to be instructive to staff at SCWS. It has also assisted with providing training programs for at least one in-house manatee researcher and identified needs for reliable research coming out of Friends of Swallow Caye. Furthermore, research programs have been designed, research equipment has been identified and in some cases equipment has been secured. The planning process has also provided opportunity for training to one community outreach officer and the development of an outreach program at FOSC. Therefore, 2011 has proven to be a testing ground and laying of the foundation for many of the aims of this plan with necessary involvement for buy-in by FOSC personnel.

The formulation of this plan has also facilitated networking in a wider sphere of agencies critical to manatee protection including participation of FOSC staff reporting on new aspects of SCWS management to add to the national picture. It has renewed involvement with Coastal Zone Management Authority and Institute, the National Manatee Working Group, Corozal Bay Manatee Sanctuary, ECOSUR, NPAS, various initiatives for improved Marine Protected Areas Management in Belize and numerous other efforts.

Final authority for the Swallow Caye Wildlife Sanctuary Management Plan is the Forest Department, Ministry of Natural Resources and the Environment. Personnel of this department have been involved in consultations and in providing the approved format for the preparation of the plan. Furthermore, during all of 2011 they have been approving research projects, as well as, being participants in these projects that have been made possible with their technical input and donor funding.

Goal

The goal of this plan is to effectively guide natural heritage management based on sound knowledge of Swallow Caye Wildlife Sanctuary and effective communication with stakeholders. The objectives are:

To increase knowledge about SCWS natural heritage;
To protect manatees of SCWS;
To protect the natural habitats and ecosystems of SCWS;

To provide opportunity for Belizean stakeholders;
To reduce threats to SCWS;
To keep SCWS functioning as a critical member of the NPAS; See appendix 3 for SCWS Ecosystem values rating

2. Current Status

2.1 Location

Swallow Caye Wildlife Sanctuary is located three miles east of Belize City in the Belize City range of cayes and includes Swallow Caye and Mapp's Caye. It comprises approximately 8,970.13 acres, is irregularly shaped with nine "corner" points with UTM coordinates as follows:

Commencing at a point having the scaled UTM co-ordinates of 1937 150 North and 378 400 East;

Thence east north east on a bearing of 73.7 degree for an approximate distance of 3970 meters to a point having the scaled UTM co-ordinates of 1938 250 North and 382 200 East;

Thence east south east on a bearing of 124.9 degree for an approximate distance of 1,642 meters to a point having the scaled UTM co-ordinates of 1937 300 North and 383 550 East;

Thence south-south west along the southern side of channel on a bearing of 189.9 degrees for an approximate distance of 3, 161 meters to a point having the scaled UTM co-ordinates of 1,243 meters to a point having the scaled UTM co-ordinates of 1933 600 North and 384 100 East;

Thence south-south east on a bearing of 176.6 degree for an approximate distance of 2, 611 meters to a point having the scaled UTM co-ordinates of 1931 000 North and 384 250 East;

Thence west on a bearing of 270 degree for an approximate distance of 6,252 meters to a point having the scaled UTM co-ordinates of 1931 000 North and 378 000 East;

Thence directly north on a bearing of 0 degree for an approximate distance of 3,540 meters to a point having the scaled UTM co-ordinates of 1934 550 North and 378 000 East;

Thence north east on a bearing of 34.9 degree for an approximate distance of 1, 762 meters to a point having the scaled UTM co-ordinates of 1936 000 North and 379 000 East;

Thence north-north west on a bearing of 332.5 degree for an approximate distance of 1,310 meters back to the point of commencement.

Source: SI 102 of 2002

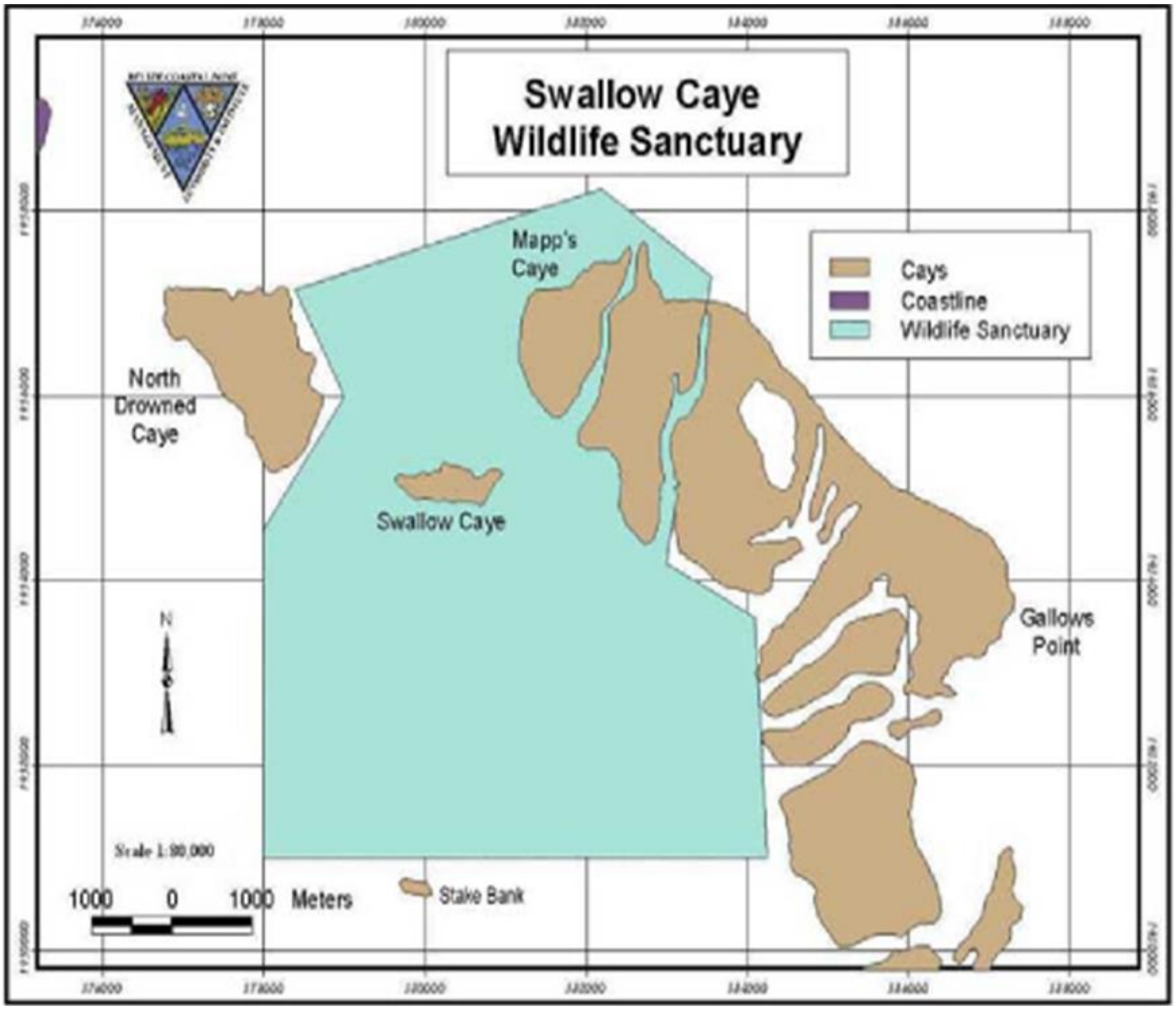
On site at Swallow Caye Wildlife Sanctuary is an over the sea Ranger Station constructed of plywood on PVC posts and with corrugated zinc roof. The Sanctuary aims to maintain at least 4 of its nine corners marked with boundary marker signs. These are always installed with the help of the Forest Department personnel to verify the GPS points. In addition, there are numerous signs within the Sanctuary to guide visitors. These signs mark entrance exit by the main hole, main hole, manatee area caution, slow, stop and others.

Swallow Caye Wildlife Sanctuary is readily accessible by boat. Its neighbouring communities are Mapp's Caye, Belize City, St. Georges Caye and Moho Caye. The Sanctuary has faced its greatest threats to total habitat alteration, some would say, obliteration, from developments planned for two mostly unoccupied cayes North Drowned Caye and Stake Bank immediately on the northwest and southern sanctuary boundaries respectively. North Drowned Caye was a pristine stand of over wash mangrove forest until the owner dredged a large channel in the mangrove and used the material to fill adjoining areas. Stake Bank was a much smaller stand of over wash mangroves which were totally removed and replaced with fill from adjacent dredging. Mega developments proposed on these two cayes include major cruise port installations, activity and sea and land access by means of re-routing and enlarging the main outer channel and the construction of causeways to Belize City. North Drowned Caye would see another causeway connection to both Stake Bank and Belize City, in excess of 500 residential units, 200 marina slips and dry slips. Plans put the marina and canal immediately at the western boundary of Swallow Caye Wildlife Sanctuary and one causeway spanning north south across most of the Sanctuary. In 2011 and 2012 it was informed that the developers were again preparing to get their plans off the ground having shown minimal activity since 2006. In 2011 artisanal fishers constructed a fishing camp on the eastern boundary of the Sanctuary and a cage fishing pilot project has been introduced in that general area outside the Sanctuary.

Swallow Caye Wildlife Sanctuary is one of Belize's very handy tourism natural heritage attractions and is popular with international visitors via San Pedro Ambergris Caye and Caye Caulker in the north, Belize City west, St. George's Caye on the east and from Placencia in the south. SCWS is also on the route for tourist sailors of bareboat charters.

Primary stakeholder groups are boat captains, fishers, tour guides, tour operators, researchers and tourists. Swallow Caye Wildlife Sanctuary is immediately of interest to Belize's largest population center and to its shipping and priority export service industry, tourism. The community co-management group is headquartered in Caye Caulker, Belize District and the public sector counterpart, the Forest Department, is in Belmopan City, Cayo District.

Map 2 Swallow Caye Wildlife Sanctuary (CZMA&I)



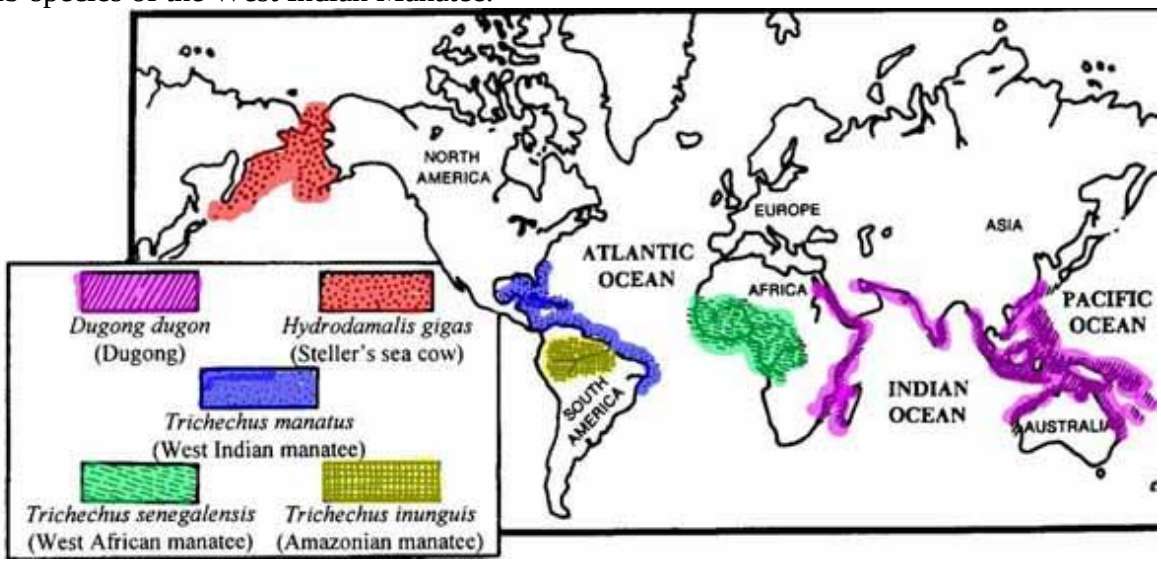
2.2 International and Regional Context

Swallow Caye Wildlife Sanctuary protects *Trichechus manatus manatus*, the Antillean Manatee, a sub-species of the West Indian Manatee. This is a sea creature, brought to endangered status, not from natural predators but from anthropogenic sources including hunting and other man-made threats to its existence. The International Union for the Conservation of Nature has classified them on its Red List of species in danger. Belize joins the ranks of regional and international concerned communities protecting global biodiversity with a high priority to protecting the manatees, an umbrella species. Manatees and their close relatives are found in a sub-tropical and tropical belt spanning the globe and face increasing threats from boat traffic, fishing gear and habitat destruction among other things.

On a regional and international level, SCWS is part of the Belize Barrier Reef Complex, part of the larger Mesoamerican Barrier Reef System on the Atlantic coast of Central America. Conservation International in 2003 highlighted the Mesoamerican area as a world "hotspot for species biodiversity". In this region, the north and south American and Antillean bioregions meet with each of these three contributing plants and animals for a rich biodiversity of Central America.

Swallow Caye Wildlife Sanctuary contributes to the protection of mangrove forests, seagrass beds, the Belize Barrier Reef and the interface of sea and rivers on the east coast of Belize. SCWS plays its part in assisting Belize to fulfill its commitments under the Convention on Biological Diversity, the Caribbean SPAW Protocols and others.

The manatees exhibit regional differences and some carry the name of the region where they can be located. See Map 3. Steller's Sea Cow became extinct in 1768. The species at Swallow Caye Wildlife Sanctuary is *Trichechus manatus manatus*, the Antillean manatee a sub-species of the West Indian Manatee.



Map 3 Manatee Distribution Worldwide (Peck, Lisa)

Manatees appeared 60 sixty million years ago and have historically been hunted for food, hide and for bones which has led to their decline and as mentioned, the disappearance of a species in the short span of about a quarter century of being discovered by humans.

Swallow Caye Wildlife Sanctuary is established for the protection of the West Indian Manatee, Trichechus manatus manatus and its importance to international and regional natural heritage and biodiversity is as listed in Table 2 following. As an umbrella species, protection of the manatee, automatically contributes to protecting many other species dependent on the same habitats. SCWS lies within the Mesoamerican Caribbean Reef ecoregion which runs from the northern tip of the Yucatan Peninsula in Mexico to the Bay Islands of Honduras. Protected species appearing in SCWS include mangroves, manatees, turtles, dolphins, birds including vulnerable species herons, ducks, frigates, pelicans; fish including parrot, snappers, grouper, (National List of Critical Species 2005 Meerman, J)

TABLE 2

ENVIRONMENTAL TREATIES RATIFIED BY BELIZE Source RODA 2000 & GPMWS	
Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR) Ratified 6/11/90	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system, protecting nesting waterfowl of mangrove wetlands in close proximity to Belize City and the Belize Barrier Reef.
International Convention for the Prevention of Pollution from Ships and the 1978 Protocol MARPOL Ratified 26/8/95	
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Ratified 19/8/86	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system, protecting marine biodiversity, threatened species with special dedication to the manatees, as per Belize's commitment under this Convention.
United Nations Convention on the Law of the Seas Ratified 13/8/83 To set up a comprehensive new legal regime for the sea and oceans and, as far as environmental provisions are concerned, to establish material rules concerning environmental standards as well as enforcement provisions dealing with pollution of the marine environment.	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system upholding such precautionary measures as is Belize's commitment under this Convention.
Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention) Ratified 11/12/97Regional convention with the objective to protect and manage the marine environment of the Wider Caribbean.	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system, protecting riverine and mangal marine biodiversity, and threatened species, as per Belize's commitment under this Convention.
Convention on Biological Diversity Ratified 1992 To conserve biological diversity, promote the sustainable use of its components, and encourage equitable sharing of benefits arising out of the utilization of genetic resources. Such equitable sharing includes	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system, protecting biodiversity and threatened species, as per Belize's commitment under the CBD and is the only marine protected area in proximity of Belize's largest urban

appropriate access to genetic resources, as well as, appropriate transfer of technology, taking into account existing rights over such resources and such technology.	area.
International Convention for the Protection and Conservation of Sea Turtles for the Western Hemisphere (December 21st, 1997) To protected and conserve sea turtle species of the Western Hemisphere.	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system and provides significant protection for sea turtles that feed and shelter within the Sanctuary since it is a no swim, no take area.
Alliance for the Sustainable Development of Central America (ALIDES) (1994) Regional alliance supporting sustainable development initiatives	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system that provides sustainable heritage tourism employment to the stakeholder communities of Belize City, Caye Caulker, St. George's Caye and San Pedro.
United Nations Framework Convention on Climate Change (UNFCCC). *Reducing Emissions from Deforestation and Forest Degradation* (REDD+) initiative	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system that provides Marine connectivity mangrove forests and seagrass beds critical to the protection of the Belize Barrier Reef as it is to the protection of Belize City.
United Nations Environment Program Specially Protected Areas and Wildlife in the Wider Caribbean (SPAW)	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system that provides biodiversity protection of critical species identified in Appendices of regional Caribbean protocols;

2.3 National Context

2.3.1 Legal and Policy Framework

The drivers for Swallow Caye Wildlife Sanctuary are **National Legislation Protecting Fauna, Flora, and National Heritage:**

The National Parks Systems Act (1981)
Empowers government to create or maintain a "national system" of protected areas.
The Wildlife Protection Act (1981)
"to provide for the conservation, restoration and development of wildlife, for the regulation of its use and for all other matters connected therewith"
Statutory Instrument #102 of 2002
This piece of legislation establishes Swallow Caye Wildlife Sanctuary
The Forest Act (1990)
Promotes the forestry industry, with the implementation of conservation techniques
Environmental Protection Act (1992)
"to promote the preservation and improvement of the environment, the rational use of natural resources, the control of pollution, and matters connected therein"
The Fisheries Act (1980)
Provides regulation of the fishing industry, and is directly concerned with maintaining sustainable fish stocks and protecting the marine and freshwater environments.
National Lands Act (1992)
Provides legislation for protecting the 66' reserve along river edges, and allows GoB permission to Access minerals etc.

The Wildlife Sanctuary is one of the five categories of protected areas under the National Parks Systems Act of 1981 and allows for research, education and tourism but no extractive activities. Swallow Caye Wildlife Sanctuary is an area of significant protection which allows no swimming with manatees, no fishing and reduces the speed of dangerous boat traffic in what is both a favourite manatee concentration area, as well as, a handy high traffic coastal hub, the country's busiest harbour.

Swallow Caye Wildlife Sanctuary was brought into existence by citizen action. This effort was led by Lionel "Chocolate" Heredia who envisioned the importance of healthy manatees in their natural environment as a heritage tourism attraction. Many others from a wide range of diverse stakeholder groups shared the vision and the commitment and demonstrated this by organizing as Friends of Swallow Caye (FOSC), for the sole purpose at the time, to establish the Sanctuary. FOSC later moved to co-management agreement with the Forest Department and continues with this responsibility to date.

Since colonial times Belize has had a policy of establishing protected areas in the forest sector for the management of natural resources. Since independence in 1981, more protected areas have been declared including in the marine sector. For the past two decades, Belize has joined the international community in promoting sustainable development and implementing the Convention on Biological Diversity. Government policies include the protection of natural and cultural heritage through regulatory agencies including the Forest, Fisheries and Archaeology Departments.

In recent years, rationalization exercises have been conducted creating the national parks policy and system plan. Swallow Caye Wildlife Sanctuary falls under the jurisdiction of the Ministry of Fisheries and Forestry's Forest Department because the protected species of the sanctuary, *Trichechus manatus manatus*. is a mammal.

The National Parks System Act provides for the establishment of different categories of Protected Areas including Wildlife Sanctuaries. The Wildlife Protection Act dictates the protection of the manatees. Statutory Instrument #102 of 2002 establishes Swallow Caye Wildlife Sanctuary. The Forest Act speaks to the protection of mangrove forests.

As the only marine protected area in a 20 mile radius around the densely populated Belize City, its importance as physical protection, a nursery for seafood, alternative employment and its inspirational wilderness values to this urban area cannot be overstated. Similarly, SCWS is part of the Belize Barrier Reef System and provides protection to the reef from land based pollution and siltation.

The location of Swallow Caye Wildlife Sanctuary is significant to manatees in their search for warm waters, fresh air, fresh water, adequate food supplies and safe surroundings. For manatees enroute and resident in this area of the Caribbean, Swallow Caye Wildlife Sanctuary is exhibiting seagrass beds, mangrove forests and underwater tunnels in the roots, warm temperatures and abundant fresh water fed by the Belize River, Haulover Creek and the Sibun River. The control of traffic in the Sanctuary and visitation to the sanctuary added to the protected forest vegetation, also gives optimum opportunity for oxygenated healthy air that the manatees surface to breathe.

Many other species utilize the same resources and the product of these resources is evident in the presence of dolphins, turtles, birds and fish species including juveniles.

SCWS then contributes to management, to plans and programs in Fish Stock replenishment, Mangrove Protection, Sea grass Protection, Climate Change Mitigation, Species Protection for Biodiversity, Protected Areas Plan, and Economic Development plans providing an alternative livelihood in Heritage Tourism, Research and Heritage Management and to the Manatee Recovery Plan.

For the co-management of Swallow Caye Wildlife Sanctuary, a co-management agreement was signed between Friends of Swallow Caye and the Minister of Natural Resources. Lobbying is underway for the renewal of this co-management agreement with improved terms. Under this agreement, a ranger station was built inside the Sanctuary and is still operating. Subsequent to this, FOSC leased a portion of beach area to establish a FOSC/SCWS Office on Caye Caulker. This office and location is still operating.

A new Fisheries legislation to replace the Fisheries Act is introduced, the **AQUATIC LIVING RESOURCES BILL, 2011For**

AN ACT to promote long-term conservation, management, and sustainable use of the aquatic living resources of Belize; to provide for fishing and registration of foreign and local fishing vessels which desire to fish beyond Belize waters; to repeal the Fisheries Act, Chapter 210 of the Laws of Belize, Revised Edition 2000; to repeal the High Seas Fishing Act, Chapter 210:01 of the Substantive Laws of Belize, Revised Edition 2000-2003; and to provide for matters connected therewith or incidental thereto. (WCS website viewed Sept. 3, 2012)

This new legislation at 2a and b calls for the precautionary approach to be applied widely to the conservation and management of fishery resources and for an ecosystem approach to be applied widely to conservation and management of aquatic resources.

The legislation empowers the Minister to close areas to fishing and to declare marine and inland reserves. The fisheries administrator prescribes criteria for Marine Scientific Research and approves applications to conduct same.

2.3.2 Land Tenure

Swallow Caye Wildlife Sanctuary is national lands except for a portion of Mapp's Caye. The entirety of Mapp's Caye is 325 acres, Drowned Cayes is 3,556 acres, Swallow Caye is 89 acres. Lease 1673 of 1986 for an area of 100 ft X 100 ft of northern Swallow Caye itself was transferred to Alligator Caye. Swallow Caye Wildlife Sanctuary is 8, 970 acres belonging to the Crown and includes land and surrounding waters. Source: Belize City Region Cayes Planning Guidelines: CZMAI 04/2003

2.3.3 Evaluation of Protected Area

Conservation Value

Swallow Caye Wildlife Sanctuary (SCWS) is an important part of the country's biodiversity protection specific to the vulnerable manatee, *Trichechus manatus* . (IUCN 2006) By extension SCWS also serves the function to protect other species such as turtles, crocodiles, dolphins, fish stocks and other species including cryptic flora and fauna that find symbiosis in a shared ecosystem. Research projects in the Belize City Cayes region attest to the presence of manatees and their predilection for this environment. Critical mangrove forests and sea grasses are also protected within the sanctuary and are a familiar landmark and protection for Belize City.

Swallow Caye Wildlife Sanctuary as part of the Belize City region cayes:

> . . . is recognized for its physical, economic, scientific and aesthetic attributes.
>
> Planning objectives for this region have included:
>
> Safeguarding of the Cayes' mitigative function to minimize the effects of hurricanes and dangerous storms
>
> The protection of the fishing resources and usuary rights of recreational and artisanal fishermen
>
> The maintenance and promotion of recreational, tourism and conservation uses
>
> The prevention of overdevelopment and speculation
>
> The protection of the character of the cayes, their environment and wildlife
>
> The safeguarding of the southern part of the region in its use as the harbor for the Belize City Port
>
> CZMAI 2003

Several species of conservation concern also live within and utilize the habitats in the Sanctuary including the American crocodile and the white crowned pigeon. The area also

provides important nursery habitats for various fish species including snappers and conch within the abundant seagrass beds in the marine protected area. Dr. L. Cho Ricketts 2006

The species checklist provided by the Rapid Ecological Assessment 2006 and continuing observations by FOSC rangers and researchers details the following significant species.

Distribution of degree of legal protection for Species of Concern within *Swallow Caye Wildlife Sanctuary*

Critically Endangered Hawksbill Turtle

Vulnerable West Indian Manatee
American Crocodile
Mutton Snapper
Roseate Spoonbill
White-Crowned Pigeon
Magnificent Frigate bird
Brown Pelican
Great Blue Heron
Double Breasted cormorant

Lower Risk /Near Threatened
Morelet's Crocodile
Southern Stingray

CITES Appendix I ***West Indian Manatee***

Table 3: **Species of concern found at SCWS** and appearing on suggested Belize Red Data List – an attempt to create a first national list of critical terrestrial and marine species. (Protected Areas System Assessment and Analysis: Critical Species; Meerman J. C. 2005)

Order	*Species*	English Name	IUCN class	Status in Belize	Justification
Birds	*Ajaia ajaja*	Roseate Spoonbill		VU	6
Birds	*Columba leucocephala*	White-Crowned Pigeon	NT	VU	4,7
Birds	*Fregata magnificens*	Magnificent Frigatebird		VU	6
Birds	*Ardea herodias*	Great Blue Heron		VU	4,10
Birds	*Phalacrocorax auritus*	Double-Crested Cormorant		VU	4,6,10

Birds	*Pelecanus occidentalis*	Brown Pelican		VU	6,10

Fishes	*Lutjanus analis*	Mutton Snapper	VU	VU	4,5,6

Reptiles	*Crocodylus acutus*	American Crocodile		NT	4,9,10
Reptiles	*Crocodylus moreletii*	Morelet's Crocodile		CD	3,4,5,9,10
Reptiles	*Eretmochelys imbricata*	Hawksbill Turtle	CR	CR	4,5,6,9

Mammals	*Trichechus manatus*	West Indian Manatee	VU	VU	4,9
Mammals	*Turiopsis truncatus*	Bottlenose Dolphin	VU	VU	9

Justification: 1. The Fisheries Department expressed that it is aware of present trends in the global populations of all Groupers. Measures have been taken to protect spawning sites of these fish in Belize and the Department is attempting to introduce measures that will allow it to sustainably manage this resource. For this reason the grouper all have been placed in the CD = Conservation Dependant category.
2. Endemic species 3. Small Range – Regional Endemic 4. Hunted – Fished 5. Economic importance
6. Colony breeder (restricted number of breeding colonies/locations) 7. Needs large range
8. Specialized ecological requirements 9. Charismatic species drawing national and international attention
10. Prosecuted as perceived pest 11. Genetically different from South American counterpart

Swallow Caye Wildlife Sanctuary now has ten years of enforcement presence and management. Collaborating with researchers, Coastal Zone Management Authority and Institute, the Forest Department and the private sector, many manatee protection initiatives have been undertaken. Regulations were introduced and are being enforced at SCWS, outreach activities are implemented from time to time and the site continues as a natural heritage tourism attraction.

In addition to the manatees, habitats on which they depend are also protected in the sanctuary: mangrove forests, seagrass beds and other flora and fauna. This is significant given the location of the sanctuary immediately outside of the heavily populated Belize City.

The focus is to protect manatees in their natural habitat. Therefore, with its combined mangrove forests on Mapp's and Swallow Caye, its extensive sea grass beds, and no take restriction, SCWS is contributing to biodiversity conservation. The manatee itself being protected internationally by CITES to which Belize is signatory means that SCWS is helping the country of Belize to fulfill a major commitment.

Ongoing video research at SCWS shows that dolphins and turtles also make SCWS a frequent stop and the mangrove roots are home to dense schools of fishes – juveniles and adults.

This Sanctuary also provides protection to the Belize Barrier Reef species as it is the first

line of defense for pollution runoff and sediment load from the Belize River and Haulover Creek.

Belize City is afforded protection from storm waves and surges by the healthy stands of mangrove forests at Swallow Caye Wildlife Sanctuary. Forests absorb carbon dioxide and produce oxygen. Oxygen is essential to living things.

Besides this, SCWS is a natural heritage area which provides necessary open landscape space critical to the health and well-being of the population of urban areas. Recognized as a heritage tourism attraction, SCWS provides tour operators and tour guides another managed marine attraction for their tour itineraries. For fishers, it is a nursery area from which fish stocks spread out to beyond the boundaries of the sanctuary.

The three major communities utilizing SCWS are Belize City, Caye Caulker and San Pedro. All three are sea faring communities dependent on seafood stocks, on tourism and navigation. Of the three, Belize City is the nearest to enjoy natural and economic benefits.

TABLE 4	**Summary of local and national environmental goods and services provided by Swallow Caye Wildlife Sanctuary**
Supporting services The services that are necessary for the production of all other ecosystem services including soil formation, photosynthesis, primary production, nutrient cycling and water cycling.	The mangrove forests and the seagrasses of the sanctuary play an important role in the cycling of nutrients The mangrove forests of Swallow Caye and Mapp's Caye area provide habitats necessary for different life stages of commercial and non-commercial species
Provisioning services The products obtained from ecosystems, including food, fibre, fuel, genetic resources, biochemicals, natural medicines, pharmaceuticals, ornamental resources and fresh water;	The mangrove roots of Swallow Caye and Mapp's Caye play an important role in protection of fish resources, especially as a nursery area for many commercial fish species Swallow Caye and Mapp's Caye mangroves provide nesting habitat for several colonies of nesting bird species, the majority being identified as species of national concern The geography of SCWS makes for convenient navigation to the busiest port.
Regulating services The benefits obtained from the regulation of ecosystem processes, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification, disease regulation, pest regulation, pollination, natural hazard regulation;	Regulation of water flow and flooding , providing a sink area for floodwaters Mangroves of the Drowned Cayes play an important role in the reduction of beach erosion The Cayes and shallow lagoon system provide protection against storm surges associated with hurricanes and tropical storms, ameliorating the strength of rising storm waters Mangrove inundation areas, seagrass beds and the shallow lagoon system provide filtration and settlement of sediment load from rivers and creeks, reducing sediment load of water reaching the coral reef
Cultural services The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences – thereby taking account of landscape values;	The area is an important resource for tourism and recreation The pristine natural scenic values are important for aesthetic appreciation by Belize City, Caye Caulker, San Pedro, and local and international visitors

Benefit to Local Communities

Mindful that Swallow Caye Wildlife Sanctuary was brought about by citizen action, led by Chocolate Heredia, and that since 2002 SCWS has enjoyed its share of support, it can be shown that benefits accrue to stakeholders and communities. Citizens at large are entitled by the protection on the terrestrial side of the coastline and rivers; and, again, on the marine side, everyone benefits from a healthy Belize Barrier Reef and attendant ecosystems and habitats. Environmental Goods and Services translate into benefits as follows:

Table 5

Total Benefits

Use Benefits				**Non-use benefits**	
Direct Use Benefits	**Indirect Use Benefits**	**Option Benefits**		**Bequest Benefits**	**Existence Benefits**
-Recreation -Sustainable harvesting -Wildlife harvesting -Fuel wood -Grazing -Agriculture -Gene -Harvesting -Education -Research	-Ecosystem Services -Climate stability -Flood control -Groundwater recharge -Carbon sequestration -Habitat -Nutrient retention -Watershed protection -Natural services	-Future information -Future uses(direct and indirect)		-Use and non- use values for legacy	-Biodiversity -ritual or Spiritual values -Culture Heritage -Community values -Landscape

At SCWS the following are further enriched by the existence of the Sanctuary – tourism, fishing, education, navigation. Underwater videos show the presence of juvenile fish of many species replenishing the waters for fishers especially those that fish immediately outside Sanctuary boundaries to bring fresh fish to feed Belize City residents and for export (e.g. the Hughes family that inherited fishing rights to the seabed to set shades and work from immediately east of Belize City to outside the east, south and west boundaries of the Sanctuary). Tourism interests are more highly valued for the presence of the manatees at the Sanctuary and tour operators and guides find that advertising Manatee tours is a big attraction. Researchers have been able to sustain long term studies in the area and, even to

the present, can recruit visiting international students to conduct studies at SCWS as part of course requirements.

The communities of Ambergris Caye, Belize City and Caye Caulker have sold tours to SCWS since its establishment and a loyal following still rely on sure sightings of manatees in crystalline waters at SCWS for their guests to experience. One immediately lucrative value of the area is real estate. A quick check of the internet shows that islands in close proximity to the Sanctuary are highly advertised and prized with ascribed per acre values of US $13,000 to US $703,000. The potential for benefits in all interest areas can be further maximized.

SCWS has shown itself to be a steady employer of at least 2 rangers and from time to time up to 5 staff and has generated the wherewithal from a combination of sources to cover some basic expenses. A significant contribution comes through payment for ecosystem services as applied by PACT Fee and contributions from agencies such as OAK Foundation, UNDP-GEF, and COMPACT as grants to annual programs. These budgets act as economic stimulus packages to the communities to provide further employment for supplies and services including artwork, oil and fuel, office supplies, mechanics, office supplies and staff, other management specialties and utilities. SCWS also relies on an entrance fee paid by visitors which numbered in the year, 2011, 2,906 persons.

For local educational purposes, Friends of Swallow Caye from time to time involves schools in its outreach activities and enables the continuing research on manatees in the Drowned Cayes area. Since 2010, SCWS compiles in-house video research of the manatees and visitors frequenting the Sanctuary. Additionally, the rangers/research officers maintain daily logs of the general conditions observed at the Sanctuary. This information contributes to informing management, the National Manatee Recovery Plan and the National Manatee Working Group.

Major navigation channels are in the Sanctuary and have been utilized since early colonial times – including for international transshipment and for local transshipment. Swallow Caye was used as safe anchorage near Belize City and St. George's Caye the first colonial capital of the country. The sugar barges pulled by tugboats are a longstanding tradition and one area of the Drowned Cayes is a graveyard for old barges. Mariners have always used the placid waters for easy access to the cayes, reef and atolls and back to Belize City. Today, mariners are very likely to be in very speedy vessels.

Mangrove and Seagrass Buffer vegetation

The seagrass beds and the mangrove forests afford physical protection to slow down wave and wind both onshore and offshore and further provide filtration from pollutants coming down river and out to sea thereby protecting the Belize Barrier Reef. Both types of vegetation create a lot of detritus maintaining an energy cycle and food web. This area is a specialty area being more salt some times than at other times when it accommodates to and filters pollutants and sediment loads from the tremendous outflow of flood waters from the

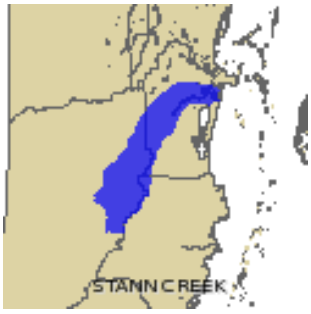
Sibun, and Belize Olde Rivers and from Haulover Creek. Dynamic natural processes are maintained which protect humans and wild flora, fauna, physical features and other naturally occurring constructs.

In size, Swallow Caye Wildlife Sanctuary is close to nine thousand acres including Swallow and Mapp's cayes. The protection of the mangrove is important for the capture of carbon dioxide and the release of oxygen in photosynthesis. About mangroves, it has been found:

> Quote:
>
> Among other characteristics, they provide important ecological services in terms of shoreline protection and serve as nurseries for reef fish. A large proportion of the country's mangroves are also intimately inter-connected with the Belize Barrier Reef Complex, the largest coral reef system in the Americas, and the second largest in the world after Australia's Great Barrier Reef (UNESCO 1996). Cooper et al (2009) found that mangroves contribute some US $174-249 million per year to Belize's economy.
>
> CATHALAC 2010, Cherrington, Emil et al.

studies 2010 indicate that Belize has lost on average 125 acres annually with the highest rate of loss being in the period since 2004. Just outside of the Sanctuary boundaries both Stake Bank and North Drowned Cayes have lost some acres of mangrove manatee habitat to development. A bit further east, St. George's and other cayes continue with plans for further developments. Some plans available on the internet can be classed as huge developments with possible major impacts. (e.g. www.treasurecovebelize.com, www.oceanviewrealty.com,

Map 4 Sibun River Watershed



Map 5 Belize River Watershed

Connectivity

Swallow Caye Wildlife Sanctuary provides connectivity for maintaining biodiversity as follows:

- Direct aquatic connectivity with the Belize Barrier Reef and Drowned Cayes;
- Direct aquatic connectivity of Belize Barrier Reef and the rivers of the Belize District;
- Direct air quality connectivity with prevailing winds from land or from sea;
- Direct connectivity SCWS with the brackish and fresh waters of the rivers;
- Mangrove deforestation of the greater Belize City makes this area critical to protect biodiversity dependent on mangroves;
- Direct connectivity of the seabed from open ocean to the tierra firme;

2.3.4 Socio-Economic Context

As per the 2010 Population and Household Census, the population of Belize is growing showing a shift to rural areas and accommodating an ever increasing influx of immigrants from neighbouring republics. This has resulted in the Belizean ethnicities such as the Creole becoming a much smaller percentage. Belize has experienced economic setbacks resulting from the international downturn in global economies with a fall in tourism arrivals and losses in preferential tariffs for some of its other traditional exports. The income of its biggest export, crude petroleum, also fluctuates depending on global conditions.

It is not surprising that all the above have been a strain on resources and that unemployment is shown by this census to be at 24% and to learn in later studies in 2012 that a majority of the employees are of low education levels.

A specter looming on the country is the repayment of the "superbond" and the fact that this has generated the presentation of a most stringent budget for the country and the position of the Government that a default in payment is likely or at the very least, a restructuring of the superbond is imperative in 2012. Serious crime is on the increase and youth and gang truce programs are being eliminated in the city.

The population center in which the Sanctuary is located is the Belize District with a total population of 87,523 inhabitants as reported by the Statistical Institute of Belize in its 2010 Population and Housing Census published May 3rd, 2011.

A closer look at this census shows the following for the major stakeholder communities of Swallow Caye Wildlife Sanctuary which are contained within the Belize District.

Table 5 Population of communities adjacent to the protected area

Labour Force Total: 42,443

	Total	Employed	Unemployed	%Unemployed
Males	23,390	18,989	4,401	18.8%
Females	19,053	13,852	5,201	27.3%
Population of Urban Centers:				
Belize City:	53,532 =	males 25,886		females 27,646
San Pedro:	11,510 =	males 5,947		females 5,563
Population of Rural Center:				
Caye Caulker:		1,684 = males 852		females 832

Source 2010 Population and Household Census

The three main communities interacting with Swallow Caye Wildlife Sanctuary are linked and dependent on the Belize Barrier Reef for economic survival. Therefore, the naturally protected Belize City Harbour where SCWS is located is a key lifeline to several major industries. Belize City is the main arrival point to the country for air and ocean shipping and for visitors. Three quarters of a million cruise visitors arrive at this port and about a quarter million overnight visitors land at the P. S. W. Goldson International airport. Of these arrivals, a significant number utilize water taxis to San Pedro, Caye Caulker, St. George's Caye, Gallows Point, Long Caye, Spanish Lookout Caye and other cayes and marine attractions. In 2008 GDP growth was 2,377.7 billion Bz dollars. There has been growth over the period 2001 to 2008 with annual fluctuations with a high of 9.3% in 2003 and negative growth compared to 2003 in the ensuing years. Source SIB as quoted in Belize Environment Outlook GEO Belize 2010.

Fishers of the communities have a long tradition making a livelihood from finfish, lobster, conch, and shrimp. The Fisheries Department reports 2,759 fishers registered in 2009 a 29% increase over the period from 1999. Belize City has the main processing plants for the two cooperatives, Northern Fisherman and National.

Sportsfishers practice catch and release fishing for permitted species including in the shallows at SCWS.

Tour operators and passengers traverse the SCWS area on SCUBA, sailing, snorkeling and sportfishing trips.

Sugar barges and tugs navigate through the channel on their route to and from Tower Hill to their Belize City storage area.

According to Belize Tourism Board statistics, together, the three destinations, Ambergris Caye, Belize District, Caye Caulker have for the year 2008, a total of 241 of the country's 611 hotels and 124 of the 222 tour operators.

The arrival figures for overnight visitors that are the visitor base for SCWS up to 2011 had not yet reached the 2007 pre-crisis levels but had improved in 2011 to 250,263.

TABLE 6 BTB Tourism Estimates

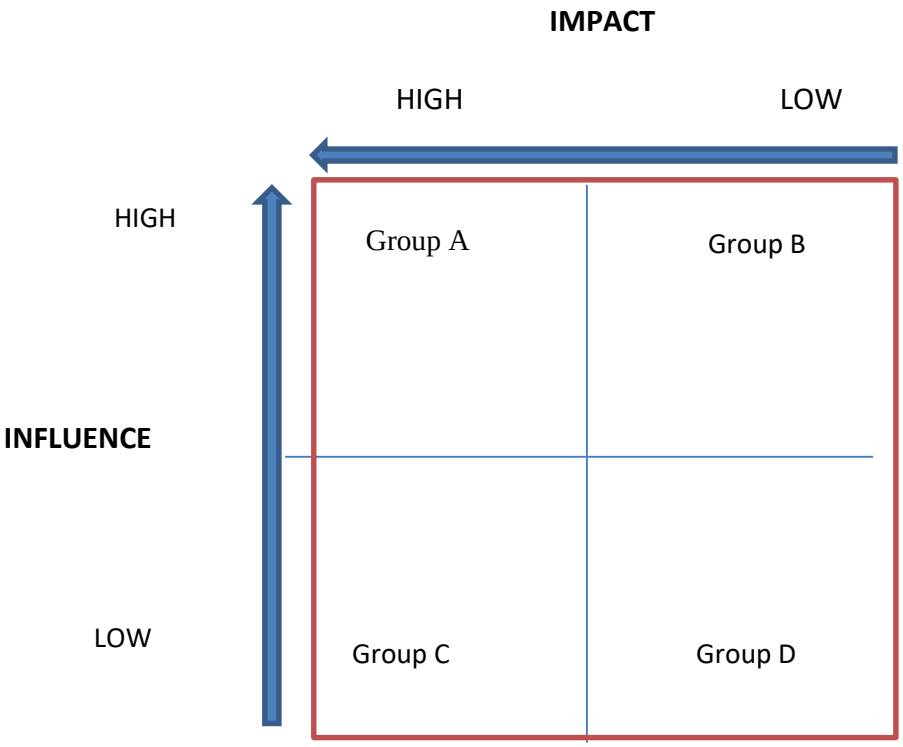
Year	Overnight Arrivals	Cruise Arrivals
2008	245,007	597,370
2009	232,249	705,219
2010	241,919	764,628
2011	250,263	Source BTB Tourism Estimates 2011

- **Belize Reef:** This unique chain of reef islands will be renowned internationally for its world heritage status and will be regarded by visitors as a pristine and well-preserved destination. It will cater mainly to day visitors and will have second order niche markets hosting exclusive sun & beach low density resorts and nautical tourism facilities.
Source: draft Belize tourism sustainable development plan 2030

All plans are indicating that the Belize Barrier Reef will continue to be a lynch pin of the Belize tourism industry on which Government of Belize and people will hitch their economic hopes for the foreseeable future. Additionally, for tourism, cultural tourism based on people and heritage is a topmost priority in the 2030 tourism plan which can mean that the need for a place like SCWS will be ever more critical. SCWS can do its part to contribute to livelihoods and alleviate poverty.

TABLE 7 Stakeholder Communities of Swallow Caye Wildlife Sanctuary				
Community	Location distance	Population	Population Components	Comments
Ambergris Caye	About 30 miles north of SCWS	11,510	Multi-cultural	Primary tourism center Numerous tour guides and fishers
Belize City	3 miles west of SCWS	53,532	Multi-cultural	Nearest community, Main population center, main port, central processing plants for fishing cooperatives; main fish markets, various tour guides and tour operators;
Caye Caulker	About 21 miles north of SCWS	1,684	Multi-cultural	Big for tourism and fishing Numerous tour guides and tour operators

Figure 1 Matrix for Prioritizing Stakeholder by Influence and Impact



Source: From CBD PA management guidelines www/cbd.int/protected/e-learning
Matrix applied in selecting final list of interviewees and participants for consultations reference Swallow Caye Wildlife Sanctuary

TABLE 8 Stakeholder Analysis for Swallow Caye Wildlife Sanctuary (+ positive effect; - negative effect)				
Stakeholder	Influence or Impact of Sanctuary on Stakeholder		Influence or Impact of Stakeholder on Sanctuary	
Belize City	Benefit from protection of biodiversity including fish, manatee, and etc; Benefit of natural open space for the urban population; Benefit of having Swallow Caye Wildlife Sanctuary as a natural heritage tourism attraction; Benefit of alternative livelihoods for income generation; Stakeholders not allowed to take flora and fauna including commercial species; Slow zone area for navigation; Benefit of spillover of fish stocks;	+ + + + - - +	Huge market access for visitation to Swallow Caye Wildlife Market Huge tourism labour force for specialized manatee tour guiding, research, etc; A conservation oriented public may be supportive of the sanctuary Huge student population to assist with the sanctuary; As commercial capital, business sponsors available to assist the Sanctuary Busy navigation activities boating dangerous to manatee; Urban development may cause habitat loss; Urban development may cause pollution and contamination Urban fishers may raid the Sanctuary	+ + + + + - - - -
Cayes	Benefit from protection of biodiversity including fish, manatee and etc; Benefit of having Swallow Caye Wildlife Sanctuary as a natural heritage tourism attraction; Benefit of income generation	+ + +	Promote visitation to the Sanctuary Promote local awareness of manatees Generate income for the Sanctuary Transiting through the Sanctuary may damage manatees or alter their behaviour;	+ + + -

Local and National, Tour Operators	Benefit of natural heritage attraction; Benefit of income generation	+ +	Promote SCWS in tour packages; Promote compliance – (educate, enforce, steward) with SCWS management; Level of compliance varies	+ + -
International Tour Operators	Benefit of natural heritage attraction	+	Promote SCWS;	+
Tour Guides	Benefit from natural heritage tourism attraction Benefit from income generation Benefit from educational material	+ + +	Promote visitation to the Sanctuary Promote compliance with SCWS management (educate, enforce, steward) Level of compliance varies Tour activities may endanger manatees Tour activities may alter manatee behaviour	+ + - - -
Coastal Developers	Benefit from protection of biodiversity including fish, manatee, etc Benefit from natural heritage tourism attraction Protection of natural heritage resources may be restrictive to developers especially in buffer areas;	+ + -	Development may be inappropriate; Development may destroy critical habitats and ecosystems; Developers may bring beneficial innovations and new markets	- - +
Tourism Interests	Benefit from protection of biodiversity including fish, manatee, etc Benefit from natural heritage tourism attraction	+ +	Sanctuary interests can be protected through proactive measures; Promote the Sanctuary May result in unsustainable visitation levels; May result in habitat destruction	+ + - -
Fisheries Interests	Benefit from protection of biodiversity including fish, manatee, etc	+	Can assist with compliance with Sanctuary regulations May overfish from immediately	+ -

			outside Sanctuary boundaries	
Mariners	Benefit from protection of biodiversity including fish, manatee, etc Benefit from central location and physical features including navigation channels, etc	+ +	Can assist with compliance with Sanctuary regulations Watercraft may directly and indirectly harm or kill manatees; Can outfit boats with protective features to protect manatees	+ - +
Local Schools and Universities, Academia International	Benefit from protection of biodiversity including fish, manatee, etc Benefit from living laboratory	+ +	Can promote SCWS Can seek more knowledge about SCWS Can contribute to income generation	+ + +
Belize & International Media	Benefit from protection of biodiversity including fish, manatee, etc Benefit of new information on internationally critical species Benefit of goodwill for being associated with worthy cause	+ + +	Inform the public Support compliance by investigative reporting and exposes Garner more support for the programs of the sanctuary	+ + +
General Belize Public	Benefit of environmental goods and services Benefit of maintenance of resource stocks including fish New knowledge and education Benefit of culture and aesthetics Benefit of income generation in spinoff opportunities	+ + + + +	Can generate goodwill for the Sanctuary Can comply with regulations Can participate in management Can assist with sponsorship and income generation Can be unlimited source of solutions Can over run the Sanctuary to unsustainability Can be source of pollute Can be source of physical destruction Can participate with education	+ + + + + - - +
Visitors- Belizeans	Benefit from protection of	+		

	biodiversity including fish, manatee, etc Benefit of Swallow Caye Wildlife Sanctuary as a natural heritage tourism attraction	 + +		
Visitors – international tourists	Benefit from protection of biodiversity including fish, manatee, etc Benefit of Swallow Caye Wildlife Sanctuary as a natural heritage tourism attraction	+ +	Contribute to income generation Word of mouth and other advertising Presence deters other intruders Tour boats can injure wildlife Tours can alter wildlife behaviour	+ + + - -
Visitors – researchers	Benefit from protection of biodiversity including fish, manatee, etc	+	Financial support Introduce scientific methods and apply technologies; Generate new findings about the biodiversity and other aspects of the PA to assist management; Add to the body of knowledge Assist in skills training of field personnel Assist in field work such as security and monitoring May be intrusive or harassing to manatees	+ + + + + + -
Government of Belize/local governments	Benefit from protection of biodiversity including fish, manatee, etc Benefit of fulfilling commitments for regional and international conventions; Benefit of contributing to	+ + +	Prioritize protective legislation' Prioritize budget allocations Prioritize benefits in development planning Can generate goodwill Institute PA system management	+ + + +

	development plans;			
Politicians	Benefit from protection of biodiversity including fish, manatee, etc Benefit of goodwill from corporate social responsibility supporting nationally and internationally recognized causes	+ +	Can influence beneficial support networks; Can highlight and glamorize a cause if needed;	+ +
FOSC Members	Benefit from protection of biodiversity; Benefit of goodwill for supporting a worthy cause	+ +	Pay dues for manatee conservation at SCWS; Members spread goodwill Membership benefits have a cost Members may get dissatisfied	+ + - -

2.4 Physical Environment of Management Area

2.4.1 Climate

General Climate

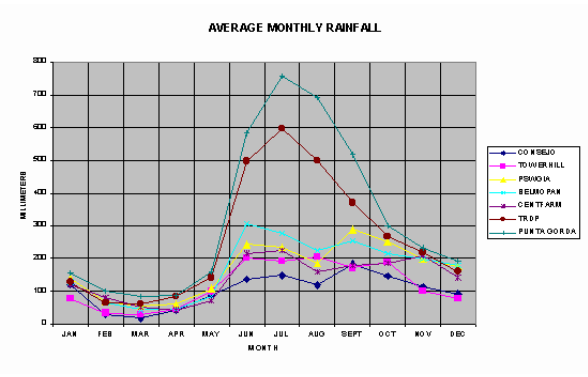
Situated between latitude 15º45' and 18º30'N, Longitude 87º30' and 89º15'
Source Belize Hydromet 2012

Belize has a typically moist tropical climate. There is little seasonal variation in temperature, but distinct 'wet' (May to October) and 'dry' (November to April) seasons. In the wet season, mean monthly rainfall can be 150 to 400mm, with highest rainfall totals in the south. In the dry season, most of the country receives less than 100mm of rainfall per month. The coastline of Belize is also vulnerable to Atlantic tropical cyclones and hurricanes from July through to October. Heavy rainfalls accompanying these storms contribute a significant fraction towards the high wet-season rainfall totals. Mean annual temperatures are 23-27°C, varying little with season through the year. The south-west, interior region of the country tends to be a little cooler than regions in closer proximity to the coast.
Inter-annual variations in climate in southern Central America are caused by the El Niño Southern Oscillation (ENSO). El Niño events bring relatively warm and dry conditions between June and August, and decreased frequencies of Atlantic tropical cyclones, whilst La Niña episodes bring colder and wetter conditions at that time of year, and more frequent than average tropical cyclones. Source: UNDP Climate Change Country Profile BELIZE 2010

Annual Rainfall

Swallow Caye Wildlife Sanctuary experiences similar rainfall as the isopleth from the central western through the northern coastal area of Belize. This amount is characteristic of north of the Belize City environs. There is a rainy and dry season with a gradual transition from rainy to dry and a more abrupt change from dry to rainy season. The Belize District averages about 171 rainy days. See rainfall map showing Belize City with 70 to 100 inches and the immediate offshore cayes with less than 70 inches.

The rainy season is generally June to December which includes the hurricane season June to November. Storms of the hurricane season can produce significant rainfall. In some of these events, the flood waters reach Swallow Caye Wildlife Sanctuary and result in salinity fluctuations. At these times, the demarcation of flood waters at sea is clearly visible and, the visibility at SCWS is reduced by the presence of fresh water and sediment load. Readily detected also is strand line pollution floating out from the land.



Source Belize Meteorological Service

www.belizenet.com/weather/climate.html

Annual Temperature

Swallow Caye Wildlife Sanctuary enjoys the tropical to sub-tropical climate enjoyed by the country of Belize. Year round warm water temperatures are ideal for manatees as they do not tolerate below 20º C (68º F) and it is this criteria that limits their range with Florida marking the northernmost point.

Temperatures for the coast nearest SCWS are recorded at the Philip Goldson Int'l Airport and fluctuate throughout the year with an annual average of 22.6ºC 72.6º F minimum and 86.2º F 30.1º C. maximum. For the country, the average minimum daily recorded is 19.7 C in January and the average maximum daily is 31.8 C in May. (Source National Meteorological Service) This weather station is at 5 meters elevation and SCWS is at 0 elevation.

In the manatee resting holes in the Drowned Cayes area, the mean temperature reported from a 2 year study is:

Daytime surface: 28.7ºC min 35.6ºC max

Daytime bottom: 28.6ºC min 32.4ºC max at 5.7 meters below (see Table 9)

Self-Sullivan in 2008 reports sea surface temperatures in the Drowned Cayes ranging for the 4 years 2001 to 2004 ranging from 25ºC to 31.6ºC with a mean of 28.6º C; mean for cooler/transitional to dry 27ºC and rainy seson 30º.

TABLE 9 Drowned Cayes descriptive statistics of environmental characteristics from Descriptive statistics of environmental characteristics of areas without and with resting holes; means are reported with ± 1 SE.Source Bacchus et all

	Non-resting hole sites				Resting hole sites				
	N	Min	Max	Mean ± SE	N	Min	Max	Mean ± SE	Significance
Depth (m)	20	1.4	3.3	2.0 ± 0.12	12	2.0	5.2	3.5 ± 0.30	<0.001
Sea surface temperature (°C)	20	30.1	33.8	31.1 ± 0.18	12	28.7	35.6	31.4 ± 0.50	NS
Surface salinity (ppt)	19	34.0	35.4	34.5 ± 0.08	12	29.7	35.5	34.3 ± 0.46	NS
Surface water velocity (cm/s)	20	0.01	17.1	4.2 ± 1.14	10	0.0	5.2	0.9 ± 0.51	0.008
Depth of middle sample (m)	11	1.0	1.7	1.2 ± 0.07	12	1.0	2.7	1.7 ± 0.15	NS
Middle sample sea temperature (°C)	11	30.2	31.7	30.9 ± 0.13	12	28.6	32.4	30.7 ± 0.30	NS
Middle sample salinity (ppt)	11	33.8	35.0	34.4 ± 0.10	12	33.7	35.5	34.8 ± 0.18	NS
Middle sample water velocity (cm/s)	11	0.0	24.7	5.02 ± 2.33	9	0.0	0.6	0.3 ± 0.08	NS
Depth of bottom sample (m)	20	1.3	3.4	2.0 ± 0.12	12	1.9	5.7	3.5 ± 0.32	NS
Bottom sample sea temperature (°C)	20	30.0	32.8	30.8 ± 0.13	12	28.6	32.4	30.5 ± 0.31	NS
Bottom sample salinity (ppt)	20	33.8	35.2	34.5 ± 0.07	12	33.8	36.4	35.0 ± 0.24	NS
Bottom water velocity (cm/s)	20	0.01	10.5	2.0 ± 0.71	10	0.0	1.2	0.3 ± 0.12	NS

Manatee resting holes day and night scans years 2005 and 2006 Bacchus et al:

Analysis shows that Belize is experiencing a warming trend with temperature increase of 0.45ºC since 1960 an average rate of 0.10ºC per decade. Hot days and hot nights are increasing as follows:

Figure 2 For the country of Belize

Average number of hot days per year in Belize increased by 67 (18.3% of days) between 1960 and 2003;

Hot nights between 1960 and 2003 increased by 37 (10.2% of nights)

During the same period cold days decreased by 21 (5.7% of days) and cold nights decreased by 23 (2.3 per month 7.5% of nights) from 1960 to 2003.
Source UNDP Climate Change country profile Belize

Humidity

For a five year period, the PSW G Int'l Airport in Ladyville reports relative humidity for the afternoons with the lowest 68% in March and the highest 77% in November. The high humidity can be tempered by cooling sea breezes, known as prevailing easterlies.

Tropical Storm Events

The Belize City Cayes, including Swallow Caye, comprise one of the offshore protective layers of Belize City from incoming storm events. In line with Belize City from east to west are Turneffe Atoll, the Belize Barrier Reef, the Belize City cayes range which includes SCWS. Conversely, the Belize City Cayes offer protection to portions of the Belize Barrier Reef from land based storm events.

Tropical storm activity is expected in the area, as well as, weather of lesser intensity and storms of any intensity on the Saffir-Simpson scale. The number of storms varies, but they are a natural threat.

The most recent hurricane experienced at SCWS is Richard in 2010 which uprooted one mangrove bush, defoliated a number of trees and damaged the Ranger Station. September is the month of highest hurricane frequency for Belize, followed by October.

Also experienced are northers, stationary northers, lows, tropical waves, and other systems.

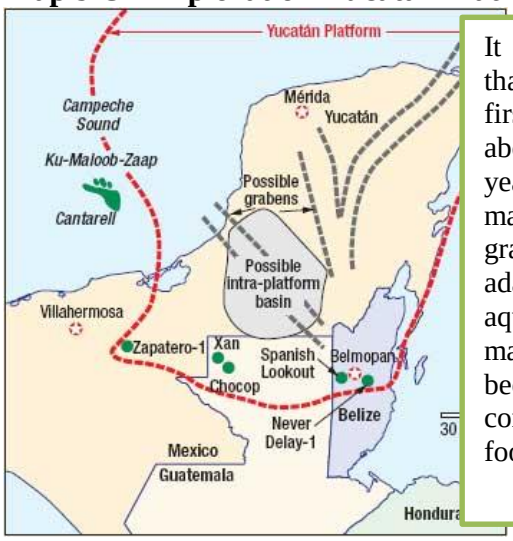
2.4.2 Geology

Northern Belize is part of the Yucatan Platform which it is theorized was land in the Jurassic period 195 million years ago. From then to the Cretaceous period 145.5 million years ago, it gradually became inundated. From the Cretaceous to the Pleistocene period which started 2.5 million years ago, limestone depositions occurred all over. Conditions for limestone deposition continued until recent time to the Late Pleistocene which ended 8,000 to 12,000 years ago. (Source Geologic time from Wikipedia) Ancient reefs have existed upon which the current reef is growing. Islands have been forming by the trapping of carbonate, sand and mud. Buried thousands of feet below the surface of the land, oil and gas reservoirs occur in limestone and dolomites. Commercial findings in and near the Yucatan Platform are shown on Map 9 below.

Map 8 Yucatan Platform

Source Maps.IHS.com oil and gas YP Whats-new-in-exploration.html

Map 9 Oil Exploration Yucatan Platform



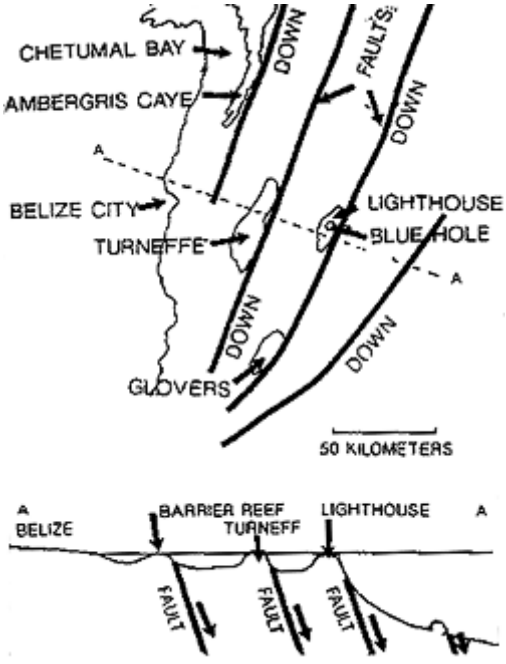
Source Worldoil.com/May-2008-

It is theorized that manatees first appeared about 60 million years ago as land mammals and gradually adapted to fully aquatic mammals because of competition for food on land.

Northern Belize is flat low lying land of extensive limestone formations. Northern Belize rests on the Yucatan Platform, a shelf comprised of chalk, marl and other sedimentary layers, typical of dolomite limestones giving rise to karst topography. (Source Department of the Environment BZ)

Offshore faults affect the seabed including the formation of the atolls, the depth of the Blue Hole and the orientation of the Belize Barrier Reef itself.

Figure 1 Fault lines offshore Belize



This illustration consists of a map and cross section illustrating the large faults off the coast of Belize that control the location of the large off shore atolls and to some degree the barrier reef. These faults are lowering blocks of the earth's crust into the sea over geologic time. The atolls are areas where limestone has been able to build up at a rate equal to, or greater than, the subsidence caused by movement on the faults. The bottom of the Blue Hole at Lighthouse Reef is 85 feet deeper than the last low sea level stand. This is because the fault has lowered the block the atoll is on. This blue hole is so huge, that it probably formed over several cycles of sea level changes.

Source Field Guide to Ambergris Caye R. L. Woods et al

Seismic Hazard

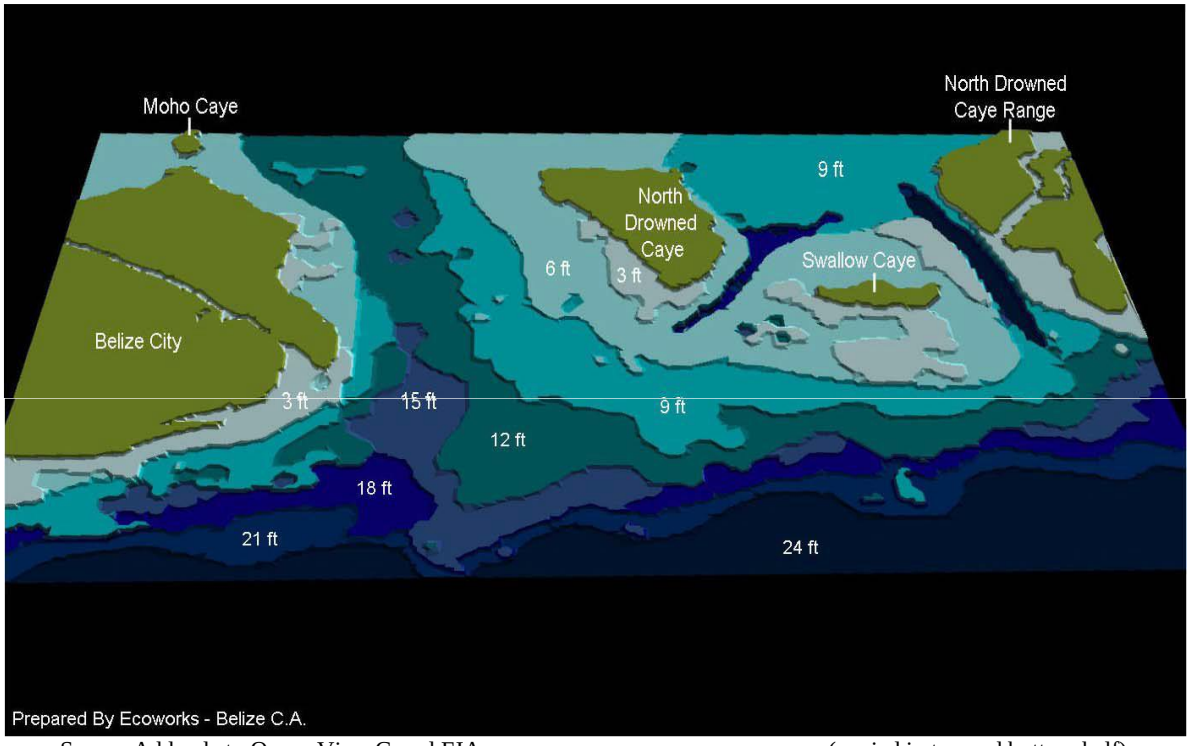
Movement of the North American and Caribbean Plates which run from the Caribbean Sea and south of the Belize/Guatemala southern border has resulted in local tectonic activity for example, in May of 2009 ranging from magnitude 4.0 to 6.5 in some parts of the country. The DoE estimates that the central area of the country including Belize City environs can possibly experience magnitude 5. (Source EIA Green Tropics)

2.4.3 Bathymetry

Swallow Caye Wildlife Sanctuary's waters have depths ranging from less than 1 meter near the mangrove islands up to 10 meters near the outer channels.

Mangrove islands – up to 1 meter;
Mangrove channels – up to 3 meters;
Outer Channels at boundaries of Sanctuary - up to 10 meters;
Moving in from Outer Channels - depths ranging from 3 meters to 7 meters;
Manatee resting holes - 1.9 to 5.7 meters; Source L. Cho-Ricketts et al; Bacchus et al;

Bathymetric characteristics of region being 3-D interpretation of 1945 British Admiralty navigation chart published by US war department map exaggerating vertical relief of sea floor water/sediment interface



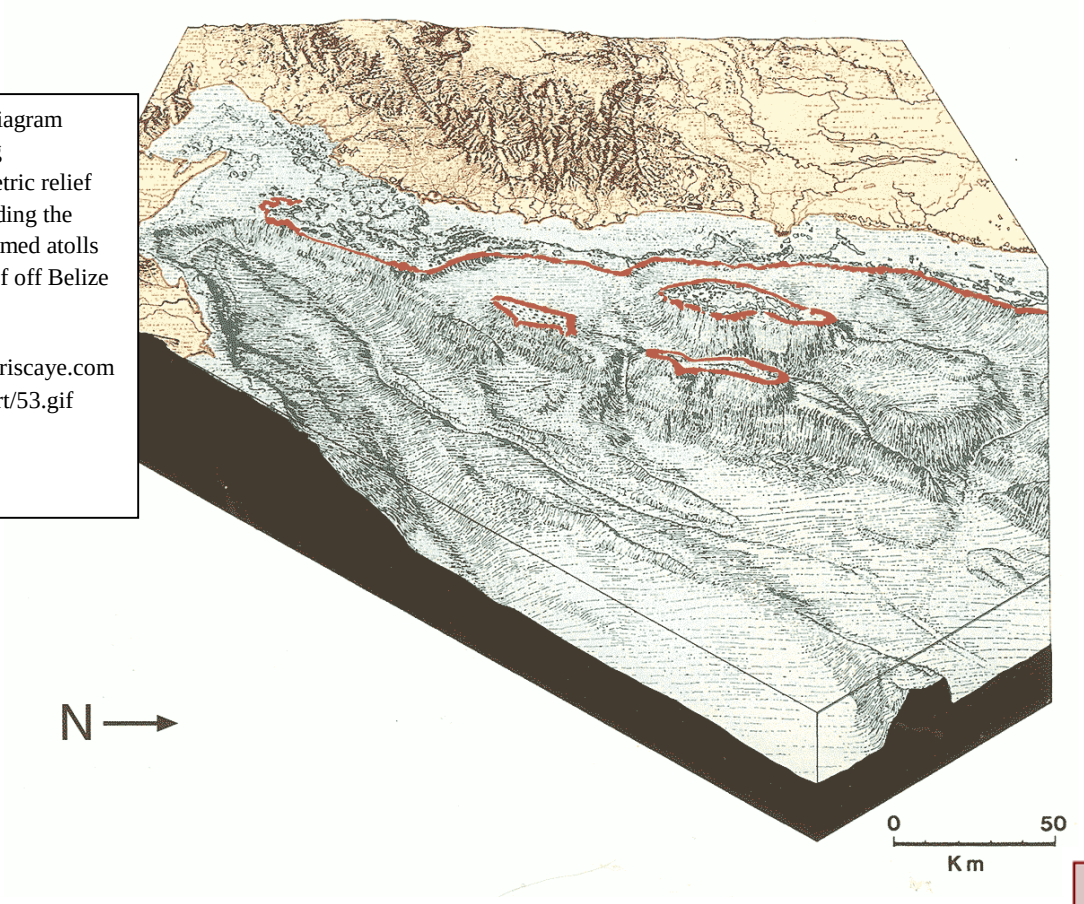
Source Addenda to Ocean View Grand EIA (copied in top and bottom half)

Within the inner reef lagoon, SCWS rests on the submerged eastward shelf from Belize City. Sediments are fine silt deposits trapped by seagrasses and mangrove roots. One Halocene marine facies map shows the presence of transitional marl comprised from pteropods. BERDS reports the area of unknown geologic age and with acidic Tintal soils.

Map 8 Cross-section Diagram sea floor

Block diagram showing bathymetric relief surrounding the reef-rimmed atolls and shelf off Belize

Source Ambergriscaye.com /maps/art/53.gif



Geology from half mile west of Swallow Caye *1. Provide a conceptual cross-section of the pre-existing soil the island, down to bedrock, based on field studies conducted to date.*Source Grimshaw, Tom 2007

There are 3 distinct horizons of unconsolidated material horizons that overlie bedrock or stiff clay beneath North Drowned Caye, as evidenced from 3 onsite percolation assays, exploratory dredging at 1 location, 4 marine cores conducted on the four sides of the Caye, 5 piling drivings around the Caye, and 10 marine cores conducted during the Marine Parade Boulevard Construction (i.e. 22 observation sites; see Illustration 12). These include:

- 1.5 – 2.5 meters of peaty silt, over
- 1.0 – 2.5 meters of sandy silt & shell fragments, over
- 3.5 – 5.0 meters of silty, fat clay, over
- Bedrock at 4 – 10 meters depth.

ILLUSTRATION 12:

Practical Cross-Section Of Unconsolidated Materials On North Drowned Caye

Map 9 Halocene Marine Facies

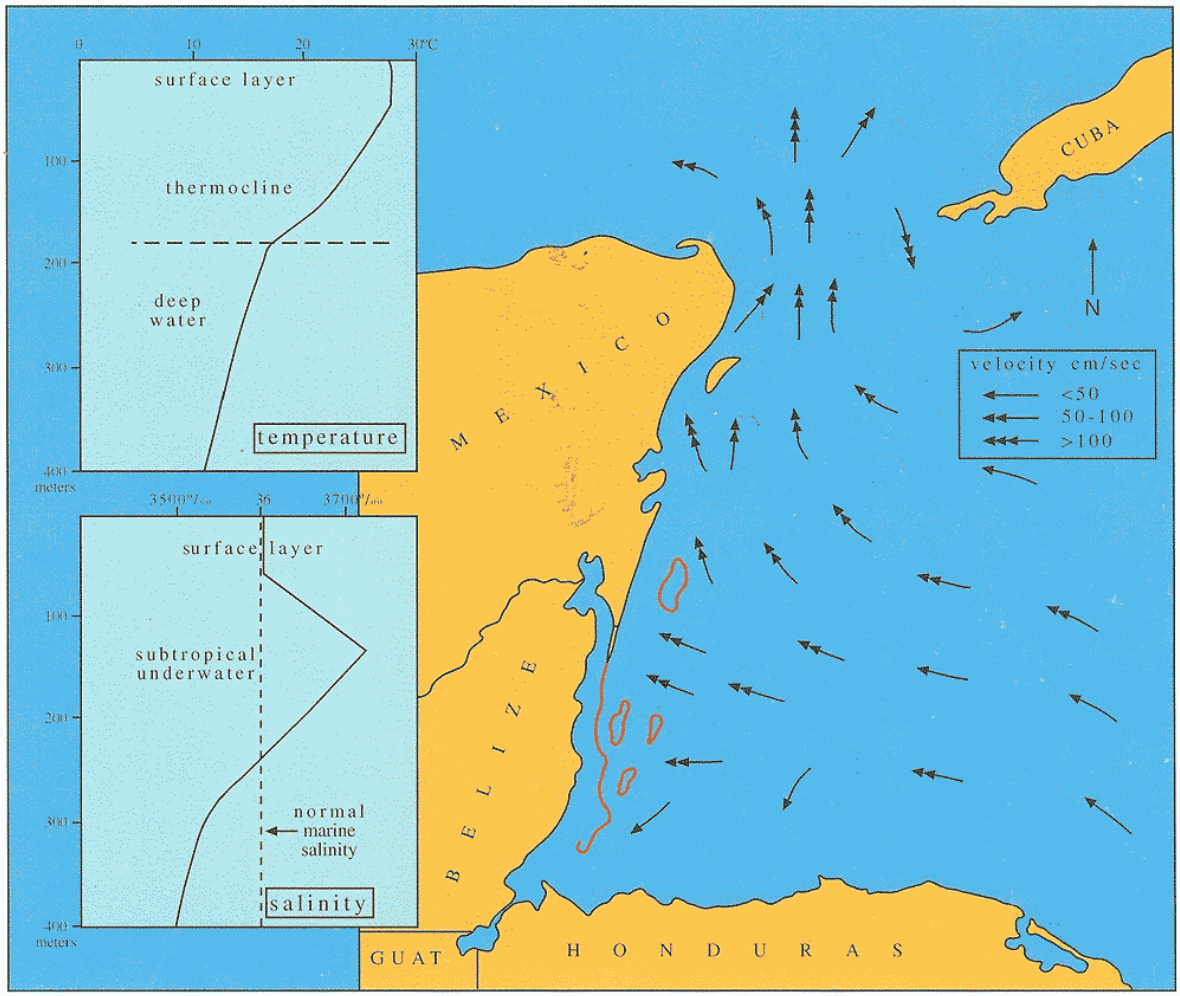
2.4.4 Tides and Water Movement

Tides in the country of Belize range 0.5 meters to a possible 0.8 meters in accordance with lunar gravity. According to Cho-Rickets, wave energy develops from the deep seas and is dissipated on the barrier reef by the prevailing easterlies and south easterlies. In this manner richly oxygenated water is brought in. The interplay of northerlies increases the suspension of calcerous sediments. For the time when the sun's gravitational pull is evident, higher and lower than usual high and low tides are experienced.

MAP 10 Main Surface Water Flow

Main surface – water flow across the Belize shelf

Source ambergriscaye.com /maps/art/55.gif



2.4.5 Water Parameters

Water parameters at Swallow Caye Wildlife Sanctuary have been reported within normal ranges.

The physical data collected from the various sites were indicative of a normal seagrass ecosystem and healthy marine environment. L.C. Ricketts et al 2006

Findings from the 2006 Rapid Ecological Assessment:

Temperature	26.5 C	Minimum
Temperature	29.6 C	Maximum
Salinity	35 to 36 psu	Normal for seawater
Turbidity	0 to 2.5 ntu	Waters of SCWS clear and free of suspended particles or sediments
Mean pH	7.34	Normal
Dissolved Oxygen	>5mg/l	High level of dissolved oxygen within normal range for healthy marine ecosystems

2.5. Biodiversity of Management Area

2.5.1 Ecosystems

TABLE	Ecosystems of Swallow Caye Wildlife Sanctuary

Mangrove forests are salt tolerant trees and shrubs occurring only in the tidal range of the tropical and subtropical zones. The trees have evergreen sclerophyllous broad-leaves with either stilt roots or pneumatophores. Mangroves thrive in nutrient rich silty deposits. Ecosystem services provided by mangroves include shoreline protection from erosion and storm surge, filtration of sediments and excess nutrients, acts as carbon dioxide sink, and act as a buffer from most human activities along the coast. Total loss of mangroves would be devastating in effect to ecosystems and to the economy of the country.

LEGEND	UNESCO Classification Source UNESCO Vegetation Classification System
47	Caribbean Mangrove Forest: dwarf mangrove scrub
49	Caribbean Mangrove Forest: mixed scrub
52	Caribbean Mangrove Forest: basin mangrove

Belize ecosystems map is showing seagrass and mangrove ecosystems occurring at SCWS. BERDS further explains that SCWS ecosystems are classified as UNESCO Code: IA5a(1)(c) and with all three species of mangrove occurring : Avicennia germinans, Laguncularia racemosa, and Rhizophora mangle. Other frequent species in this category include Acoelorraphe wrightii, Acrostichum aureum, Conocarpus erectus, Eragrostis prolifera, Myrica cerifera and Rhabdadenia biflora.

Basic ecotypes

Mangrove littoral forest
Seagrass

Specific ecotypes description

Narrow fringe of scrub to high mangrove with a height of 2 to 14 meters located along beaches and river mouths;

Water regime

Develops in conditions of permanent inundation

Frequent plant species

Rhizophora mangle is characteristically dominant in these communities.

The two ecosystems occurring at SCWS, Mangroves and Aquatic, in combination with the coral reef are considered to be three of the most productive ecosystems globally. They are critical in the energy cycle and food web. They are important as primary producers absorbing carbon dioxide and producing oxygen through photosynthesis. Both contribute to filtration and entrapment of sediments and produce biomass. By their existence they shelter species and are part of the food chain. Mangroves are protected in Belize as they form protection for the coastline but are the first to be destroyed by coastal developers. Having healthy mangrove forests at SCWS is of critical importance to Belize City. The shelter and sustenance offered to manatees by the mangrove forests and seagrasses is ideal.

Seagrasses found at SCWS are underwater flowering plants called turtle, manatee and shoal. They stabilize coastal sediments and capture and recycle nutrients. Seagrass acts to reduce wave energy. Seagrasses act as nurseries and provide food and shelter for fish. In Belize, 50% of the commercial species, Lobster, and 40% of Conch production is from seagrass beds. This is an annual value of about $10 million Bz. Seagrass beds provide food for manatees, turtles and marine birds. Seagrass health is dependent on light and water quality and can be affected by salinity and sedimentation.

The REA finds healthy seagrass cover throughout the sanctuary, medium to dense, but with evidence of epiphytes and one area with consistently shorter blade length. The presence of epiphytes, on the grass blade, the report further explains indicates disturbances and the shorter blade length may have developed from sedimentation cover in a shallow area. This would need further monitoring. In 2011 and 2012, underwater video photography of the seabed and observations by the rangers show similar medium to dense coverage with continuous daily grazing by manatees in several areas of the sanctuary.

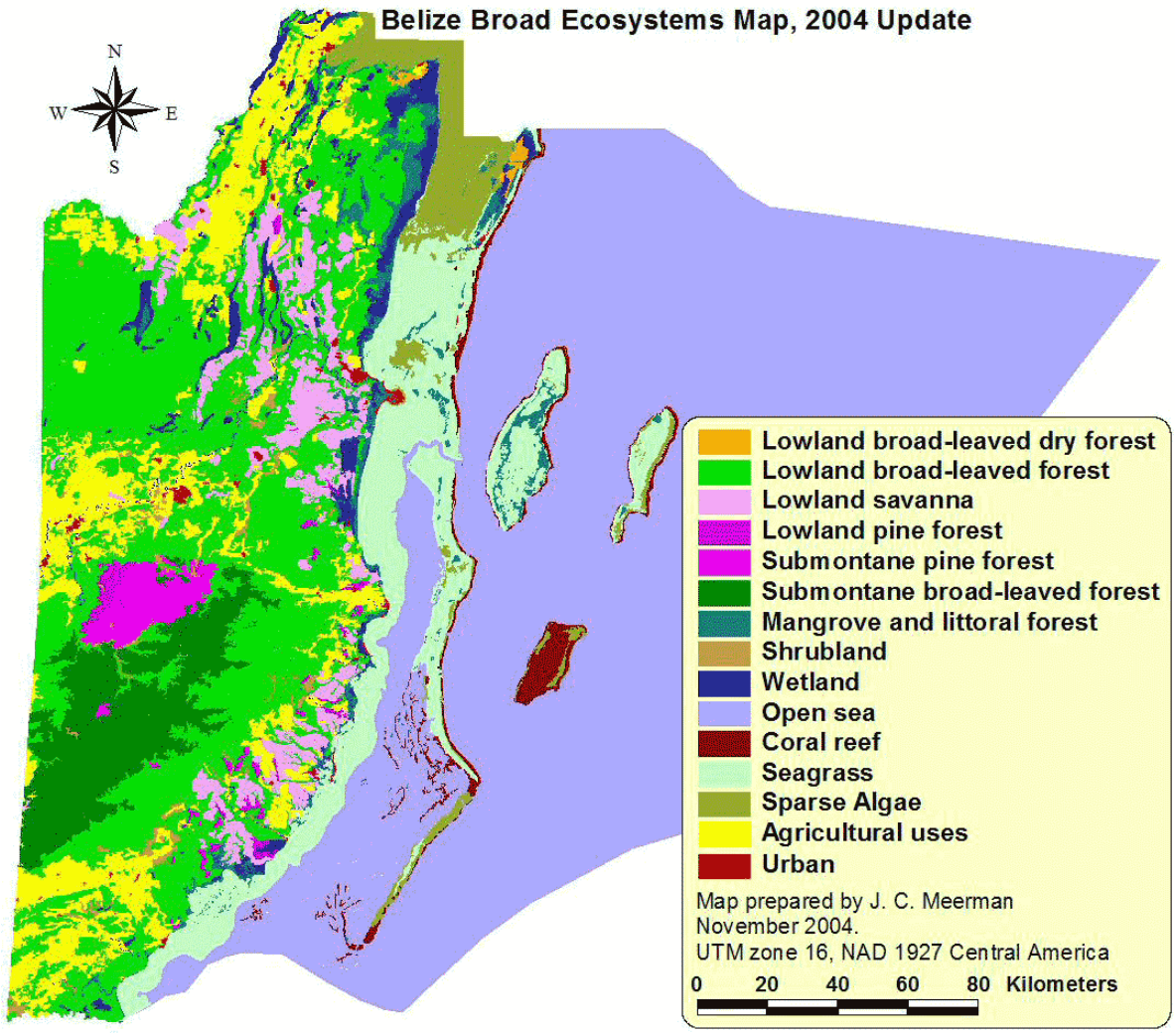
Mangrove canopy and root systems support a wide range of other creatures as do the extensive sea grass beds at the Sanctuary.

The following can now be added to the REA baseline list of the Sanctuary:

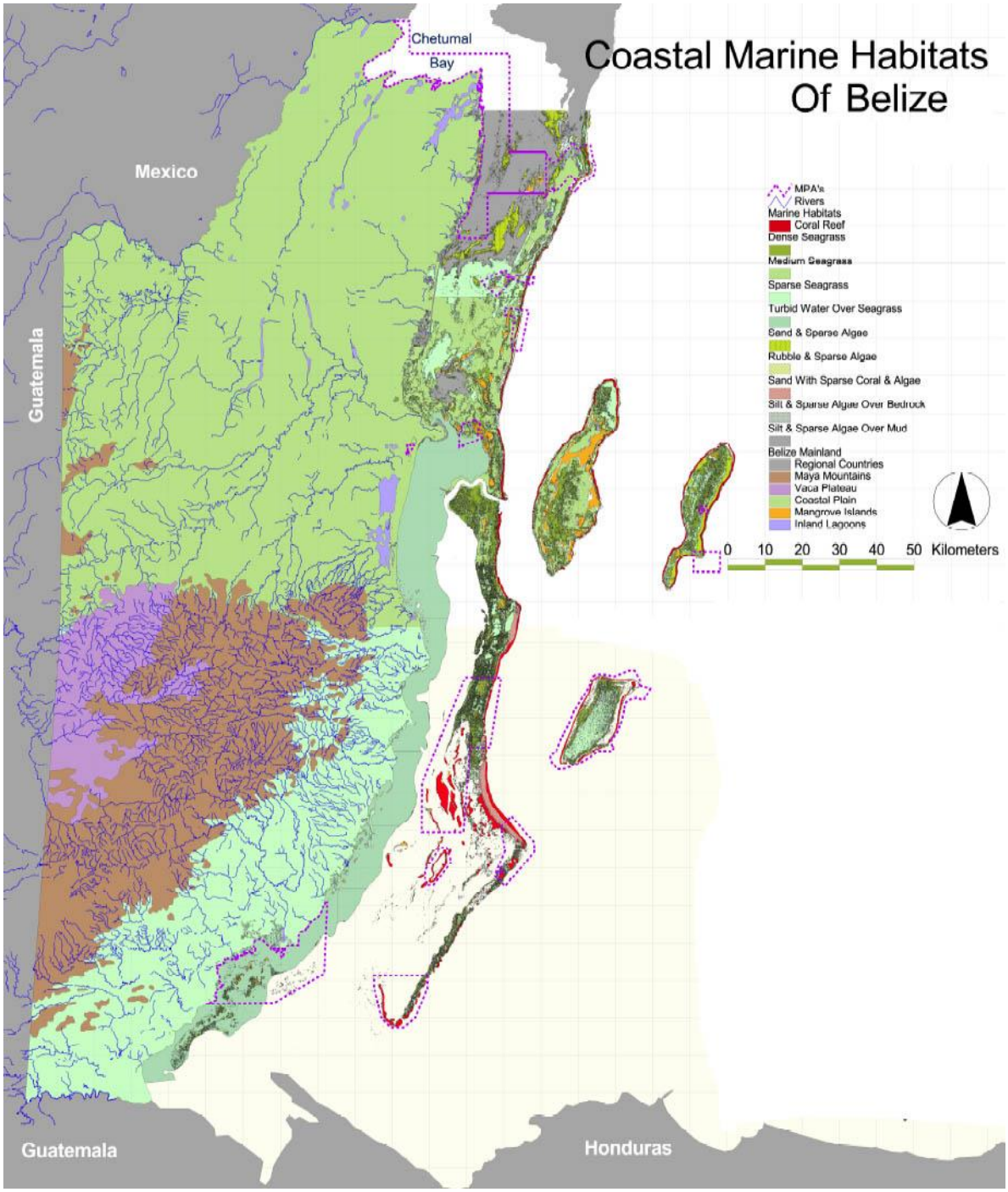
Reptile:	Boa constrictor
Fish:	Lionfish and Barracuda
Slug:	Sea slug,
Plant:	Saltwort,

(Personal observations M. Vega and video footage)

MAP 11 Ecosystems Map of Belize



MAP 12 Coastal Marine habitats of Belize



2.5.2 Flora

The vegetation at Swallow Caye Wildlife Sanctuary is red, black and white mangrove all protected in Belize.

Seagrasses found are the herbs, turtle grass and manatee grass, Syringodium filiforme and Thalassia testudinum and the most grasslike of the three, shoal grass, Halodule beaudettei.

Both mangroves and seagrasses are conservation targets for the sanctuary as critical habitat for the manatees and by extension other species.

Found amongst the mangrove trees in muddy areas sometimes exposed in low tide is Batis maritima L. known as pickle weed or saltwort.

2.5.3 Fauna

Species of concern are manatees, dolphins, turtles, crocodiles, as well as, commercial finfish species. A boa constrictor was seen on September 11, 2012 living in the branches of a live mangrove. On the seabed numerous starfish, on the mangrove roots snails were observed and amongst the roots a sea slug and crabs in the mud. Turtles, dolphin (up to ten at one sighting, manatees single, in pairs adult with calf, and in herd of up to 34 in a herd have been observed at SCWS (observations by Carl Burgess, Research Assistant/Ranger).

Bonefish distribution research confirms at least one adult station within SCWS;
Tarpon distribution research confirms local adult runs within SCWS;
Permit distribution research confirms both adult and spawning stations within SCWS;

Underwater video shows many juvenile fish amongst the mangrove roots and at different times schools of fish throughout the sanctuary. A few lobsters have been observed inside the sanctuary but not conch.

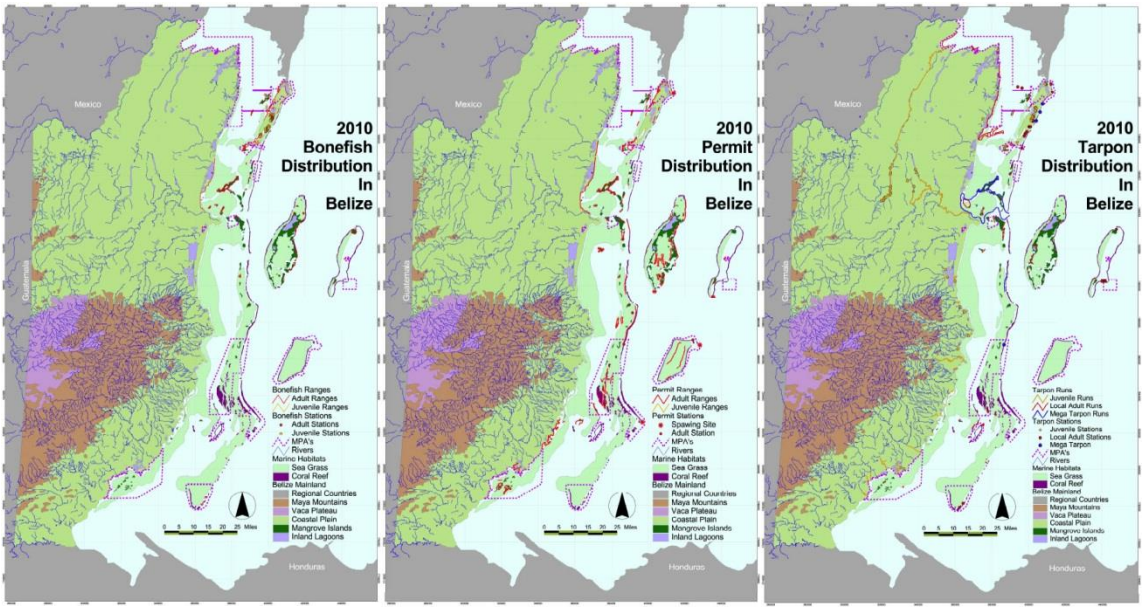
Snails can be found on the mangrove roots.

> The conch and lobster fisheries form the two most important components of the capture fisheries in Belize, with production representing over 90% of total capture fisheries production in 2008, and an export value of Bz$20.30 million (Ministry of Agriculture and Fisheries, 20093). Lobster landings peaked in 1981 at 2,204,622 lbs, but fell to 457,680 lbs in 2006. 511,389 lbs were harvested in 2009 (tails and head meat combined), with a market value of Bz$13.8 million (Ministry of Agriculture and Fisheries, 2009). It is significant to note that the general trend of total national lobster production over the period from 1981 to 2008 is a decline of almost 77%, and there are concerns for the continued sustainability of the lobster fishing industry. As with lobster, national conch landings have declined significantly, peaking at 1,239,000 lbs in 1972, and subsequently declining by 54% to 574,756 lbs in 2008 (Ministry of Agriculture, 2008).

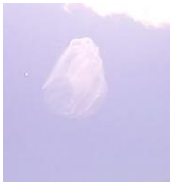
See species list at Appendix 4.

Conservation targets for SCWS are manatees, mangroves, seagrass beds, juveniles of commercial species and endangered birds.

MAP 13, 14, 15 Bonefish	Permit	Tarpon



Photographs from Swallow Caye Wildlife Sanctuary all photos are ambient light showing the clarity of the water



Lionfish found by Ranger Station and barges Jellyfish several types appear

Barracuda

Bottlenose dolphins

School of juvenile fish

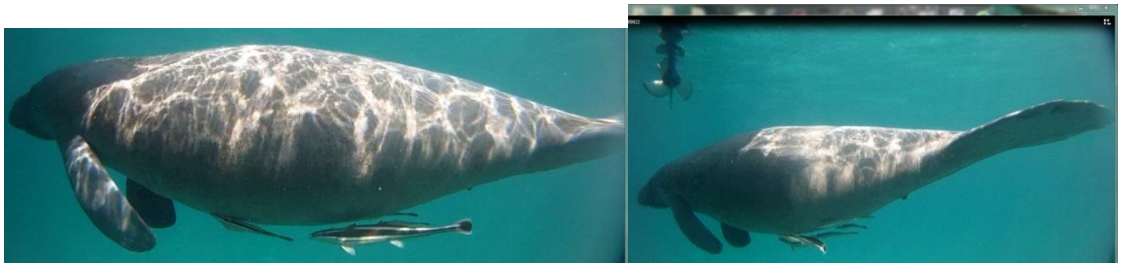
Osprey

Manatee Behaviours

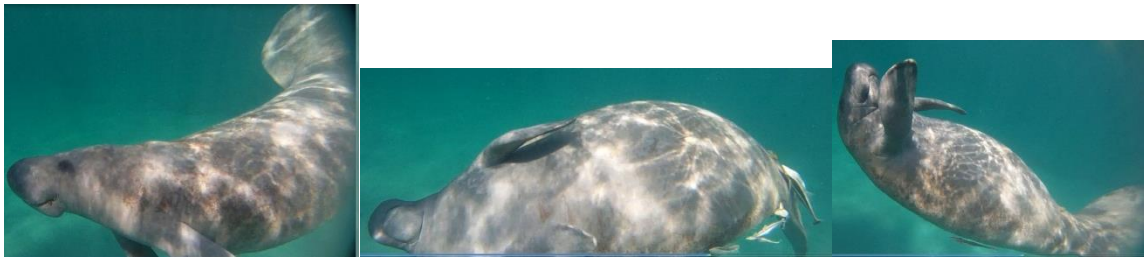
Resting

Surfacing to breathe

Curious about the camera



Swimming with remora and close to the boat



Manatee rolling over and over in the water complete sequences captured by video

Manatee

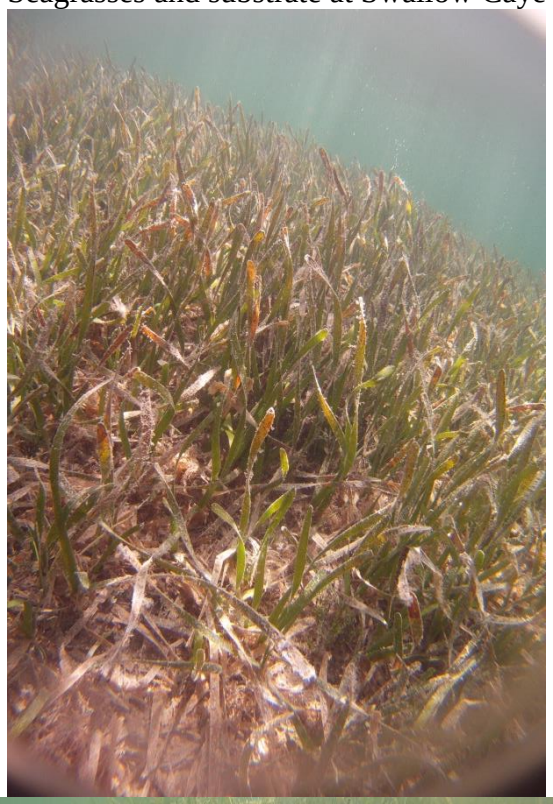
starfish

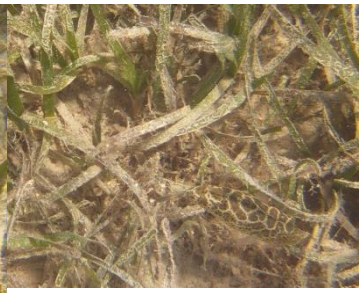
stingray

Red Mangrove

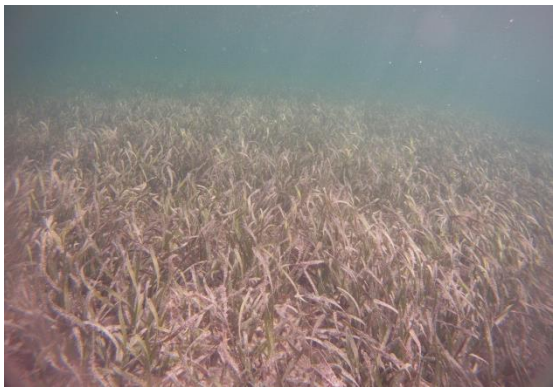
Scenic beauty and dense mangrove forests

Seagrasses and substrate at Swallow Caye Wildlife Sanctuary





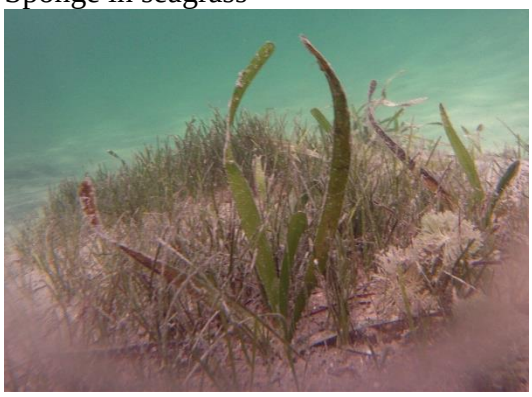
Puffer fish in seagrass

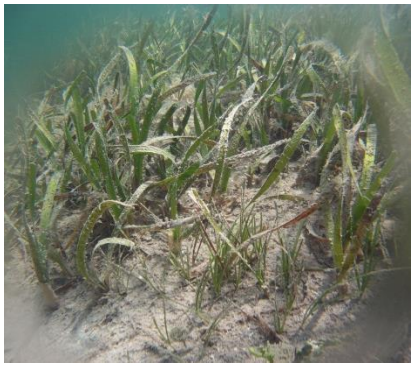


Dense seagrass meadow

Sandy area at SCWS

Sponge in seagrass





seagrasses and algas

Diving dapper

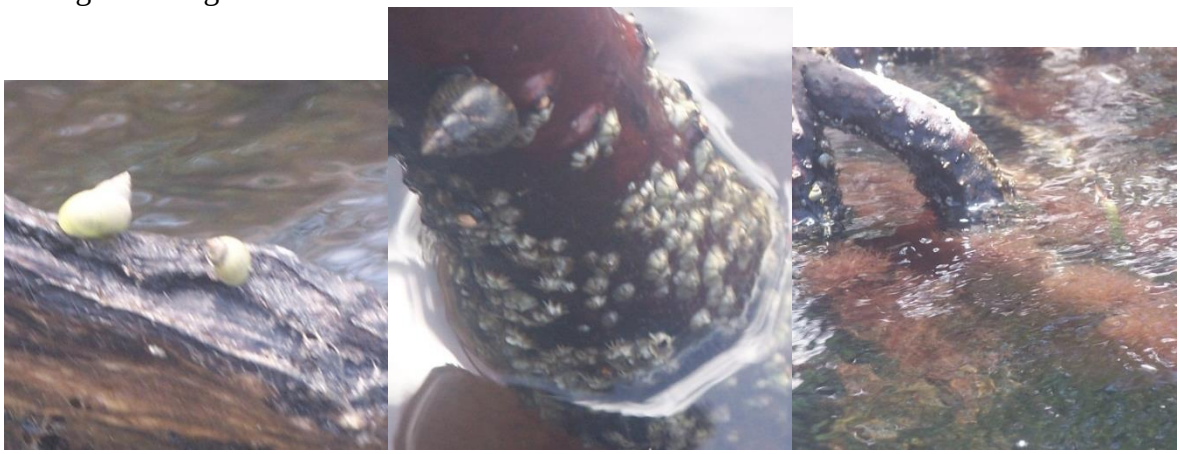
sea slug

boa

Mangrove roots

Mangrove channel

Young red mangroves



Inter tidal Colonies on mangrove roots

Fish in mangrove roots silty bottom

School of Snappers in mangrove roots

2.5.4 Past and Present Research

Research past

Tremendous research has been ongoing in the area of Swallow Caye Wildlife Sanctuary and the Drowned Cayes centered on the *Trichechus manatus manatus.* Some of the researchers since the 1960's are Charnock Wilson, Janet Gibson, Nicole Auil, Angeline Valentine, Jamal Galves, Dorian Alvarez, the Coastal Zone Management Institute and many non-Belizeans pursuing their dissertation research focusing on the specimen, manatee. These include Powell, Self-Sullivan, LaCommare, and numerous other interns such as Arce and Balderas from ECOSUR currently at SCWS.

Increasingly, research is gaining more depth as full habitat studies are being seen as important e.g mangrove, seagrass, pollution and other water quality.

Additionally, research material is also growing reference more precise monitoring terminology and criteria, management effectiveness of protected areas and in the application of new technologies in research or new application of technologies.

Research significance

The area is strategically located in proximity to Belize City the largest urban area of Belize City to be a critical research node for conservation of biodiversity, habitat health, pollution sensor and water connectivity for free-ranging species. The area is strategically protected being a totally non-extractive zone surrounded by areas where the natural environment is under constant change and manipulation by humans. Research conducted at SCWS aims to understand the natural environment which is so rapidly being lost in most of the neighbouring areas. The purpose of SCWS is to protect manatees and this purpose is well-served by ongoing research.

For the country of Belize, SCWS and the Drowned Cayes area is a manatee grand central area whose full significance is yet being evaluated. SCWS provides a unique opportunity to study the interface of manatee and humans in a site managed, where possible, under the precautionary principle. To adequately manage an area to protect a species, the full needs of that species would need to be known and the full extent of their habitat range would require protecting. More research is necessary.

2.6 Cultural and Socio-Economic Values of Management Area

2.6.1 Community and Stakeholder Use

The area of SCWS is within the prehistoric sea lanes of the Maya and the colonial trade routes. Most recently, it is major navigation access for the sugar barges and tugs, tour boats, fishing boats, water taxis and private boats visiting or transiting the area.

The communities and stakeholders using and benefitting from SCWS are tour operators,

tour guides, researchers and nearby fishers. For manatees, speeding boats present a big collision danger and strandings with propeller injuries or death from such contact are reported on the increase 2011 a total of 19 with watercraft primary cause of death. Source NMWG 2012.

Management Concern

For transiting speeding vessels, alternate navigational routes need to be established and enforced outside of the Sanctuary boundaries. Since the reason boats pass through the sanctuary is to save time, invariably, they are passing through at full speed. This however, only displaces the problem as the alternate navigation lane west of North Drowned Caye is prime manatee area as shown by past studies and current tracking by Sea2Shore Alliance. Slow zones or propeller guards may have to be required in all high density manatee areas. SCWS will undertake initiatives for public awareness and promotion in Belize City to engage more Belize City tour operators in in manatee protection and bringing tours to SCWS.

2.6.2 Archaeological Sites

The coastal Maya were proficient seafarers, with the K'ak' Naab' canoe paddle providing direct evidence of canoe travel.
The Late Preclassic provides the first clear evidence of sea trade, with island settlement on Cancun and Moho Cay, as well as the coastal settlements of Cerros and Butterfly Wing. 2010 Heather McKillop

During colonial times, navigational reports mention the importance of Swallow Caye as preferred anchorage for some captains. It is theorized that Swallow Caye was named after the HMS Swallow under the command of Captain Samuel Axe. The HMS Swallow would have been named after the bird. E.O.Winzerling

Manatees have been a source of food to humans since pre-Colombian times. In the area of SCWS, evidence unearthed "*at Moho Caye show conspicuous remains of marine mammals. Most plentiful are the bones of manatee which can be easily identified by the lack of marrow structure. Many fragments of these bones can be seen in situ, and in 1965, there were still numbers of the large, curved rib bones to be found littered about on the irregular surface of beach rock where they had been deposited by bank erosion. "* Alan K. Craig 1966

Dampier 1906 *"The manner of striking manatee and tortoise is much the same; only when they seek for manatee they paddle so gently, that they make no noise. Because it is a creature that hears very well." The flesh was used to feed slaves and pickled as a delicacy; the skin for flexible oarlocks, the black hide for horsewhips. In Alan K. Craig 1966*

Buccaneers are among the first to establish on the British Honduras coast at St. Georges Caye with their occupation of smoking, drying and salting turtle and manatee meat for sale to passing privateers, logwood cutters etc was a legitimate venture and considered to be an indispensable service to all seafarers then in the Caribbean. For this, the Spanish early on gave the name Cayo Cosina, (Kitchen Cay) to St. Georges's.

In 1968, Charnock-Wilsom found an abundance of manatees all along the coast of British Honduras. *"Moreover, predation was at a minimum as the people who formerly ate manatee meat now show little interest in it, and the alligator, its only other predator, has been persecuted almost to extinction."* Oryx Volume 9 May 1968

2.6.3 Tourism and Recreation Use

Since its inception, SCWS is open to visitation and at the maximum has received 5,000 tourists in one year. Most visitors are international overnight tourists on guided tours originating mostly from Ambergris Caye, Belize City and Caye Caulker. The total number of visitors to SCWS for the year 2011 is 2,906 persons with visitors arriving every month of the year. The highest visitation is in the months January, February, March and December corresponding to the country's peak tourism season. Year to date provisional figures for 2012 are showing a 2.9% increase over 2011.

TABLE
2011 Visitation to Swallow Caye Wildlife Sanctuary

Total	J	F	M	A	M	J	J	A	S	O	N	D
2,906	451	390	531	319	168	101	180	146	26	34	204	356

Source FOSC Rangers' Daily Logs & Tickets

TABLE
2012 Visitation to Swallow Caye Wildlife Sanctuary

Total	J	F	M	A	M	J	J	A	S	O	N	D
2,416	432	525	372	265	173	146	225	203	12			

Provisional Figures Tickets M. Vega

Most tour boats with destination Swallow Caye Wildlife Sanctuary try to obey the regulations to improve their chances of viewing manatees. From time to time there can be one or two non-compliant operators. High visibility of the Ranger's video camera has proven to be a good deterrent to these. If that fails, the captain and guides are cautioned and their management offices informed verbally. If desired behaviour is still not forthcoming, a written complaint is sent to the Management of such tour company with a copy to the Belize Tourism Board as all tour operators and tour guides must be exemplary to qualify for annual renewal of licenses.

Most tourist visitors to the Sanctuary engage in the activities of viewing manatees, picnicking on their boat, photography, and interpretation by their guides and captains. International media visitors engage in photography and research. Research visitors conduct their course of research which includes viewing, observations and data gathering. Once inside the Sanctuary, all visitors get to experience boating without the use of engines and, instead, by the Captains' dexterity with a pole.

A stop at SCWS is not a standalone tour for regular tourists. It is a tour combined with at least 2 other stops on the reef. Many tourists that do not visit SCWS prefer to visit areas of the reef where swimming with manatees is allowed with no entrance fee. This is the unrestricted reef area off north Caye Caulker where manatees are populating in the warmer months.

At the Sanctuary, regulations governing the behaviour of boats and tourists are in place to protect the manatees.

1. There are Directional, educational and other necessary signs erected at strategic locations within the area to enhance compliance within the sanctuary.
2. From designated points, all boat operators shall turn off their engines and pole their way into the main area;

3. Once in the area of the main hole, all boats shall plant pole and tie up;

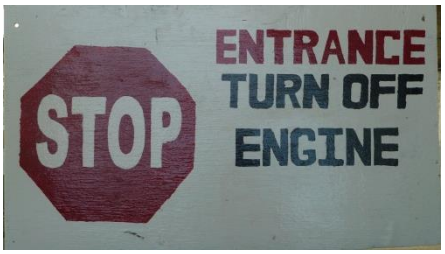
4. There are specific and clearly marked Entrance and Exit points. These shall be variable depending on prevailing winds to enable boats to drift with the wind;

5. Noise pollution, including the playing of loud music, and the use of engines within the main hole is restricted within the SCWS;
6. Only a maximum of six boats shall inhabit the main hole at any one time, for a time frame not exceeding 30 minutes;
7. Only boats with a maximum length of 36 feet shall be allowed within Zone 1 - the main hole area;
8. All vessels of lengths exceeding 36 ft shall remain outside the main hole in the turtle grass and secondary hole areas;
9. No inboard/outboard diesel engine boats shall be allowed in the main hole;
10. Boat operators and tour guides shall ensure that their passengers maintain good behavioural conduct while in the area;
11. Molestation of the animals is prohibited. This includes petting, feeding and swimming with the animals;
Manatee molestation is not defined under the Wildlife Protection Act CAP. 220 which would have implications for enforcement. The National Parks System Act CAP 215 provides at 4 (d) no person shall hunt, shoot, kill or take any wild animal, or take or destroy any egg of any bird or reptile or any nest of any bird, in any wildlife sanctuary.

12. All tour and boat operators shall meet the BTB's and Ports and Harbours Regulations for passenger/guide ratio and other safety regulations;

Vessels operating in and around Swallow Caye Wildlife Sanctuary are from the 205 foot long barges, the 51 foot long catamarans, various sizes of water taxis, private boats and smaller fishing boats. The two water taxi lines have multiple runs daily. Attempts are being made to have all water taxi vessels travel west of North Drowned Caye instead of using Swallow Caye Bogue. However, there is no restriction on tour boats with cruise passengers looking for the most direct route to snorkel and dive sites east of SCWS.

13. No littering in the Sanctuary.
Although visitors do not litter in the Sanctuary, solid waste is evident trapped in the mangrove roots. Some items include plastic slippers, buckets, ropes, wood, and fabrics among other things.



14. The hovering of any flying aircraft that infringes or in any way affects the natural behavior of the manatees

within or in the proximity of the sanctuary is prohibited.

This regulation is enforced with the cooperation of the Forest Department and Civil Aviation Department and is a problem with the helicopter tours. Low flying helicopters are especially disruptive to the manatees because of excessive noise and tremendous displacement of water. The Ranger must photograph any such intruding aircraft and this is followed up with the tour company and/or the enforcement agencies. Low flying helicopters at the Sanctuary are also very disruptive to those on boat tours.

Visitors come to the sanctuary with one purpose: to see live manatees in their natural habitat. At SCWS up to now it can be guaranteed that manatees will be seen most times in crystalline waters. To improve chances of sightings, visitors must maintain quiet, they must remain inside the boats and the captains must turn off boat engines and pole to the favourite manatee areas as indicated by the rangers on any given day.

Visitors must pay an entrance fee and must abide by the guidance of the ranger on site.

All adjacent communities are welcome to visit the Sanctuary to enjoy a natural experience but without leaving their boat.

Areas of management concern

Enforcement and patrolling is only possible when the ranger is on duty at the Sanctuary 8:30 am to 4:00 pm. This means that for all the other hours, the Sanctuary is open but unattended. FOSC and Forest Department have no monitoring in place during the other sixteen and a half hours. Even when the ranger is on duty, the ranger is limited in response by the speed of his boat (60 HP maximum) especially compared to water taxi and tour boats that are high powered with up to 600 HP. Attempts could be made to find out more information about visitors so as to better market the Sanctuary and increase visitation. Additionally, more can be done with neighbouring Belize City to attract more visitors and more support and management input from this City.

Tourists viewing manatees in front of tall mangroves **Photo SCWS FOSC**

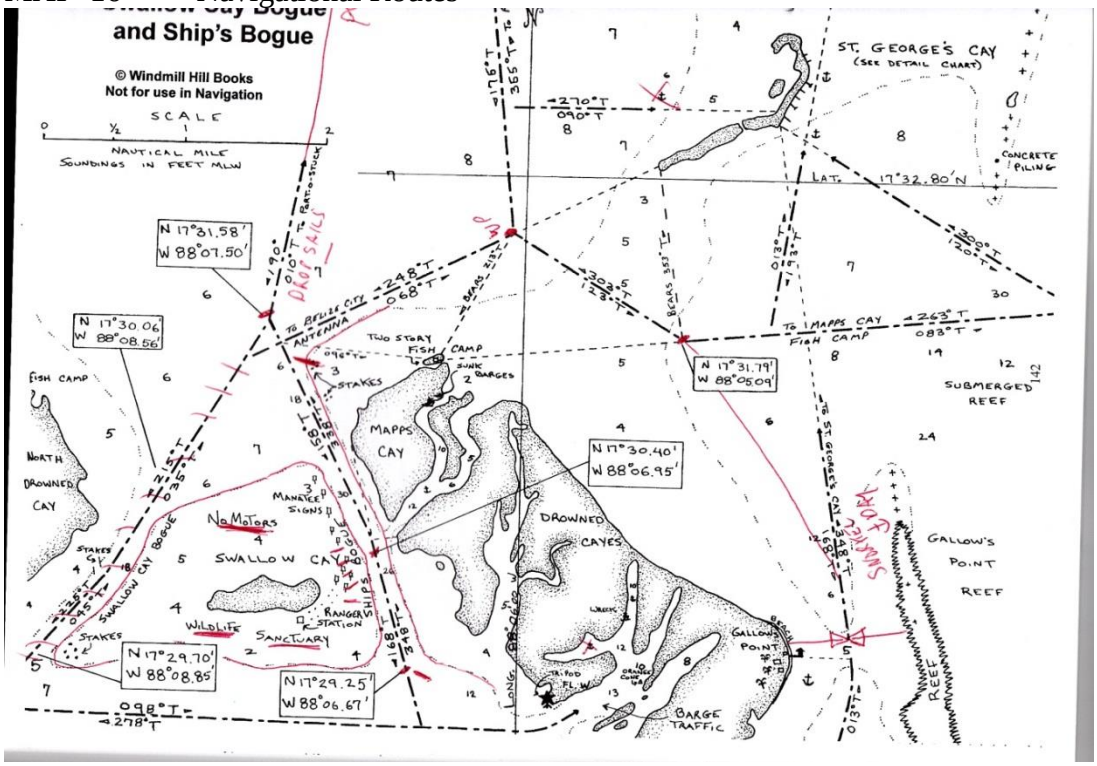
2.6.4 Other Economic Use

Swallow Caye Wildlife Sanctuary is in major navigational routes. Sugar barges and tugs run alongside the east and north, water taxis run along the west and tour, private and fishing boats transit east west from Belize City to the cayes and reef.

BSI barges traverse the deeper channel at SCWS
In 2007 transported for export in excess of 89,000 tons of sugar and in excess of 46,000 tons of molasses.
40 barges with dimensions of 205ft X 40ft X height 14ft

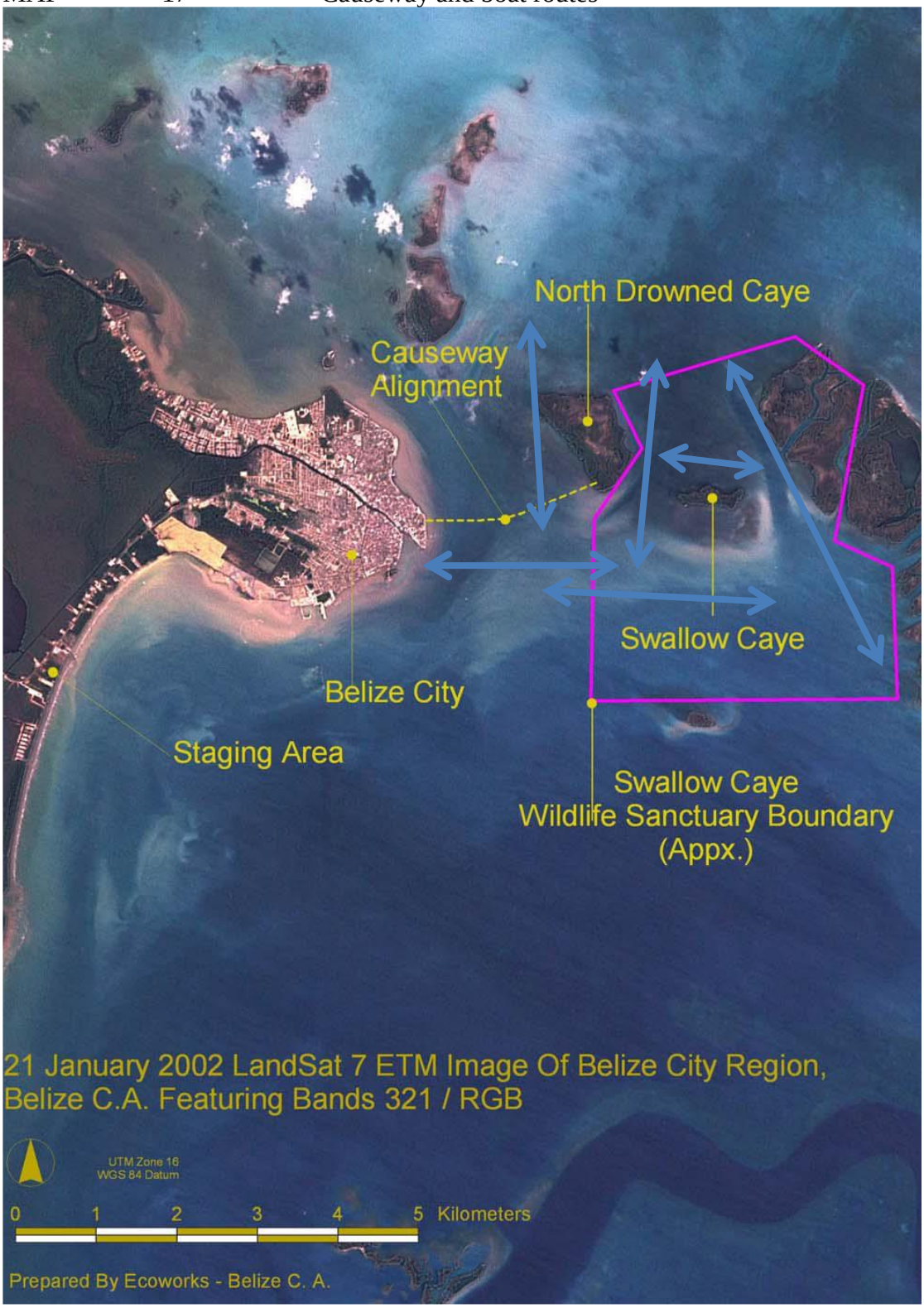
Catamaran charters enter the Sanctuary in transit in the deeper channel and as a tour stop;
One company has a fleet of 7 ranging in size from: 46 ft X 24 ft X draft 4.3 ft To 51 ft x 28ft x draft 4.7 ft
For touring, the small runabout is to be used within the sanctuary; this depends on voluntary compliance by the Captain

MAP 16 Navigational Routes



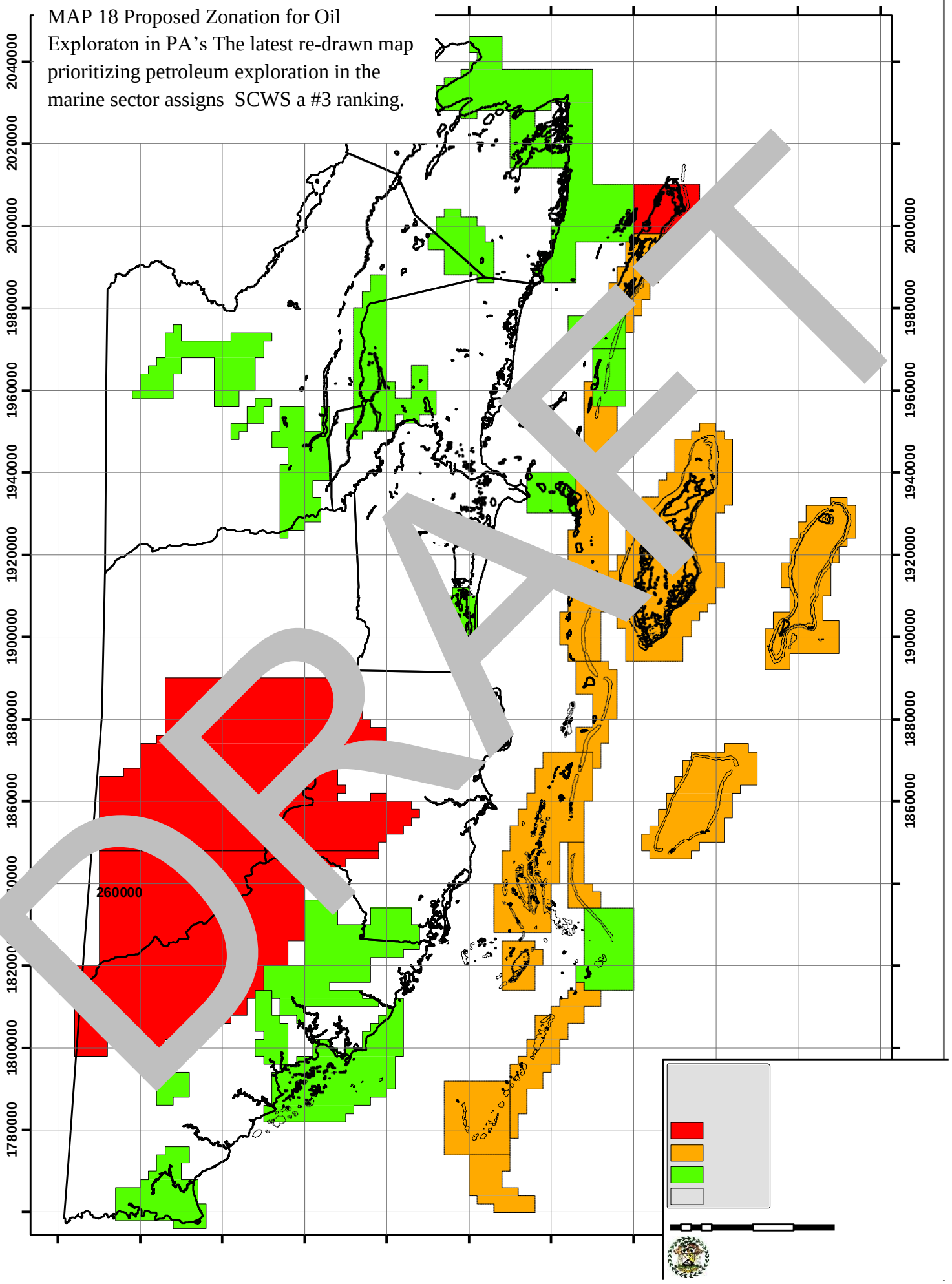
Swallow Caye Bogue, Ship's Bogue and Catamaran Navigational Channels inside the Sanctuary Source TMM Charters

MAP 17 Causeway and boat routes



KEY Causeway ---------- Boat routes transiting (not visiting) ⟷

MAP 18 Proposed Zonation for Oil Exploraton in PA's The latest re-drawn map prioritizing petroleum exploration in the marine sector assigns SCWS a #3 ranking.



2.6.5 Education Use

SCWS has previously collaborated with Dr. Leandra Cho-Ricketts and the University of Belize for students to undertake the research resulting in the Rapid Ecological Assessment of Swallow Caye Wildlife Sanctuary.

Chocolate Heredia annually donates field trips to Swallow Caye Wildlife Sanctuary to the Caye Caulker Roman Catholic Primary School.

Friends of Swallow Caye conduct outreach activities to schools in Belize City, San Pedro and Caye Caulker when funds permit. From its office location on Caye Caulker, community service activities centered on the manatee are sometimes undertaken with the students. FOSC also produces print material which it distributes to all interested parties. FOSC is currently planning to collaborate with environmental/science clubs for select primary and high schools in Belize City to offer heritage and manatee education.

Field trips for primary school students from San Pedro and Belize City are sometimes funded by grant funds.

Along with the National Manatee Working Group, children's manuals have been developed on manatee protection and trainers have been trained.

FOSC is always lobbying BTB and other interested parties for frequent specialized manatee tour guiding courses. In 2004 to 2005 FOSC conducted a manatee tour guiding course as a special project funded by GEF.

Other science educators bring groups of international students to get field research experience at SCWS these include Belize Zoo/Cincinnati Zoo and Miami University, Sirenian International/Caryn Self-Sullivan. SCWS also has the opportunity to work with international interns from various countries, including, at present, from ECOSUR.

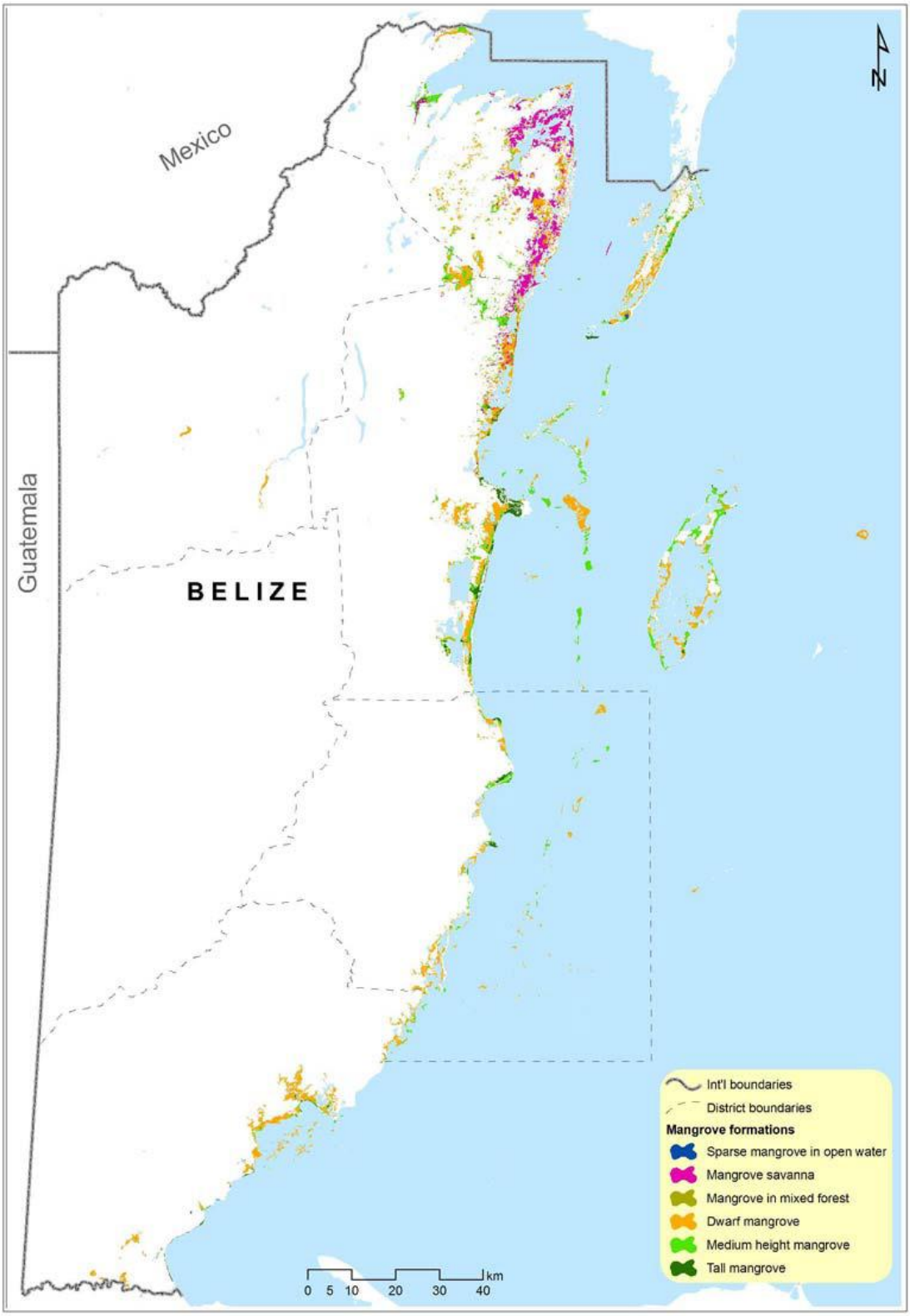
Research Assistants/Ranger conduct daily manatee underwater video research at SCWS, as well as, mangrove research. Analysis is advancing aiming to identify and quantify manatees at SCWS. In addition, in-depth surveying of communities is being conducted to produce a model for working with the communities. Ranger are required to keep daily data logs of their observations.

Coastal Zone Management Institute had previously headed major manatee education programs by many supporters and researchers of SCWS.

Areas of management concern

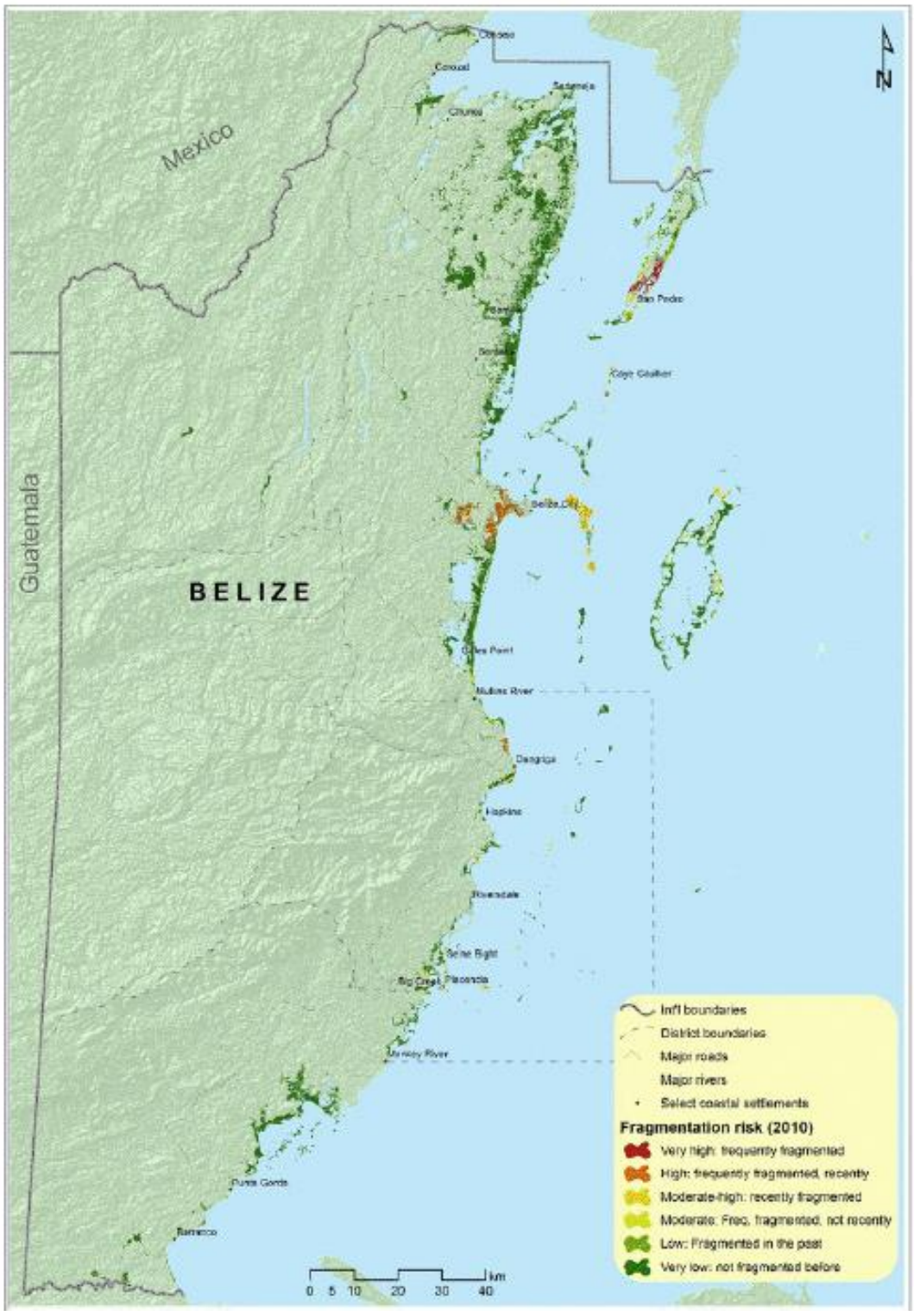
There are no qualified in-house researchers and there are no multi-year arrangements with any institutions of advanced learning to give quality and continuity to the education initiatives. Programs must be funded by donor grants and there is absence of any full-time administrative or management staff to consistently support company programs, including no one to supervise visiting researchers and interns.

FIGURE 1 **:** Belize's mangrove formations, based on Zisman (1998)



Source Cherrington, etl CATAHLAC 2010

FIGURE 2 Dynamics of Fragmentation of Belize's Mangroves 2010



Source Cherrington et al CATHALAC 2010

2. Current Status

2.1 Location

Swallow Caye Wildlife Sanctuary is located three miles east of Belize City in the Belize City range of cayes and includes Swallow Caye and Mapp's Caye. It comprises approximately 8,970.13 acres, is irregularly shaped with nine "corner" points with UTM coordinates as follows:

Commencing at a point having the scaled UTM co-ordinates of 1937 150 North and 378 400 East;

Thence east north east on a bearing of 73.7 degree for an approximate distance of 3970 meters to a point having the scaled UTM co-ordinates of 1938 250 North and 382 200 East;

Thence east south east on a bearing of 124.9 degree for an approximate distance of 1,642 meters to a point having the scaled UTM co-ordinates of 1937 300 North and 383 550 East;

Thence south-south west along the southern side of channel on a bearing of 189.9 degrees for an approximate distance of 3, 161 meters to a point having the scaled UTM co-ordinates of 1,243 meters to a point having the scaled UTM co-ordinates of 1933 600 North and 384 100 East;

Thence south-south east on a bearing of 176.6 degree for an approximate distance of 2, 611 meters to a point having the scaled UTM co-ordinates of 1931 000 North and 384 250 East;

Thence west on a bearing of 270 degree for an approximate distance of 6,252 meters to a point having the scaled UTM co-ordinates of 1931 000 North and 378 000 East;

Thence directly north on a bearing of 0 degree for an approximate distance of 3,540 meters to a point having the scaled UTM co-ordinates of 1934 550 North and 378 000 East;

Thence north east on a bearing of 34.9 degree for an approximate distance of 1, 762 meters to a point having the scaled UTM co-ordinates of 1936 000 North and 379 000 East;

Thence north-north west on a bearing of 332.5 degree for an approximate distance of 1,310 meters back to the point of commencement. Source: SI 102 of 2002

On site at Swallow Caye Wildlife Sanctuary is an over the sea Ranger Station constructed of plywood on PVC posts and with corrugated zinc roof. The Sanctuary aims to maintain at least 4 of its nine corners marked with boundary marker signs. These are always installed with the help of the Forest Department personnel to verify the GPS points. In addition, there are numerous signs within the Sanctuary to guide visitors. These signs mark entrance exit by the main hole, main hole, manatee area caution, slow, stop and others.

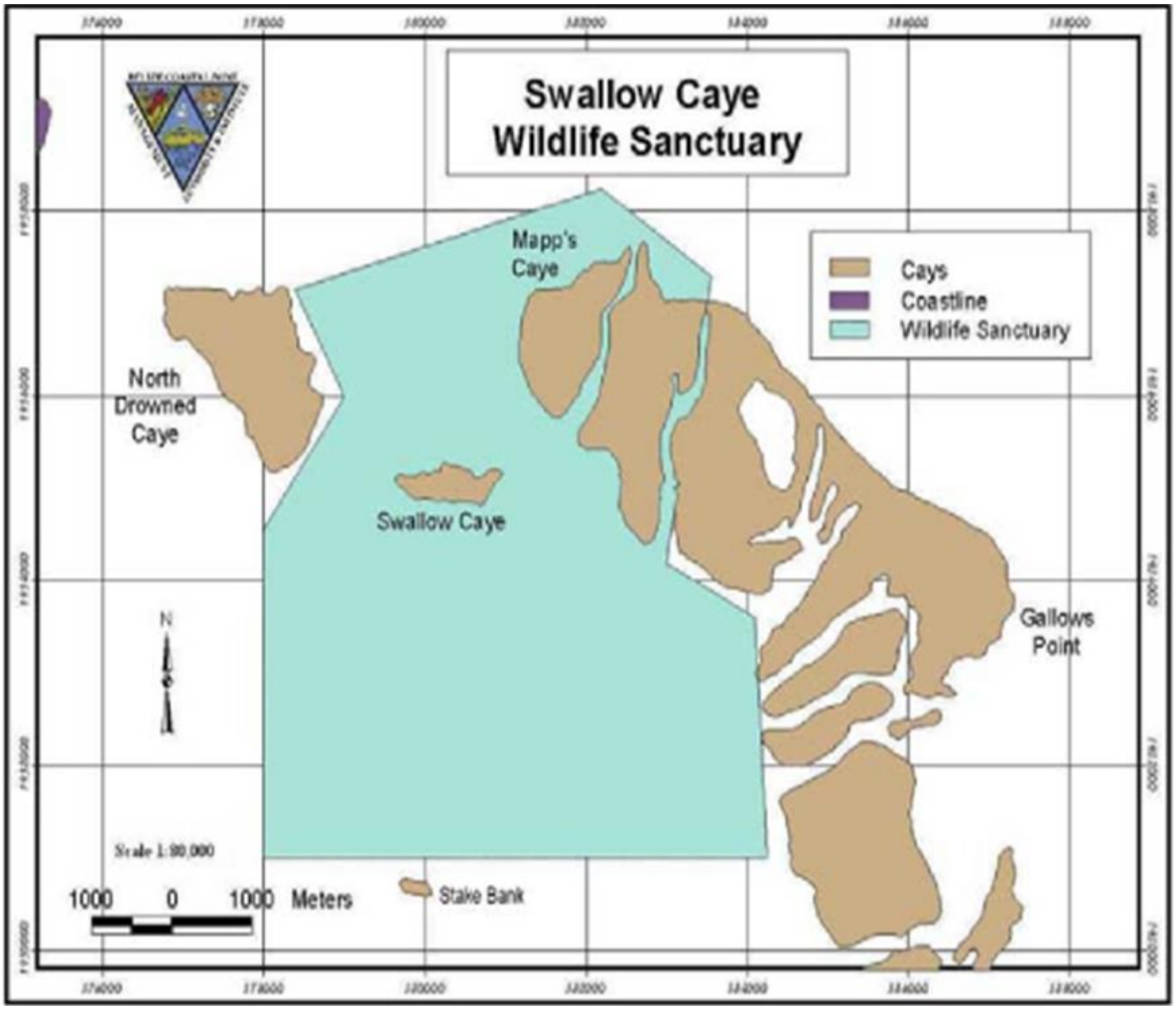
Swallow Caye Wildlife Sanctuary is readily accessible by boat. Its neighbouring communities are Mapp's Caye, Belize City, St. Georges Caye and Moho Caye. The Sanctuary has faced its greatest threats to total habitat alteration, some would say, obliteration, from developments planned for two mostly unoccupied cayes North Drowned Caye and Stake Bank immediately on the northwest and southern sanctuary boundaries respectively. North Drowned Caye was a pristine stand of over wash mangrove forest until the owner dredged a large channel in the mangrove and used the material to fill adjoining areas. Stake Bank was a much smaller stand of over wash mangroves which were totally removed and replaced with fill from adjacent dredging.

Mega developments proposed on these two cayes include major cruise port installations, activity and sea and land access by means of re-routing and enlarging the main outer channel and the construction of causeways to Belize City. North Drowned Caye would see another causeway connection to both Stake Bank and Belize City, in excess of 500 residential units, 200 marina slips and dry slips. Plans put the marina and canal immediately at the western boundary of Swallow Caye Wildlife Sanctuary and one causeway spanning north south across most of the Sanctuary. In 2011 and 2012 it was informed that the developers were again preparing to get their plans off the ground having shown minimal activity since 2006. In 2011 artisanal fishers constructed a fishing camp on the eastern boundary of the Sanctuary and a cage fishing pilot project has been introduced in that general area outside the Sanctuary.

Swallow Caye Wildlife Sanctuary is one of Belize's very handy tourism natural heritage attractions and is popular with international visitors via San Pedro Ambergris Caye and Caye Caulker in the north, Belize City west, St. George's Caye on the east and from Placencia in the south. SCWS is also on the route for tourist sailors of bareboat charters.

Primary stakeholder groups are boat captains, fishers, tour guides, tour operators, researchers, tourists, passenger and cargo carriers. Swallow Caye Wildlife Sanctuary is immediately of interest to Belize's largest population center and to its shipping and priority export service industry, tourism. The community co-management group is headquartered in Caye Caulker, Belize District and the public sector counterpart, the Forest Department, is in Belmopan City, Cayo District.

Map 2 Swallow Caye Wildlife Sanctuary (CZMA&I)



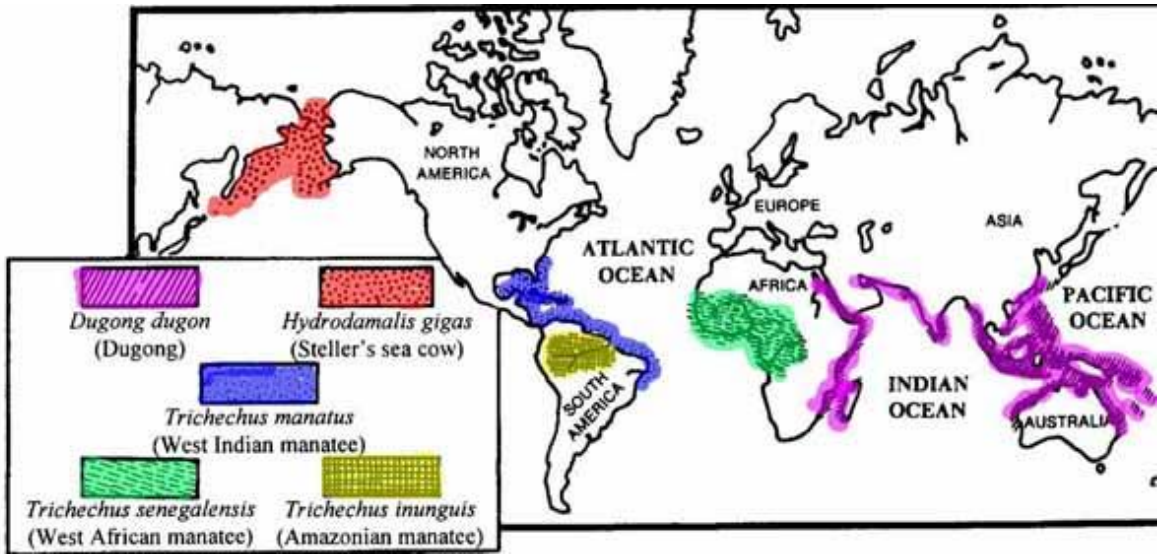
2.2 International and Regional Context

Swallow Caye Wildlife Sanctuary protects *Trichechus manatus manatus*, the Antillean Manatee, a sub-species of the West Indian Manatee. This is a sea creature, brought to endangered status not from natural predators but from anthropogenic sources including hunting and other man-made threats to its existence. The International Union for the Conservation of Nature has classified them on its Red List of species in danger. Belize joins the ranks of regional and international concerned communities protecting global biodiversity with a high priority to protecting the manatees, an umbrella species. Manatees and their close relatives are found in a sub-tropical and tropical belt spanning the globe and face increasing threats from boat traffic, fishing gear and habitat destruction among other things.

On a regional and international level, SCWS is part of the Belize Barrier Reef Complex, part of the larger Mesoamerican Barrier Reef System on the Atlantic coast of Central America. Conservation International in 2003 highlighted the Mesoamerican area as a world "hotspot for species biodiversity". In this region, the north and south American and Antillean bioregions meet with each of these three contributing plants and animals for a rich biodiversity of Central America.

Swallow Caye Wildlife Sanctuary contributes to the protection of mangrove forests, seagrass beds, the Belize Barrier Reef and the interface of sea and rivers on the east coast of Belize. SCWS plays its part in assisting Belize to fulfill its commitments under the Convention on Biological Diversity, the Caribbean SPAW Protocols and others.

The manatees exhibit regional differences and some carry the name of the region where they can be located. See Map 3. Steller's Sea Cow became extinct in 1768. The species at Swallow Caye Wildlife Sanctuary is *Trichechus manatus manatus*, the Antillean manatee a sub-species of the West Indian Manatee.



Map 3 Manatee Distribution Worldwide (Peck, Lisa)

Manatees appeared 60 sixty million years ago and have historically been hunted for food, hide and for bones which has led to their decline and as mentioned, the disappearance of a species in the short span of about a quarter century of being discovered by humans.

Swallow Caye Wildlife Sanctuary is established for the protection of the West Indian Manatee, Trichechus manatus manatus and its importance to international and regional natural heritage and biodiversity is as listed in Table 2 following. As an umbrella species, protection of the manatee, automatically contributes to protecting many other species dependent on the same habitats. SCWS lies within the Mesoamerican Caribbean Reef ecoregion which runs from the northern tip of the Yucatan Peninsula in Mexico to the Bay Islands of Honduras. Protected species appearing in SCWS include mangroves, manatees, turtles, dolphins, birds including vulnerable species herons, ducks, frigates, pelicans; fish including parrot, snappers, grouper, (National List of Critical Species 2005 Meerman, J)

TABLE 2

ENVIRONMENTAL TREATIES RATIFIED BY BELIZE Source RODA 2000 & GPMWS	
Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR) Ratified 6/11/90	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system, protecting nesting waterfowl of mangrove wetlands in close proximity to Belize City and the Belize Barrier Reef.
International Convention for the Prevention of Pollution from Ships and the 1978 Protocol MARPOL Ratified 26/8/95	
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Ratified 19/8/86	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system, protecting marine biodiversity, threatened species with special dedication to the manatees, as per Belize's commitment under this Convention.
United Nations Convention on the Law of the Seas Ratified 13/8/83 To set up a comprehensive new legal regime for the sea and oceans and, as far as environmental provisions are concerned, to establish material rules concerning environmental standards as well as enforcement provisions dealing with pollution of the marine environment.	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system upholding such precautionary measures as is Belize's commitment under this Convention.
Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention) Ratified 11/12/97Regional convention with the objective to protect and manage the marine environment of the Wider Caribbean.	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system, protecting riverine and mangal marine biodiversity, and threatened species, as per Belize's commitment under this Convention.
Convention on Biological Diversity Ratified 1992 To conserve biological diversity, promote the sustainable use of its components, and encourage equitable sharing of benefits arising out of the utilization of genetic resources. Such equitable sharing includes appropriate access to genetic resources, as well as, appropriate transfer of technology, taking into account existing rights over such resources and such technology.	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system, protecting biodiversity and threatened species, as per Belize's commitment under the CBD and is the only marine protected area in proximity of Belize's largest urban area.
International Convention for the Protection and Conservation of Sea Turtles for the	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system

Western Hemisphere (December 21st, 1997) To protected and conserve sea turtle species of the Western Hemisphere.	and provides significant protection for sea turtles that feed and shelter within the Sanctuary since it is a no swim, no take area.
Alliance for the Sustainable Development of Central America (ALIDES) (1994) Regional alliance supporting sustainable development initiatives	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system that provides sustainable heritage tourism employment to the stakeholder communities of Belize City, Caye Caulker, St. George's Caye and San Pedro.
United Nations Framework Convention on Climate Change (UNFCCC). *Reducing Emissions from Deforestation and Forest Degradation* (REDD+) initiative	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system that provides Marine connectivity mangrove forests and seagrass beds critical to the protection of the Belize Barrier Reef as it is to the protection of Belize City.
United Nations Environment Program Specially Protected Areas and Wildlife in the Wider Caribbean (SPAW)	Swallow Caye Wildlife Sanctuary is an important and integral component of the national protected areas system that provides biodiversity protection of critical species identified in Appendices of regional Caribbean protocols;

2.3 National Context

The National Parks Systems Act (1981)
Empowers government to create or maintain a "national system" of protected areas.
The Wildlife Protection Act (1981)
"to provide for the conservation, restoration and development of wildlife, for the regulation of its use and for all other matters connected therewith"
Statutory Instrument #102 of 2002
This piece of legislation establishes Swallow Caye Wildlife Sanctuary
The Forest Act (1990)
Promotes the forestry industry, with the implementation of conservation techniques
Environmental Protection Act (1992)
"to promote the preservation and improvement of the environment, the rational use of natural resources, the control of pollution, and matters connected therein"
The Fisheries Act (1980)
Provides regulation of the fishing industry, and is directly concerned with maintaining sustainable fish stocks and protecting the marine and freshwater environments.
National Lands Act (1992)
Provides legislation for protecting the 66' reserve along river edges, and allows GoB permission to Access minerals etc.

2.3.1 Legal and Policy Framework

The drivers for Swallow Caye Wildlife Sanctuary are **National Legislation Protecting Fauna, Flora, and National Heritage:**

The Wildlife Sanctuary is one of the five categories of protected areas under the National Parks Systems Act of 1981 and allows for research, education and tourism but no extractive activities. Swallow Caye Wildlife Sanctuary is an area of significant protection which allows no swimming with manatees, no fishing and reduces the speed of dangerous boat traffic in what is both a favourite manatee concentration area, as well as, a handy high traffic coastal hub, the country's busiest harbour.

Swallow Caye Wildlife Sanctuary was brought into existence by citizen action. This effort was led by Lionel "Chocolate" Heredia who envisioned the importance of healthy manatees in their natural environment as a heritage tourism attraction. Many others from a wide range of diverse stakeholder groups shared the vision and the commitment and demonstrated this by organizing as Friends of Swallow Caye (FOSC), for the sole purpose at the time, to establish the Sanctuary. FOSC later moved to co-management agreement with the Forest Department and continues with this responsibility to date.

Since colonial times Belize has had a policy of establishing protected areas in the forest sector for the management of natural resources. Since

independence in 1981, more protected areas have been declared including in the marine sector. For the past two decades, Belize has joined the international community in promoting sustainable development and implementing the Convention on Biological Diversity. Government policies include the protection of natural and cultural heritage through regulatory agencies including the Forest, Fisheries and Archaeology Departments.

In recent years, rationalization exercises have been conducted creating the national parks policy and system plan. Swallow Caye Wildlife Sanctuary falls under the jurisdiction of the Ministry of Fisheries and Forestry's Forest Department because the protected species of the sanctuary, *Trichechus manatus manatus*. is a mammal.

The National Parks System Act provides for the establishment of different categories of Protected Areas including Wildlife Sanctuaries. The Wildlife Protection Act dictates the protection of the manatees. Statutory Instrument #102 of 2002 establishes Swallow Caye Wildlife Sanctuary. The Forest Act speaks to the protection of mangrove forests.

As the only marine protected area in a 20 mile radius around the densely populated Belize City, its importance as physical protection, a nursery for seafood, alternative employment and its inspirational wilderness values to this urban area cannot be overstated. Similarly, SCWS is part of the Belize Barrier Reef System and provides protection to the reef from land based pollution and siltation.

The location of Swallow Caye Wildlife Sanctuary is significant to manatees in their search for warm waters, fresh air, fresh water, adequate food supplies and safe surroundings. For manatees enroute and resident in this area of the Caribbean, Swallow Caye Wildlife Sanctuary is exhibiting seagrass beds, mangrove forests and underwater tunnels in the roots, warm temperatures and abundant fresh water fed by the Belize River, Haulover Creek and the Sibun River. The control of traffic in the Sanctuary and visitation to the sanctuary added to the protected forest vegetation, al gives optimum opportunity for oxygenated healthy air that the manatees surface to breathe.

Many other species utilize the same resources and the product of these resources is evident in the presence of dolphins, turtles, birds and fish species including juveniles.

SCWS then contributes to management, to plans and programs in Fish Stock replenishment, Mangrove Protection, Sea grass Protection, Climate Change Mitigation, Species Protection for Biodiversity, Protected Areas Plan, and Economic Development plans providing an alternative livelihood in Heritage Tourism, Research and Heritage Management and to the Manatee Recovery Plan.

For the co-management of Swallow Caye Wildlife Sanctuary, a co-management agreement was signed between Friends of Swallow Caye and the Minister of Natural Resources. Lobbying is underway for the renewal of this co-management agreement with improved terms. Under this agreement, a ranger station was built inside the Sanctuary and is still operating. Subsequent to this, FOSC leased a portion of beach area to establish a FOSC/SCWS Office on Caye Caulker. This office and location is still operating.

A new Fisheries legislation to replace the Fisheries Act is introduced, the **AQUATIC LIVING RESOURCES BILL, 2011For**

AN ACT to promote long-term conservation, management, and sustainable use of the aquatic living resources of Belize; to provide for fishing and registration of foreign and local fishing vessels which desire to fish beyond Belize waters; to repeal the Fisheries Act, Chapter 210 of the Laws of Belize, Revised Edition 2000; to repeal the High Seas Fishing Act, Chapter 210:01 of the Substantive Laws of Belize, Revised Edition 2000-2003; and to provide for matters connected

therewith or incidental thereto. (WCS website viewed Sept. 3, 2012)
This new legislation at 2a and b calls for the precautionary approach to be applied widely to the conservation and management of fishery resources and for an ecosystem approach to be applied widely to conservation and management of aquatic resources.

The legislation empowers the Minister to close areas to fishing and to declare marine and inland reserves. The fisheries administrator prescribes criteria for Marine Scientific Research and approves applications to conduct same.

2.3.2 Land Tenure

Swallow Caye Wildlife Sanctuary is national lands except for a portion of Mapp's Caye. The entirety of Mapp's Caye is 325 acres, Drowned Cayes is 3,556 acres, Swallow Caye is 89 acres. Lease 1673 of 1986 for an area of 100 ft X 100 ft of northern Swallow Caye itself was transferred to Alligator Caye. Swallow Caye Wildlife Sanctuary is 8, 970 acres belonging to the Crown and includes land and surrounding waters. Source: Belize City Region Cayes Planning Guidelines: CZMAI 04/2003

2.3.3 Evaluation of Protected Area

Conservation Value
Swallow Caye Wildlife Sanctuary (SCWS) is an important part of the country's biodiversity protection specific to the vulnerable manatee, *Trichechus manatus* . (IUCN 2006) By extension SCWS also serves the function to protect other species such as turtles, crocodiles, dolphins, fish stocks and other species including cryptic flora and fauna that find symbiosis in a shared ecosystem. Research projects in the Belize City Cayes region attest to the presence of manatees and their predilection for this environment. Critical mangrove forests and sea grasses are also protected within the sanctuary and are a familiar landmark and protection for Belize City.

Swallow Caye Wildlife Sanctuary as part of the Belize City region cayes:

. . . is recognized for its physical, economic, scientific and aesthetic attributes.

Planning objectives for this region have included:

Safeguarding of the Cayes' mitigative function to minimize the effects of hurricanes and dangerous storms

The protection of the fishing resources and usuary rights of recreational and artisanal fishermen

The maintenance and promotion of recreational, tourism and conservation uses

The prevention of overdevelopment and speculation

The protection of the character of the cayes, their environment and wildlife

The safeguarding of the southern part of the region in its use as the harbor for the Belize City Port
CZMAI 2003

Several species of conservation concern also live within and utilize the habitats in the Sanctuary including the American crocodile and the white crowned pigeon. The area also provides important nursery habitats for various fish species including snappers and conch within the abundant seagrass beds in the marine protected area. Dr. L. Cho Ricketts 2006

The species checklist provided by the Rapid Ecological Assessment 2006 and continuing observations by FOSC rangers and researchers details the following significant species.

Distribution of degree of legal protection for Species of Concern within *Swallow Caye Wildlife Sanctuary*

Critically Endangered Hawksbill Turtle

Vulnerable West Indian Manatee
American Crocodile
Mutton Snapper
Roseate Spoonbill
White-Crowned Pigeon
Magnificent Frigate bird
Brown Pelican
Great Blue Heron
Double Breasted cormorant

Lower Risk /Near Threatened
Morelet's Crocodile
Southern Stingray

CITES Appendix I ***West Indian Manatee***

Table 3: **Species of concern found at SCWS** and appearing on suggested Belize Red Data List – an attempt to create a first national list of critical terrestrial and marine species. (Protected Areas System Assessment and Analysis: Critical Species; Meerman J. C. 2005)

Order	*Species*	English Name	IUCN class	Status in Belize	Justification
Birds	*Ajaia ajaja*	Roseate Spoonbill		VU	6
Birds	*Columba leucocephala*	White-Crowned Pigeon	NT	VU	4,7
Birds	*Fregata magnificens*	Magnificent Frigatebird		VU	6
Birds	*Ardea herodias*	Great Blue Heron		VU	4,10
Birds	*Phalacrocorax auritus*	Double-Crested Cormorant		VU	4,6,10
Birds	*Pelecanus occidentalis*	Brown Pelican		VU	6,10

Fishes	*Lutjanus analis*	Mutton Snapper	VU	VU	4,5,6

Reptiles	*Eretmochelys imbricata*	Hawksbill Turtle	CR	CR	4,5,6,9
Reptiles	*Crocodylus acutus*	American Crocodile		NT	4,9,10
Reptiles	*Crocodylus moreletii*	Morelet's Crocodile		CD	3,4,5,9,10

Mammals	*Trichechus manatus*	West Indian Manatee	VU	VU	4,9
Mammals	*Turiopsis truncatus*	Bottlenose Dolphin	VU	VU	9

Justification: 1. The Fisheries Department expressed that it is aware of present trends in the global populations of all Groupers. Measures have been taken to protect spawning sites of these fish in Belize and the Department is attempting to introduce measures that will allow it to sustainably manage this resource. For this reason the grouper all have been placed in the CD = Conservation Dependant category.
2. Endemic species 3. Small Range – Regional Endemic 4. Hunted – Fished 5. Economic importance
6. Colony breeder (restricted number of breeding colonies/locations) 7. Needs large range
8. Specialized ecological requirements 9. Charismatic species drawing national and international attention
10. Prosecuted as perceived pest 11. Genetically different from South American counterpart

Swallow Caye Wildlife Sanctuary now has sixteen years of enforcement presence and management. Collaborating with researchers, Coastal Zone Management Authority and Institute, the Forest Department and the private sector, many manatee protection initiatives have been undertaken. Regulations were introduced and are being enforced at SCWS, outreach activities are implemented from time to time and the site continues as a natural heritage tourism attraction.

In addition to the manatees, habitats on which they depend are also protected in the sanctuary: mangrove forests, seagrass beds and other flora and fauna. This is significant given the location of the sanctuary immediately outside of the heavily populated Belize City.

The focus is to protect manatees in their natural habitat. Therefore, with its combined mangrove forests on Mapp's and Swallow Caye, its extensive sea grass beds, and no take restriction, SCWS is contributing to biodiversity conservation. The manatee itself being protected internationally by CITES to which Belize is signatory means that SCWS is helping the country of Belize to fulfill a major commitment.

Ongoing video research at SCWS shows that dolphins and turtles also make SCWS a frequent stop and the mangrove roots are home to dense schools of fishes – juveniles and adults.

This Sanctuary also provides protection to the Belize Barrier Reef species as it is the first line of defense for pollution runoff and sediment load from the Belize River and Haulover Creek.

Belize City is afforded protection from storm waves and surges by the healthy stands of mangrove forests at Swallow Caye Wildlife Sanctuary. Forests absorb carbon dioxide and

produce oxygen. Oxygen is essential to living things.

Besides this, SCWS is a natural heritage area which provides necessary open landscape space critical to the health and well-being of the population of urban areas. Recognized as a heritage tourism attraction, SCWS provides tour operators and tour guides another managed marine attraction for their tour itineraries. For fishers, it is a nursery area from which fish stocks spread out to beyond the boundaries of the sanctuary.

The three major communities utilizing SCWS are Belize City, Caye Caulker and San Pedro. All three are sea faring communities dependent on seafood stocks, on tourism and navigation. Of the three, Belize City is the nearest to enjoy natural and economic benefits.

TABLE 4	**Summary of local and national environmental goods and services provided by Swallow Caye Wildlife Sanctuary**
Supporting services The services that are necessary for the production of all other ecosystem services including soil formation, photosynthesis, primary production, nutrient cycling and water cycling.	The mangrove forests and the seagrasses of the sanctuary play an important role in the cycling of nutrients The mangrove forests of Swallow Caye and Mapp's Caye area provide habitats necessary for different life stages of commercial and non-commercial species
Provisioning services The products obtained from ecosystems, including food, fibre, fuel, genetic resources, biochemicals, natural medicines, pharmaceuticals, ornamental resources and fresh water;	The mangrove roots of Swallow Caye and Mapp's Caye play an important role in protection of fish resources, especially as a nursery area for many commercial fish species Swallow Caye and Mapp's Caye mangroves provide nesting habitat for several colonies of nesting bird species, the majority being identified as species of national concern The geography of SCWS makes for convenient navigation to the busiest port.
Regulating services The benefits obtained from the regulation of ecosystem processes, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification, disease regulation, pest regulation, pollination, natural hazard regulation;	Regulation of water flow and flooding , providing a sink area for floodwaters Mangroves of the Drowned Cayes play an important role in the reduction of beach erosion The Cayes and shallow lagoon system provide protection against storm surges associated with hurricanes and tropical storms, ameliorating the strength of rising storm waters Mangrove inundation areas, seagrass beds and the shallow lagoon system provide filtration and settlement of sediment load from rivers and creeks, reducing sediment load of water reaching the coral reef
Cultural services The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences – thereby taking account of landscape values;	The area is an important resource for tourism and recreation The pristine natural scenic values are important for aesthetic appreciation by Belize City, Caye Caulker, San Pedro, and local and international visitors

Benefit to Local Communities

Mindful that Swallow Caye Wildlife Sanctuary was brought about by citizen action, led by Chocolate Heredia, and that since 2002 SCWS has enjoyed its share of support, it can be shown that benefits accrue to stakeholders and communities. Citizens at large are entitled by the protection on the terrestrial side of the coastline and rivers; and, again, on the marine side, everyone benefits from a healthy Belize Barrier Reef and attendant ecosystems and

habitats. Environmental Goods and Services translate into benefits as follows:

Table 5

Total Benefits

Use Benefits				**Non-use benefits**	
Direct Use Benefits	**Indirect Use Benefits**	**Option Benefits**		**Bequest Benefits**	**Existence Benefits**
-Recreation -Sustainable harvesting -Wildlife harvesting -Fuel wood -Grazing -Agriculture -Gene -Harvesting -Education -Research	-Ecosystem Services -Climate stability -Flood control -Groundwater recharge -Carbon sequestration -Habitat -Nutrient retention -Watershed protection -Natural services	-Future information -Future uses(direct and indirect)		-Use and non- use values for legacy	-Biodiversity -ritual or Spiritual values -Culture Heritage -Community values -Landscape

At SCWS the following are further enriched by the existence of the Sanctuary – tourism, fishing, education, navigation. Underwater videos show the presence of juvenile fish of many species replenishing the waters for fishers especially those that fish immediately outside Sanctuary boundaries to bring fresh fish to feed Belize City residents and for export (e.g. the Hughes family that inherited fishing rights to the seabed to set shades and work from immediately east of Belize City to outside the east, south and west boundaries of the Sanctuary). Tourism interests are more highly valued for the presence of the manatees at the Sanctuary and tour operators and guides find that advertising Manatee tours is a big attraction. Researchers have been able to sustain long term studies in the area and, even to the present, can recruit visiting international students to conduct studies at SCWS as part of course requirements.

The communities of Ambergris Caye, Belize City and Caye Caulker have sold tours to SCWS since its establishment and a loyal following still rely on sure sightings of manatees in crystalline waters at SCWS for their guests to experience. One immediately lucrative value of the area is real estate. A quick check of the internet shows that islands in close proximity to the Sanctuary are highly advertised and prized with ascribed per acre values of US $13,000 to US $703,000. The potential for benefits in all interest areas can be further maximized.

SCWS has shown itself to be a steady employer of at least 2 rangers and from time to time up to 5 staff and has generated the wherewithal from a combination of sources to cover

some basic expenses. A significant contribution comes through payment for ecosystem services as applied by PACT Fee and contributions from agencies such as OAK Foundation, UNDP-GEF, and COMPACT as grants to annual programs. These budgets act as economic stimulus packages to the communities to provide further employment for supplies and services including artwork, oil and fuel, office supplies, mechanics, office supplies and staff, other management specialties and utilities. SCWS also relies on an entrance fee paid by visitors which numbered in the year, 2011, 2,906 persons.

For local educational purposes, Friends of Swallow Caye from time to time involves schools in its outreach activities and enables the continuing research on manatees in the Drowned Cayes area. Since 2010, SCWS compiles in-house video research of the manatees and visitors frequenting the Sanctuary. Additionally, the rangers/research officers maintain daily logs of the general conditions observed at the Sanctuary. This information contributes to informing management, the National Manatee Recovery Plan and the National Manatee Working Group.

Major navigation channels are in the Sanctuary and have been utilized since early colonial times – including for international transshipment and for local transshipment. Swallow Caye was used as safe anchorage near Belize City and St. George's Caye the first colonial capital of the country. The sugar barges pulled by tugboats are a longstanding tradition and one area of the Drowned Cayes is a graveyard for old barges. Mariners have always used the placid waters for easy access to the cayes, reef and atolls and back to Belize City. Today, mariners are very likely to be in very speedy vessels.

Mangrove and Seagrass Buffer vegetation

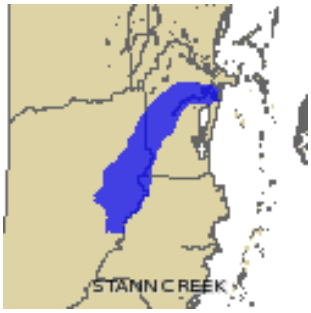
The seagrass beds and the mangrove forests afford physical protection to slow down wave and wind both onshore and offshore and further provide filtration from pollutants coming down river and out to sea thereby protecting the Belize Barrier Reef. Both types of vegetation create a lot of detritus maintaining an energy cycle and food web. This area is a specialty area being more salt some times than at other times when it accommodates to and filters pollutants and sediment loads from the tremendous outflow of flood waters from the Sibun, and Belize Olde Rivers and from Haulover Creek. Dynamic natural processes are maintained which protect humans and wild flora, fauna, physical features and other naturally occurring constructs.

In size, Swallow Caye Wildlife Sanctuary is close to nine thousand acres including Swallow and Mapp's cayes. The protection of the mangrove is important for the capture of carbon dioxide and the release of oxygen in photosynthesis. About mangroves, it has been found:

> Quote:
>
> Among other characteristics, they provide important ecological services in terms of shoreline protection and serve as nurseries for reef fish. A large proportion of the country's mangroves are also intimately inter-connected with the Belize Barrier Reef Complex, the largest coral reef system in the Americas, and the second largest in the world after Australia's Great Barrier Reef (UNESCO 1996). Cooper et al (2009) found that mangroves contribute some US $174-249 million per year to Belize's economy.
>
> CATHALAC 2010, Cherrington, Emil et al.

Swallow Caye Wildlife Sanctuary is a no take mangrove area remarkably intact in the midst of communities that utilize mangrove for building of fishing shades and for fuel. Communities also engage in mangrove removal for housing, road access, marine transport networks and other development purposes. The results of the CATHALAC mangrove studies 2010 indicate that Belize has lost on average 125 acres annually with the highest rate of loss being in the period since 2004. Just outside of the Sanctuary boundaries both Stake Bank and North Drowned Cayes have lost some acres of mangrove manatee habitat to development. A bit further east, St. George's and other cayes continue with plans for further developments. Some plans available on the internet can be classed as huge developments with possible major impacts. (e.g. www.treasurecovebelize.com, www.oceanviewrealty.com,

Map 4 Sibun River Watershed



Map 5 Belize River Watershed

Connectivity

Swallow Caye Wildlife Sanctuary provides connectivity for maintaining biodiversity as follows:

- Direct aquatic connectivity with the Belize Barrier Reef and Drowned Cayes;
- Direct aquatic connectivity of Belize Barrier Reef and the rivers of the Belize District;
- Direct air quality connectivity with prevailing winds from land or from sea;
- Direct connectivity SCWS with the brackish and fresh waters of the rivers;
- Mangrove deforestation of the greater Belize City makes this area critical to protect biodiversity dependent on mangroves;
- Direct connectivity of the seabed from open ocean to the tierra firme;

2.3.4 Socio-Economic Context

As per the 2010 Population and Household Census, the population of Belize is growing showing a shift to rural areas and accommodating an ever increasing influx of immigrants from neighbouring republics. This has resulted in the Belizean ethnicities such as the Creole becoming a much smaller percentage. Belize has experienced economic setbacks resulting

from the international downturn in global economies with a fall in tourism arrivals and losses in preferential tariffs for some of its other traditional exports. The income of its biggest export, crude petroleum, also fluctuates depending on global conditions.

It is not surprising that all the above have been a strain on resources and that unemployment is shown by this census to be at 24% and to learn in later studies in 2012 that a majority of the employees are of low education levels.

A specter looming on the country is the repayment of the "superbond" and the fact that this has generated the presentation of a most stringent budget for the country and the position of the Government that a default in payment is likely or at the very least, a restructuring of the superbond is imperative in 2012. Serious crime is on the increase and youth and gang truce programs are being eliminated in the city.

The population center in which the Sanctuary is located is the Belize District with a total population of 87,523 inhabitants as reported by the Statistical Institute of Belize in its 2010 Population and Housing Census published May 3rd, 2011.

A closer look at this census shows the following for the major stakeholder communities of Swallow Caye Wildlife Sanctuary which are contained within the Belize District.

Table 5 Population of communities adjacent to the protected area

Labour Force Total: 42,443

	Total	Employed	Unemployed	%Unemployed
Males	23,390	18,989	4,401	18.8%
Females	19,053	13,852	5,201	27.3%

Population of Urban Centers:

Belize City: 53,532 = males 25,886 females 27,646

San Pedro: 11,510 = males 5,947 females 5,563

Population of Rural Center:

Caye Caulker: 1,684 = males 852 females 832 Source 2010 Population and Household Census

The three main communities interacting with Swallow Caye Wildlife Sanctuary are linked and dependent on the Belize Barrier Reef for economic survival. Therefore, the naturally

protected Belize City Harbour where SCWS is located is a key lifeline to several major industries. Belize City is the main arrival point to the country for air and ocean shipping and for visitors. Three quarters of a million cruise visitors arrive at this port and about a quarter million overnight visitors land at the P. S. W. Goldson International airport. Of these arrivals, a significant number utilize water taxis to San Pedro, Caye Caulker, St. George's Caye, Gallows Point, Long Caye, Spanish Lookout Caye and other cayes and marine attractions. In 2008 GDP growth was 2,377.7 billion Bz dollars. There has been growth over the period 2001 to 2008 with annual fluctuations with a high of 9.3% in 2003 and negative growth compared to 2003 in the ensuing years. Source SIB as quoted in Belize Environment Outlook GEO Belize 2010.

Fishers of the communities have a long tradition making a livelihood from finfish, lobster, conch, and shrimp. The Fisheries Department reports 2,759 fishers registered in 2009 a 29% increase over the period from 1999. Belize City has the main processing plants for the two cooperatives, Northern Fisherman and National.

Sportsfishers practice catch and release fishing for permitted species including in the shallows at SCWS.

Tour operators and passengers traverse the SCWS area on SCUBA, sailing, snorkeling and sportfishing trips.

Sugar barges and tugs navigate through the channel on their route to and from Tower Hill to their Belize City storage area.

According to Belize Tourism Board statistics, together, the three destinations, Ambergris Caye, Belize District, Caye Caulker have for the year 2008, a total of 241 of the country's 611 hotels and 124 of the 222 tour operators.

The arrival figures for overnight visitors that are the visitor base for SCWS up to 2011 had not yet reached the 2007 pre-crisis levels but had improved in 2011 to 250,263.

TABLE 6 BTB Tourism Estimates

Year	Overnight Arrivals	Cruise Arrivals
2008	245,007	597,370
2009	232,249	705,219
2010	241,919	764,628
2011	250,263	Source BTB Tourism Estimates 2011

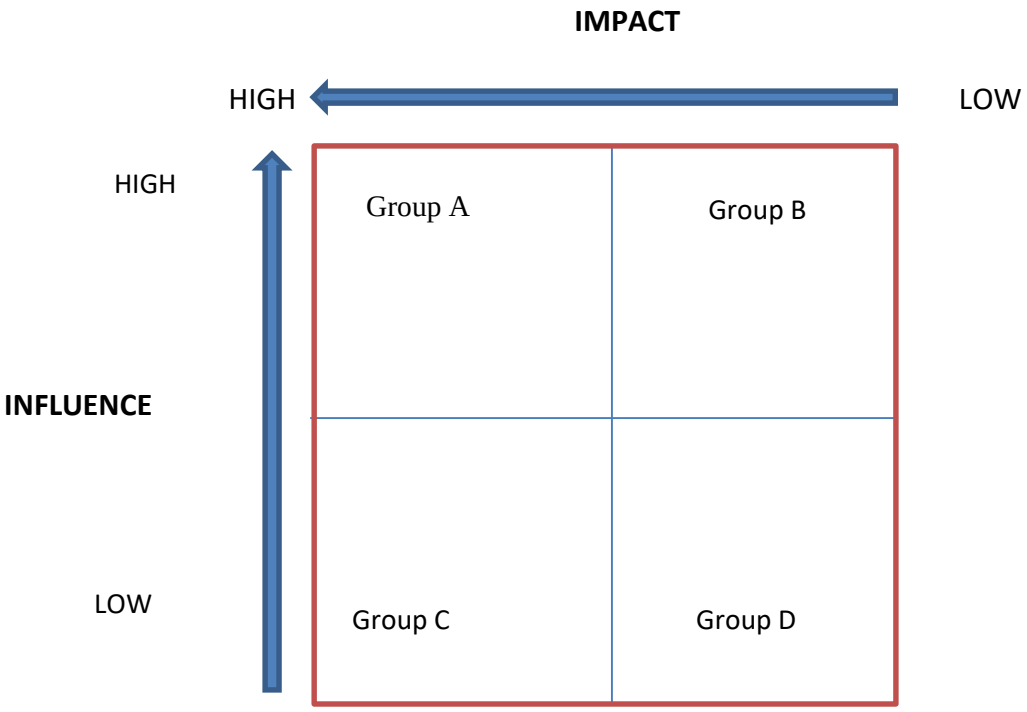
Belize Reef: This unique chain of reef islands will be renowned internationally for its world heritage status and will be regarded by visitors as a pristine and well-preserved destination. It will cater mainly to day visitors and will have second order niche markets hosting exclusive sun & beach low density resorts and nautical tourism facilities.
Source: draft Belize tourism sustainable development plan 2030

All plans are indicating that the Belize Barrier Reef will continue to be a lynch pin of the Belize tourism industry on which Government of Belize and people will hitch their economic hopes for the foreseeable future. Additionally, for tourism, cultural tourism based on people and heritage is a topmost priority in the 2030 tourism plan which can mean that the need for a place like SCWS will be ever more critical. SCWS can do its part to contribute to livelihoods and alleviate poverty.

TABLE 7 Stakeholder Communities of Swallow Caye Wildlife Sanctuary

Community	Location distance	Population	Population Components	Comments
Ambergris Caye	About 30 miles north of SCWS	11,510	Multi-cultural	Primary tourism center Numerous tour guides and fishers
Belize City	3 miles west of SCWS	53,532	Multi-cultural	Nearest community, Main population center, main port, central processing plants for fishing cooperatives; main fish markets, various tour guides and tour operators;
Caye Caulker	About 21 miles north of SCWS	1,684	Multi-cultural	Big for tourism and fishing Numerous tour guides and tour operators

Figure 1 Matrix for Prioritizing Stakeholder by Influence and Impact



Source: From CBD PA management guidelines www/cbd.int/protected/e-learning
Matrix applied in selecting final list of interviewees and participants for consultations reference Swallow Caye Wildlife Sanctuary

TABLE 8 Stakeholder Analysis for Swallow Caye Wildlife Sanctuary (+ positive effect; - negative effect)

Stakeholder	Influence or Impact of Sanctuary on Stakeholder		Influence or Impact of Stakeholder on Sanctuary	
Belize City	Benefit from protection of biodiversity including fish, manatee, and etc; Benefit of natural open space for the urban population; Benefit of having Swallow Caye Wildlife Sanctuary as a natural heritage tourism attraction; Benefit of alternative livelihoods for income generation; Stakeholders not allowed to take flora and fauna including commercial species; Slow zone area for navigation; Benefit of spillover of fish stocks;	+ + + + - - +	Huge market access for visitation to Swallow Caye Wildlife Market Huge tourism labour force for specialized manatee tour guiding, research, etc; A conservation oriented public may be supportive of the sanctuary Huge student population to assist with the sanctuary; As commercial capital, business sponsors available to assist the Sanctuary Busy navigation activities boating dangerous to manatee; Urban development may cause habitat loss; Urban development may cause pollution and contamination Urban fishers may raid the Sanctuary	+ + + + + - - - -
Cayes	Benefit from protection of biodiversity including fish, manatee and etc; Benefit of having Swallow Caye Wildlife Sanctuary as a natural heritage tourism attraction; Benefit of income generation	+ + +	Promote visitation to the Sanctuary Promote local awareness of manatees Generate income for the Sanctuary Transiting through the Sanctuary may damage manatees or alter their behaviour;	+ + + -

Local and National, Tour Operators	Benefit of natural heritage attraction; Benefit of income generation	+ +	Promote SCWS in tour packages; Promote compliance – (educate, enforce, steward) with SCWS management; Level of compliance varies	+ + -
International Tour Operators	Benefit of natural heritage attraction	+	Promote SCWS;	+
Tour Guides	Benefit from natural heritage tourism attraction Benefit from income generation Benefit from educational material	+ + +	Promote visitation to the Sanctuary Promote compliance with SCWS management (educate, enforce, steward) Level of compliance varies Tour activities may endanger manatees Tour activities may alter manatee behaviour	+ + - - -
Coastal Developers	Benefit from protection of biodiversity including fish, manatee, etc Benefit from natural heritage tourism attraction Protection of natural heritage resources may be restrictive to developers especially in buffer areas;	+ + -	Development may be inappropriate; Development may destroy critical habitats and ecosystems; Developers may bring beneficial innovations and new markets	- - +
Tourism Interests	Benefit from protection of biodiversity including fish, manatee, etc Benefit from natural heritage tourism attraction	+ +	Sanctuary interests can be protected through proactive measures; Promote the Sanctuary May result in unsustainable visitation levels; May result in habitat destruction	+ + - -
Fisheries Interests	Benefit from protection of biodiversity including fish, manatee, etc	+	Can assist with compliance with Sanctuary regulations May overfish from immediately	+ -

			outside Sanctuary boundaries	
Mariners	Benefit from protection of biodiversity including fish, manatee, etc Benefit from central location and physical features including navigation channels, etc	+ +	Can assist with compliance with Sanctuary regulations Watercraft may directly and indirectly harm or kill manatees; Can outfit boats with protective features to protect manatees	+ - +
Local Schools and Universities, Academia International	Benefit from protection of biodiversity including fish, manatee, etc Benefit from living laboratory	+ +	Can promote SCWS Can seek more knowledge about SCWS Can contribute to income generation	+ + +
Belize & International Media	Benefit from protection of biodiversity including fish, manatee, etc Benefit of new information on internationally critical species Benefit of goodwill for being associated with worthy cause	+ + +	Inform the public Support compliance by investigative reporting and exposes Garner more support for the programs of the sanctuary	+ + +
General Belize Public	Benefit of environmental goods and services Benefit of maintenance of resource stocks including fish New knowledge and education Benefit of culture and aesthetics Benefit of income generation in spinoff opportunities	+ + + + +	Can generate goodwill for the Sanctuary Can comply with regulations Can participate in management Can assist with sponsorship and income generation Can be unlimited source of solutions Can over run the Sanctuary to unsustainability Can be source of pollute Can be source of physical destruction Can participate with education	+ + + + + + - - +
Visitors- Belizeans	Benefit from protection of	+		

	biodiversity including fish, manatee, etc Benefit of Swallow Caye Wildlife Sanctuary as a natural heritage tourism attraction	 + +		
Visitors – international tourists	Benefit from protection of biodiversity including fish, manatee, etc Benefit of Swallow Caye Wildlife Sanctuary as a natural heritage tourism attraction	+ +	Contribute to income generation Word of mouth and other advertising Presence deters other intruders Tour boats can injure wildlife Tours can alter wildlife behaviour	+ + + - -
Visitors - researchers	Benefit from protection of biodiversity including fish, manatee, etc	+	Financial support Introduce scientific methods and apply technologies; Generate new findings about the biodiversity and other aspects of the PA to assist management; Add to the body of knowledge Assist in skills training of field personnel Assist in field work such as security and monitoring May be intrusive or harassing to manatees	+ + + + + + -
Government of Belize/local governments	Benefit from protection of biodiversity including fish, manatee, etc Benefit of fulfilling commitments for regional and international conventions; Benefit of contributing to	+ + +	Prioritize protective legislation' Prioritize budget allocations Prioritize benefits in development planning Can generate goodwill Institute PA system management	+ + + +

	development plans;			
Politicians	Benefit from protection of biodiversity including fish, manatee, etc Benefit of goodwill from corporate social responsibility supporting nationally and internationally recognized causes	+ +	Can influence beneficial support networks; Can highlight and glamorize a cause if needed;	+ +
FOSC Members	Benefit from protection of biodiversity; Benefit of goodwill for supporting a worthy cause	+ +	Pay dues for manatee conservation at SCWS; Members spread goodwill Membership benefits have a cost Members may get dissatisfied	+ + - -

2.4 Physical Environment of Management Area

2.4.1 Climate

General Climate

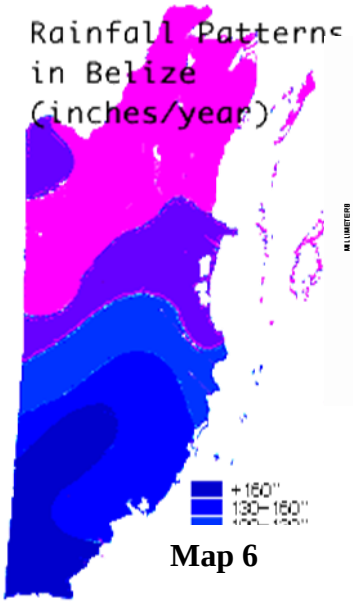
Situated between latitude 15º45' and 18º30'N, Longitude 87º30' and 89º15'
Source Belize Hydromet 2012

Belize has a typically moist tropical climate. There is little seasonal variation in temperature, but distinct 'wet' (May to October) and 'dry' (November to April) seasons. In the wet season, mean monthly rainfall can be 150 to 400mm, with highest rainfall totals in the south. In the dry season, most of the country receives less than 100mm of rainfall per month. The coastline of Belize is also vulnerable to Atlantic tropical cyclones and hurricanes from July through to October. Heavy rainfalls accompanying these storms contribute a significant fraction towards the high wet-season rainfall totals. Mean annual temperatures are 23-27°C, varying little with season through the year. The south-west, interior region of the country tends to be a little cooler than regions in closer proximity to the coast.
Inter-annual variations in climate in southern Central America are caused by the El Niño Southern Oscillation (ENSO). El Niño events bring relatively warm and dry conditions between June and August, and decreased frequencies of Atlantic tropical cyclones, whilst La Niña episodes bring colder and wetter conditions at that time of year, and more frequent than average tropical cyclones. Source: UNDP Climate Change Country Profile BELIZE 2010

Annual Rainfall

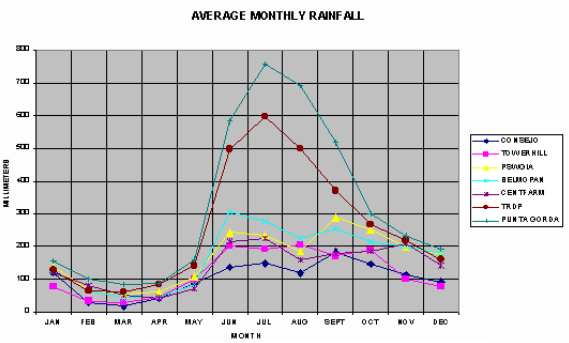
Swallow Caye Wildlife Sanctuary experiences similar rainfall as the isopleth from the central western through the northern coastal area of Belize. This amount is characteristic of north of the Belize City environs. There is a rainy and dry season with a gradual transition from rainy to dry and a more abrupt change from dry to rainy season. The Belize District averages about 171 rainy days. See rainfall map showing Belize City with 70 to 100 inches and the immediate offshore cayes with less than 70 inches.

The rainy season is generally June to December which includes the hurricane season June to November. Storms of the hurricane season can produce significant rainfall. In some of these events, the flood waters reach Swallow Caye Wildlife Sanctuary and result in salinity fluctuations. At these times, the demarcation of flood waters at sea is clearly visible and, the visibility at SCWS is reduced by the presence of fresh water and sediment load. Readily detected also is strand line pollution floating out from the land.



Map 6

Figure 2 For the country of Belize



Source Belize Meteorological Service

www.belizenet.com/weather/climate.html

Annual Temperature

Swallow Caye Wildlife Sanctuary enjoys the tropical to sub-tropical climate enjoyed by the country of Belize. Year round warm water temperatures are ideal for manatees as they do not tolerate below 20º C (68º F) and it is this criteria that limits their range with Florida marking the northernmost point.

Temperatures for the coast nearest SCWS are recorded at the Philip Goldson Int'l Airport and fluctuate throughout the year with an annual average of 22.6ºC 72.6º F minimum and 86.2º F 30.1º C. maximum. For the country, the average minimum daily recorded is 19.7 C in January and the average maximum daily is 31.8 C in May. (Source National Meteorological Service) This weather station is at 5 meters elevation and SCWS is at 0 elevation.

In the manatee resting holes in the Drowned Cayes area, the mean temperature reported from a 2 year study is:

Daytime surface:	28.7ºC min	35.6ºC max	
Daytime bottom:	28.6ºC min	32.4ºC max	at 5.7 meters below (see Table 9)

Self-Sullivan in 2008 reports sea surface temperatures in the Drowned Cayes ranging: 25ºC to 31.6ºC with a mean of 28.6º C.

TABLE 9 Drowned Cayes descriptive statistics of environmental characteristics from
Descriptive statistics of environmental characteristics of areas without and with resting holes; means are reported with ± 1 SE.Source Bacchus et all

	Non-resting hole sites				Resting hole sites				
	N	Min	Max	Mean ± SE	N	Min	Max	Mean ± SE	Significance
Depth (m)	20	1.4	3.3	2.0 ± 0.12	12	2.0	5.2	3.5 ± 0.30	<0.001
Sea surface temperature (°C)	20	30.1	33.8	31.1 ± 0.18	12	28.7	35.6	31.4 ± 0.50	NS
Surface salinity (ppt)	19	34.0	35.4	34.5 ± 0.08	12	29.7	35.5	34.3 ± 0.46	NS
Surface water velocity (cm/s)	20	0.01	17.1	4.2 ± 1.14	10	0.0	5.2	0.9 ± 0.51	0.008
Depth of middle sample (m)	11	1.0	1.7	1.2 ± 0.07	12	1.0	2.7	1.7 ± 0.15	NS
Middle sample sea temperature (°C)	11	30.2	31.7	30.9 ± 0.13	12	28.6	32.4	30.7 ± 0.30	NS
Middle sample salinity (ppt)	11	33.8	35.0	34.4 ± 0.10	12	33.7	35.5	34.8 ± 0.18	NS
Middle sample water velocity (cm/s)	11	0.0	24.7	5.02 ± 2.33	9	0.0	0.6	0.3 ± 0.08	NS
Depth of bottom sample (m)	20	1.3	3.4	2.0 ± 0.12	12	1.9	5.7	3.5 ± 0.32	NS
Bottom sample sea temperature (°C)	20	30.0	32.8	30.8 ± 0.13	12	28.6	32.4	30.5 ± 0.31	NS
Bottom sample salinity (ppt)	20	33.8	35.2	34.5 ± 0.07	12	33.8	36.4	35.0 ± 0.24	NS
Bottom water velocity (cm/s)	20	0.01	10.5	2.0 ± 0.71	10	0.0	1.2	0.3 ± 0.12	NS

Analysis shows that Belize is experiencing a warming trend with temperature increase of 0.45ºC since 1960 an average rate of 0.10ºC per decade. Hot days and hot nights are increasing as follows:
Average number of hot days per year in Belize increased by 67 (18.3% of days) between 1960 and 2003;
Hot nights between 1960 and 2003 increased by 37 (10.2% of nights)
During the same period cold days decreased by 21 (5.7% of days) and cold nights decreased by 23 (2.3 per month 7.5% of nights) from 1960 to 2003.
Source UNDP Climate Change country profile Belize

Humidity

For a five year period, the PSW G Int'l Airport in Ladyville reports relative humidity for the afternoons with the lowest 68% in March and the highest 77% in November. The high humidity can be tempered by cooling sea breezes, known as prevailing easterlies.

Tropical Storm Events

The Belize City Cayes, including Swallow Caye, comprise one of the offshore protective layers of Belize City from incoming storm events. In line with Belize City from east to west are Turneffe Atoll, the Belize Barrier Reef, the Belize City cayes range which includes SCWS. Conversely, the Belize City Cayes offer protection to portions of the Belize Barrier Reef from land based storm events.

Tropical storm activity is expected in the area, as well as, weather of lesser intensity and storms of any intensity on the Saffir-Simpson scale. The number of storms varies, but they are a natural threat.

The most recent hurricane experienced at SCWS is Richard in 2010 which uprooted one mangrove bush, defoliated a number of trees and damaged the Ranger Station. September is the month of highest hurricane frequency for Belize, followed by October.

Also experienced are northers, stationary northers, lows, tropical waves, and other systems.

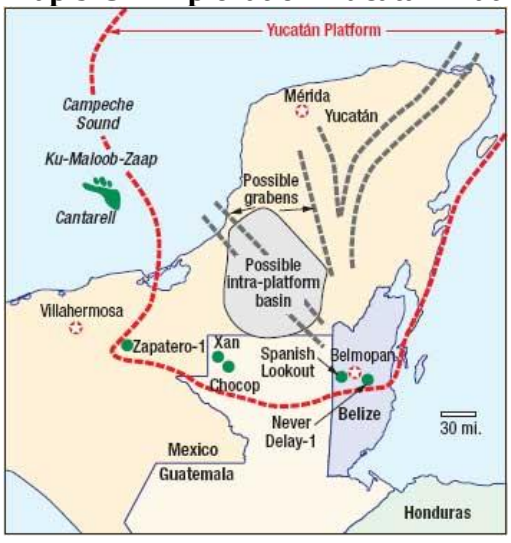
2.4.2 Geology

Northern Belize is part of the Yucatan Platform which it is theorized was land in the Jurassic period 195 million years ago. From then to the Cretaceous period 145.5 million years ago, it gradually became inundated. From the Cretaceous to the Pleistocene period which started 2.5 million years ago, limestone depositions occurred all over. Conditions for limestone deposition continued until recent time to the Late Pleistocene which ended 8,000 to 12,000 years ago. (Source Geologic time from Wikipedia) Ancient reefs have existed upon which the current reef is growing. Islands have been forming by the trapping of carbonate, sand and mud. Buried thousands of feet below the surface of the land, oil and gas reservoirs occur in limestone and dolomites. Commercial findings in and near the Yucatan Platform are shown on Map 9 below.

Map 8 Yucatan Platform

Source Maps.IHS.com oil and gas YP

Map 9 Oil Exploration Yucatan Platform

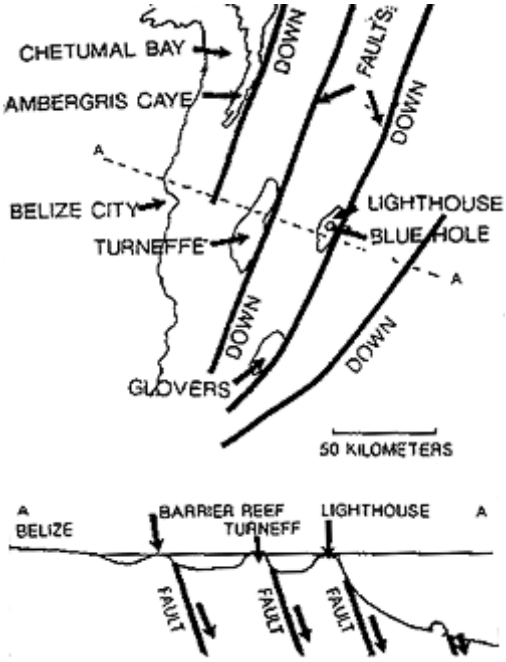


Source Worldoil.com/May-2008-Whats-new-in-exploration.html

It is theorized that manatees first appeared about 60 million years ago as land mammals and gradually adapted to fully aquatic mammals because of competition for food on land.

Northern Belize is flat low lying land of extensive limestone formations. Northern Belize rests on the Yucatan Platform, a shelf comprised of chalk, marl and other sedimentary layers, typical of dolomite limestones giving rise to karst topography. (Source Department of the Environment BZ)

Offshore faults affect the seabed including the formation of the atolls, the depth of the Blue Hole and the orientation of the Belize Barrier Reef itself.



This illustration consists of a map and cross section illustrating the large faults off the coast of Belize that control the location of the large off shore atolls and to some degree the barrier reef. These faults are lowering blocks of the earth's crust into the sea over geologic time. The atolls are areas where limestone has been able to build up at a rate equal to, or greater than, the subsidence caused by movement on the faults. The bottom of the Blue Hole at Lighthouse Reef is 85 feet deeper than the last low sea level stand. This is because the fault has lowered the block the atoll is on. This blue hole is so huge, that it probably formed over several cycles of sea level changes.

Source Field Guide to Ambergris Caye R. L. Woods et al

Seismic Hazard

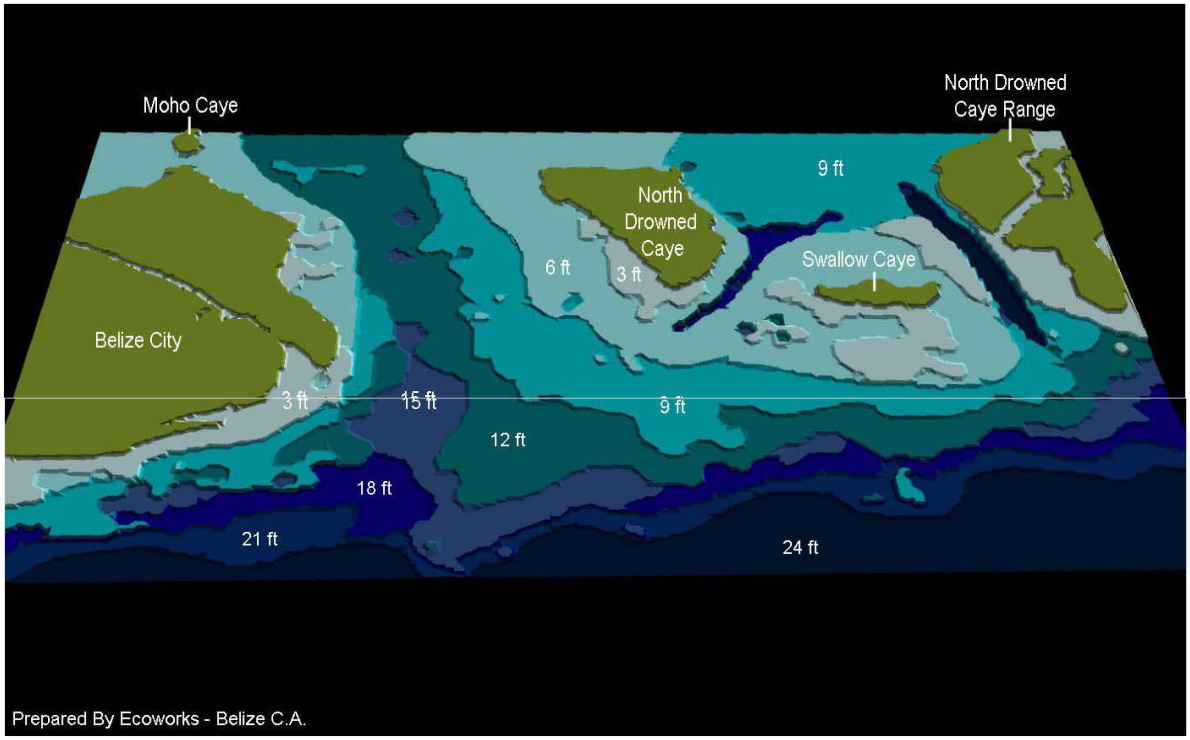
Movement of the North American and Caribbean Plates which run from the Caribbean Sea and south of the Belize/Guatemala southern border has resulted in local tectonic activity for example, in May of 2009 ranging from magnitude 4.0 to 6.5 in some parts of the country. The DoE estimates that the central area of the country including Belize City environs can possibly experience magnitude 5. (Source EIA Green Tropics)

2.4.3 Bathymetry

Swallow Caye Wildlife Sanctuary's waters have depths ranging from less than 1 meter near the mangrove islands up to 10 meters near the outer channels.

Mangrove islands – up to 1 meter;
Mangrove channels – up to 3 meters;
Outer Channels at boundaries of Sanctuary - up to 10 meters;
Moving in from Outer Channels - depths ranging from 3 meters to 7 meters;
Manatee resting holes - 1.9 to 5.7 meters; Source L. Cho-Ricketts et al; Bacchus et al;

Bathymetric characteristics of region being 3-D interpretation of 1945 British Admiralty navigation chart published by US war department map exaggerating vertical relief of sea floor water/sediment interface



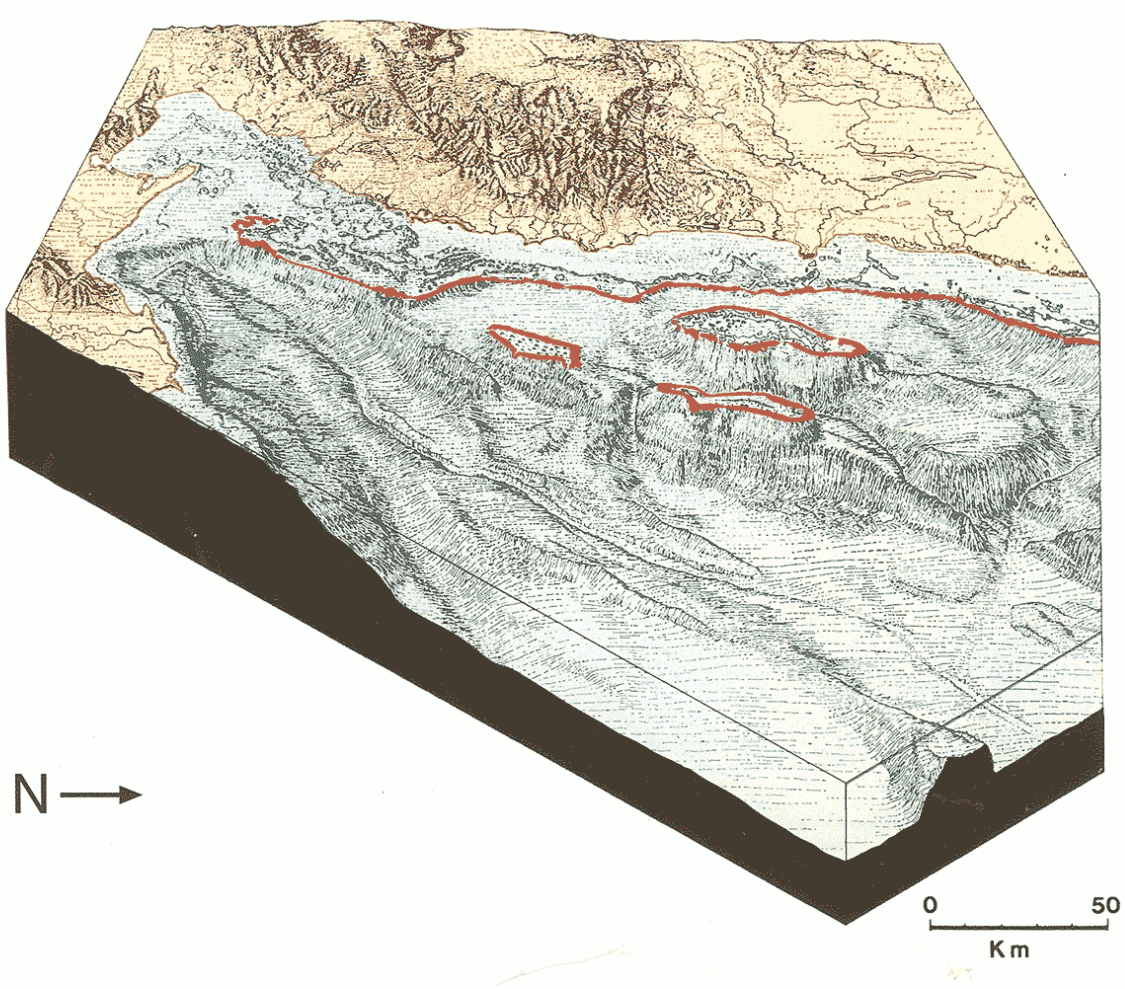
Source Addenda to Ocean View Grand EIA (copied in top and bottom half)

Within the inner reef lagoon, SCWS rests on the submerged eastward shelf from Belize City. Sediments are fine silt deposits trapped by seagrasses and mangrove roots. One Halocene marine facies map shows the presence of transitional marl comprised from pteropods. BERDS reports the area of unknown geologic age and with acidic Tintal soils.

Map 8 Cross-section Diagram sea floor

Block diagram showing bathymetric relief surrounding the reef-rimmed atolls and shelf off Belize

Source Ambergriscaye.com /maps/art/53.gif



Geology from half mile west of Swallow Caye

1. Provide a conceptual cross-section of the pre-existing soil horizons on the island, down to bedrock, based on field studies conducted to date.

There are 3 distinct horizons of unconsolidated material horizons that overlie bedrock or stiff clay beneath North Drowned Caye, as evidenced from 3 onsite percolation assays, exploratory dredging at 1 location, 4 marine cores conducted on the four sides of the Caye, 5 piling drivings around the Caye, and 10 marine cores conducted during the Marine Parade Boulevard Construction (i.e. 22 observation sites; see Illustration 12). These include:

- 1.5 – 2.5 meters of peaty silt, over
- 1.0 – 2.5 meters of sandy silt & shell fragments, over
- 3.5 – 5.0 meters of silty, fat clay, over
- Bedrock at 4 – 10 meters depth.

ILLUSTRATION 12:

Practical Cross-Section Of Unconsolidated Materials On North Drowned Caye

Source Grimshaw, Tom 2007

Map 9 Halocene Marine Facies

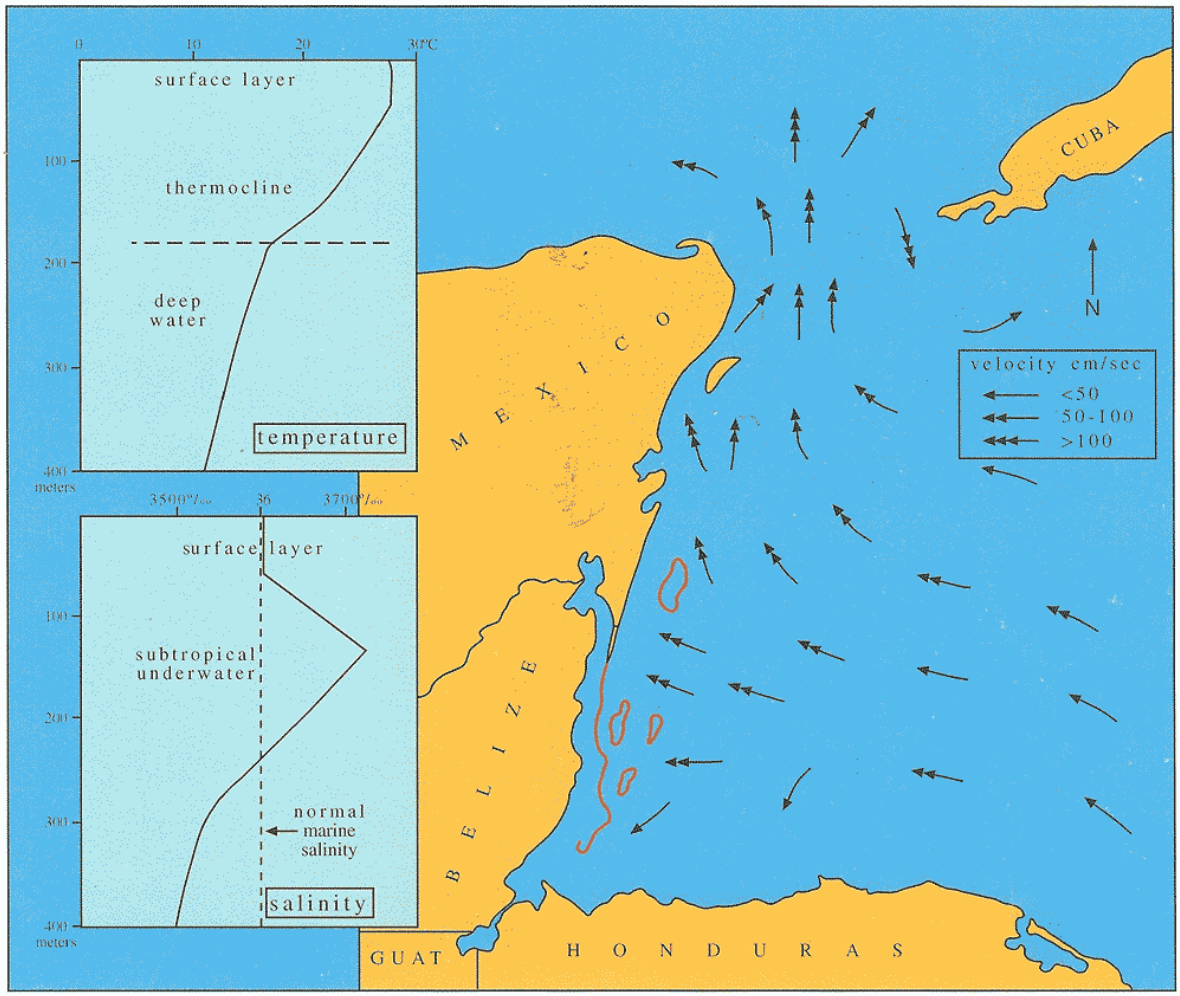
2.4.4 Tides and Water Movement

Tides in the country of Belize range 0.5 meters to a possible 0.8 meters in accordance with lunar gravity. According to Cho-Rickets, wave energy develops from the deep seas and is dissipated on the barrier reef by the prevailing easterlies and south easterlies. In this manner richly oxygenated water is brought in. The interplay of northerlies increases the suspension of calcerous sediments. For the time when the sun's gravitational pull is evident, higher and lower than usual high and low tides are experienced.

MAP 10 Surface Wind Flor

Main surface – water flow across the Belize shelf

Source ambergriscaye.com /maps/art/55.gif



2.4.5 Water Parameters

Water parameters at Swallow Caye Wildlife Sanctuary have been reported within normal ranges.

The physical data collected from the various sites were indicative of a normal seagrass ecosystem and healthy marine environment. L.C. Ricketts et al 2006

Findings from the 2006 Rapid Ecological Assessment:

Temperature	26.5 C	Minimum
Temperature	29.6 C	Maximum
Salinity	35 to 36 psu	Normal for seawater
Turbidity	0 to 2.5 ntu	Waters of SCWS clear and free of suspended particles or sediments
Mean pH	7.34	Normal
Dissolved Oxygen	>5mg/l	High level of dissolved oxygen within normal range for healthy marine ecosystems

Manatee resting holes day and night scans years 2005 and 2006 Bacchus et al:

2.5. Biodiversity of Management Area

2.5.1 Ecosystems

TABLE	Ecosystems of Swallow Caye Wildlife Sanctuary

Mangrove forests are salt tolerant trees and shrubs occurring only in the tidal range of the tropical and subtropical zones. The trees have evergreen sclerophyllous broad-leaves with either stilt roots or pneumatophores. Mangroves thrive in nutrient rich silty deposits. Ecosystem services provided by mangroves include shoreline protection from erosion and storm surge, filtration of sediments and excess nutrients, acts as carbon dioxide sink, and act as a buffer from most human activities along the coast. Total loss of mangroves would be devastating in effect to ecosystems and to the economy of the country.

LEGEND	UNESCO Classification Source UNESCO Vegetation Classification System
47	Caribbean Mangrove Forest: dwarf mangrove scrub
49	Caribbean Mangrove Forest: mixed scrub
52	Caribbean Mangrove Forest: basin mangrove

Belize ecosystems map is showing seagrass and mangrove ecosystems occurring at SCWS. BERDS further explains that SCWS ecosystems are classified as UNESCO Code: IA5a(1)(c) and with all three species of mangrove occurring : Avicennia germinans, Laguncularia racemosa, and Rhizophora mangle. Other frequent species in this category include Acoelorraphe wrightii, Acrostichum aureum, Conocarpus erectus, Eragrostis prolifera, Myrica cerifera and Rhabdadenia biflora.

Basic ecotypes

Mangrove littoral forest
Seagrass

Specific ecotypes description

Narrow fringe of scrub to high mangrove with a height of 2 to 14 meters located along beaches and river mouths;

Water regime

Develops in conditions of permanent inundation

Frequent plant species

Rhizophora mangle is characteristically dominant in these communities.

The two ecosystems occurring at SCWS, Mangroves and Aquatic, in combination with the coral reef are considered to be three of the most productive ecosystems globally. They are critical in the energy cycle and food web. They are important as primary producers

absorbing carbon dioxide and producing oxygen through photosynthesis. Both contribute to filtration and entrapment of sediments and produce biomass. By their existence they shelter species and are part of the food chain. Mangroves are protected in Belize as they form protection for the coastline but are the first to be destroyed by coastal developers. Having healthy mangrove forests at SCWS is of critical importance to Belize City. The shelter and sustenance offered to manatees by the mangrove forests and seagrasses is ideal.

Seagrasses found at SCWS are underwater flowering plants called turtle, manatee and shoal. They stabilize coastal sediments and capture and recycle nutrients. Seagrass acts to reduce wave energy. Seagrasses act as nurseries and provide food and shelter for fish. In Belize, 50% of the commercial species, Lobster, and 40% of Conch production is from seagrass beds. This is an annual value of about $10 million Bz. Seagrass beds provide food for manatees, turtles and marine birds. Seagrass health is dependent on light and water quality and can be affected by salinity and sedimentation.

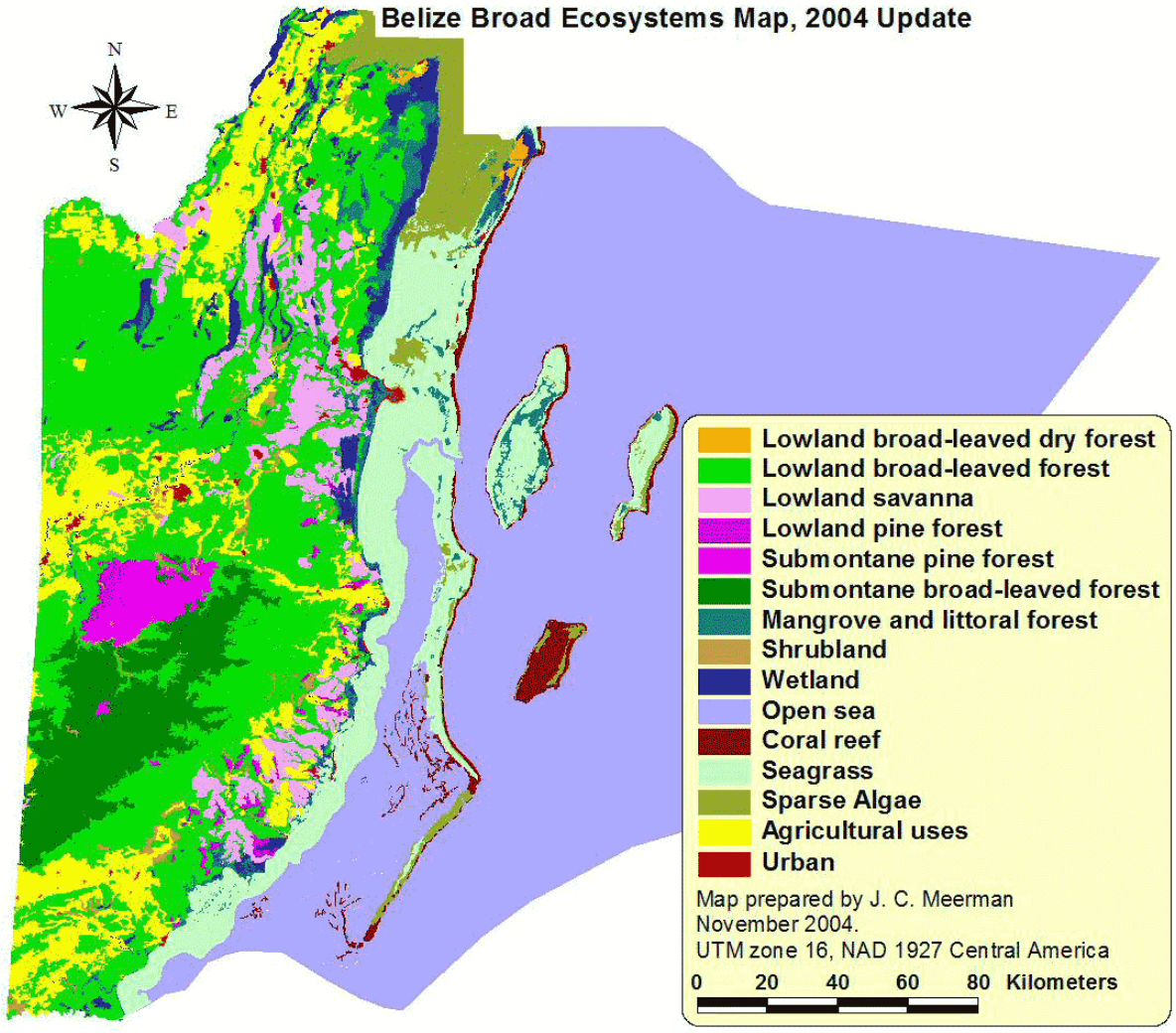
The REA finds healthy seagrass cover throughout the sanctuary, medium to dense, but with evidence of epiphytes and one area with consistently shorter blade length. The presence of epiphytes, on the grass blade, the report further explains indicates disturbances and the shorter blade length may have developed from sedimentation cover in a shallow area. This would need further monitoring. In 2011 and 2012, underwater video photography of the seabed and observations by the rangers show similar medium to dense coverage with continuous daily grazing by manatees in several areas of the sanctuary.

Mangrove canopy and root systems support a wide range of other creatures as do the extensive sea grass beds at the Sanctuary.

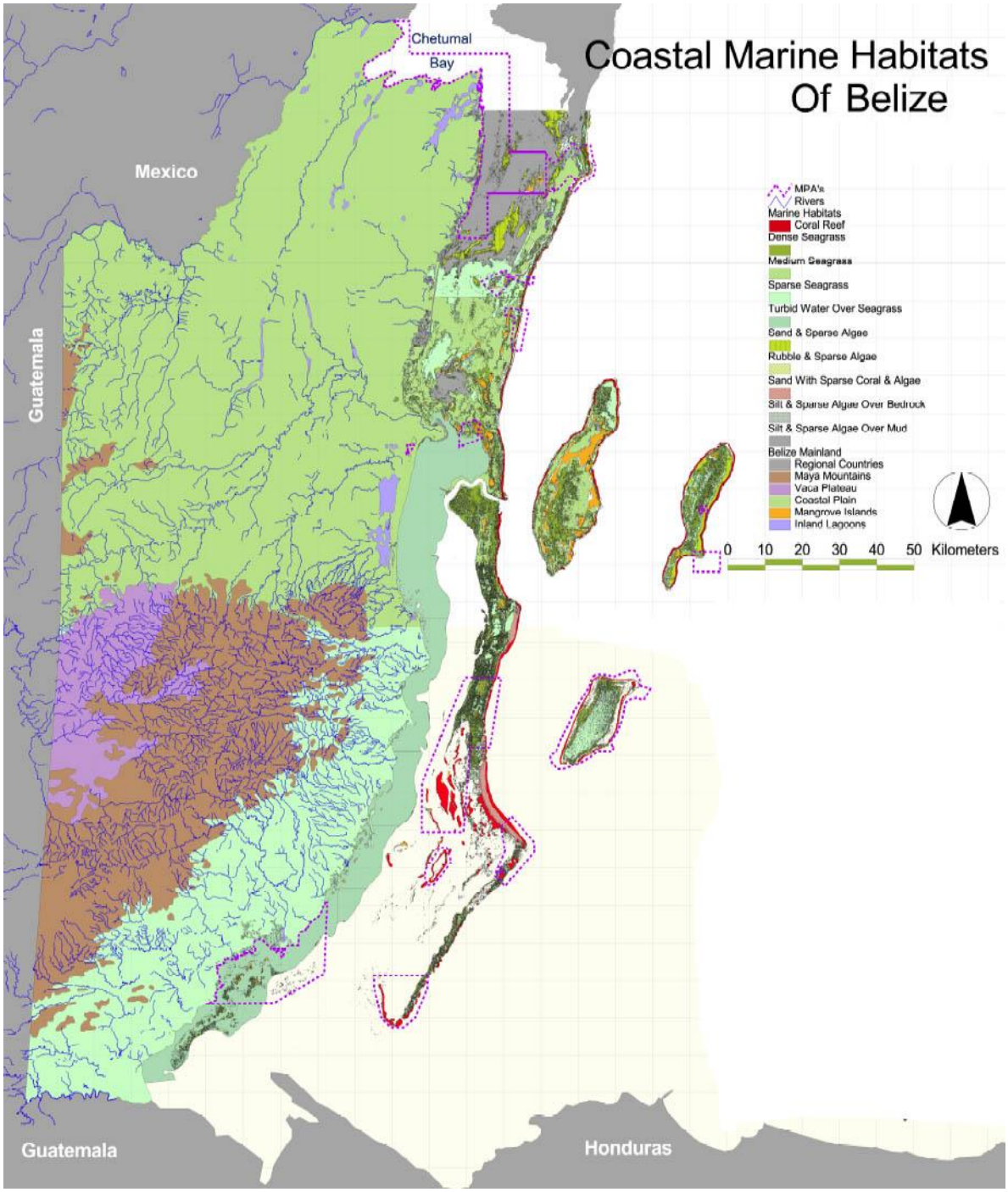
The following can now be added to the REA baseline list of the Sanctuary:

Reptile:	Boa constrictor	
Fish:	Lionfish and Barracuda	
Slug:	Sea slug,	
Plant:	Saltwort,	(Personal observations M. Vega and video footage)

MAP 11 Ecosystems Map of Belize



MAP 12 Coastal Marine habitats of Belize



2.5.2 Flora

The vegetation at Swallow Caye Wildlife Sanctuary is red, black and white mangrove all protected in Belize.

Seagrasses found are the herbs, turtle grass and manatee grass, Syringodium filiforme and Thalassia testudinum and the most grasslike of the three, shoal grass, Halodule beaudettei.

Both mangroves and seagrasses are conservation targets for the sanctuary as critical habitat for the manatees and by extension other species.

Found amongst the mangrove trees in muddy areas sometimes exposed in low tide is Batis maritima L. known as pickle weed or saltwort.

2.5.3 Fauna

Species of concern are manatees, dolphins, turtles, crocodiles, as well as, commercial finfish species. A boa constrictor was seen on September 11, 2012 living in the branches of a live mangrove. On the seabed numerous starfish, on the mangrove roots snails were observed and amongst the roots a sea slug and crabs in the mud. Turtles, dolphin (up to ten at one sighting, manatees single, in pairs adult with calf, and in herd of up to 34 in a herd have been observed at SCWS (observations by Carl Burgess, Research Assistant/Ranger).

Bonefish distribution research confirms at least one adult station within SCWS;
Tarpon distribution research confirms local adult runs within SCWS;
Permit distribution research confirms both adult and spawning stations within SCWS;

Underwater video shows many juvenile fish amongst the mangrove roots and at different times schools of fish throughout the sanctuary. A few lobsters have been observed inside the sanctuary but not conch.

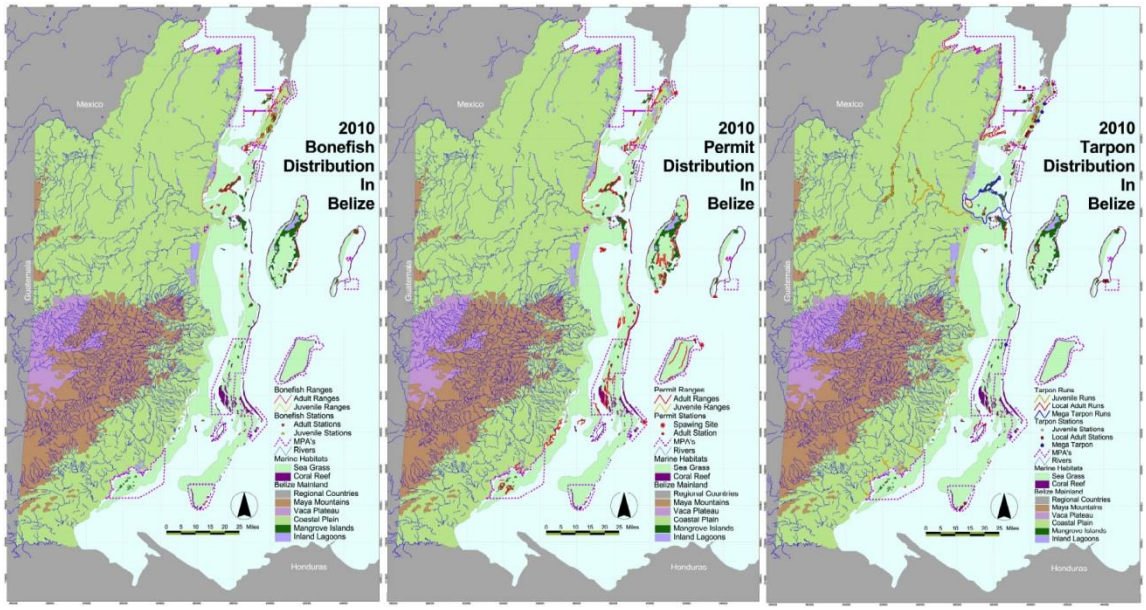
Snails can be found on the mangrove roots.

> The conch and lobster fisheries form the two most important components of the capture fisheries in Belize, with production representing over 90% of total capture fisheries production in 2008, and an export value of Bz$20.30 million (Ministry of Agriculture and Fisheries, 20093). Lobster landings peaked in 1981 at 2,204,622 lbs, but fell to 457,680 lbs in 2006. 511,389 lbs were harvested in 2009 (tails and head meat combined), with a market value of Bz$13.8 million (Ministry of Agriculture and Fisheries, 2009). It is significant to note that the general trend of total national lobster production over the period from 1981 to 2008 is a decline of almost 77%, and there are concerns for the continued sustainability of the lobster fishing industry. As with lobster, national conch landings have declined significantly, peaking at 1,239,000 lbs in 1972, and subsequently declining by 54% to 574,756 lbs in 2008 (Ministry of Agriculture, 2008).

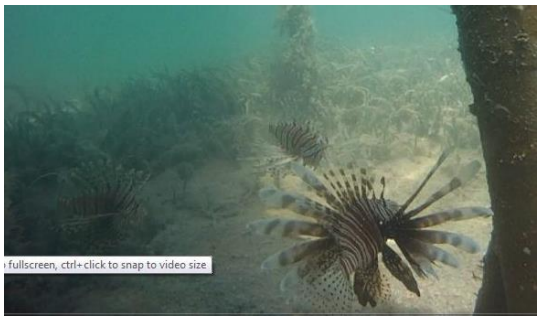
See species list at Appendix 4.

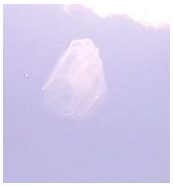
Conservation targets for SCWS are manatees, mangroves, seagrass beds, juveniles of commercial species and endangered birds.

MAP 13, 14, 15 Bonefish	Permit	Tarpon



Photographs from Swallow Caye Wildlife Sanctuary all photos are ambient light showing the clarity of the water





Lionfish found by Ranger Station and barges

Jellyfish several types appear

Barracuda

Bottlenose dolphins

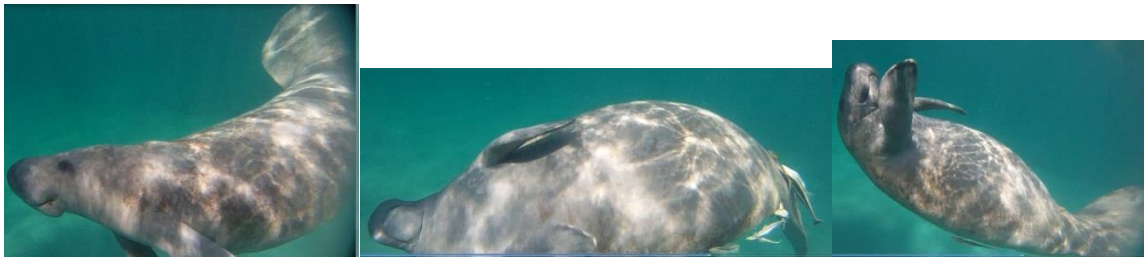

School of juvenile fish

Manatee Behaviours


Resting Surfacing to breathe

Curious about the camera


Swimming with remora and close to the boat



Manatee rolling over and over in the water complete sequences captured by video

Manatee

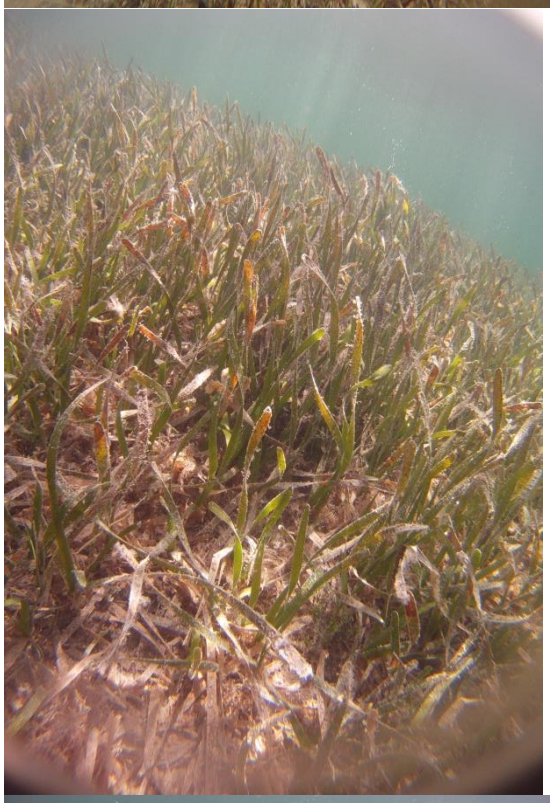
starfish

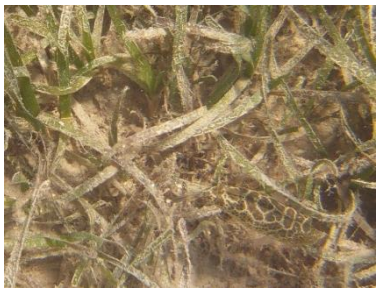
stingray

Red Mangrove

Scenic beauty and dense mangrove forests

Seagrasses and substrate at Swallow Caye Wildlife Sanctuary





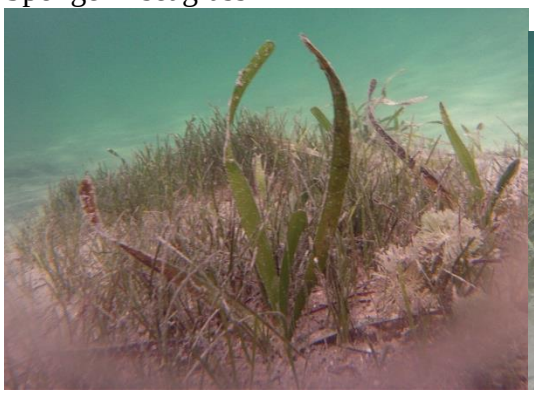
Puffer fish in seagrass

Dense seagrass meadow

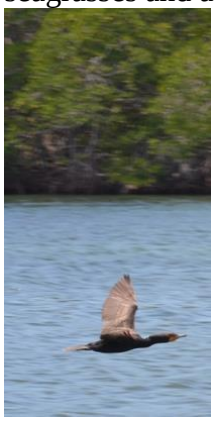
Sandy area at SCWS

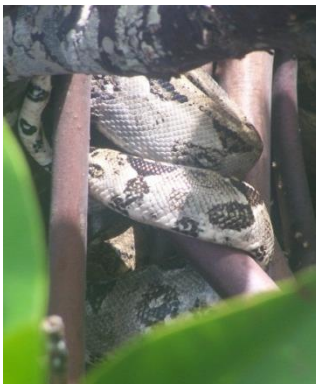


Sponge in seagrass




seagrasses and algas





Diving dapper sea slug boa


Mangrove roots Mangrove channel

Young red mangroves

Inter tidal Colonies on mangrove roots

Fish in mangrove roots silty bottom

2.5.4 Past and Present Research

Research past

Tremendous research has been ongoing in the area of Swallow Caye Wildlife Sanctuary and the Drowned Cayes centered on the *Trichechus manatus manatus.* Some of the researchers since the 1960's are Charnock Wilson, Janet Gibson, Nicole Auil, Angeline Valentine, Jamal Galves, Dorian Alvarez, the Coastal Zone Management Institute and many non-Belizeans pursuing their dissertation research focusing on the specimen, manatee. These include Powell, Self-Sullivan, LaCommare, and numerous other interns such as Arce and Balderas from ECOSUR currently at SCWS.

Increasingly, research is gaining more depth as full habitat studies are being seen as important e.g mangrove, seagrass, pollution and other water quality.

Additionally, research material is also growing reference more precise monitoring terminology and criteria, management effectiveness of protected areas and in the application of new technologies in research or new application of technologies.

Research significance

The area is strategically located in proximity to Belize City the largest urban area of Belize City to be a critical research node for conservation of biodiversity, habitat health, pollution sensor and water connectivity for free-ranging species. The area is strategically protected being a totally non-extractive zone surrounded by areas where the natural environment is under constant change and manipulation by humans. Research conducted at SCWS aims to understand the natural environment which is so rapidly being lost in most of the neighbouring areas. The purpose of SCWS is to protect manatees and this purpose is well-served by ongoing research.

For the country of Belize, SCWS and the Drowned Cayes area is a manatee grand central area whose full significance is yet being evaluated. SCWS provides a unique opportunity to study the interface of manatee and humans in a site managed, where possible, under the precautionary principle. To adequately manage an area to protect a species, the full needs of that species would need to be known and the full extent of their habitat range would require protecting. More research is necessary.

2.6 Cultural and Socio-Economic Values of Management Area

2.6.1 Community and Stakeholder Use

The area of SCWS is within the prehistoric sea lanes of the Maya and the colonial trade routes. Most recently, it is major navigation access for the sugar barges and tugs, tour boats, fishing boats, water taxis and private boats visiting or transiting the area.

The communities and stakeholders using and benefitting from SCWS are tour operators, tour guides, researchers and nearby fishers. For manatees, speeding boats present a big collision danger and strandings with propeller injuries or death from such contact are reported on the increase 2011 a total of 19 with watercraft primary cause of death. Source NMWG 2012.

Management Concern

For transiting speeding vessels, alternate navigational routes need to be established and enforced outside of the Sanctuary boundaries. Since the reason boats pass through the sanctuary is to save time, invariably, they are passing through at full speed. This however, only displaces the problem as the alternate navigation lane west of North Drowned Caye is prime manatee area as shown by past studies and current tracking by Sea2Shore Alliance. Slow zones or propeller guards may have to be required in all high density manatee areas. SCWS will undertake initiatives for public awareness and promotion in Belize City to engage more Belize City tour operators in in manatee protection and bringing tours to SCWS.

2.6.2 Archaeological Sites

The coastal Maya were proficient seafarers, with the K'ak' Naab' canoe paddle providing direct evidence of canoe travel. The Late Preclassic provides the first clear evidence of sea trade, with island settlement on Cancun and Moho Cay, as well as the coastal settlements of Cerros and Butterfly Wing. 2010 Heather McKillop

During colonial times, navigational reports mention the importance of Swallow Caye as preferred anchorage for some captains. It is theorized that Swallow Caye was named after the HMS Swallow under the command of Captain Samuel Axe. The HMS Swallow would have been named after the bird. E. O. Winzerling

Manatees have been a source of food to humans since pre-Colombian times. In the area of SCWS, evidence unearthed "*at Moho Caye show conspicuous remains of marine mammals. Most plentiful are the bones of manatee which can be easily identified by the lack of marrow structure. Many fragments of these bones can be seen in situ, and in 1965, there were still numbers of the large, curved rib bones to be found littered about on the irregular surface of beach rock where they had been deposited by bank erosion. "* Alan K. Craig 1966

Dampier 1906 *"The manner of striking manatee and tortoise is much the same; only when they seek for manatee they paddle so gently, that they make no noise. Because it is a creature that hears very well." The flesh was used to feed slaves and pickled as a delicacy; the skin for flexible oarlocks, the black hide for horsewhips. In Alan K. Craig 1966*

Buccaneers are among the first to establish on the British Honduras coast at St. Georges Caye with their occupation of smoking, drying and salting turtle and manatee meat for sale to passing privateers, logwood cutters etc was a legitimate venture and considered to be an indispensable service to all seafarers then in the Caribbean. For this, the Spanish early on gave the name Cayo Cosina, (Kitchen Cay) to St. Georges's.

In 1968, Charnock-Wilsom found an abundance of manatees all along the coast of British Honduras. *"Moreover, predation was at a minimum as the people who formerly ate manatee meat now show little interest in it, and the alligator, its only other predator, has been persecuted almost to extinction."* Oryx Volume 9 May 1968

2.6.3 Tourism and Recreation Use

Since its inception, SCWS is open to visitation and at the maximum has received 5,000 tourists in one year. Most visitors are international overnight tourists on guided tours originating mostly from Ambergris Caye, Belize City and Caye Caulker. The total number of visitors to SCWS for the year 2011 is 2,906 persons with visitors arriving every month of the year. The highest visitation is in the months January, February, March and December corresponding to the country's peak tourism season. Year to date provisional figures for 2012 are showing a 2.9% increase over 2011.

TABLE
2011 Visitation to Swallow Caye Wildlife Sanctuary

Total	J	F	M	A	M	J	J	A	S	O	N	D
2,906	451	390	531	319	168	101	180	146	26	34	204	356

Source FOSC Rangers' Daily Logs & Tickets

TABLE
2012 Visitation to Swallow Caye Wildlife Sanctuary

Total	J	F	M	A	M	J	J	A	S	O	N	D
2,416	432	525	372	265	173	146	225	203	12			

Provisional Figures Tickets M. Vega

Most tour boats with destination Swallow Caye Wildlife Sanctuary try to obey the regulations to improve their chances of viewing manatees. From time to time there can be one or two non-compliant operators. High visibility of the Ranger's video camera has proven to be a good deterrent to these. If that fails, the captain and guides are cautioned and their management offices informed verbally. If desired behaviour is still not forthcoming, a written complaint is sent to the Management of such tour company with a copy to the Belize Tourism Board as all tour operators and tour guides must be exemplary to qualify for annual renewal of licenses.

Most tourist visitors to the Sanctuary engage in the activities of viewing manatees, picnicking on their boat, photography, and interpretation by their guides and captains. International media visitors engage in photography and research. Research visitors conduct their course of research which includes viewing, observations and data gathering. Once inside the Sanctuary, all visitors get to experience boating without the use of engines and, instead, by the Captains' dexterity with a pole.

A stop at SCWS is not a standalone tour for regular tourists. It is a tour combined with at least 2 other stops on the reef. Many tourists that do not visit SCWS prefer to visit areas of the reef where swimming with manatees is allowed with no entrance fee. This is the unrestricted reef area off north Caye Caulker where manatees are populating in the warmer months.

At the Sanctuary, regulations governing the behaviour of boats and tourists are in place to protect the manatees.

1. There are Directional, educational and other necessary signs erected at strategic locations within the area to enhance compliance within the sanctuary.
2. From designated points, all boat operators shall turn off their engines and pole their way into the main area;

3. Once in the area of the main hole, all boats shall plant pole and tie up;

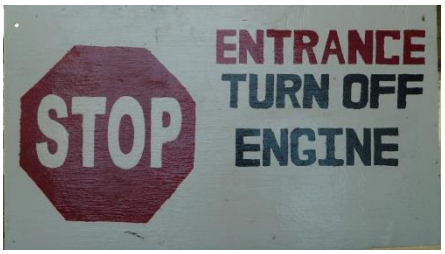
4. There are specific and clearly marked Entrance and Exit points. These shall be variable depending on prevailing winds to enable boats to drift with the wind;

5. Noise pollution, including the playing of loud music, and the use of engines within the main hole is restricted within the SCWS;
6. Only a maximum of six boats shall inhabit the main hole at any one time, for a time frame not exceeding 30 minutes;
7. Only boats with a maximum length of 36 feet shall be allowed within Zone 1 - the main hole area;
8. All vessels of lengths exceeding 36 ft shall remain outside the main hole in the turtle grass and secondary hole areas;
9. No inboard/outboard diesel engine boats shall be allowed in the main hole;
10. Boat operators and tour guides shall ensure that their passengers maintain good behavioural conduct while in the area;
11. Molestation of the animals is prohibited. This includes petting, feeding and swimming with the animals;
Manatee molestation is not defined under the Wildlife Protection Act CAP. 220 which would have implications for enforcement. The National Parks System Act CAP 215 provides at 4 (d) no person shall hunt, shoot, kill or take any wild animal, or take or destroy any egg of any bird or reptile or any nest of any bird, in any wildlife sanctuary.

12. All tour and boat operators shall meet the BTB's and Ports and Harbours Regulations for passenger/guide ratio and other safety regulations;

Vessels operating in and around Swallow Caye Wildlife Sanctuary are from the 205 foot long barges, the 51 foot long catamarans, various sizes of water taxis, private boats and smaller fishing boats. The two water taxi lines have multiple runs daily. Attempts are being made to have all water taxi vessels travel west of North Drowned Caye instead of using Swallow Caye Bogue. However, there is no restriction on tour boats with cruise passengers looking for the most direct route to snorkel and dive sites east of SCWS.

13. No littering in the Sanctuary.
Although visitors do not litter in the Sanctuary, solid waste is evident trapped in the mangrove roots. Some items include plastic slippers, buckets, ropes, wood, and fabrics among other things.



14. The hovering of any flying aircraft that infringes or in any way affects the natural behavior of the manatees within or in the proximity of the sanctuary is prohibited.

This regulation is enforced with the cooperation of the Forest Department and Civil Aviation Department and is a problem with the helicopter tours. Low flying helicopters are especially disruptive to the manatees because of excessive noise and

tremendous displacement of water. The Ranger must photograph any such intruding aircraft and this is followed up with the tour company and/or the enforcement agencies. Low flying helicopters at the Sanctuary are also very disruptive to those on boat tours.

Visitors come to the sanctuary with one purpose: to see live manatees in their natural habitat. At SCWS up to now it can be guaranteed that manatees will be seen most times in crystalline waters. To improve chances of sightings, visitors must maintain quiet, they must remain inside the boats and the captains must turn off boat engines and pole to the favourite manatee areas as indicated by the rangers on any given day.

Visitors must pay an entrance fee and must abide by the guidance of the ranger on site.

All adjacent communities are welcome to visit the Sanctuary to enjoy a natural experience but without leaving their boat.

Areas of management concern

Enforcement and patrolling is only possible when the ranger is on duty at the Sanctuary 8:30 am to 4:00 pm. This means that for all the other hours, the Sanctuary is open but unattended. FOSC and Forest Department have no monitoring in place during the other sixteen and a half hours. Even when the ranger is on duty, the ranger is limited in response by the speed of his boat (60 HP maximum) especially compared to water taxi and tour boats that are high powered with up to 600 HP. Attempts could be made to find out more information about visitors so as to better market the Sanctuary and increase visitation. Additionally, more can be done with neighbouring Belize City to attract more visitors and more support and management input from this City.

Tourists viewing manatees in front of tall mangroves Photo SCWS FOSC

2.6.4 Other Economic Use

Some fishing also takes place in the sanctuary as is evident from the behaviour of manatees

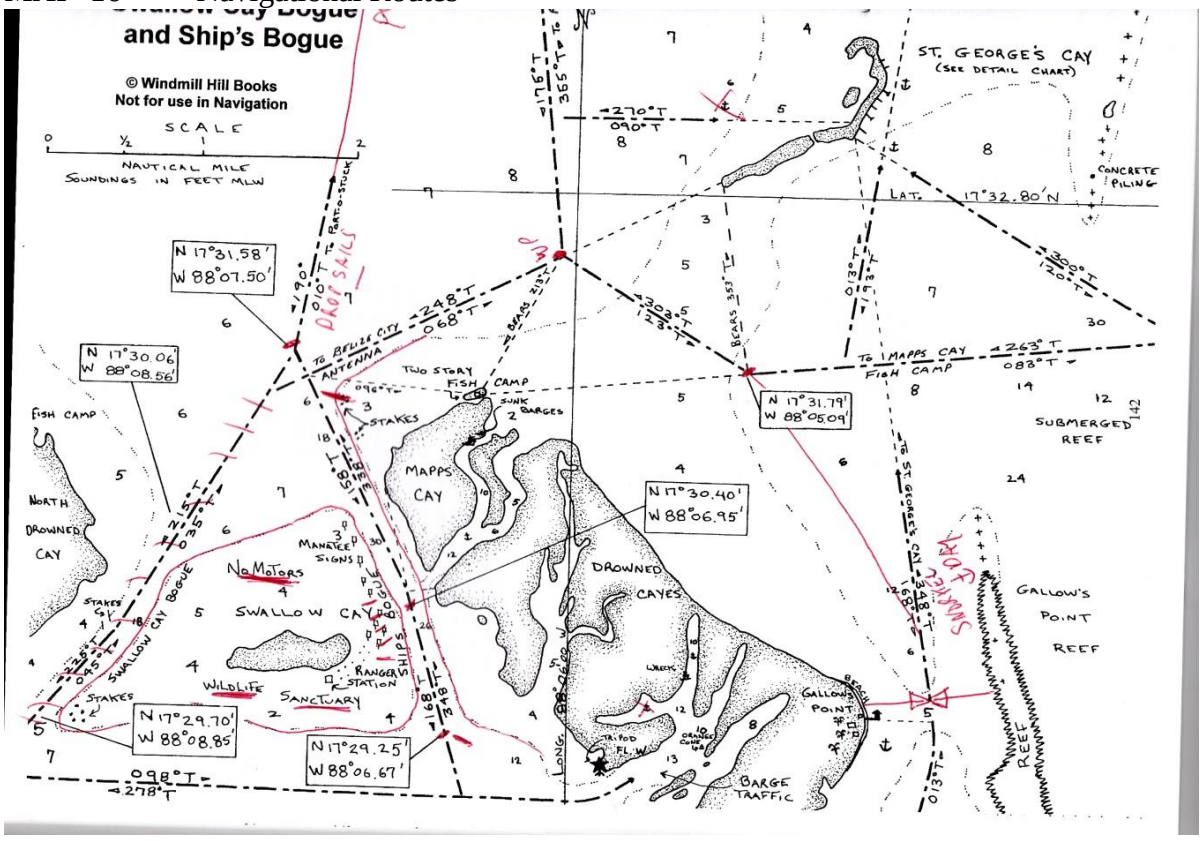
and from discarded monofilament line that gets caught in the mangroves in the dark of night and have to be left entangled in the trees.

Swallow Caye Wildlife Sanctuary is in major navigational routes. Sugar barges and tugs run alongside the east and north, water taxis run along the west and tour, private and fishing boats transit east west from Belize City to the cayes and reef.

BSI barges traverse the deeper channel at SCWS
In 2007 transported for export in excess of 89,000 tons of sugar and in excess of 46,000 tons of molasses.
40 barges with dimensions of 205ft X 40ft X height 14ft

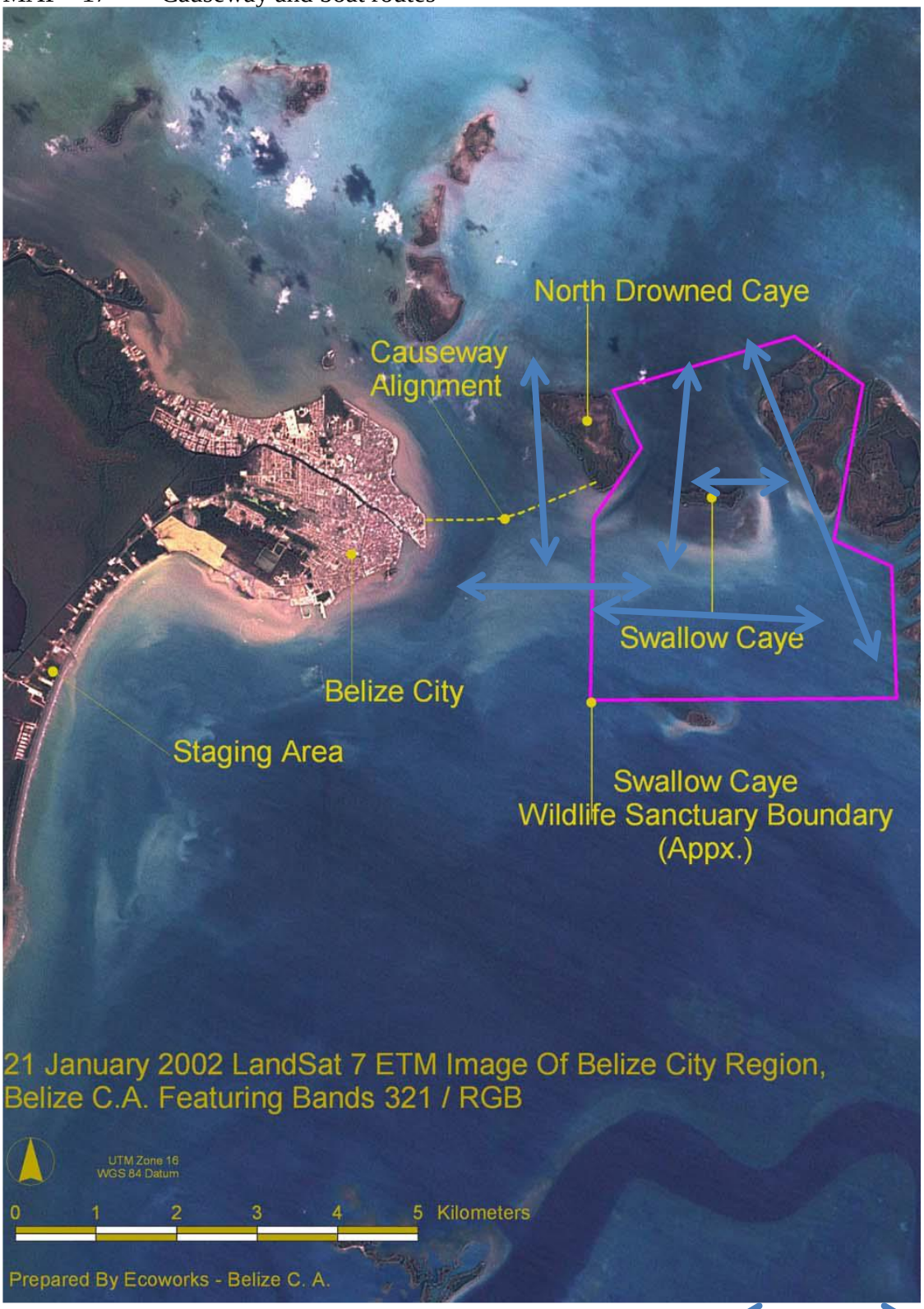
Catamaran charters enter the Sanctuary in transit in the deeper channel and as a tour stop;
One company has a fleet of 7 ranging in size from: 46 ft X 24 ft X draft 4.3 ft To 51 ft x 28ft x draft 4.7 ft
For touring, the small runabout is to be used within the sanctuary; this depends on voluntary compliance by the Captain

MAP 16 Navigational Routes



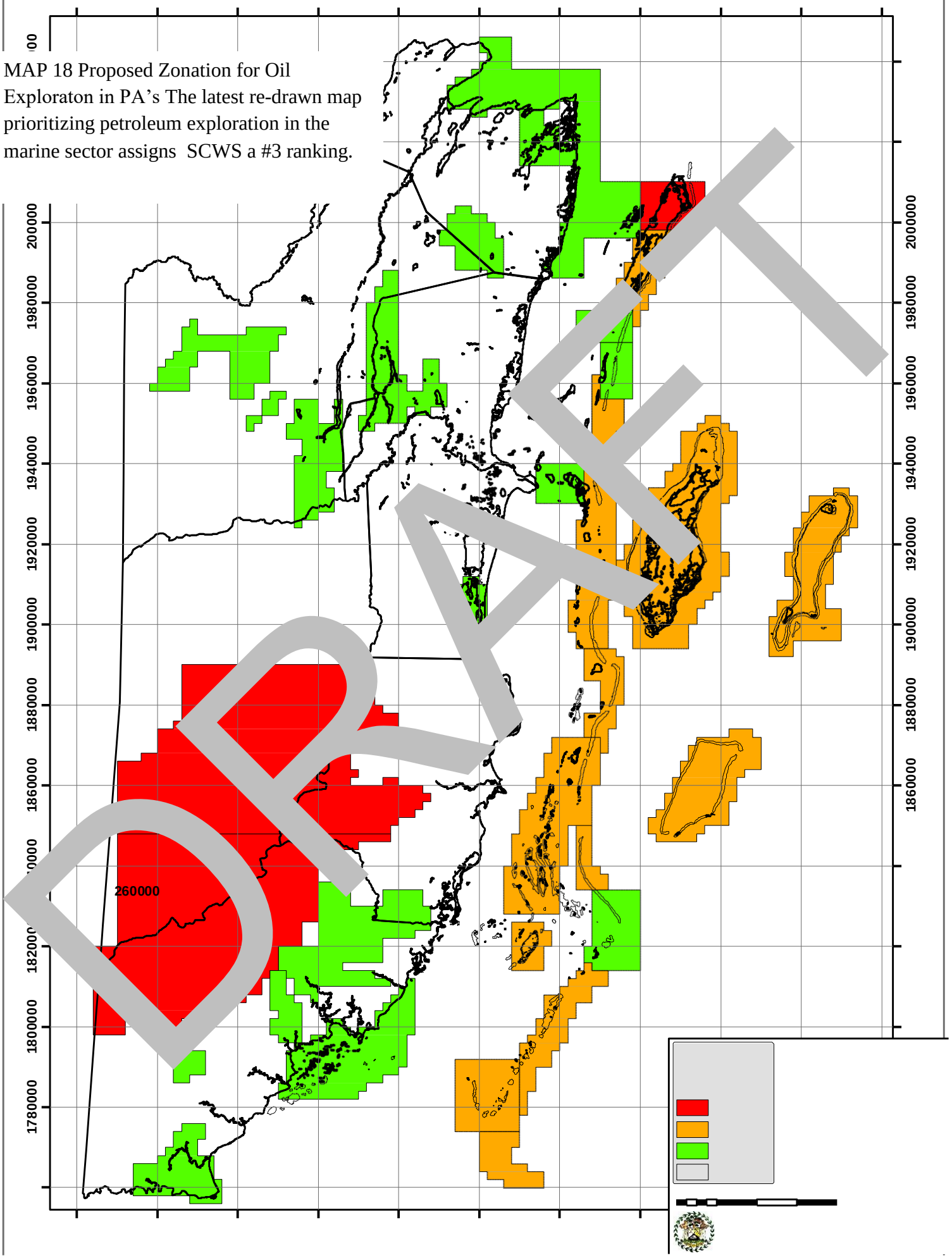
Swallow Caye Bogue, Ship's Bogue and Catamaran Navigational Channels inside the Sanctuary Source TMM Charters

MAP 17 Causeway and boat routes



KEY Causeway ---------- Boat routes transiting (not visiting) ⟷

MAP 18 Proposed Zonation for Oil Exploraton in PA's The latest re-drawn map prioritizing petroleum exploration in the marine sector assigns SCWS a #3 ranking.



2.6.5 Education Use

SCWS has previously collaborated with Dr. Leandra Cho-Ricketts and the University of Belize for students to undertake the research resulting in the Rapid Ecological Assessment of Swallow Caye Wildlife Sanctuary.

Chocolate Heredia annually donates field trips to Swallow Caye Wildlife Sanctuary to the Caye Caulker Roman Catholic Primary School.

Friends of Swallow Caye conduct outreach activities to schools in Belize City, San Pedro and Caye Caulker when funds permit. From its office location on Caye Caulker, community service activities centered on the manatee are sometimes undertaken with the students. FOSC also produces print material which it distributes to all interested parties. FOSC is currently planning to collaborate with environmental/science clubs for select primary and high schools in Belize City to offer heritage and manatee education.

Field trips for primary school students from San Pedro and Belize City are sometimes funded by grant funds.

Along with the National Manatee Working Group, children's manuals have been developed on manatee protection and trainers have been trained.

FOSC is always lobbying BTB and other interested parties for frequent specialized manatee tour guiding courses. In 2004 to 2005 FOSC conducted a manatee tour guiding course as a special project funded by GEF.

Other science educators bring groups of international students to get field research experience at SCWS these include Belize Zoo/Cincinnati Zoo and Miami University, and Sirenian International/Caryn Self-Sullivan.
SCWS also has the opportunity to work with international interns from various countries, including, at present, from ECOSUR.

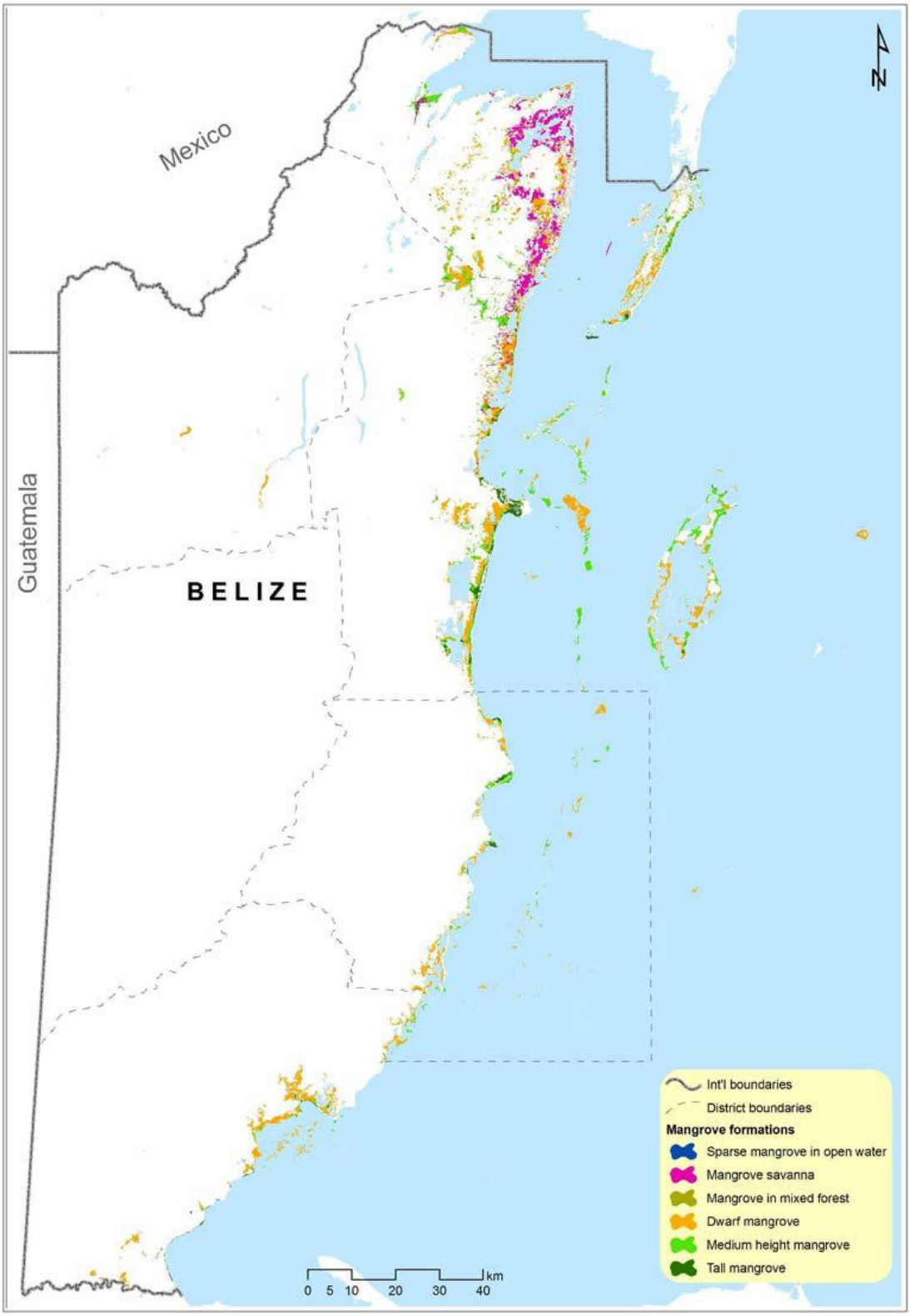
Research Assistants/Ranger conduct daily manatee underwater video research at SCWS, as well as, mangrove research. Analysis is advancing aiming to identify and quantify manatees at SCWS. In addition, in-depth surveying of communities is being conducted to produce a model for working with the communities. Ranger are required to keep daily data logs of their observations.

Coastal Zone Management Institute had previously headed major manatee education programs by many supporters and researchers of SCWS.

Areas of management concern

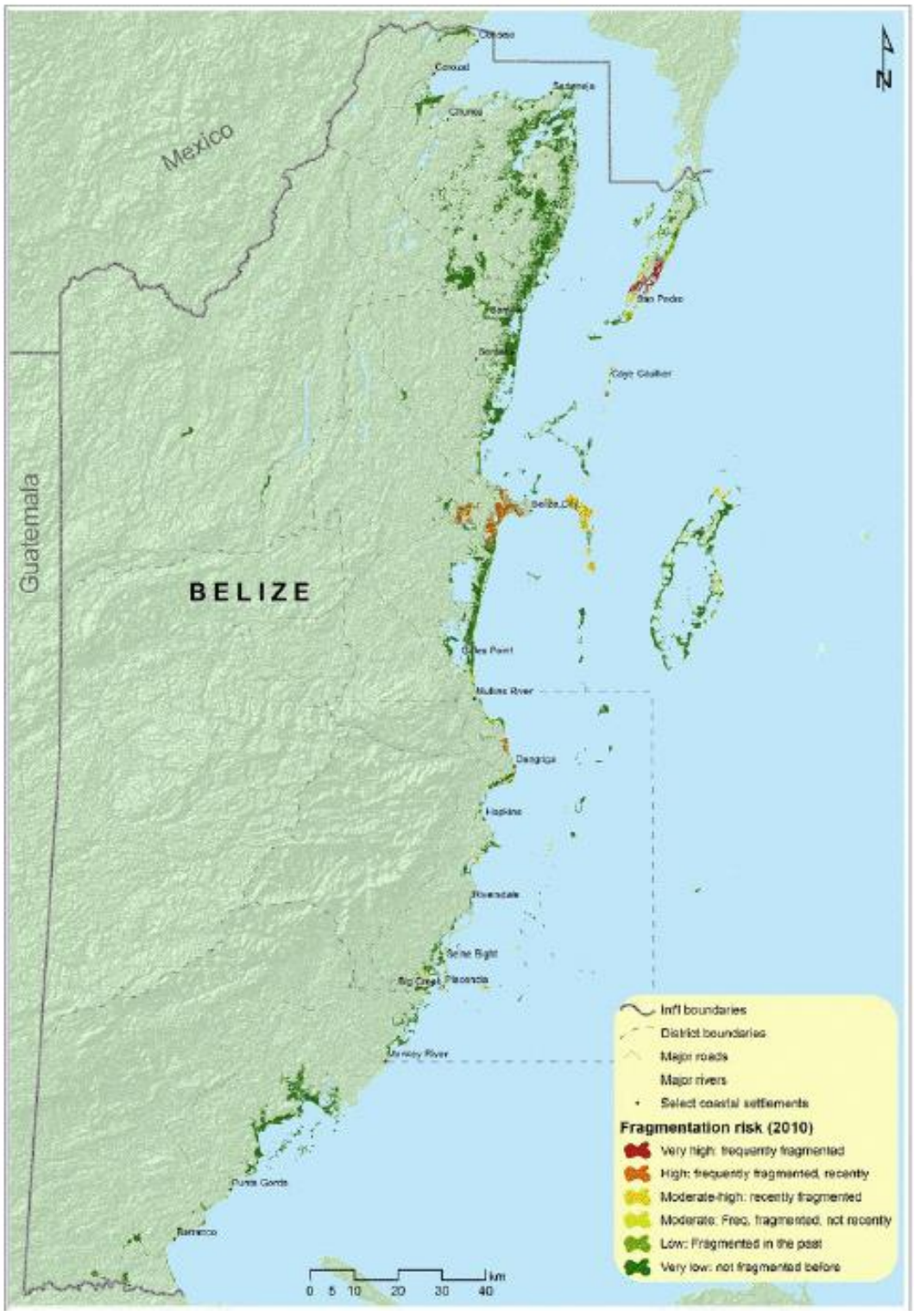
There are no qualified in-house researchers and there are no multi-year arrangements with any institutions of advanced learning to give quality and continuity to the education initiatives. Programs must be funded by donor grants and there is absence of any full-time administrative or management staff to consistently support company programs, including no one to supervise visiting researchers and interns.

FIGURE 1 **:** Belize's mangrove formations, based on Zisman (1998)



Source Cherrington, etl CATAHLAC 2010

FIGURE 2 Dynamics of Fragmentation of Belize's Mangroves 2010



Source Cherrington et al CATHALAC 2010

3.0 Analysis of Conservation Targets and Threats

3.1 Conservation Targets

Conservation targets are selected to represent the biodiversity of an area. Swallow Caye Wildlife Sanctuary, by virtue of water connectivity and by virtue of the free ranging prime species that depends on off-site locations to fulfill its needs such as for fresh water, targets will include species, species assemblages and ecosystems.

3.1.1 Identification of Conservation Targets

Swallow Caye Wildlife Sanctuary comprises almost 9,000 acres of the 400,000 acres of marine protected areas of the National Protected Areas System of Belize. As a wildlife sanctuary category the specific legislation under which it exists is the National Parks System Act Chapter 215 as a "wildlife sanctuary" meaning any area reserved as a nature conservation reserve in accordance with the provisions of Section 3 for the protection of nationally significant species, groups of species, biotic communities or physical features of the environment requiring specific human manipulation for their perpetuation. In this case, the flagship species for which the sanctuary was established to protect is the Antillean Manatee, *Trichechus manatus manatus*, a sub-species of the West Indian Manatee. The corresponding IUCN category is "Category IV", Habitat Species Management Area. The Antillean Manatee falls under the protection of the Wildlife Conservation Act and is protected internationally as a red list species under IUCN vulnerable to extinction as a result of human activity.

The Friends of Swallow Caye Strategic Plan 2011 to 2014 sets the foundation for promoting and advocating for the proper management of Swallow Caye Wildlife Sanctuary. The primary purpose of this sanctuary is to protect biodiversity, specifically the manatee in natural habitat.

On the international level, SCWS contributes to fulfilling the country's commitments under the Convention on Biological Diversity (CBD). Setting conservation targets in the face of threats relates to the CBD Program of Work on Protected Areas (PoWPA):

Goal 1.5 "Governments should prevent and mitigate negative impacts and key threats to protected areas"

1.5.1 EIA required for plans and projects with potential effect on protected areas; incorporate biodiversity related issues into EIA legislation and/or processes and in strategic environmental assessments;
1.5.2 by 2010 national approaches to liability and redress measures, incorporating the polluter pays principle or other appropriate mechanism in relation to damages to protected areas;
1.5.3 establish and implement measures for rehabilitation and restoration of the ecological integrity of protected area;
1.5.4 take measures to control risks associated with invasive alien species in protected areas.
1.5.5 Assess key threats to protected areas and develop and implement strategies to prevent and/or mitigate such threats;
1.5.6 Develop policy, improve governance & ensure enforcement of urgent measures that can

halt the illegal exploitation of resources from protected areas, and strengthen international and regional cooperation to eliminate illegal trade in such resources taking into account sustainable customary resource use of indigenous and local communities in accordance with article 10 of the Convention.
Goal 1.5 to prevent and mitigate the negative impacts of key threats to protected areas

PoWPA Target for goal:
By 2008, effective mechanisms for identifying and preventing, and/or mitigating the negative impacts of the key threats to protected areas are in place;

The key conservation targets of Swallow Caye Wildlife Sanctuary are those that represent the biodiversity value of the area, including ecosystems and species. These are mangroves and littoral, sea grasses, manatee and other free ranging vertebrates, native fish species, and coastal lagoons and estuaries.

3.1.2 Assessment of Conservation Target Viability

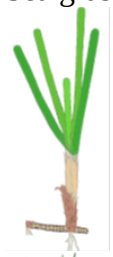
The viability assessment of the current status of each target was done by review of literature, interviews with marine researchers, marine protected areas managers, and discussion in public meetings held with stakeholders. Viability is judged by high probability of continued existence over time, that is, that there is a 90% certainty of surviving 100 years and/or 10 generations. Meeting the goal means that there be sufficient variability across the range to adapt naturally in the face of continually changing environmental conditions.

TABLE
The conservation targets identified for Swallow Caye Wildlife Sanctuary are:

Target	Condition
Sea grass ecosystem	fair
Mangroves and Littoral Ecosystems	fair
Aquatic, Riparian and Estuarine Ecosystems	fair
Native Fish Populations	poor
Wide ranging large marine vertebrates (manatee)	poor

A ranking of fair indicates that ecosystems and species are vulnerable requiring human intervention to prevent further degradation. A ranking of poor indicates that if allowed to remain in the present status, restoration or preventing local extinction will be impossible.

TABLE

Conservation Target	Justification for Target Selection	Species, Communities, or Ecological Systems represented by Target
Sea grass ecosystem  Flat leaves 10-60 cm long *(Thalassia testudinum)* MANATEE GRASS  Leaves round Leaves 10-60 cm (*Syringodium filiforme*) SHOAL GRASS  Leaves flat and thin Leaves 2-22 cm long Halodule wrightii EEL GRASS Seagrassnet January 2006 Seagrass Belize	Sea grasses at SCWS perform many important functions. Sea grasses are part of the energy cycle, produce biomass, act as carbon sinks, physically trap sediment which builds land and protects the coral at the reef. Sea grasses provide food and shelter to marine animals and birds. In addition sea grasses provide habitat for juvenile of fish and other species. Sea grasses are a primary and favourite food of the manatees of SCWS. These manatees feed on the roots and blades of the grass. Sea grasses produce oxygen and other products that contribute to the ozone layer. Sea grasses also reduce wave energy to protect coastlines and regulate temperature. Manatees at SCWS can be observed grazing daily on sea grasses and they have been observed to be selective of different types of grass at different times. Sea grass meadows are also used by manatees for resting, breeding and for warming up in the sunlight. If sea grass is not present, manatees will move away. Sea grass areas are very much under threat disappearing under coastal development – dredging, filling and construction. Considerations for climate change are sea level rise as sea grasses require the right depth for sunlight to penetrate, temperature and salinity.	The foods of the manatees are represented which include *Thalassia Testudinum, Syringodium filiforme,* and *Halodule beaudettei;* Ten species of algaes including 2 species of green calcareous algae, *Halimeda monile* and *Halimeda Incrassata* Juveniles of many fish can be found harbouring throughout the sea grass savannas including parrot fish, snappers, jacks, permit, snook, and numerous others including adults of some species e.g tarpon. Hawksbill turtles, manatees and bottle nose dolphins are found in the sea grass areas of SCWS. Cormorants, ospreys and other marine birds feed off sea grass areas.
Mangroves and Littoral Forest Ecosystems	Mangroves are uniquely adapted to live in saltwater and to establish in wave currents. In open sea the red mangrove is the first to take root followed by the black mangrove. As soil is trapped and drier land created, other species of mangrove also colonize. Land, sea and air creatures depend on the mangroves for food and shelter. At SCWS the mangroves give rise to creeks, dead end canals and bogues which are critical to manatee, dolphins, turtles, alligators for resting, breeding and sheltering.	Countless species are being protected in the mangroves red and black; *Trichechus manatus manatus*, Hawksbill turtle Birds include white winged dove, great blue heron, double breasted cormorant, osprey, mangrove warbler, melodious blackbird, white crowned pigeon – near threatened,

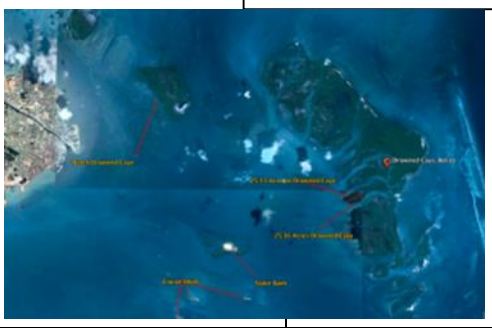
	Mangroves are part of the energy cycle and consume carbon dioxide and produce oxygen in photosynthesis. They create biomass and trap sediment to build land and to reduce siltation of the reef. Mangroves trap pollution from land based sources and reduce wave energy to reduce coastal erosion. Mangroves support many life forms at SCWS providing food and shelter to birds, crabs, snails, lizards, snakes, alligators, algas, fish, spiders and etc. For the manatees, mangroves can also be a source of food and it is in the canals that manatees find undisturbed resting areas and shelter from storms. Coastal mangroves are the first to be destroyed for development purposes. In the immediate environs of SCWS the rate of loss is high as evident at Belize City, Stake Bank, and the canal at North Drowned Caye. Considerations for climate change would include changes in sea level and temperature. Littoral Forests are coastal forests being unique and fragile ecosystems on high sandy ground. Comprised of shrubs and trees, this thick vegetation is home to some endangered species who survive off its seasonal fruits and berries. The Littoral Forest covers the smallest area of any habitat in Belize. The littoral forest of Belize's cayes are under similar development pressures as mangroves. The loss of littoral forest spells the loss of birds.	Amongst the mangroves roots, video footage shows schools of fish including: Parrotfish - Emerald, Princess, Stoplight and Redband, Mojarras – Yellowfin and Flagfin; Puffer – Bandtail and Checkered; Snappers – Yellowtail, Mutton, Gray, and Lane, Grunt – French, Blue striped, Striped and Smallmouth; Remoras, nurse shark, schoolmaster, permit, bar jacks, sergeant major, tomtate, webb burrfish, ocean surgeonfish, and plumed scorpionfish. Anoles, spiders, ants , crabs, snails, barnacles, algas, are found on the mangroves some above and some below sea level. American crocodile - vulnerable; Southern stingray Rufous necked woodrail Black catbird White crowned pigeon Boobies
Aquatic, riparian and estuarine Ecosystems	Waterways are essential to manatee survival. First to support the body weight, second fresh water is needed for drinking and third connectivity is needed for various manatee life needs including for reproduction to improve genetic diversity. Although adapted to a salt water environment, the manatees of SCWS accommodate readily to brackish or fresh water as necessary. The Sibun, Belize and Haulover fresh water sources are critical to manatees of SCWS. Studies have shown that manatees can be free ranging along coastal, riparian and estuarine areas for fresh water, food	This specialized area of fresh water systems is home to protected mangroves, vulnerable manatees, endangered crocodiles and turtles and some wetlands are of RAMSAR concern. Recreational and commercial species find shelter in aquatic, riparian and estuarine areas: The Belize City and Belize River area show juvenile, adult and mega tarpon runs, and stations; Just offshore Belize City are adult runs and stations for bonefish;

	variety, reproduction, and shelter. Manatees can avail themselves of various key habitats for survival e.g. sheltering from hurricanes Only if these exist and are accessible to manatees. Coastal areas are fast altered and obliterated for human use as residential, commercial and transportation access areas. These areas are denuded of vegetation, changed from aquatic/estuarine to dry land by filling, demolished by dredging and excavation and converted to urban areas which are sources of waste, pollution, noise, etc e.g Belize City and proposed mega-developments of North Drowned Caye and Stake Bank. Considerations for climate change are sea level rise and security of food stocks.	Adult runs of permit are found on the immediate coast north of Belize City and in the Belize City cayes; Commercial fish, lobster and shrimp are found immediately in front of Belize City;
Native Fish Populations	By all accounts Belize's commercial fishing industry is showing losses. Many key species are in decline including lobster, conch, fin fishes. This is despite closed seasons, protected areas, best practices and more sustainable fishing method and equipment and other control measures to try to protect viability of species. The number of fishermen continues to increase and the effort per catch likewise. Nine months of almost daily underwater water photography is revealing the abundance of juveniles and various size fin fish that are being nurtured within Swallow Caye Wildlife Sanctuary. This includes many of the popular species preferred by Belizeans for food including several types of snapper, and grunts. Schools of barracuda and sheeps head are observed in the seagrasses and different stages of 5 types of the protected parrot fish are sheltered in the Sanctuary. Clouds of tiny fries are visible throughout the sanctuary. Findings have shown SCWS is part of the area inhabited by the permit, bonefish and tarpon of recreational fishing fame. SCWS has importance as a necessary nursery to re-stock supplies of fish and other marine species. SCWS has the	Protected, endangered and vulnerable species include: Bonefish Permit Tarpon Manatee Hawksbill turtle Snappers Parrotfish Sharks Undisturbed stands of mangroves are of impressive natural beauty and the natural history they support is of great interest to those on recreational visits. Other commercial species include barracuda, grunts, and others. Birds include white winged dove, great blue heron, double breasted cormorant, osprey, mangrove warbler, melodious blackbird, and the near threatened white crowned pigeon,

	ability for spillover benefit to the rest of the Belize marine environment.	
Wide ranging large marine vertebrates (manatee)	Between 2001 and 2004, research conducted by Caryn Self-Sullivan found that Swallow Caye is a preferred area of manatees, recording consistently higher sighting at Swallow Caye, 82%, than the 37% observed in other areas of the Sanctuary and outside. This finding supports local wisdom that Swallow Caye is a "manatee hotspot" and the reason it was originally selected for protected status by Leonel Heredia and Friends of Swallow Caye. Reference manatee health, and viability, her findings indicate 0.44 probability of encountering manatees with scars in SCWS. Further, her findings indicate no significant increase in count of manatees with scars to indicate that increased boating is resulting in trending increase of injuries to manatees. The National Manatee Working Group in 1997 reported eight manatee carcasses, 16 mortalities in 2000 and a total of nineteen in 2011 with watercraft collision being the primary cause of death in 2011. By September of 2012 there are eleven manatee strandings reported. Friends of Swallow Caye Rangers have been reporting since 2004 on daily sightings of manatees at Swallow Caye Wildlife Sanctuary and can confirm multiple sightings on every day during the hours on site. The largest herd was seen in August 2012 with an estimate of thirty-seven manatees. This same year saw the largest group of dolphins at one time in the Sanctuary, a group of ten. Calf sightings are higher than minimum required for viability at >8%. Belize Two other studies speak to the viability of the Antillean manatee. Specific to the Belize population, genetic variation as per nuclear DNA study found the Belize and Florida manatee to	***Trichechus manatus manatus*** protected in Belize, protected by CITES, protected on the IUCN Red List

	be two different species not interbreeding at this time. Nuclear DNA revealed Belize manatees to be a "bottlenecked" endangered species because of low genetic diversity. The less genetic diversity in a species, the less its chance of surviving threats such as disease, random events and etc. Encouragingly, nuclear DNA did reveal differences in Belize among manatees from Belize City, the Cayes, lagoons and rivers. This study prompted co-author, Nicole Auil Gomez to say, "These results show the importance of corridors of suitable habitat and low human impact that allow manatees to travel between key sites." Source U.S. Geological Survey (USGS) conservation geneticist Margaret Hunter, Ph.D., 2010 Since its inception, the Belize National Manatee Working Group has been reporting an unvarying national manatee population of one thousand. This is acknowledged as the largest concentration of the Antillean manatee. Historically, manatees have been more common and decades of surveys since show them still present from Belize's atolls, reef, cayes, coast to estuaries, rivers and lagoons.have shown manatees along the atolls, reefs. The 2012 aerial count was an all-time high at 507 manatees. Source Edwards, Holly, Bonde, B, Oceanic Society 2012 Regional Using latest information on the subspecies and different threats and pressures, simulations to analyze the viability of the metapopulation, Antillean manatee, in the face of best and worst case scenarios of human pressure and level of fragmentation. The baseline model described a population in positive growth. The model suggested that the metapopulation would not be able to withstand an annual anthropogenically induced mortality rate >5%. The model was not sensitive to hurricanes. Source Castelblanco-Martínez D, et al 2012	

TABLE

Conservation Targets - Current Viability Rating			
Conservation Target	**Current Rating**	**Goal**	**Justification for Rating, Goal and Indicator**
Sea grass 17 acres Stakebank US $12,000,000 Property type: Island 4.5 mls from BZ city  	Fair	Good	**Justification:** The accelerated rate of boating, dredging, and pollution sources in the immediate vicinity is a threat. The extreme flood events from Belize City cause suspended sediments in the water reaching to SCWS; the sedimentation caused by dredging at Stake Bank and North Drowned Caye was evident for long periods. Further loss of mangrove cover in adjacent areas may lead to increased wave energy and suspended sediments enough to affect seagrasses; **Goal:** Establish a buffer zone for Swallow Caye Wildlife Sanctuary that includes east to west from Reef and Drowned Cayes to Belize City and north to south buffers also. **Indicator:** Monitor Sea grass areas, root and shoot density, blade sizes, and biomass
Mangroves and Littoral Forest Ecosystem 50 acres Drowned Cayes US$650,000 Property type: Island 9mls from Bz City and 1 ml west of Bz Barrier Reef 	Fair	Good	**Justification:** Mangrove and littoral forests are under heavy development pressures being prized areas for tourism developments on cayes and on shore Belize District. The cumulative effective of these losses lead to fragmentation and loss of connectivity detrimental to viability of species dependent on them and to erosion of shorelines. SCWS having no littoral forest itself, the system relies on those existing on nearby islands and coast. **Goal:**. To maintain critical mass of vegetation cover. **Indicators:** Mangrove and littoral forest clearing on islands and coastline; reforestation;
Aquatic, Riparian and Estuarine Ecosystem	Fair	Good	**Justification:** These ecosystems are critical to *Trichechus manatus manatus* and other species that must meet their life needs in both fresh and salt water. The urban expansion of Belize City on land and sea is a source of pollution and the removal of vegetation cover leads to increased sediment load downriver. Goal: Maintain water quality within Swallow Caye Wildlife Sanctuary **Indicator:** Physical data of SCWS waters remain within normal parameters: PH levels, Salinity, Fecal Coliform Turbidity. Conductivity, Oxygen

			Temperature etc
Native Fish Populations	Poor	Fair	**Justification:** Fishing and visitation is occurring within the Sanctuary in the absence of the Rangers during 16.5 hours every day. This is negating the beneficial effect of the Sanctuary to replenish stocks to lead to spillover effect outside the sanctuary. Manatee behaviour is negatively affected by boats speeding inside the sanctuary and, when unpatrolled, visitors have been encountered swimming with the manatees in the sanctuary. **Goal:** Swallow Caye Wildlife Sanctuary is a fully no take no swim zone 24 hours of every day. **Indicator:** Fish counts increase within the sanctuary;
Wide ranging large marine vertebrates (West Indian Manatee)	Poor	Fair	**Justification:** Fifty percent of manatees sighted in SCWS are scarred some with multiple scars. Swallow Caye is a critical manatee center and transiting boats speed all around the island. Boat collisions are a major cause of manatee mortality in the Belize City rivers and cayes area. **Goal:** Reduce death and injury from boat collisions and improve the condition of manatees at Swallow Caye Wildlife Sanctuary **Indicator:** population count, behaviour evaluation, identification of individuals, no new scars or fatalities from boat collisions appear.

Source for real estate images and values: Ocean View Realty the Feinstein group of companies

150 acres Hick's Caye
US $2,250,000
Property type: Island

Summary of Conservation Target – Viability Prioritization

Viability ratings are used to prioritize the conservation targets to aid in management decision-making to guide application of resources.

TABLE

Priority	Conservation Target	Viability Rating
High Priority	Wide ranging large marine vertebrates (manatee)	Poor
	Native Fish Populations	Poor
Medium Priority	Aquatic, Riparian and Estuarine	Fair
	Mangroves and littoral forest	Fair
	Sea grass	Fair
Low Priority		

3.2 Threats to Biodiversity

The strategic planning exercise elicited from the Board of Directors and Staff of Friends of Swallow Caye, a variety of ecological and environmental issues identifying threats resulting from global, national and site specific sources for example, climate change, petroleum exploration, fishing, navigation, tour guide and tourist activity. Stakeholders identified a serious need for information from and about SCWS to the public. Further, they recommended that conservation goals and financial sustainability could be improved for the sanctuary if specialized manatee tour guide training was readily available to the public to increase visitation and best practices at the sanctuary. The Rapid Ecological Assessment of 2006 identified four threats and their sources.

3.2.1 Identified Threats

The Rapid Ecological Assessment identified four threats to SCWS.

Loss of Manatee source Navigation,

Boat collisions resulting from navigation in, and around Swallow Caye Wildlife Sanctuary is an immediate and direct threat to the life and limb of the manatee. This is a present and increasing threat as SCWS is part of the maritime crossroads in front of the Port of Belize. Boating ranges from slow moving dories and barges (which in time past have been known to bodily crush a manatee), to large catamarans and large high velocity tour boats and water taxis. With the increase in overnight and cruise tourism attracted to the marine environment, there has been a corresponding increase in tour boats and water taxis. The sanctuary has two deeper channels which have been utilized for navigation for centuries, Swallow Caye Bogue and Ship's Bogue. Boats and manatees use these bogues for connectivity to move from one area to another.

Over the years, as water taxis to northern communities increased in size and speed, their routes were self-adjusted to navigate mostly west of North Drowned Caye as they do currently. This is a benefit to SCWS but a hazard to all manatees traversing outside and for connectivity to Belize Old River, Haulover Creek and other points. At present, this area and inside the rivers are the areas of most boat collision fatalities.

At the same time, tour boat numbers and activity has increased to service the cruise industry clientele on very short excursions to nearby marine attractions in Belize.

If plans proceed, boating immediately at the Sanctuary would skyrocket as North Drowned Cayes introduces a 200 slip marina right on the western boundary and Stake Bank diverts deep water access for four mega cruise ships at a time to dock almost right at the SCWS southern boundary.

As described by Self-Sullivan, boats must be on the surface of the sea and manatees must break the surface of the sea to breathe - when manatee and fast boat intersect on this shared plane, it is tragic for the manatee.

Loss of Habitat source Development

Accelerated development is ongoing on surrounding Belize City cayes, altering over wash mangrove and littoral forests, riverbanks and the estuarine areas of Belize District. This is unabated activity with plans for mega-developments.

Development activities involve clear cutting of vegetation, dredging, excavating and filling in of aquatic and other wetland ecosystems. Usually, the first to be clear cut are river banks and shorelines to allow for appealing views and breezes or to create artificial shorelines. Only one type of mangrove, buttonwood, will survive on dry land. Neal, Dwight 2007

Historically, a major part of Belize City is reclaimed land and this expansion along riverbanks, mangrove and estuarine areas continues unabated. The tourism industry has spurred boating traffic upriver and out to sea.

Pollution source Belize City and Belize River; solid waste

Fresh and salt water are essential to the manatees. Belize is blessed with an abundance of both these important natural resources. Expansion in agriculture, tourism and other industries bring increased demand for water and in turn more water is contaminated. Water quality is under pressure from contamination and pollution from agrochemicals, fertilizers and the discharge of liquid effluents. Inadvisable practices such as deforestation compound the problem of agrochemical runoff. Other polluting practices contribute to the problem including illegal dumping of any waste, laundry in the river and inappropriate sewage disposal. Specific to Belize City, wetlands are drained and filled and drainage patterns changed, developments continue

along river banks and the coastline. This results in increased sediment load and agrochemicals reaching the sea, cayes and reefs. Vehicles and boats produce contamination from the fossil fuels used. Pollution has resulted in lung infections of some manatees in Gales Point.

For the manatees, noise pollution is also detrimental.

Behaviour Changes **Source Tourist Activity**

Manatees would be responding to interference by any users of the sanctuary. A user may be transiting boaters, cargo boaters, organized tours, and etc.

The regulations prohibit swimming, molestation and noise pollution. However, manatees routinely alter their activities to accommodate human traffic – they interrupt their feeding, investigate boats and visitors with curiosity, leap away when surprised and take rapid evasive action if necessary.

Any of these activities may be enough of a problem to negatively affect the health and survival of the manatee if sustained, affecting nourishment, resting, reproduction and independence.

Already, scars are evident on many manatees and the effect of the trauma on the manatee is not fully known. Obviously, severe scars will handicap the manatee especially if the flippers are damaged as these flippers are very important to the manatee.

At this time, the following two threats are being included, loss of native fish populations and, with the appearance of the lionfish, alien invasive species.

Loss of Native Fish Population **source Fishing**

In addition to local consumption, fishing is a major export industry for Belize and Belize City is the major hub for fishers. Belize City based fishers exploit the fishing at the nearby cayes and reef. Sarteneja fishers deploy from Belize City for intensive fishing to all points along the reef and barrier islands to fish and to dive for lobster and conch.

Belizean fishers numbering about three thousand depend on fisheries stocks for food, income and their livelihood. From 1977 to 2003, fishing production experienced a sharp decline from over a million pounds to just barely one hundred thousand pounds before leveling off in 2007. (Belize Environment Outlook Geo Belize 2010) All naturally occurring commercial species are reporting a decline and where increased value of exports is reported, it has been from aquaculture production. The decline has prompted a longer closed season for conch in 2012, the protection of parrot fish, bonefish, permit and Nassau grouper. To discourage selling of protected finfish, fillet must now carry a patch of skin for enforcement purposes. For sport fishing, only catch and release is encouraged. The use of 3” gill nets is being phased out. Additionally, tilapia has been introduced and a cage fish pilot project is being tested just outside SCWS.

Although no hunting of any species is allowed within SCWS, this is not being enforced and fishing is occurring inside and all around the Sanctuary.

The largest pressure on Belize's fisheries stocks is from fishing including illegal fishing. (Geo Belize 2010). The number of licensed Belizean fishers in the decade from 2000 to 2009 increased by 47.4%.

Alien Invasive Species **Source Lionfish**

Underwater video research at Swallow Caye Wildlife Sanctuary is showing the presence of Lionfish within the sanctuary since 2012. The lionfish have been found in two parts of the Sanctuary. Lionfish are known to be voracious causing devastating impact to tropical marine environments including coral reefs and mangroves. Lionfish feed on juveniles of native species and the rate of destruction is 79% of juveniles lost in a 5 week period. One lionfish is able to eat 20 small fish in 30 minutes. With no natural predator in the Caribbean, the resulting imbalance leads to absence of grazers which allows algae growth to the detriment of coral and the general health and biodiversity of the Belize Barrier Reef Complex.

The Board of Directors has also identified climate change, sea level rise and ocean acidification as looming threats.

TABLE

COASTAL CAPITAL 2007: from reef and mangrove dependent economic activities

Tourism:	Tourists spent between $150 to $196 Million (12 to 15% of GDP); Overnight tourists spent between US$30 to 37 Million on diving and sport fishing alone; Cruise tourists spent between US$5.3 to $6.4 Million;
Fisheries:	estimated at between US$14 to $16 Million
Protection:	Emergent reefs mitigate ¾ of wave energy for estimated US $120 to 180 Million in avoided damage; Mangroves offer $US 111 to $167 million per year additionally;

All combined: US$395 to $559 Million per year; of this total, mangroves independently and with supporting roles contribute US$174 - $249;

Marine Protected Areas: 2007 recorded 115,000 visitors;
Glover's Reef Marine Reserve tourism: US$3.9 to $5.9 million per year to the economy;

- Commercial fishing within reserve: US$1 to $1.5 million

Source Belize Environment Outlook Geo Belize 2010

3.2.2 Review of Current Situation – Areas of Concern

Swallow Caye and Swallow Caye Wildlife Sanctuary

The island Swallow Caye continues to be confirmed as a key center of preference for manatees to conduct their activities. It contains all the necessary requirements for manatees to satisfy their needs of water, food, oxygen, and a variety in the surroundings including secluded coves, canals, open areas, bogues, resting holes etc. The manatees move around and in and out of the sanctuary as they need to. Considering that this is a highly preferred spot for manatees, there is too much dangerous boating activity occurring. In addition, the illegal fishing taking place in the Sanctuary is bothersome to the manatees and contravenes the no take status of the area.

- Navigation channels surround Swallow Caye
- Fishing boats operate within the mangroves of Swallow Caye
- Fast boats and catamarans traverse the Sanctuary in any direction
- Fishers discard monofilament lines in the Sanctuary as evident by the lines caught up in the mangroves of Swallow Caye
- Tour boats speed into the Sanctuary
- Scuba and snorkel tours to other islands transit through the Sanctuary and add on manatee viewing in the Sanctuary on the return to Belize City but do not care to pay entry fee
- BDF, Coast Guard and Port Authority speed through on patrols;
- A few water taxis sometimes run south to north well inside the western boundary of the sanctuary
- Sea level rise attributed to climate change will eventually contribute to major ecological changes and impacts on SCWS;
- Legislated penalties too low for injury and hunting of manatees
- Non-payment of entrance fees including changing tour schedule to arrive before or after Ranger patrol;
- Some guides chase the manatees poling to jockeying for better viewing position;

Belize Harbour, Belize River, Belize City

Manatees are free ranging and there is tracking evidence from research by Wildlife Trust and Sea2Shore Alliance that some can go for long distances. One of the reasons that manatee move to another area is for food or fresh water, another is for reproduction and others to seek safe shelter. The manatees of the Belize District area traverse the area from rivers, the Belize City coast, SCWS, the cayes and reef for all these reasons and more. At this time, Sea2Shore Alliance is tracking 3 of these individuals. This area is also the traffic lanes of many boats, barges and ships.

Increasingly, water taxis, tour boats and fishers just speed through to access points further on. This is very dangerous to the manatee. The continued expansion of Belize City is a source of pollution, solid waste and sedimentation which can reach SCWS and affect the quality of water. Cruise tourism facilities have caused massive dredging and land filling and more plans are in the offing, including causeway running 30ft overhead across Swallow Caye Wildlife Sanctuary. The purpose of this causeway would be for thundering busses to move the almost million cruise tourists annually. The vehicle exhaust settling over Swallow Caye Wildlife Sanctuary and the increased level of noise overhead could be a major factor in behavior modification and health of

the manatees.

● Boat Collisions with manatees occur at sea and in the rivers;
● Absence of Manatee protection signage in critical waterways and in areas visible by the public (areas where the public normally congregate anywhere in the country)
●Natural vegetation cover has mostly disappeared from all of Belize City giving way to urbanization
●Pollution from Belize City
●Tour guide and tourist molestation of manatees
●Helicopter tours from time to time fly low and need to be reminded of no fly zone
●Some guides chase the manatees poling to jockeying for better viewing position
●Lack of information to stakeholders
●Absence of Manatee protection signage in critical waterways and in areas visible by the public
●Visitation to Swallow Caye Wildlife Sanctuary restricted by number of available specialty guides
●Absence of specialized manatee tour guiding training for new guides
●Some tour guides are sometimes in a hurry and have to be cautioned to slow down;

Belize City Cayes

Comprised of mangrove and littoral forests the Belize City cayes are valuable real estate for the still growing tourism industry. All of them are part of the Belize Barrier Reef Complex and part of their value is the attraction of a living Belize Barrier Reef at hand.

Many of the cayes are mud flats in low tide and inundated in high tide so that preparing them for tourism entails major manipulation to create elevated dry areas, clearing of vegetation, dredging and excavating for the most affordable source of land fill. This results in major habitat loss which threatens the biodiversity of Belize.

Development guidelines for these cayes have been suggested but not enacted into law. Immediately bordering SCWS west and south are North Drowned Caye and Stake Bank, for which mega developments are proposed.
●Local and national municipal authorities allow certain development activities (e.g., dredging, mangrove clearance, housing in swampy areas, etc.) that undermine the integrity of the ecology of the protected areas;
●Mega development projects at North Drowned Caye and Stake Bank
● The ecological integrity of the wildlife sanctuary and mangrove ecosystems is undermined by unregulated caye development, poorly controlled tourism, and unregulated fishing activities;
●Destruction of mangroves, littoral forest and seagrass beds eliminate a source of food, shelter and nursery areas for many species;
●Increases in tourism development of the cayes results in increased tourist activity in and around SCWS;
●Contamination also increases with increased populations and boating activities on the cayes;

Threats to Swallow Caye Wildlife Sanctuary

Coastal Development Threat	Moderate Severity
Threats from Land Based Sources	High
Marine Based Threat	High

Immediately outside SCWS Boundaries

Coastal Development Threat	High west of SCWS
Overfishing	Moderate east of SCWS
Dredging	Moderate west and southeast of SCWS

From Belize Coastal Threats Atlas 2005

Manatees - Antillean Manatee, sub-species of the West Indian Manatee

All sources report the Antillean manatee as having a small population which is the reason why it is currently listed as endangered on the IUCN Red List. According to Self-Sullivan and Mignucci-Giannoni, 2008, it is a small and declining population without ongoing, effective conservation actions. The manatee is protected throughout Belize and three wildlife sanctuaries have been established for its protection. BMMSN in 2012 from the result of this year's aerial survey is reporting confirmation that Belize's manatee population is on the increase because 507 manatees were sighted, 50 of which were calves, far more than previous counts. (N. Auil G. 2012) The previous highest count was 338 sighted in the wet 2002 survey and 38 calf sightings in the dry 1999 survey. The plight of the manatee is otherwise negatively affected by injury, behaviour modification and death by boat collisions.

2012 data shows that 13 deaths this year are from boat collisions; more than 50% of manatees in SCWS carry scars from boat injuries and monofilament fishing line is also showing up as a source of injury. Manatee parts can be amputated by entanglement in lines which is particularly devastating if the manatee loses a fin, critical to feeding and mobility.

Mangroves

Mangroves have an important role to play for the safety and survival of human settlements in Belize because they are integral to, and mutually inter-dependent with, the Belize Barrier Reef and other coastal ecosystems giving Belize a particular wealth of natural capital. Although mangroves are protected in Belize, their destruction is still allowed through permits for clearing to accommodate developments. The location of mangrove ecosystems is the preferred location for coastal development such as roads, urbanizations, aquaculture, tourism, fishing and shipping developments.

- Manatees migrate beyond boundaries of SCWS and outside immediate management of FOSC;
- Water and noise pollution, water quality and destruction of mangroves affect manatees.

Seagrasses

The importance of seagrasses is increasingly being recognized from a primary producer, sediments trap, nursery, wave energy control, to a tremendous carbon sink. The protected shallow lagoons of northern Belize between the coast and the Belize Barrier Reef are ideal for extensive seagrass savannas. Along with mangroves, this habitat is being destroyed by water quality and by physical destruction as seabed areas are excavated, dredged and trampled. Water quality is further compromised from sources far upriver. The seagrass meadows of SCWS are at the outflow of the Belize Old River, Haulover Creek and Sibun River watersheds. These waterways have the potential to bring pollutants from, in the case of the Belize Old River, as far away as the Guatemalan Peten traversing more than a hundred miles.

The southern cayes of Belize are already showing unacceptably high levels of chemical and solid waste pollution downstream from land based sources. The development practices leading to that situation must be studied and solved so as to not repeat and so that the problem does not continue to spread northward. Of immediate concern to SCWS are the Belize and Sibun Rivers, the expansion of Belize City, and the agricultural, tourism, fishing and navigation developments from river mouth to source.

●Offshore petroleum extraction activities would have a major negative impact on coastal and marine environments;
●Some catamarans sometimes leave the deeper waters and slide through the muddy shallows ripping up seagrass including very near to Swallow Caye;
●Fishing and swimming in the Sanctuary

Native Fish Populations

Despite policies and practices to maintain its native fisheries stocks, these have been experiencing declines. Commercial species continue to decline even with the introduction of closed seasons, size limits, and other conservation measures since decades ago. Marine protected areas, sustainable measures such as catch and release sport fishing, protected species such as parrot fish, all contribute to some level of protection. However, from 1977 to 2007 Belize fisheries production has declined with the composition of exports now showing that farmed fish outweigh captured fish by more than double and farmed shrimp by almost five times. (Belize Environment Outlook – 2010)

●Illegal fishing occurring within the Sanctuary
●There is no buffer zone around the Sanctuary

TABLE
Marine resources provide employment for many persons in Belize including:

Activity	2008 Licenses
Black Coral	30
Boat License	643
Shrimp Trawlers	2 (this activity currently banned in BZ waters)
Fishermen License	2,267
Research License	7
Aquarium License	2
Sea Food Export Permits	2,210
Fish Exporters	18
Aquaculture Operations	0

Source: Fisheries Department in Belize Environment Outlook 2010)

The rapid ecological assessment of SCWS explains that:

> **Threats are defined as stresses to the environment or resources. A stress is a process or event that has or may have direct, deleterious impact on species, natural communities or ecosystems. After threats or stresses have been determined the source also needs to be identified to be successful in reducing or alleviating the particular stress or threat. A source of stress is an action or entity from which the stress is derived. (Source: REA 2006 Cho-Ricketts, L. et al.)**

Further to that study, public consultations and interviews conducted with stakeholders in Ambergris Caye, Caye Caulker and Belize City, agreed that there are knowledge gaps about manatees and about Swallow Caye Wildlife Sanctuary. Additionally, the threats to manatees were identified and solutions suggested. Aiding in the analysis was the experience and the background knowledge of the members of the FOSC Board of Directors and the staff.

The Convention on Biological Diversity (CBD) defines a threat as any human activity, direct or indirect that degrades or harms the biodiversity features, ecological processes, or cultural assets within protected areas. A group of recognized conservation organizations has agreed on drafting uniform terminology in the:
Common taxonomy of threats from www.conservationmeasures.org Exposition pages for threat categories under construction as shown in the following table column one.

TABLE

Threats Taxonomy: Column one	**Threats to SCWS ✓Yes ✗ No Column two**
1 Residential & Commercial Development **Threats from human settlements or other non-agricultural land uses with a substantial footprint** **1.1 Housing & Urban Areas** **Human cities, towns, and settlements including non-housing development typically integrated with housing** **1.2 Commercial & Industrial Areas** **Factories and other commercial centers** **1.3 Tourism & Recreation Areas** **Tourism and recreation sites with a substantial footprint**	✓ **Belize City housing developments, Belize City, Stake Bank, North Drowned Caye commercial development and tourism infrastructure tourism visitation, development, tourism and fishing encroachment,**
2 Agriculture & Aquaculture **Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture** **2.1 Annual & Perennial Non-Timber Crops** **Crops planted for food, fodder, fiber, fuel, or other uses** **2.2 Wood & Pulp Plantations** **Stands of trees planted for timber or fiber outside of natural forests, often with non-native species** **2.3 Livestock Farming & Ranching** **Domestic terrestrial animals raised in one location on farmed or non-local resources (farming); also domestic**	✓ **Upriver crop cultivation, livestock and grazing, aquaculture,**

or semi-domesticated animals allowed to roam in the wild and supported by natural habitats (ranching) **2.4 Marine & Freshwater Aquaculture** **Aquatic animals raised in one location on farmed or non-local resources; also hatchery fish allowed to roam in the wild**	
3 Energy Production & Mining **Threats from production of non-biological resources** **3.1 Oil & Gas Drilling** **Exploring for, developing, and producing petroleum and other liquid hydrocarbons** **3.2 Mining & Quarrying** **Exploring for, developing, and producing minerals and rocks** **3.3 Renewable Energy** **Exploring, developing, and producing renewable energy**	✓ **GoB oil and/or gas drilling and exploration, Stake Bank, North Drowned Caye mining and quarrying and energy generation**
4 Transportation & Service Corridors **Threats from long narrow transport corridors and the vehicles that use them including associated wildlife mortality** **4.1 Roads & Railroads** **Surface transport on roadways and dedicated tracks** **4.2 Utility & Service Lines** **Transport of energy & resources** **4.3 Shipping Lanes** **Transport on and in freshwater and ocean waterways** **4.4 Flight Paths** **Air and space transport**	✓ **Belize City roads and proposed causeways, utility and service lines, Port of Belize shipping lanes, Civil Aviation flight paths, helicopter routes, fast boats and water taxi routes;**
5 Biological Resource Use **Threats from consumptive use of "wild" biological resources including both deliberate and unintentional harvesting effects; also persecution or control of specific species** **5.1 Hunting & Collecting Terrestrial Animals** **Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch** **5.2 Gathering Terrestrial Plants** **Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons** **5.3 Logging & Wood Harvesting** **Harvesting trees and other woody vegetation for timber, fiber, or fuel** **5.4 Fishing & Harvesting Aquatic Resources** **Harvesting aquatic wild animals or plants for commercial, recreation, subsistence, research, or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch**	✓ **Biological resource use – overfishing**
6 Human Intrusions & Disturbance **Threats from human activities that alter, destroy and disturb habitats and species associated with non-consumptive uses of biological resources** **6.1 Recreational Activities** **People spending time in nature or traveling in vehicles outside of established transport corridors, usually for recreational reasons**	✓ **Visitation** **Transit** ✓ **Catamarans in seagrass,**

6.2 War, Civil Unrest & Military Exercises **Actions by formal or paramilitary forces without a permanent footprint**	
6.3 Work & Other Activities **People spending time in or traveling in natural environments for reasons other than recreation, military activities, or research**	✓
7 Natural System Modifications **Threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human welfare**	✗
7.1 Fire & Fire Suppression **Suppression or increase in fire frequency and/or intensity outside of its natural range of variation**	
7.2 Dams & Water Management/Use **Changing water flow patterns from their natural range of variation either deliberately or as a result of other activities**	
7.3 Other Ecosystem Modifications **Other actions that convert or degrade habitat in service of "managing" natural systems to improve human welfare**	✓
8 Invasive & Other Problematic Species & Genes **Threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread and/or increase in abundance**	**Invasion of alien species – presence of lionfish**
8.1 Invasive Non-Native/Alien Species **Harmful plants, animals, pathogens and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities**	
8.2 Problematic Native Species **Harmful plants, animals, or pathogens and other microbes that are originally found within the ecosystem(s) in question, but have become ŧout-of-balanceŧ or ŧreleasedŧ directly or indirectly due to human activities**	
8.3 Introduced Genetic Material **Human altered or transported organisms or genes**	
9 Pollution **Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources**	✓ **Belize City and Belize District sources Upriver sources**
9.1 Household Sewage & Urban Waste Water **Water-borne sewage and non-point runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments**	
9.2 Industrial & Military Effluents **Water-borne pollutants from industrial and military sources including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals and/or sediments**	
9.3 Agricultural & Forestry Effluents **Water-borne pollutants from agricultural, silvicultural, and aquaculture systems that include nutrients, toxic**	

chemicals and/or sediments including the effects of these pollutants on the site where they are applied **9.4 Garbage & Solid Waste** **Rubbish and other solid materials including those that entangle wildlife** **9.5 Air-Borne Pollutants** **Atmospheric pollutants from point and nonpoint sources** **9.6 Excess Energy** **Inputs of heat, sound, or light that disturb wildlife or ecosystems**	**✓Some solid waste** **✓Exhaust from tour boats**
10 Geological Events **Threats from catastrophic geological events** **10.1 Volcanoes** **Volcanic events** **10.2 Earthquakes/Tsunamis** **Earthquakes and associated events** **10.3 Avalanches/Landslides** **Avalanches or landslides**	**✓** **Ash cover possible from nearby volcanoes e.g. El Chichón in Mexico** **Earthquake effect possible to 5 magnitude** **Earth movements along fault lines**
11 Climate Change & Severe Weather **Threats from long-term climatic changes which may be linked to global warming and other severe climatic/weather events that are outside of the natural range of variation, or potentially can wipe out a vulnerable species or habitat** **11.1 Habitat Shifting & Alteration** **Major changes in habitat composition and location** **11.2 Droughts** **Periods in which rainfall falls below the normal range of variation** **11.3 Temperature Extremes** **Periods in which temperatures exceed or go below the normal range of variation** **11.4 Storms & Flooding** **Extreme precipitation and/or wind events**	**✓** **Climate change forecasts are underway with cumulative significant changes forecast for 2050;** **In the meantime, changes being reported:** **Increasing temperatures** **Storms and flooding events being reported as more frequent and more severe** **Extreme events to be expected**

In the face of threats, management responsibilities are to abate threats, maintain ecological integrity, and minimize impact to biodiversity. The more threats that have to be endured by a species makes that species less resilient and more vulnerable to "tipping point" to less diversity. Species, landscapes and ecosystem are to be protected.

A Threats Assessment Matrix was arrived at from the Rapid Ecological Assessment. The threats assessment matrix was developed using 5 main ranking criteria that assessed the severity (potential impact); scope (geographic extent); immediacy (current or potential); likelihood (probability of occurring); and reversibility (restoration potential) of each threat or stress. The assessment was done using a matrix which had stresses along one side and critical ecosystems and species of concern along the other side. Threats were ranked using a numerical scale where: low – 1, medium – 2, high – 3, very high – 4. These same criteria are being applied in the management plan preparation.

THREATS – current list

Loss of Manatee - Boat collisions – boat traffic around and through the sanctuary

Habitat destruction – **Development** - unsustainable land development in the vicinity (e.g. Drowned Cayes, Stake Bank, North Drowned Caye)
Pollution – from boats, Belize City and spills
Behavioural Modification – **harassment** of animals by visitors inside the sanctuary but primarily in unregulated areas outside the sanctuary; harassment from general human activity that manatees must adjust to;
Illegal Fishing – illegal fishing inside the sanctuary
Invasive alien species - lionfish

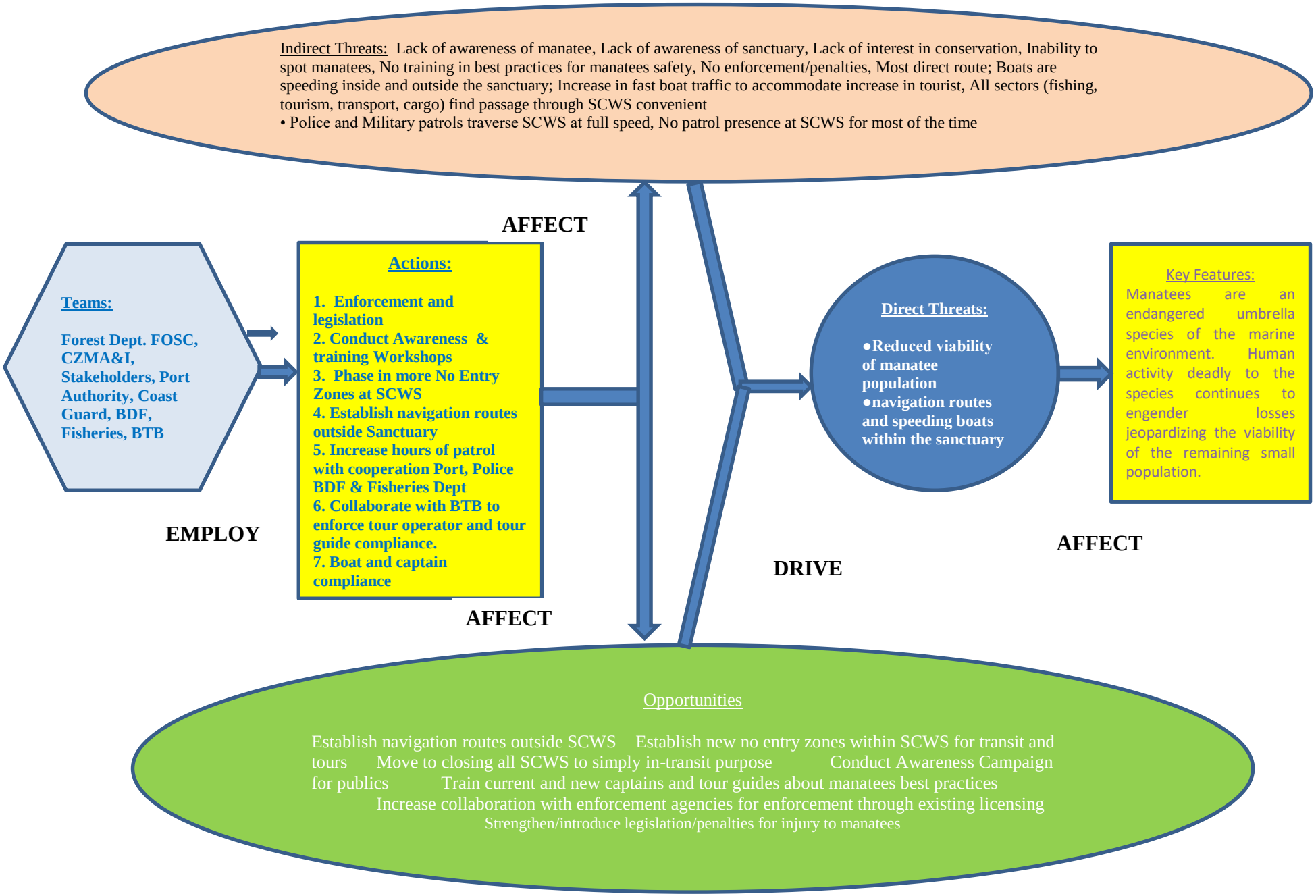
3.3 Strategies to Reduce Threats

It is important that management and conservation strategies be identified and developed as a preventative measure to avoid irreversible loss of manatees and their primary habitat. Cho-Ricketts 2006

TABLE

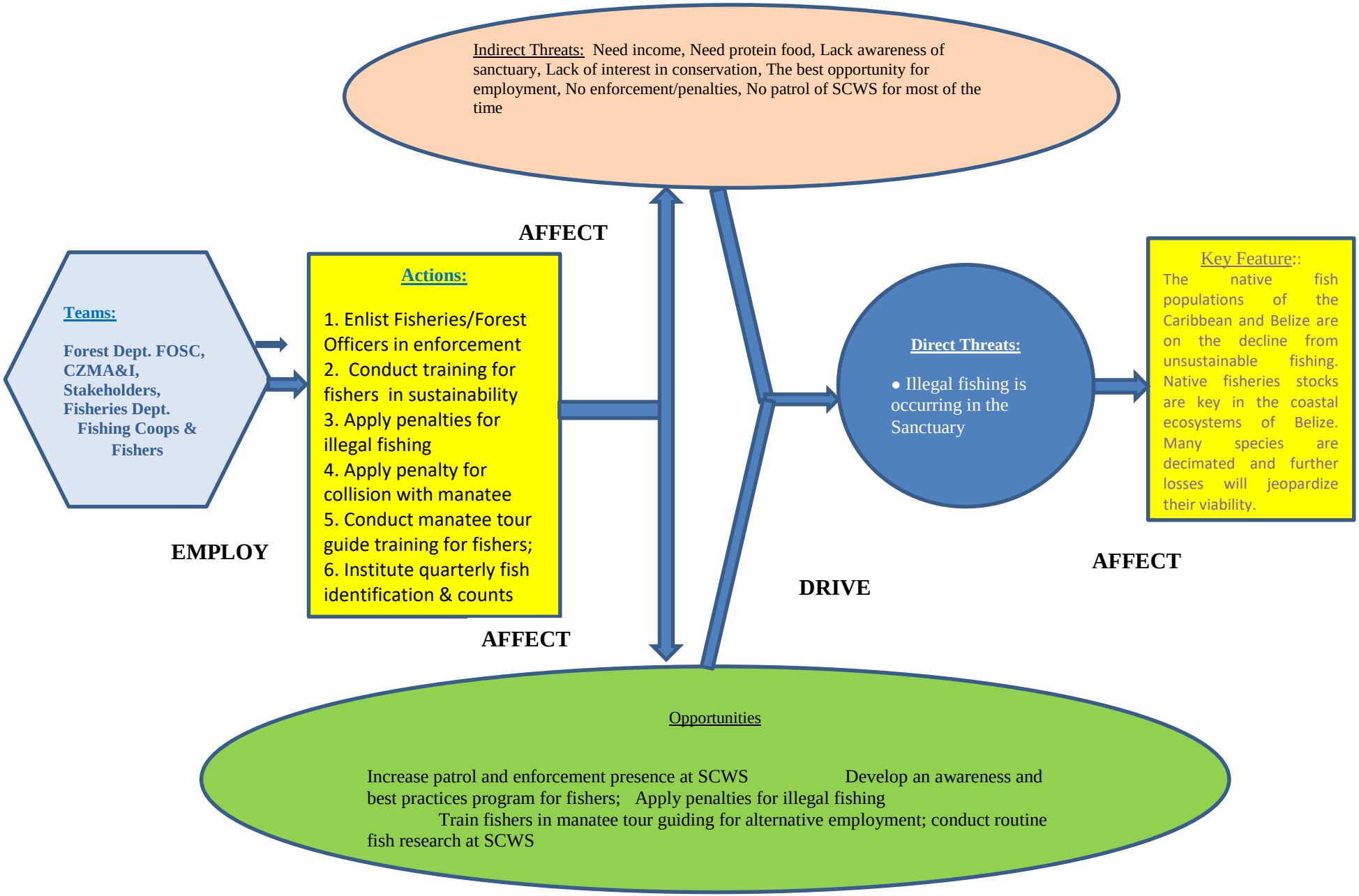
Threats to Biodiversity at Swallow Caye Wildlife Sanctuary			
Loss of Manatee	**Status:** Active **Target**: Wide ranging large marine vertebrate (manatee) **Threats** (Direct): Reduced viability of manatee population • navigation routes are within the sanctuary • boats are speeding inside and outside the sanctuary; • increase in fast boat traffic to accommodate increase in tourism • all sectors (fishing, tourism, transport, cargo) find passage through SCWS convenient • Police and Military patrols traverse SCWS at full speed • no patrol for most of the time **Source:** (Indirect Threat) Need income Lack of awareness of manatee Lack of awareness of sanctuary Lack of interest in conservation The best opportunity for employment Inability to spot manatees No training in best practices for manatees No enforcement/penalties Most direct route		
	Scope (area)	4	Loss of manatee is happening now inside and outside of SCWS
	Severity	3	Injuries and fatalities are on the increase
	Immediacy (Urgency)	3	The threat is occurring now and needs action
	Likelihood	4	Ongoing and Increasing
	Reversibility	1	Extinction possible
	Management Goal: Reduce death and injury from boat collisions and improve the condition of manatees at Swallow Caye Wildlife Sanctuary **Management Strategy:** **Strategy 1:** Increase no entry zones at SCWS; **Strategy 2:** Support manatee slow/safe zones along the coast and rivers **Strategy 3:** Phase in entire SCWS as non-transit zone; **Strategy 4:** Train all boat handlers about SCWS and manatees		

Management Goal: Reduce death and injury from boat collisions and improve the condition for manatees in SCWS

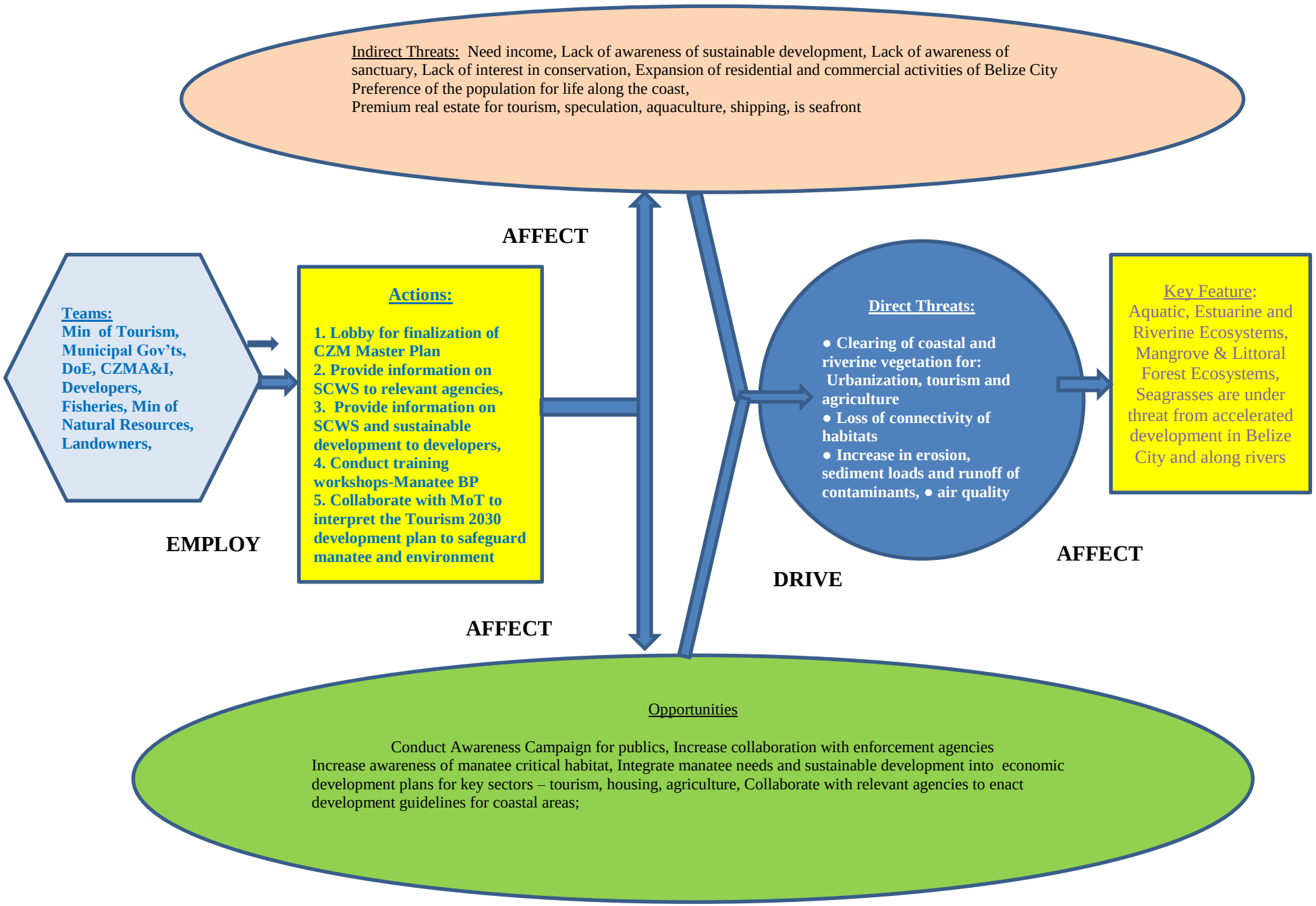


Threats to Biodiversity at Swallow Caye Wildlife Sanctuary			
Illegal Fishing	**Status:** Active **Target:** Native Fish Populations **Threats** (Direct)**:** • Illegal fishing is occurring in the Sanctuary **Source** (Indirect Threat): Need income Need protein for food Have no other opportunities Have no training in sustainable practices Have no interest in sustainable practices Unaware of existence of SCWS;		
	Scope (Area)	4	Illegal fishing is occurring in SCWS
	Severity	3	Fisheries stock are declining at SCWS
	Immediacy (Urgency)	3	Fishing is happening now and needs action
	Likelihood	4	Continuously occurring in and around SCWS
	Reversibility	3	Decline can be slowed or halted
	Management Goal: At Swallow Caye Wildlife Sanctuary, the stock of native fish increases. **Management Strategy:** **Strategy 1:** Increase patrol and enforcement presence at SCWS **Strategy 2**: Develop an awareness and best practices program for fishers; **Strategy 3:** Phase in penalties for illegal fishing **Strategy 4:** Train fishers in manatee tour guiding **Strategy 5:** Conduct native fish research at SCWS		

Management Goal: Swallow Caye Wildlife Sanctuary is a fully no take no swim zone 24 hours of every day.

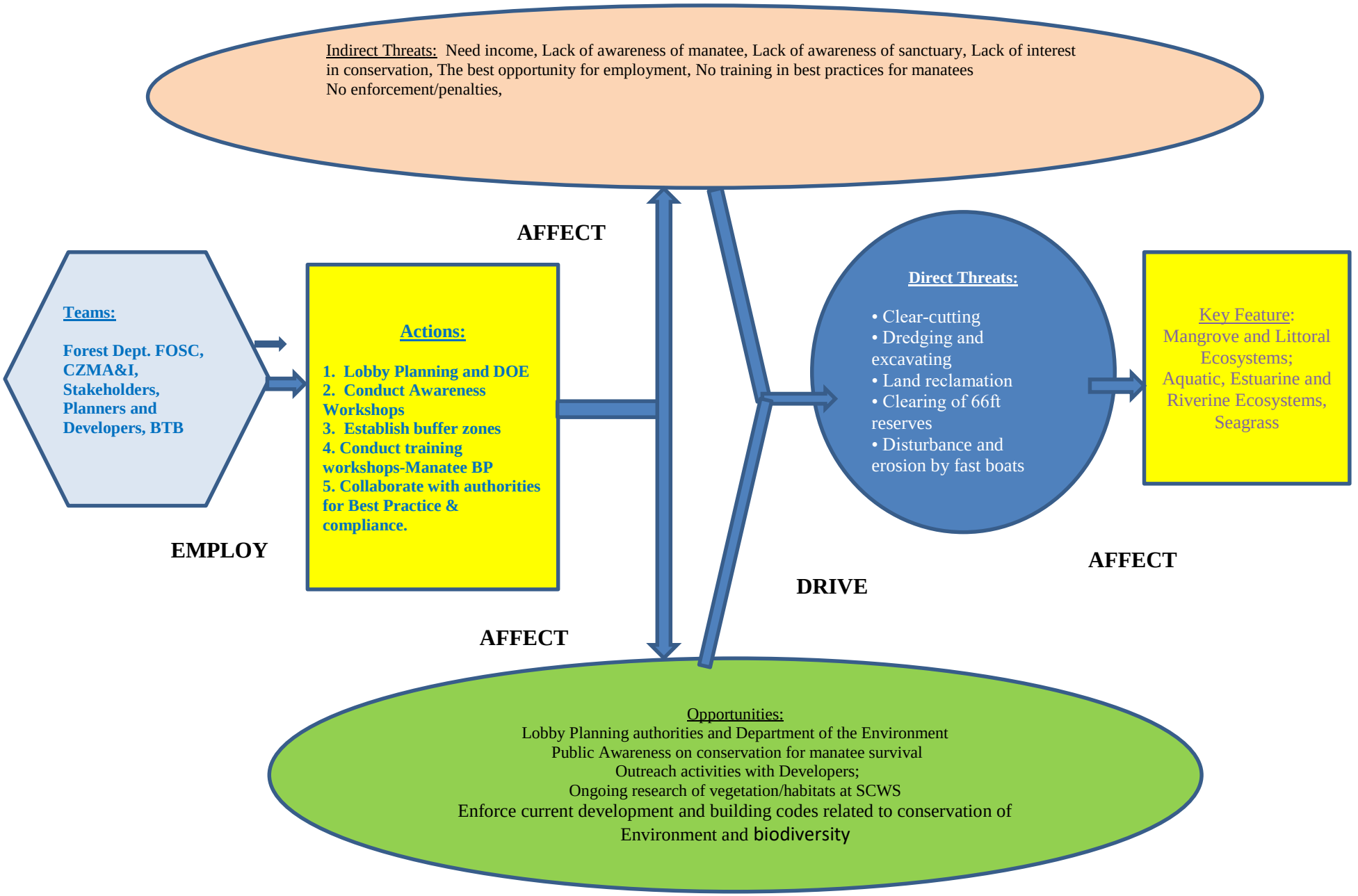


Threats to Biodiversity at Swallow Caye Wildlife Sanctuary			
Land Use Changes	**Status:** Active **Target:** Aquatic, Riparian and Estuarine Ecosystems **Threats** (Direct)**:** • Clearing of coastal vegetation for urbanization • Clearing of riverine vegetation for tourism and agriculture • Loss of connectivity of habitats • Increase in erosion and sediment loads • Increase in runoff of contaminants **Source** (Indirect Threat): Expansion of residential and commercial activities of Belize City Preference of the population for life along the coast Premium real estate for tourism, speculation, aquaculture, shipping is seafront		
	Scope (Area)	4	Occurring all around and accelerated at river mouth
	Severity	3	Ecosystems are being destroyed
	Immediacy (Urgency)	3	Ecosystems are being destroyed continuously
	Likelihood	4	Continuous
	Reversibility	2	Some Restoration is possible
	Management Goal: Maintain water quality within Swallow Caye Wildlife Sanctuary **Management Strategy:** **Strategy 1:** Enact sustainable development guidelines **Strategy 2**: Inform developers of the importance of conservation of unique coastal ecosystems **Strategy 3:** Public awareness for the life cycle needs of the manatee especially the connectivity of habitats **Strategy 4:** Routine water quality monitoring		


Indirect Threats: Need income, Lack of awareness of sustainable development, Lack of awareness of sanctuary, Lack of interest in conservation, Expansion of residential and commercial activities of Belize City
Preference of the population for life along the coast,
Premium real estate for tourism, speculation, aquaculture, shipping, is seafront
AFFECT
Teams:
Min of Tourism, Municipal Gov'ts, DoE, CZMA&I, Developers, Fisheries, Min of Natural Resources, Landowners,
EMPLOY
Actions:
1. Lobby for finalization of CZM Master Plan
2. Provide information on SCWS to relevant agencies,
3. Provide information on SCWS and sustainable development to developers,
4. Conduct training workshops-Manatee BP
5. Collaborate with MoT to interpret the Tourism 2030 development plan to safeguard manatee and environment
AFFECT
Direct Threats:
● Clearing of coastal and riverine vegetation for: Urbanization, tourism and agriculture
● Loss of connectivity of habitats
● Increase in erosion, sediment loads and runoff of contaminants, ● air quality
DRIVE
Key Feature:
Aquatic, Estuarine and Riverine Ecosystems, Mangrove & Littoral Forest Ecosystems, Seagrasses are under threat from accelerated development in Belize City and along rivers
AFFECT
Opportunities
Conduct Awareness Campaign for publics, Increase collaboration with enforcement agencies
Increase awareness of manatee critical habitat, Integrate manatee needs and sustainable development into economic development plans for key sectors – tourism, housing, agriculture, Collaborate with relevant agencies to enact development guidelines for coastal areas;

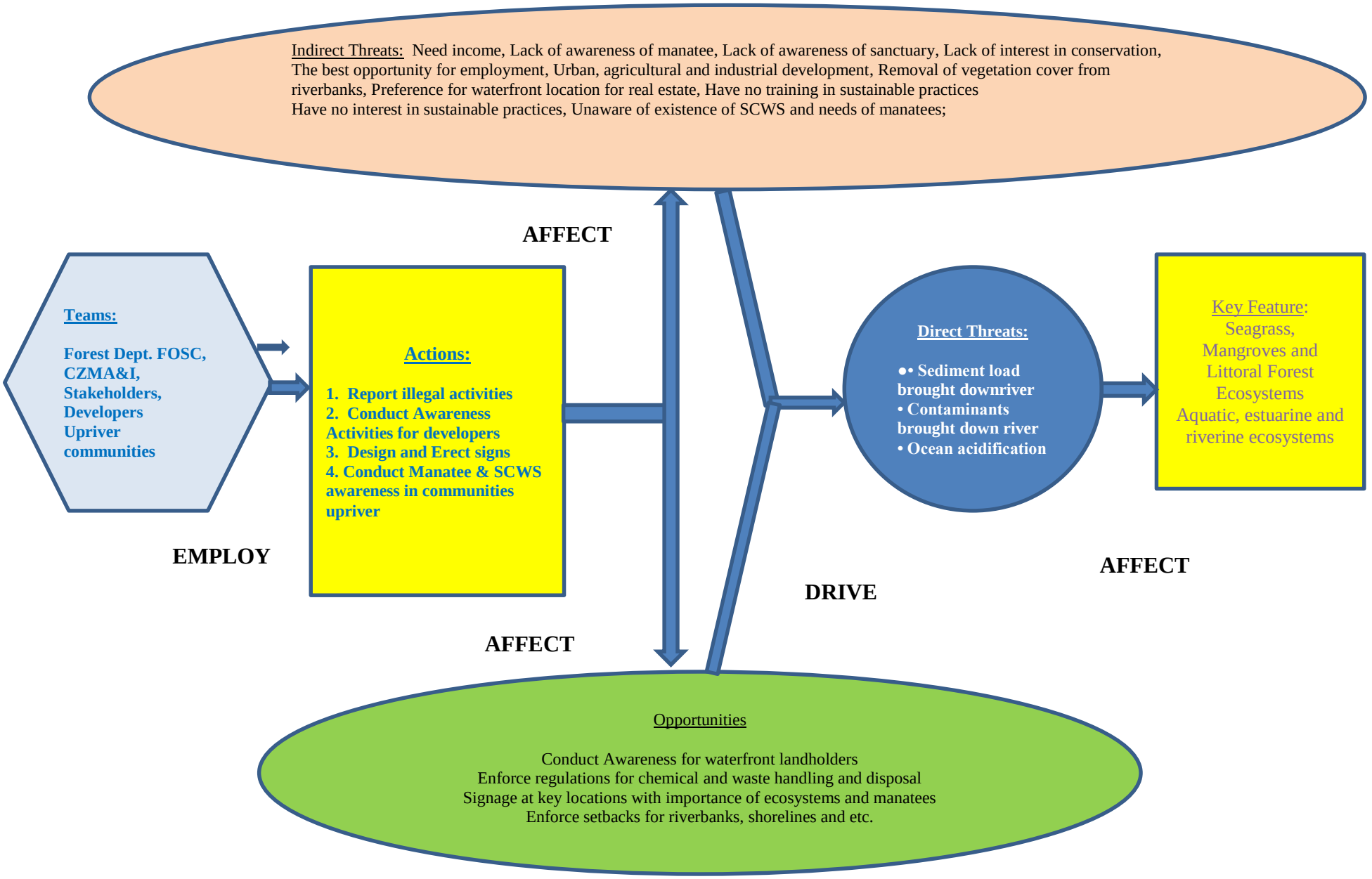
Threats to Biodiversity at Swallow Caye Wildlife Sanctuary			
Habitat Loss	**Status:** Active **Target:** Mangrove and Littoral Ecosystems **Threats** (Direct)**:** • Clear-cutting • Dredging and excavating • Land reclamation • Clearing of 66ft reserves • Disturbance and erosion by wake of fast boats especially in river **Source** (Indirect Threat): Need income Tourism Development Aquaculture Development Oil Exploration Have no training in sustainable practices Have no interest in sustainable practices Unaware of existence of SCWS and manatees;		
	Scope (Area)	4	Happening in Belize City and cayes
	Severity	3	Habitats are being destroyed
	Immediacy (Urgency)	3	Habitat loss is occurring now & action needed
	Likelihood	4	Ongoing
	Reversibility	2	Restoration potential to some degree
	Management Goal: Maintain critical mass of natural vegetation cover in SCWS and buffer area **Management Strategy:** **Strategy 1:** Lobby Planning authorities and Department of the Environment **Strategy 2**: Public Awareness on conservation for manatee survival **Strategy 3:** Outreach activities with Developers; **Strategy 4** Ongoing research of vegetation/habitats at SCWS		

Management Goal:



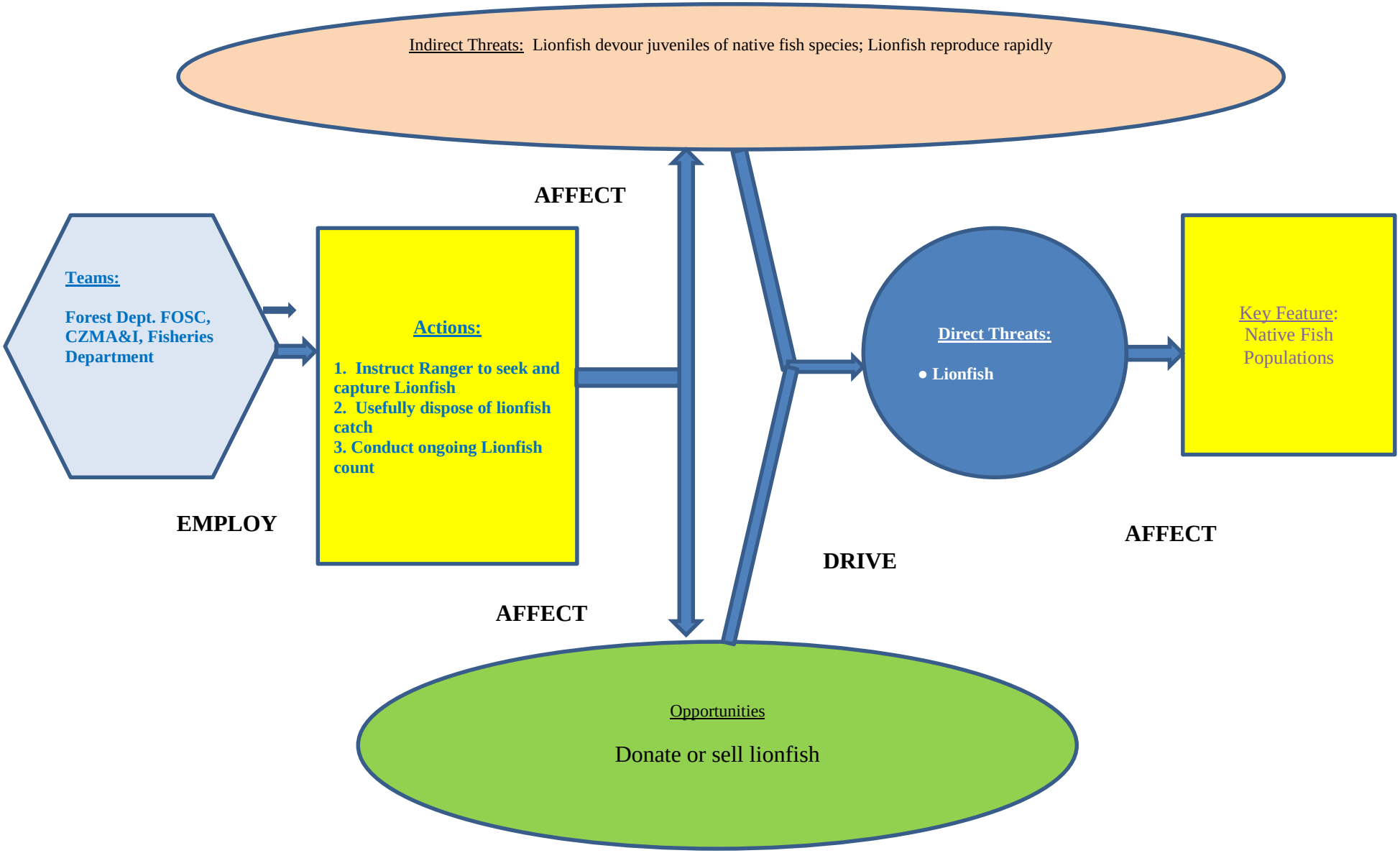
Threats to Biodiversity at Swallow Caye Wildlife Sanctuary			
Pollution	**Status:** Active **Target:** Seagrass **Threats** (Direct)**:** • Sediment load brought downriver • Contaminants brought down river • Ocean acidification **Source** (Indirect Threat): Urban, agricultural and industrial development Removal of vegetation cover from riverbanks Preference for waterfront location for real estate Have no training in sustainable practices Have no interest in sustainable practices Unaware of existence of SCWS and needs of manatees;		
	Scope (Area)	4	Belize City and rivers
	Severity	3	Will be widespread
	Immediacy (Urgency)	2	Happening now and needs action
	Likelihood	3	Ongoing
	Reversibility	2	No restoration occurring
	Management Goal: Establish a manatee management zone countrywide, starting with Belize City and Belize River; **Management Strategy:** **Strategy 1:** Conduct Awareness for waterfront landholders **Strategy 2**: Enforce regulations for chemical and waste handling and disposal **Strategy 3:** Signage at key locations with importance of ecosystems and manatees **Strategy 4:** Enforce setbacks for riverbanks, shorelines and etc.		

Management Goal: Protect the natural habitat of the manatee



Threats to Biodiversity at Swallow Caye Wildlife Sanctuary			
Invasive Alien Species	**Status:** Active **Target:** Commercial/Recreation species **Threats** (Direct)**:** • Lionfish **Source** (Indirect Threat): Devours juveniles of native fish		
	Scope (Area)	4	Belize City and rivers
	Severity	3	Will be widespread
	Immediacy (Urgency)	2	Happening now and needs action
	Likelihood	4	Widespread in Belize
	Reversibility	1	Attempts to eradicate ongoing
	Management Goal: Reduce the number of Lionfish in Swallow Caye Wildlife Sanctuary **Management Strategy:** **Strategy 1:** Capture all Lionfish and destroy **Strategy 2**: Donate caught Lionfish to charity when possible **Strategy 3:** Research - Conduct Lionfish count		

Management Goal: To eradicate Lionfish from Swallow Caye Wildlife Sanctuary



3.3 Strategies to Reduce Risk

3.3.1 Primary Cross-cutting Strategies were identified during the strategic planning, business planning and management planning exercises.

Cross-cutting Strategies	Aquatic/Estuarine Riparian	Mangrove and Littoral	Seagrass	Native Fish Populations	Wide ranging marine Mammal/Manatee
Institutional strengthening of SCWS: Governance Improvement, Human Resources Development and Financial Sustainability					
Renewal of Co-management agreement with Forest Dept.					
Improve in management effectiveness by implementing management and business plans					
Further develop member recruitment and retention programs					
Public Awareness and Communications					
Conduct public awareness programs					
Conduct educational programs					
Expand Outreach Activities for the public					
Conduct educational activities with all schools in Belize					
Strategic Alliances: Advocacy, Networking, Alliances					
Increase networking with BMMSN, NMWG and CZMA&I					
Partner with UB & international Universities on research and other activities					
Expand collaboration efforts to Fisheries and Forest Dept for enforcement activities and ongoing staff training					
Protected Areas Management: Integrated Management, Surveillance and Enforcement, Research and Monitoring					
Lobby for legislation to Increase Penalties for collisions with manatees and injuries to manatees					

Enforce existing legislation reference mangroves, and 66 ft river reserves					
Increase patrolling and enforcement					
Explore and introduce Alternative Livelihoods initiatives					
Conduct Research on mangrove, seagrass, manatee					
Monitor water and air quality					
Fine tune Zoning within SCWS					
Communities agree to identify and establish alternate Navigation Routes outside of SCWS					
Communities agree for the Creation of Buffer area around SCWS					
Communities agree for the creation of Manatee safe zones along the entire coastline					

3.4 Monitoring of Success of Conservation Strategies

Measures of Success **Cross-cutting Strategies**	Target	What to Monitor	How to Monitor	Indicator
Institutional strengthening of SCWS ***Institutional strengthening of SCWS: Governance Improvement, Human Resources Development and Financial Sustainability***	Election of Active Officers Board of Directors Motivated and Effective Active and growing membership Management and financial plans implemented Adequately resourced	Frequency of Board Meetings General Membership Meetings and AGM Managers and staff Legal compliance	FOSC BoD oversight	Minutes of meetings Appointment of staff Election/Appointment of Officers Reports to NGO Ministry New members New Income
Renewal of Co-management agreement with Forest Dept.	Current and valid co-management agreement	Application for co-management	FOSC BoD will secure	Signed and valid co-management contract
Further develop member recruitment and retention programs	Increase membership	Membership applications	FOSC BoD	Dues payments
Public Awareness and Communications				
Implement public awareness programs	Disseminate Information	Number of Variety of Media Audiences	FOSC BoD, Manager & Outreach Officer	Programs, Messages and Materials
Conduct educational programs	Stakeholders protecting manatees, ecosystems and habitats	Footprint of developments	Outreach Officer & Research Officer	Ecosystems remaining intact; manatees alive, uninjured and healthy
Conduct educational activities with all schools in Belize	Students protecting manatees, ecosystems and habitats	School Projects	Outreach Officer & Manager	Attendance at Workshops, School Projects
Expand Outreach Activities for the public	Stakeholder Involvement in SCWS; developers protecting ecosystems;	Number of supporters involved in SCWS activities	Outreach and Research Officers	Number of Joint projects;
Strategic Alliances: Advocacy, Networking, Alliances				
Increase networking with BMMSN, NMWG and CZMA&I	Manatee survival	Frequency of Meetings System collaboration	President and Research Officer	Minutes of meetings; Number of joint activities
Expand collaboration efforts to Fisheries and Forest Dept for enforcement activities and ongoing staff training	18 to 24Hours of surveillance and enforcement per day at SCWS	Hours of patrol presence at SCWS Incidents of illegal activity	Ranger, Forest and Fisheries Departments, BTB, Port Authority	Actual Schedule of patrols; daily data logs; Warnings and charges to offenders
Partner with UB & international	Ongoing in-house research at	Number of research	UB, and other academia,	Research Plans and

Universities on research and other activities	SCWS – manatees, habitats, water quality, fish species	projects per year; Expansion of research projects	Fisheries & Forest Depts, FOSC BoD, Research Officer	permits, Research Reports
Lobby for legislation to Increase Penalties for collisions with manatees and injuries to manatees	Penalties for collisions with manatees	Legislation and enforcement	Boaters, Rangers, communities, BMMSN, NMWG, Transport and Fisheries Officers	Reduction in collisions Increase in fines and convictions
Lobby for new practices and measures				
Protected Areas Management: Integrated Management, Surveillance and Enforcement, Research and Monitoring				
Enforce existing legislation reference mangroves, and 66 ft river reserves	Intact vegetation cover	Developments and EIA's, Best Practices	Planning Authorities, FOSC BoD and Outreach, CZMA&I,	No new areas clear-cut Best Practices applied
Increase patrolling and enforcement	SCWS is patrolled for at least 12 hours on at least 2 days per week	Level of non-compliance – illegal fishing, speeding, transiting Hours of patrol and surveillance	Discussions FOSC with Fisheries Dept	Level of illegal activities Patrol and enforcement activities
Conduct Research on mangrove, seagrass, manatee	Sound science is informing management decision-making	Research projects underway	UB, Alliances, Forest and Fisheries Dept, Research Officer	Reports, findings and recommendations
Monitor water and air quality	Water and air quality remain within normal parameters	All water and air quality parameters	Ranger and Research Officer, CZMA&I	Readings for water and air quality including CO2, O, Ph, conductivity, turbidity, etc
Fine tune Zoning in SCWS	More Manatee safe areas within SCWS	Entry and speed zones and boating activities	Manager, Ranger, Research and Outreach Officers, Forest Dept	No entry zones, signage for navigation, compliance by users; less injuries to manatees at SCWS
Explore and introduce Alternative Livelihoods initiatives	Belize City stakeholders engaged	New entrepreneurship ideas/startups	Outreach Officer	New products/packages; Participants trained or re-trained
Improve in management effectiveness by implementing management and business plans	FOSC is advancing all program activities – research, outreach, awareness, membership, enforcement, personnel and income etc.	Management effectiveness	Annual Management Effectiveness Assessment (MEA)	Results of MEA

Limits of Acceptable Change	Visitor Satisfaction	Social and biophysical impacts	Ranger/Manager/Outreach	Results and management measures
Communities agree to identify and establish alternate Navigation Routes outside of SCWS	SCWS a slow zone and no transit zone	Number of boats and speed of boats	Port Authority, Ranger, Fisheries and Forest Department	No speeding near Swallow Caye, other no entry zones observed
Communities agree for the Creation of Buffer area around SCWS	Buffer zone surrounding SCWS established	Seagrass, Mangrove and littoral forest; Fishing and Tourism activity	Ranger Reports	Mangrove, littoral forest and seagrass maintain and increase in volume; No illegal fishing No speeding boats
Communities agree for the creation of Manatee safe zones along the entire coastline	Areas of slow and stop for manatee zones countrywide	Safe zones for manatees enforced for entire coast of Belize	Number of signs Number of boaters complying	Less or no new manatee injuries Less or no new manatee fatalities from boat collisions

4. Management Planning

4.1 Management and Organizational Background

Swallow Caye Wildlife Sanctuary was established by Statutory Instrument #2 of 2002. It was identified as a critical area for manatee survival by a group of citizenry since 1990's led by Mr. Lionel "Chocolate" Heredia. This group formally organized as Friends of Swallow Caye to lobby for the establishment of the Sanctuary with the help of manatee researchers, tour guides, planners, photographers, politicians and other community members.

Responsibility for this protected area lies with the Forest Department of the Ministry of Forestry, Fisheries and Sustainable Development.

Co-management is between Forest Department and Friends of Swallow Caye since 2003 and Friends of Swallow Caye is again now seeking renewal of co-management. For years, the government of Belize has maintained a moratorium on new or renewals of co-management. In 2012, the Minister of Fisheries, Forestry and Sustainable Development has informed that the new co-management contract has been approved by Cabinet and is ready to be signed in October 2012 for those groups that are interested.

The first official action taken to protect manatees at SCWS was the drafting of regulations to be implemented with tour guides bringing visitors to the area. With co-management responsibility, FOSC sought financial support from PACT and UNDP Global Environmental Funds in 2004, to introduce management measures and presence at SCWS. With this help, personnel, equipment and infrastructure was put in place. Since then, a ranger is present daily at the Sanctuary and the regulations, with the addition of an aerial boundary, continue to be applied.

In the intervening years, FOSC has phased in a series of marine protected areas management measures as follows:

- Co-management contract
- Management Statements for Surveillance, Enforcement, Outreach, and Research, Networking, Income Generation, Membership and Volunteerism.
- Baseline information by Daily Data logs
- Rapid Ecological Assessment baseline information;
- Annual Work Plan
- Research Plan
- Outreach Plan
- Strategic Plan
- Business Plan
- Management Plan

FOSC continues to secure resources to improve management of SCWS including boats, engines, fuel, office and research equipment, and staffing. FOSC has also invested in a Ranger Station constructed at the Sanctuary and an Office on Caye Caulker. At times, FOSC has employed up to three full-time and two part-time staff to implement programmes. In addition, management

software is applied including accounting, manatee photo identification, GIS, database, web base and others. FOSC is also aiming to expand the reach of its website and social media.

Friends of Swallow Caye was incorporated on December 20, 2002 and registered as a non-governmental organization on September 27, 2004. The association must be led by a minimum 5 person Board of Directors with the current BoD membership as follows:

President	Lionel Chocolate Heredia
Vice President	Albert Pacheco
Secretary	Nicole Auil Gomez
Treasurer	Ann Seashore Heredia
Director	Cassian Aguet
Director	Marcial Alamina

4.2 Review of Previous Management Programmes

An independent Belize since 1981 has accorded protected status for the manatees in the Wildlife Protection Act, the National Parks System Act and the Fisheries Act. In the case of the first two, they protect the manatee from "hunting" and the latter from "commercial fishing". The maximum penalty is $500 for Wildlife and Fisheries offence and $200 for Park System offence.

The definition for hunting is presented as follows:
National Parks System Act – "to hunt" means to kill, take, or molest by any method and includes attempting to kill, to take or molest by any method any species of wildlife;
"to fish" means to take, kill or attempt to take or kill any aquatic organism;

Wildlife Protection Act – "To hunt" means to kill, take or molest by any method and includes attempting to kill, to take or molest by any method any species of wildlife;

Fisheries Act – "Commercial Fishing" is defined as the taking, breeding, producing, killing or capturing of any fish whatever or the attempt or preparation to do so, for the purpose of the sale or other disposition of such fish for money or money's worth. "Fish" is defined in this act as all or any of the varieties of marine or fresh water animal or plant life.

Two wildlife Sanctuaries, Corozal Bay and Gales Point were designated in 1998 by the Government of Belize specifically for the protection of manatees. Efforts to establish Swallow Caye Wildlife Sanctuary organized under the leadership of Lionel Chocolate Heredia in the 1990's. With this lobbying effort, some management has been in place at the Swallow Caye area since 1996 when manatees of Belize were made the subject of the six-point regulations issued by the then Conservation Forest Officer, Rafael Manzanero to apply to manatees countrywide:
1. Snorkeling with the manatees is not allowed;
2. Manatees should be viewed from the boats only;
3. Use slow speed on approaching the region where manatees are found;
4. Use pole, not engine in the area to approach "homes" of manatees;
5. Chasing manatees on boats constitutes "molesting" and is illegal;
6. Lookout and respect signs protecting manatees.

Any of the above constitute an offence and on first count subject to summary conviction of a fine of $500.00. Later on, the list of Regulations was expanded to fourteen and, most recently, a fifteenth regulation, the aerial boundary was added. Ideally, protected areas must be protected in all three dimensions. SCWS is protected in only two dimensions which leaves it exposed to mining and oil exploration from below.

The organization Friends of Swallow Caye was formed and incorporated to "establish and support a community based conservation management plan and to support the development process of Caye Caulker, San Pedro and Belize City in the Belize District and to protect, preserve and educate visitors about the manatees in the Swallow Caye Wildlife Sanctuary and adjacent areas. Swallow Caye Wildlife Sanctuary was enacted in 2002 and FOSC was successful in its bid for co-management in 2003.

At the outset, the management priorities have been infrastructure, surveillance and enforcement, community outreach, networking and income generation. Later management programs now include institutional strengthening, research, planning and human resources.

Management effectiveness reported in the State of the Protected Areas report 2009 ascribes to Swallow Caye Wildlife Sanctuary a score of 2.5 of a maximum score of 4 which aligns SCWS close to the national average.

TABLE Indicator Categories for Assessment of Management Effectiveness

Indicator Categories are the following:
1. Resource Information
2. Resource Administration, Management and Protection
3. Participation, Education and Socio-economic Benefit
4. Management Planning
5. Governance
6. Human Resource
7. Financial and Capital Management

Conclusions and Recommendations

This average score does demonstrate the almost 40% room for improvement that Swallow Caye Wildlife Sanctuary has the opportunity to use. Definitely, improvements can be made in each of the indicator categories and FOSC started intensive improvement activities since 2009 as it computerized its accounting and financial systems, underwent Board of Directors training, and formulated several of its planning documents. For the individual indicators within the indicator categories, improvements are possible and planned as follows:

1. Resource Information

To add to the impressive amount of information already known about the resources at SCWS the following is ongoing: updating of the baseline; Manatee identification and population studies, mangrove and underwater video research.
To these will be added water quality monitoring, sea grass studies and manatee behaviour studies. Among others, the questions still remaining to be answered are:
The number, gender and health of manatees at SCWS, the status of native fish populations at SCWS and the identification and placing into species list, any and all other species identified at SCWS. Computer software models are being tested to assist with the data management, analysis and storage. Development, oil exploration and climate change implications are also on the table.

2. Resource Administration, Management and Protection

SCWS has a lot to do in this category: It routinely maintains and refurbishes the Ranger Station, the Office building, boundary demarcations and other signage.

INDIVIDUAL INDICATORS:

1. Resource Information

1.1 Inventory: Physical Environment
1.2 Inventory: Biotic Environment
1.3 Inventory: Cultural and Archaeological Resources
1.4 Inventory: Social, Cultural, and Economic Context
1.5 Inventory: Resource Use and Occupancy
1.6 Inventory: Tenures and Claims
1.7 Site Assessment: Conservation Target
1.8 Site Assessment: Systematic Threat Assessment
1.9 Traditional Knowledge
1.10 Information Management Systems
1.11 Environmental Monitoring Activities
1.12 Scientific Research Activities

2. Resource Administration, Management and Protection

2.1 Legal: Legal Status
2.2 Legal: Boundary Survey and Demarcation
2.3 Legal: Permit, and Approval Processes
2.4 Tenure Claim Conflict Resolution
2.5 Guidelines and Best Management Practices
2.6 Natural Resource Management
2.7 Protection: Surveillance Activities
2.8 Protection: Enforcement Activities
2.9 Visitor and Tourism Management Activities
2.10 Visitor and Tourism Monitoring Activities

Surveillance and Enforcement need to be increased to cover more hours of the day and night. Closer collaboration is needed with Fisheries and Forestry Departments and Port Authority to effectively carry out enforcement. The no hunt, no take status of the Sanctuary needs to be enforced. New no entry zones are being recommended to assist with visitor management at SCWS. Regulatory Agencies need to resolve the conflicting needs of Sanctuary Management and navigation through and around Swallow Caye Wildlife Sanctuary. A priority is the ongoing FOSC compilation and maintenance of visitor statistics including visitor feedback and statistics to arrive at limits of acceptable change. Lobbying for the third dimension boundary is also recommended.

3. Participation, Education, and Socio-Economic Benefits

FOSC will continue its membership drive locally and internationally. Resources will be secured to implement its Communications, Outreach and networking initiatives. New entrepreneurship and employment activities related to SCWS will be explored with interested Belize City stakeholders. FOSC will continue its marketing efforts to attract more visitors to the Sanctuary so that more tour operators and tour guides find employment. FOSC will work with the communities of Ambergris Caye, Belize City and Caye Caulker to keep SCWS a premier tourism heritage attraction for everyone's benefit. Resources will be secured to work with schools and to disseminate information widely.

4. Management Planning

Friends of Swallow Caye will move to fully implementing its approved plans: Strategic, Management, Business, Research, Communications, Outreach, Surveillance, Enforcement and Annual Work Plan.
FOSC will move to signing an enlightened co-management agreement. The Board of Directors

will re-energize and take ownership of the programmes and projects indicated. The Board of Directors will be proactive arriving at a succession strategy and will address the matter of maintaining a vibrant board of directors despite individual crises. Directors will be requested to champion specific activities in the strategic plan and to establish a calendar of BoD meetings.

5. Governance

SCWS is an IUCN Category IV managed by shared governance – co-management with the Forest Department. Having undergone in 2011 considerable training in Board duties and responsibilities, the FOSC BoD will make every effort to strengthen the institution. FOSC will continue its membership in APAMO and the National Manatee Working Group and will collaborate more with the other two manatee wildlife Sanctuaries. FOSC will need to appoint an Advisory Committee and will develop procedures for such a committee to involve communities and stakeholders in management. FOSC will expand its inter-organizational collaboration for surveillance, enforcement, education, research, and income generation. Additionally, FOSC will continue its push to meet all legal requirements.

6. Human Resources

FOSC has a worthy mission and ambitious plans and work programs and staffs these through project funding. At the minimum, a Ranger/Researcher Assistant is available on the site daily. Ideally at least five full-time employees would be necessary - two rangers and one research officer are needed at the Sanctuary and at least one middle manager and an administrative assistant are needed in the main office. Technical, scientific, and professional expertise is accessed from the Forest Department, volunteers or on part time contract basis. It is expected that this will continue in response to the priorities of the day. Training and capacity building is needed for officers and all staff. Personnel policies are to be further developed. FOSC will assess fully the opportunity

of collaborating with universities to enlist their collaboration in different aspects of protecting manatees at SCWS.

7. Financial and Capital Management

The Association finances its activities from a variety of sources with the biggest contribution coming from grant funds and in-kind contributions. Mindful that most donor agencies require matching funds which can range from 25% to 100% in-kind contributions, the Board of Directors has a huge task to maintain levels to leverage funding. FOSC has opportunities to increase income but a dedicated staff member is required to work the business plan and income generation centers of the organization. FOSC has managed to cover recurrent expenditures and some program costs with the entrance fee, membership dues, donations and grant funds. Infrastructure includes one ranger station and one main office on which refurbishment and necessary improvements will continue. Minimum equipment is needed for the following programmes:

Surveillance and enforcement
Research
Communications
Outreach
Institutional Strengthening
Infrastructure

Friends of Swallow Caye once had and is encouraged to again establish, a reserve account as soon as funds permit. FOSC will continue with computerized accounting systems and procedures approved to international accounting standards. Improvements will be made to infrastructure both at Swallow Caye and on Caye Caulker. Signage is routinely refurbished and new signs erected at SCWS.

Friends of Swallow Caye plans to submit further proposals for funding to PACT and COMPACT amongst others and to implement other aspects of its business plan.

4.3 Management Goal

Since the 1990's the goal is the Preservation of Belizean natural heritage through protection of the Antillean Manatee, *Trichechus manatus manatus* in its natural habitat at Swallow Caye Wildlife Sanctuary for the benefit of Belizeans.

This goal is further guided by the International Union for the Conservation of Nature's (IUCN's) goals for their category corresponding to Belize's wildlife sanctuary category. In this case, SCWS is an IUCN Category IV: Habitat/species management area with the Primary Objective being: **To maintain, conserve and restore species and habitats**.

<u>IUCN Management Category IV</u>

Protected Area	Primary Protected Area Vision/ Goal	Recommended IUCN Category (NPAPSP, 2005)	IUCN Category Recommendation (2011)	Rationale
Wildlife Sanctuaries	*For the protection of nationally significant species, biotic communities or physical features*			
Swallow Caye	To safeguard the future of manatees by reducing threats to their health and their habitat.	IV	IV	Focus is solely on protection of manatees. Important conservation, education and tourism area.

Protected Areas Category IV
Protected areas aiming to protect particular species or habitats and management reflects this priority. Many category IV protected areas will need regular, active interventions to requirements of particular species or to maintain habitats, but this is not a requirement of the category.

Primary objective: To maintain, conserve and restore species and habitats.
Other Objectives

- To protect vegetation patterns or other biological features through traditional management approaches;
- To protect fragments of habitats as components of landscape or seascape-scale conservation strategies;
- To develop public education and appreciation of the species and/or habitats concerned;
- To provide a means by which the urban residents may obtain regular contact with nature;

Category IV protected areas usually help to protect, or restore:

1. Flora species of international, national, or local importance;
2. Fauna species of international, national or local importance including resident or migratory fauna; and/or
3. Habitats

IUCN definition
A protected area is: "A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

Vision

Swallow Caye Wildlife Sanctuary
is a cherished natural heritage experience of bountiful biodiversity and ecological integrity protected and managed by Belizeans to safeguard all waterways, processes and habitats critical for manatee survival

SWALLOW CAYE WILDLIFE SANCTUARY
MANAGEMENT GOALS

1. To protect and maintain the biodiversity of Swallow Caye Wildlife Sanctuary as part of the National Protected Areas System of Belize, the Caribbean and the Americas.
2. To protect the Antillean manatee, Trichechus manatus manatus, and native species found within Swallow Caye Wildlife Sanctuary.
3. To promote sustainable natural heritage tourism for recreation at Swallow Caye Wildlife Sanctuary for the benefit of Belizean communities.
4. To conduct research and monitoring activities at Swallow Caye Wildlife Sanctuary.
5. To provide recreational opportunities at Swallow Caye Wildlife Sanctuary.
6. To provide educational opportunities.
7. To improve planning and management of Swallow Caye Wildlife Sanctuary through participatory and science based management.

4.4 Management Strategies

Swallow Caye Wildlife Sanctuary does embody the issues usually associated with IUCN Category IV protected areas:

- The area can be considered relatively small;
- The area is fragmented from ecosystems in other protected areas;
- It is not self-sustaining as it is part of the Belize Barrier Reef Complex from coast to open ocean;
- Connectivity has not been planned in;
- It is near to a large urban center
- It is highly accessible to the public;

The manatee is and will continue to be the keystone species protected at Swallow Caye Wildlife Sanctuary – this in turn is protection to all other species under this umbrella.

Seagrass and mangrove habitats will be protected at Swallow Caye Wildlife Sanctuary both for manatees and as stepping-stones for all other species needing a safe haven on their path.

Native species populations will be protected by ensuring optimum environmental conditions and extracting alien species.

Connectivity will be forged so that wide ranging species can mobilize naturally in safe corridors and buffer areas and the quality of shared waters are protected from source to watershed to ocean.

Underpinning management of SCWS are communities and stakeholders engaging in active management of Swallow Caye Wildlife Sanctuary with the aim of enjoying priceless Belizean natural heritage for generations to come.

The successful management of SCWS hinges on ecosystems management, whole-catchment management and active extraction of invasive species. The need to anticipate and mitigate

impacts from far and wide was recognized by the founding members of the Association and is enshrined in Article 1 of the Memorandum of Association, *"To establish and support a community based conservation management plan to support the development process of Caye Caulker Village, San Pedro Town and Belize City in the Belize District through the establishment of said management plan."*

4.4.1 Management Zones

Zoning for Manatees – The entire SCWS is a manatee no molestation, no injury no hunting area;
Zoning for Fishing - The entire SCWS is a no take zone; this includes sports fishing;
Zoning for Forestry – The entire SCWS is a no extraction zone;
Zoning for Swimming – The entire SCWS is a no swim zone;
Zoning for Navigation

Swallow Caye Bogue and Ship's Bogue are Port Authority approved navigation routes; these will be marked as No Wake zones;
No boats are allowed in the main hole, "No Entry" zone;
A feeding hole is being identified as a second "No Entry" zone;
From designated areas boats enter a "Slow Speed" zone;
From designated areas boats enter a non-motorized, "Poling", zone;
The entire Swallow Caye Wildlife Sanctuary is a "Manatee First" zone where traffic is to slow down and yield to manatees;

Zoning for Research and Monitoring

The entire SCWS has scan points for water quality testing;
The entire SCWS has scan points for seagrass studies;
The entire SCWS has manatee study areas;
The entire SCWS has native fish population study areas;
Mangrove research plots are on Swallow Caye and Mapp's Caye

Zoning for core Sanctuary

- Mangrove canals are no entry zones;

Zoning for Tourism – manatee viewing for a limited time is permitted from the boat only in designated areas and as advised by the Ranger on duty;

There are two primordial conflicts at Swallow Caye Wildlife Sanctuary:

1. between navigation/shipping interests and marine protected area management interests in what is a wide open highly accessible preferred waterway;
2. between runaway urbanization/development interests and marine protected area management interests in what is the country's biggest population center and highly preferred waterfront real estate;

4.4.2 Limits of Acceptable Change

Swallow Caye Wildlife Sanctuary has sixteen years of some level of management at the site. During this time, tourist visitation reached a maximum of almost 5,000 visitors per year and then visitation declined. With education, interpretation and enforcement, the Sanctuary has maintained its quality of environment, maintaining near-pristine conditions.

Swallow Caye Wildlife Sanctuary can continue to provide economic and social benefits to local stakeholders and the Belizean economy. The co-managers continue efforts to promote the Sanctuary with the goal of bringing visitation back up to at least, 6,000 persons per annum.

Visitors come to SCWS to view manatees. This they do successfully and memorably as a distinguishing feature of the sanctuary is its crystalline waters preferred by these manatees.

Right up to this time, daily between the hours of 8:30 am and 4:00 pm there is a ranger on duty at SCWS and visitor behaviour is monitored. Overcrowding by visitors is not an issue during these hours.

Quality of Environment:

- Water quality parameters are within normal range;
- All seagrass parameters are within normal range;
- All mangrove parameters are within normal range;
- Air quality parameters are within normal range;

Connectivity:

- Needs protective intervention measures and buffer zones;

Condition of Manatees

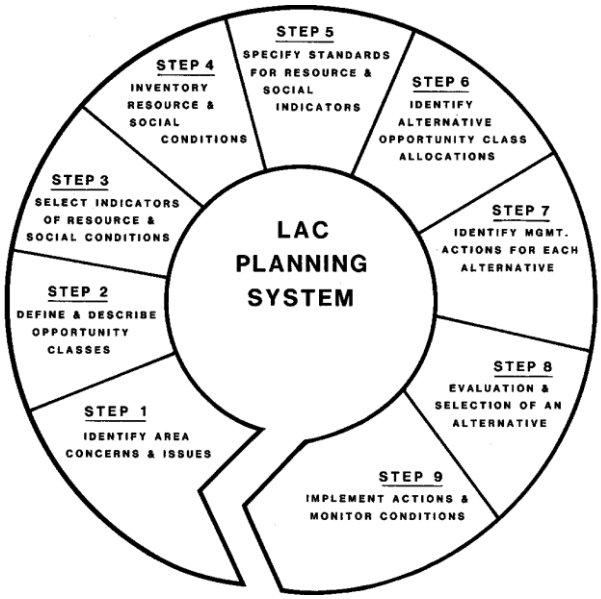
- Manatees are exhibiting range of known activities and behaviours; including maintaining a viable reproductive rate as evident by young every year;
- In excess of 50% of the Manatees at the sanctuary are exhibiting boat collision scars with some individual manatees showing multiple scars;

Visitation

- Year to date, visitation has experienced a slight increase in 2012;
- Some tour operators/guides try to evade paying the entrance fee;
- There are still occasional incidents of speeding in the wrong zone;
- There are a few incidents where one boat captain will not stick the pole but while poling will pursue the manatees;

Navigation

- SCWS and its surroundings is a cross roads dangerous and sometimes fatal to manatees.



The Nine-Step Process (source Professor Ed Krumpe)

With enough staffing, the limits of acceptable change planning system can be implemented at SCWS. There is information at hand and enough interest from stakeholders to get their continuous participation in this system of management.

The Mesoamerican Barrier Reef System Manual for the preparation of public use programs in protected areas in the MBRS proposes that a mix of methodologies be considered in developing public use programs. Among those methodologies to be considered it recommends and evaluates the following six:

- Recreational Opportunities Spectrum (ROS)
- Conceptual Reference Framework for Carrying Capacity
- Limits of Acceptable Change (LAC)
- Visitor Impact Management (VIM)
- Tourism Carrying Capacity
- Visitor Experience and Resource Protection Reference Framework (VERP)

Swallow Caye Wildlife Sanctuary is experiencing conflicts arising from different interest groups since it is a protected area that cannot be closed. Ideally, it would open in the morning with the arrival of the staff and close when the staff leaves. In reality, it is not only open seas, it is open season in the absence of the staff in view of its geographic location and deep channels and with the traditional role of the area as a high trafficked area.

4.4.3 Management Constraints and Limitations

The management of SCWS is inconsistent depending on the financial standing of the company. There is never enough money to retain qualified staff to implement all the necessary programs. It is a struggle to secure the financial resources for the one position of Ranger/Research assistant and to procure the necessary resources to support the activities of this position. The organization

has formulated many of its main plans but has not gone the next step - to phase them in step by step.

The absence of a valid co-management agreement, the many pending changes at "system" level combined with unexpected emergencies makes for a lot of uncertainty. A tremendous amount of time is invested by the volunteer board and scarce staff members in analyzing and responding to the evolving issues in the big picture of Belize Protected Areas management. In the past year, among other topics, system issues have revolved around:

- Co-management negotiation of terms and conditions;
- Fees collection mechanisms;
- Income generation for Protected Areas;
- Management Effectiveness;
- Protected Areas Accounting and financial management;
- Standardized training for all Protected Areas Staff;

Since the FOSC Annual General Membership Meeting September 4, 2011, there have also been constraints at Board of Directors level. In the past year at least three members have become inactive for long spells because of medical or personal crises. The organization does not have a quick response mechanism to compensate for this situation. This means that the Association is not enjoying the energy and attention it needs from a fully active and vibrant Board of Directors. Communications can be improved amongst Board of Directors and with the general membership.

There is only one employee, the Ranger/Research Assistant, on site at Swallow Caye Wildlife Sanctuary. There is a lack of qualified paid staff members to undertake the other activities.

FOSC has acquired necessary infrastructure, equipment, plans and supplies but is financially strapped and unable to cover full time staff positions.

4.5 Management Programmes and Objectives

From the Strategic Planning Exercise, four Key Result Areas (KRA's) were identified as below:

※Protected Areas Management

※Strategic Alliances

※Public Awareness

※Institutional Strengthening

From the threats analysis, the following priority ratings were identified for conservation targets:

Priority	Conservation Target	Viability Rating	Primary Threat
High Priority	Manatee	Poor	Boat collisions
	Native Fish Populations	Poor	Illegal Fishing
Medium Priority	Aquatic, Riparian and Estuarine	Fair	Land Clearance
	Mangroves and littoral forest	Fair	Land Clearance
	Sea grass	Fair	Pollution
Low Priority			

Threats	**Criteria Rankings**	**Total Ranking**		
	Area	**Severity**	**Urgency**	
Loss of Manatee	4	3	3	36
Illegal Fishing	4	3	3	36
Land Use Change	4	3	3	36
Habitat Loss	4	3	3	36
Pollution	4	3	2	24
Invasive Alien Species	4	3	2	24
Climate Change	3	3	2	18
Petroleum Exploration	3	3	2	18

With the threats prioritization, cross-cutting strategies were identified all of which are to be brought to bear in specifying actions and the application of resources in the planned time.

TABLE

Cross-cutting Strategies	**Aquatic/Estuarine Riparian**	**Mangrove and Littoral**	**Seagrass**	**Native Fish Populations**	**Wide ranging marine Mammal/Manatee**	
Institutional strengthening of SCWS: Governance Improvement, Human Resources Development and Financial Sustainability						
Renewal of Co-management agreement with Forest Dept.						
Improve in management effectiveness by implementing management and business plans						
Further develop member recruitment and retention programs						
Public Awareness and Communications						
Conduct public awareness programs						
Conduct educational programs						
Expand Outreach Activities for the public						
Conduct educational activities with all schools in Belize						
Strategic Alliances: Advocacy, Networking, Alliances						
Increase networking with BMMSN, NMWG and CZMA&I						
Partner with UB & international Universities on research and other activities						
Expand collaboration efforts to Fisheries and Forest Dept for enforcement activities and ongoing staff training						
Protected Areas Management: Integrated Management, Surveillance and Enforcement, Research and Monitoring						
Lobby for legislation to Increase Penalties for collisions with manatees and injuries to manatees						
Enforce existing legislation reference mangroves, and 66 ft river reserves						
Increase patrolling and enforcement						
Explore and introduce Alternative Livelihoods initiatives						
Conduct Research on mangrove, seagrass, manatee						
Monitor water and air quality						
Fine tune Zoning within SCWS						
Communities agree to identify and establish alternate Navigation Routes outside of SCWS						
Communities agree for the Creation of Buffer area around SCWS						

Communities agree for the creation of Manatee safe zones along the entire coastline						
Wide-ranging cross cutting issues (4-5)						
Medium ranging cross cutting issues 2-(3 targets)						
Narrow ranging cross cutting issues (1target)						

This management plan format stipulates the following seven management programs and Swallow Caye Wildlife Sanctuary management plan has priority activities in each:

1. **Natural Resources Management Programme**
2. **Research and Monitoring Programme**
3. **Community Participation Programme**
4. **Public Use Programme**
5. **Infrastructure Management Programme**
6. **Administrative Programme**
7. **Management Policies**

4.5.1 Natural Resources Management Programme

Natural Resource Management Programme

Vision

To safeguard in full health and function at SCWS, all ecosystems, hydrological processes, and species on which the manatee thrives.

Objective	Activity Area	Actions
To improve the structure and opportunities for natural resource management	- Friends of Swallow Caye agrees a succession strategy of alternates for all positions - Friends of Swallow Caye re- negotiates an enlightened co- management agreement - Activate partnerships with friends of Swallow Caye - Improve community participation in decision making - Improve communications with membership for LAC	A1, A2 A2 A3 A3, A4 A4
To implement further measures to protect biodiversity viability in Swallow Caye Wildlife Sanctuary	- Complete the installation of all boundary markers - Add the third dimension boundary in legislation - Improve the Enforcement Plan - Enlist enforcement officers in patrols on rotation basis - Increase the hours of patrol - Strengthen Manatee protection legislation and implement - Train Manatee Specialty tour guides - Licence Tour Boats to operate in SCWS	A5 A6,A7 A8,11-14 A7, 8, 11,15 A9 A16, 17 A18 A18
Increase the viability of conservation targets within Swallow Caye Wildlife Sanctuary	- Maintain and monitor manatee population in SCWS - Develop and implement program to protect native fish populations at SCWS - Maintain and monitor seagrass and mangrove vegetation cover in SCWS and buffer areas - Monitor aquatic, riparian and estuarine vegetation cover along the coastline - Implement the water quality monitoring programme - Apply monitoring results to adaptive planning of SCWS	A19 to 27 A28 to 33 A33 to A46
Prepare for other impacts	- Identify policies and proactive measures to deal with climate change, mining, oil exploration and other uncertainties	A47-49

Natural Resource Management Programme

ABC: Ambergris Caye, Belize City, Caye Caulker Ad: Administrative Assistant APAMO: Ass'n of Protected Areas Management Organization BoD: Board of Directors
CO: Community Outreach Officer CZMA&I: Coastal Zone Management Authority & Institute FOSC: Friends of Swallow Caye FD: Forest Department
GoB: Government of Belize LAC: Local Advisory Committee M: Manager R: Ranger RO: Research Officer SCWS: Swallow Caye Wildlife Sanctuary V: Volunteer

To improve the structure and opportunities for natural resource management for Swallow Caye Wildlife Sanctuary

Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
A1	Implement succession strategy for automatic re-energizing of the Board of Directors of FOSC no matter what the circumstance	Board of Directors with limited activity resulting from illness, personal crises and time constraints; no succession strategy at this time;	Every slot of the Board of Directors filled with dedicated active persons and an alternate who acts in the substantive member's absence or leave of absence; incapacitated members to automatically and officially take leave of absence as they need;	Y1	BoD Members	Appoint active dedicated members to the Board of Directors; identify and appoint alternates and institute "formal succession strategy and leave of absence status" for BoD members;
A2	FOSC renews co-management with GoB	Expired co-management agreement	Improved and valid co-management contract with GoB	Y1	FOSC, GoB, APAMO Ministry of Forest, Fisheries	Finalize negotiations with GoB for improved terms and conditions; Sign on.
A3	Seek collaboration for specific initiatives from all national, regional and international persons, organizations, and governments that are already friends of Swallow Caye Wildlife Sanctuary	Substantial friendship base has been forged over the years but is not being tapped adequately for support on a long term and organized basis for approved activities.	Map the interest, expertise and clout of all "Friends" of Swallow Caye and match them to assist in resourcing program needs	Y1-3	FOSC M, CO, V, LAC	Pool of national, regional and international friends in sectors of education, finance, media, research, management, etc, etc. May be limited by leadership, staffing
A4	Identify Local Advisory Committee	The wider membership base is an automatic community participation	A representative group of dedicated members appointed as the Local Advisory Committee	Y2-3	FOSC, BoD,	Representation from Ambergris, Caye Caulker, Belize City and from economic, research and educational

		mechanism for decision making; this opportunity is not being utilized as, in a decade, FOSC has held only one annual general membership meeting.	and in close communication with the BoD;			etc sectors prioritized by FOSC;

To implement further measures to protect biodiversity viability in Swallow Caye Wildlife Sanctuary						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
A5	Complete the installation of all the corner markers at SCWS	Only four of the nine corners are marked	Nine corners are to be marked with boundary signs	Y2	FOSC, R, FD	Some areas are too deep or too muddy and may require special adaptations on which to mount the signs;
A6	Complete the boundaries of SCWS	Only 2 of the 3 dimensions are with boundaries	Legislated boundary for the 3 dimensions of the Sanctuary	Y2	FOSC, APAMO, GoB, Members	This is needed to preclude disruption or destruction from mining and oil exploration and production
A7	Distribute Sanctuary plans and regulations more widely and to known violators	A lot of awareness has been done with the tourism sector; but infractions are increasing from the regulatory agencies – Belize Defense Force, Port Authority, Coast Guard and the fishing sector	Particularly the Coastal Authorities are to be fully informed and on board with the protection of the Sanctuary; illegal fishing is eliminated from inside the sanctuary	Y1	FOSC, BDF, Port, Coast Guard	Inform the agencies and involve them actively in enforcement;
A8	Continuously improve the enforcement plan and adjust as indicated	The Sanctuary is patrolled for only 7.5 hrs daily by only 1 ranger during daylight hours only.	Increase the hours of patrol and increase the number of trained officers on patrol.	Y2	FOSC, BDF, Port, Coast Guard, Tourist Police, Fisheries Officers, FD	Liaise with the agencies and make the official request for a roster of enforcement and surveillance duties at SCWS including night hours;
A9	Increase number of patrol personnel at SCWS	Only 1 ranger	Enlist Fisheries Officers, Port Authority, Tourist Police, Belize	Y2	FOSC, BDF, Port, Coast Guard, Tourist	Liaise with the agencies and make the official request for a roster of

			Defense Force and Coast Guard to boost surveillance and enforcement at SCWs		Police, Fisheries Officers, FD	enforcement and surveillance duties at SCWS including night hours;
A10	Provide opportunity for continuing training for the 1 FOSC Ranger	Current Ranger has learned on the job and is willing to learn more	Ranger trained to Fisheries Officer or Special Constable status;	Y2	R, FD, Police	Training can be done on the job while serving together with the Fisheries Officers;
A11	Increase hours of patrol	The Sanctuary is daily monitored only 7.5 hours during daylight hours	Increase patrols daily to between 12 to 18 hours;	Y2-3	Coast Guard, Tourist Police, Fisheries Officers, FD	Liaise with the agencies and make the official request for a roster of enforcement and surveillance duties at SCWS including night hours;
A12	Obtain remaining equipment needed by Ranger for improved surveillance and enforcement	Ranger equipped with boat, fuel, radio, pole, GPS and camera;	Outfit ranger with new pole, binoculars and canopy on the boat	Y2	FOSC	Funds will need to be secured for this.
A13	Image for enforcement and surveillance	The uniform of the ranger is now years old and faded and deteriorated	Produce and provide new uniform	Y1	FOSC	The order just needs to be placed.
A14	Process and analyze Ranger data logs promptly	There is no other staff member to give follow-up support to surveillance and enforcement	Research Officer on staff charged with this duty	Y2	FOSC	Funds to be secured for this post.
A15	Implement improved adaptive surveillance and enforcement activities as planned	Inadequate Enforcement Plan	Always improving Enforcement Plan being utilized.	Y2-3	FOSC, FD, Fish Dept, CZM, Port, Police Coast Guard	Organize and supervise a larger surveillance and enforcement team
A16	Effect change to national legislation to increase manatee protection and penalties	Imprecise definitions for molestation of manatees; penalty for injury and death to manatees from	New legislation will enable precise definitions of “molestation”, and include injuries as maim, harm and etc	Y1-3	BMMSN, NMWG, FOSC, CZM, APAMO, Oceana	Lobby for changes; encourage more detective work to track down captains whose vessels injure manatees because of speeding and etc;

		collisions is too low; Safe corridors currently can possibly exist only in the PA's immediately outside there are no slow or manatee zones at sea or up rivers;	with penalties high and increasing with severity or repeat offences; Buffer areas, corridors and other non-PA known manatee areas are protected by a national plan of manatee zones;		CBWS, GPMWS	
A17	Implement new legislation	At present nobody is prosecuted for injury to manatees no matter how severe nor is it known if these incidents occur in PA's	Convictions will be made for injury or death to manatees from boat collisions	Y2-3	FOSC, stakeholders, enforcement agencies	River and coastal communities informed and enlisted to make reports to BMMSN or CZM to report perpetrators and incidents;
A18	Introduce licensing for vessels and training for guides & captains operating in SCWS	Tours companies have reduced tours to SCWS because they do not have trained guides; because it is highly accessible to anyone, SCWS is not holding market position since manatee protection is not everyone's priority in the Sanctuary; untrained captains and guides do not understand manatee needs	SCWS is a high status Heritage Tourism Attraction with a cadre of trained specialty tour guides and trained boat captains with special licenses to operate within the Sanctuary; FOSC advertising this cadre of manatee specialty service providers to ensure manatee protection in this sector	Y2-3	Tour Operators, Tour Guides, BTB, FOSC, CZMA&I	The competitive edge for SCWS is to be a well-managed Sanctuary employing members of the community in manatee protection for their livelihood

Increase the viability of conservation targets within Swallow Caye Wildlife Sanctuary						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Conservation Target: Antillean Manatee *Trichechus manatus manatus*						
A19	Apply new wildlife tracking technologies at SCWS	Manatee captures not utilized at SCWS	One SCWS manatee per year tracked	Y2,3	M, RO NMWG, CZMA&I, S2S, SI	Important to know the geographic range of the SCWS manatees

A20	Evaluate SCWS Manatee and habitat health	The only manatee health issue studied currently studied is boat collision scars	Identify and monitor other key criteria for animal and habitat health	Y2, 3	M, RO, Researchers, FD, CZMI	Establish a baseline for health criteria
A21	Establish and enforce no wake zones in buffer areas, coastline and rivers of Belize District area and nationally	Enough boaters are not sensitized to manatee safety as a priority resulting in collisions inside and outside of SCWS	Reduction in boating speed resulting in decrease in injury and death to manatees in all waterways in the country	Y1-3	M, Port Authority, Fisheries, FD, BTB, CZMA&I, GoB	National campaign required to keep manatee safety a top priority;
A22	Reduce boat traffic within SCWS	SCWS is a major crossroads for navigation	Navigation lanes re-directed to outside the Sanctuary	Y2-3	M, R, CO, Port Authority, Boat captains	Include rationale for this in Captaincy training and in processing for annual licenses to boating public;
A23	Increase no entry and no wake zones within the sanctuary	Recent studies are showing that besides the main hole, other areas inside SCWS are key manatee living areas	Establish a second No Entry point at the feeding hole	Y1	Ranger, BoD, FD, M	Signs are ready to be installed
A24	Collaborate with BTB, BNTOA and Port Authority for enforcement of compliance with SCWS regulations as part of annual licensing process for these service sectors;	One lone ranger is responsible for enforcement	Report non-compliance to SCWS regulations to licensing authorities as misconduct of tour guides, operators and captains which would have a bearing on renewal of operating licenses;	Y1-3	Admin	This assistance is already agreed with BTB and just requires routine implementation;
A25	Conduct Public Awareness Campaigns	Minimal awareness efforts	Multi-pronged, Sustained national public awareness campaign underway	Y2-3	BoD, CO	Radio, TV, schools, interest groups, etc
A26	Conduct specialized Manatee Tour guide training	Curriculum is prepared but no delivery taking place	Regular training delivery schedule	Y2-3	RO, CZMA&I, SI, S2S, tour guides and operators	Lobby BTB to again recognize this curriculum and prioritize in the routine tour guide training
A27	Collaborate with national, regional and international	Currently collaborating with 6 entities	Formalize Collaboration with at least 24 agencies	Y1-3	FOSC and various	Universities, Research, Natural Heritage Sites, Donors, corporate and

	agencies to assist with manatee conservation					individuals identify and formalize collaboration

Increase the viability of conservation targets within Swallow Caye Wildlife Sanctuary						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Conservation Target:		Native Fish Populations				
A28	Develop program to protect native fish populations	No program	Well-designed program is being implemented	Y1-3	RO, Fisheries, M	
A29	Apply penalties for illegal fishing and manatee collisions in SCWS	Illegal fishing occurring in the SCWS	No take status of SCWS is fully enforced; Zero illegal fishing in the Sanctuary	Y2, 3	Fisheries, Port Authority, Coast Guard, Police	Patrols are on site for more hours of the day
A30	Eliminate invasive alien species from SCWS	Extract Lionfish from SCWS	Zero Lionfish in SCWS	Y1-3	R and volunteers	Elimination of the Lionfish is a national priority
A31	Public Awareness to show importance of SCWS in replenishment of native fish stocks	No awareness program	Awareness program implemented	Y2, 3	CO	Target Fishers of Sarteneja and of the Belize City area
A32	Conduct training in sustainability and conservation for fishers	No training with fishers	6 Fishers trained	Y2, 3	CO	Belize City Fishers
A33	Conduct Manatee Tour Guide training for fishers	No training with fishers	6 Fishers trained	Y2,3	M, CZMI, S2S	Belize City Fishers

Increase the viability of conservation targets within Swallow Caye Wildlife Sanctuary						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Conservation Target:		Seagrass Ecosystem				
A34	Map seagrass vegetation of SCWS and monitor changes	Only few transects have been checked	Seagrass beds at SCWS mapped and evaluated in detail and with ongoing monitoring	Y2-3	RO, R,	Financial constraints for staffing
A35	Increase awareness of the importance of seagrass ecosystem in SCWS and	Seagrass value has not been fully highlighted in awareness campaigns	Seagrass on the Agenda for schools, communities and developers	Y2-3	RO, CO	

	in general					
A36	Increase awareness of best practices for development in buffer, coastal and riverine communities – enforce setbacks from riverbanks, shorelines, etc	No outreach taking place currently	Close relationship forged with communities and developers; Signs with value of ecosystem services installed in key population locations	Y2-3	CO, RO,	Enforcement by DoE, FD, etc also critical
A37	Report non-compliance with dredging permits and mining permits, pollution – chemical and waste handling and disposal etc.	FOSC monitoring only what happens inside the Sanctuary	Monitoring of ocean shipping, urban, river, agricultural and industrial development on the mainland a routine activity for FOSC	Y2-3	FOSC and communities incl upriver; developers, FD,	Participation on planning networks may be helpful;
A38	Implement water quality testing at SCWS	Only few months of testing one parameter conducted in 2012	Full-fledged water quality monitoring underway at SCWS	Y2-3	RO, M	Work with CZM or Fisheries for national protocols;

Increase the viability of conservation targets within Swallow Caye Wildlife Sanctuary						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Conservation Target:		Mangrove and Littoral Forest Ecosystems				
A39	Lobby Planning Authorities incl Dept of Environment to enforce best practices river to reef	Mangrove is protected but is still clear-cut to make way for development	Mangroves integrated in developments especially in the 66ft reserves; further mangrove and littoral forest clearance reduced along the coast and islands	Y1-3	FOSC, FD, DOE, etc	Regulatory agencies generate income from mangrove clearing permits;
A40	Conduct Public Awareness on need for connectivity for manatee survival	Reactive to address only specific developments	Proactive campaign so Students and the general public sensitized to the importance of mangroves and littoral forests to manatees and Belize	Y2-3	CO, RO	Message may be met with disinterest especially if developers are polarized from the conservation message;
A41	Conduct outreach activities for Developers	No communication with developers	Waterfront Landowners and developers solicited for safe corridors, buffer zones and	Y2-3	BoD, M, CO	Benefit to developers: Corporate Social Responsibility

			membership in FOSC and maintained informed through membership communications			
A42	Map mangrove vegetation at SCWS and monitor	Mangrove is mapped in ecosystem map and 1 20 ft-transect is being monitored;	Implement fully the mangrove monitoring program already developed	Y1-3	RO, FD	Map favourite manatee areas in specific mangrove locations in Sanctuary

Increase the viability of conservation targets within Swallow Caye Wildlife Sanctuary						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Conservation Target: Aquatic, Riparian and Estuarine Ecosystems						
A43	Monitor Aquatic, Riparian and Estuarine Ecosystems	Urban expansion without regard to ecosystem	Importance given to protection of this ecosystem in coastal development masterplan	Y2-3	RO, FD, DoE, River resorts	Work with one or two agencies and developers if baseline map and level of effort for entire area is not realistic
A44	Lobby for CZM Coastal Masterplan	Masterplan is in initial stages	Masterplan accepted by GoB and adhered to by all	Y2	BoD, FOSC, M, RO,CO, CZM, communities	Ratified Master plan is long overdue
A45	Conduct Public awareness for value of ecosystem	Even if ecosystem importance understood, it is not being protected	Tour Companies, Boaters and developers accept and adhere to masterplan	Y2-3	CO and tour operators, boaters and developers	Enforcement agencies need to be involved
A46	Conduct outreach with Belize City for re-planting of some vegetation	No replanting at this time	Replanting occurring in at least 2 locations	Y2-3	CO, RO, schools and City Council	Can be part of beautification campaign

Increase the viability of biodiversity within Swallow Caye Wildlife Sanctuary						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Contingency Planning for Climate Change, Mining and Oil Exploration						
A47	Legislate the 3rd dimension boundary for SCWS to bar Mining and Oil Exploration	SCWS has boundaries for 2 dimensions; On the recent protection against these mining nad	SCWS has legislated boundaries for 3 dimensions	Y2	BoD, GoB, FC, Ministry FFSD, DoE	URGENT. SCWS was able to make an arrangement for a working second dimension “aerial” boundary by agreement between FD and Civil

		Oil Exploration activities, SCWS given low priority				Aviation
A48	Develop a plan to address Climate Change and sea level rise	No plan currently	Equipment installed at SCWS to measure sea level baseline to advise the plan; Plan formulated; Manatee health monitored as signal species in view of climate change;	Y2-3	Climate Change Office, FD, CZMA&I, M, RO	URGENT
A49	Lobby for formulation of policy governing commercial/business investments in protected areas	No policy	Policy based on the pre-cautionary principles in place	Y2-3	All interested parties	URGENT

4.5.2 Research and Monitoring Programme

Vision

To provide the sound science on which management decision-making is based for biodiversity conservation, effective monitoring and evaluation.

Objective	Activity Area	Actions
To generate and analyze scientific data to assist in informed management decision-making and to contribute to the body of knowledge about Swallow Caye Wildlife Sanctuary	- Apply monitoring results to adaptive planning of SCWS	B1, 7
	- Identify research gaps and adapt planning;	B1, 5
	- Continue and expand manatee research at SCWS	B3 to 23
	- Continue and expand mangrove ecosystem research at SCWS	B3, 22
	- Implement seagrass ecosystem research at SCWS	B3,18,21
	- Implement the water quality monitoring programme	B13
	- Develop and monitor native fish population program	B10, 12, 19
	- Extract invasive species	B24
	- Enforce no take zones	B25
	- Ongoing research of vegetation/habitats at SCWS	B17
	- Develop Epidemio surveillance and animal healthcare studies	B20
	- Liaise with local and international universities and coordinate/facilitate research at SCWS	B2
	- Ongoing publishing of research results	B7, 8
	- Continue process for limits of acceptable change	B6, 15

Research and Monitoring Programme

Research and Monitoring Programme					
Management Actions	Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
General Research and Monitoring					
B1	Increase integration of research with management of SCWS	Valuable research being generated awaits management staff	Qualified staff routinely integrating research into adaptive PA management	Y2-3	RO, M, BoD, NMWG	Personnel to work the plans is critical
B2	Liaise with local and international universities and coordinate/facilitate research at SCWS	Ad hoc efforts with few institutions	Identify 12 best partners and sign contracts with them for long term support to research	Y1-3	BoD, M, RO, ECOSUR, UB, SI, EU, ETC	FOSC already has an extensive list of interested contacts to work with;
B3	Collaborate with national and regional Manatee wildlife sanctuaries to further biodiversity research	Some information sharing occurs informally in the NMWG	Belize adopts internationally recognized manatee and biodiversity research protocols and injects reliable info into integrated national, regional and int'l manatee management	Y1-3	M, RO, CZMI, FD, CBWS, GPWS, PHMR, Chet Bay, Crystal River, etc	Identify a few goals that everyone can work on and benefit from
B4	Collaborate with CZMI to lead effort to establish a national Belize manatee database	BZ Nat'l Manatee Recovery Plan mostly shelved; individual sites managing data on their own	Improved BZ Manatee Recovery Plan is being implemented. All sites following approved protocols that feed into the national databases	Y2-3	CZMI, MFFSD FOSC, NMWG,	National manatee plans need a home institution; previously Manatee program housed at CZMI;

Research Gaps						
B5	Review existing research	To some extent done for purpose of current research and preparation of management plan	BoD routinely apprised of relevant findings by full-time staff	Y1-3	BoD, M, RO,	A lot of valuable information lost with high turnover of part-time staff
B6	Continue process for limits of acceptable change	Started with volunteer help from ECOSUR	Complete the plan and implement the long term process	Y1-3	BoD, RO,	Qualified staff needed
B7	Identify software applications for wildlife data management and analysis	Software application for manatee identification in one time use	Adopt for routine use and move to have universal use in Belize for manatee photo ID;	Y1-3	BoD, RO, CZMI	Data systems need to be "system" wide or national to create a complete picture of Belize
B8	Identify best Belizean forum for publishing SCWS research results	SCWS ad hoc and intermittent publishing;	National credible voice for manatee/PA research needed; Agency identified;	Y2-3	BoD, RO, CZMI, ERI	ERI may be one such entity that can house PA's research
Baseline Information						
B9	Conduct more comprehensive surveys of manatee feeding areas	Two main feeding holes identified	Results of comprehensive studies utilized in SCWS management	Y1-3	RO, M, BoD	Establish and patrol no entry zones as indicated
B10	Conduct assessments of fish nursery areas and biomass studies	None at this time	Comprehensive assessments underway	Y2-3	RO, BoD	
B11	Conduct investigations of deep channel areas (8-12m) to identify communities within	No deep channel investigations	Deep channel investigations are routine and findings aid planning	Y2-3	RO, M, BoD	

	these areas					
B12	Conduct detailed studies of native fish populations	Only ad hoc video sampling in Y1 and some updating to baseline	Detailed studies of Native Fish populations are routine and aiding planning; baseline updated as indicated	Y2-3	RO, M, BoD	
B13	Conduct detailed water quality and current studies	Only visibility being tested	Routine testing of various water quality parameters	Y1-3	RO	
B14	Complete inventories of bird and reptile populations in the Sanctuary identifying species of conservation concern and critical habitats for protection	Only ad hoc photo sampling in Y1; some updating to previous baseline	Routine identifications and updating of baseline	Y1-3	RO	
B15	Collect complete visitation and visitor behaviour data for the Sanctuary	Minimal info captured on Ranger data logs	Design and maintain database of visitors and utilize in market id and expansion	Y1-3	R & CO, BoD, M	Current info is about tour operators, captains and guides need focus on actual tourists;
B16	Investigate boat related injuries and deaths to manatees in the Sanctuary	Manatee injuries and deaths are being recorded but no info on perpetrators	Framework for criminal investigations instituted	Y2-3	RO, BoD, FD, Fisheries, communities	Enlist stakeholders for intelligence gathering
B17	Identify breeding and nursery areas	No studies currently	At least one study implemented in SCWS	Y2-3	RO, interns, CZMI,	Partner with other research institutes
Monitoring						
B18	Utilize new technologies for	Minimal use of GPS	Integrate GPS, GIS, Spatial modeling,	Y1-3	RO, M, CZMI, FD, UB	

	monitoring natural resources		photography and etc routinely			
B19	Apply new wildlife tracking technologies	Investigate what is possible and affordable	Outfit at least one manatee	Y2-3	RO, CZMI,	
B20	Continue underwater video footage	Raw footage produced ad hoc	Design more targeted research program and implement with full analysis	Y2-3	RO, R, M	Continue manatee population and identification studies
B20	Evaluate SCWS Manatee and Habitat Health	Only injury documentation underway currently	Design and implement evaluation plan	Y2-3	RO, M	
B21	Detailed studies of Seagrass distribution and condition	Basic plan designed	Implement Plan	Y2-3	RO,	
B22	Detailed studies of Mangroves distribution and condition	Basic plan designed and study started	Continue Studies	Y1-3	RO	
B23	Detailed studies of the manatees	Revise and improve the current plan	Continue manatee studies	Y1-3	RO, R	
B24	Record count of lionfish catch and sightings	To date, Lionfish only photographed in SCWS	Eliminate lionfish whenever detected	Y2-3	R	Implementing national programme; instruct disposal of lionfish if the catch is significant
B25	Convictions for illegal fishing	No charges made currently	Patrol, enforce and charge perpetrators	Y2-3	R, Police, Fisheries, Port	

4.5.3 Community Participation Programme

Vision Innovatively motivate stakeholders to protect manatees.

Objective	Activity Area	Actions
To activate the full framework for meaningful involvement in management of SCWS	- Co-management signed and duties and responsibilities more equitably assigned - Community participation as Champions for Strategic Plan; - Community participation in natural resource management through Local Advisory Committee. - Community participation in conducting research at SCWS; - Community participation in surveillance and enforcement in corridors and buffer areas - Community participation in delivery of outreach and awareness activities	
To increase opportunities for socio-economic benefits to the ABC communities	- Train fishers, tour operators and tour guides in specialized manatee tour guiding - Community participation in entrepreneurship, product development and marketing for alternative livelihoods; - Work with community leaders for support - Maintain links with international communities	

4.5.3 Community Participation Programme

Community Participation Programme						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Improving community management of SCWS						
C1	With renewal of Co-management, Institute equitable division of labour for co-managers of SCWS	FOSC is carrying almost the full burden of SCWS management with expired agreement	Co-management valid and duties more equitably divided between FD and community based organization;	Y2-3	BoD, MFFSD FD	Regulatory agencies more active on site; community role more realistically defined;
C2	Identify volunteer Champions for key result areas of the strategic plan	Strategic Plan has been formulated	Each member of the Board of Directors Champions and owns a specific "project" of the strategic plan	Y2-3	BoD	
C3	Implement outreach activities	Minimal outreach occurring	Outreach includes: Schools, ABC publics, Especially developers	Y2-3	Outreach Officer	
C4	Strengthen networking and strategic alliances	Ongoing	Networking is geared to accomplishing more results in FOSC programmes	Y1-3	BoD, M	
C5	Advocate for manatee protection to become a way of life outside of PA's	Minimal effort	Manatees are protected by slow speed and stop Zones along the entire coast and waterways throughout the country	Y1-3	BoD, CO, RO, M	
C6	Appoint the Local Advisory Committee	BoD is comprised of a few community members	Representative community group appointed for advisory purposes	Y1-3	BoD, Community	
C7	Develop terms of	None	TOR in place	Y2	BoD, M	

	reference for LAC					
C8	Orient LAC	None	Orient LAC members to MPA management, value of biodiversity and legislation	Y2-3	BoD, LAC, APAMO	
C9	Network with other agencies for manatee awareness activities	None	Manatee day, week, fair, radio/TV shows, etc	Y1-3	CO, M, Ad	
Increasing awareness and economic benefits to communities						
C10	Pilot projects for entrepreneurial initiatives	No involvement	One new tour package or product developed out of Belize City	Y2-3	CO, M	Manatee as Motif – be creative
C11	Provide incentives for compliance	Currently no positive re-inforcement for stakeholders	Award Annual certificates of recognition to different categories of stakeholders	Y2-3	BoD, LAC, FD	Also can be advertised on SCWS website and social media;
C12	Develop workshop materials on value of Protected Area to fishers – include env services, manatees, no take zones etc	No manual about SCWS for this purpose	Materials produced	Y2-3	RO, CO, M	Partner with UB, Cooperatives, Fisheries Dept and individual fishers
C12	Train fishers about value of Sanctuary and importance no take zones and replenishment of fish stocks	Minimal interaction with fishers	Conduct workshop for Belize City fishers	Y2-3	RO, M, FD and Fisheries, UB	
C13	Update and produce training materials for manatee specialty tour guiding	Material previously developed is available	Manual updated and reproduced	Y2-3	RO, M, CO Manatee, CZMI	In-house staff to work with long time experts

C14	Develop presentation for all stakeholders	Only basic brochures currently available	Prepare in-depth presentation to deliver to developers, planners, students etc	Y2-3	CO, Ad	Utilize results of SCWS research including video research and emphasize connectivity and buffer zone compliance
C15	Promote tourist service providers that commission FOSC	24 service providers signed for FOSC to be their commissioned sales agent	FOSC tour agency activated, providers advertised and commissioned sales increase.	Y1-3	CO, Ad	Renew tour operator license annually and update website for sales;
Community collaboration for surveillance and enforcement						
C16	Compile legislation guide for stakeholders	No handy guide available	Handy guide of legislation governing SCWS is available to stakeholders	Y2-3	CO, M, FD	Advise stakeholders of enforcement crackdown; follow-up action with regulatory and enforcement agencies
C17	Train Ranger and volunteer rangers to new NPA's standards	Ranger taught on the job; No volunteer rangers	Ranger and volunteer rangers trained to national stds;	Y2-3	UB, R, V	
C18	Enlist boat captains and tour guides for surveillance	Not done currently	Boat captains and tour guides assisting	Y2-3	R, RO, stakeholders	Select from those having received the SCWS and Manatee training
Community collaboration for research						
C19	Cooperate with tour operators and tour guides for visitor satisfaction and expenditure surveys	Not done currently	Continuous and current visitor information is utilized for limits of acceptable change	Y2-3	R, RO, Ad, M	
C20	Work with fishers and boaters in buffer areas to monitor indicators and collisions with	Only fatalities are currently reported	Manatee hotspots in buffer areas are being mapped and remedial action taken	Y2-3	RO, R, M	

	manatees					
C21	Enlist students and interns in conducting research at SCWS	Programs have been designed with educational institutions	Implement programs	Y1-3	BoD, M, Grant agencies, RO, CO	Delays resulted from lack of funding for staff and resources

4.5.4 Public Use Programme

Vision Expanding heritage tourism and spiritual and economic opportunities at SCWS through greater understanding of conservation values amongst the broader public

Objective	Activity Area	Actions
To improve the framework for public use	Apply the best mix of methodologies to improve public use programme for Swallow Caye Wildlife Sanctuary	
To improve the framework for Eco-tourism	Position SCWS as singular high status ecotourism attraction in proximity to city; Set standards for tour operators and tour guides Implement measures for visitor impacts Further develop systems for data collection and monitoring of visitor and community use	
To stop illegal activities in SCWS	Develop plan with enforcement agencies for routine detection, arrests and convictions for speeding, illegal fishing, and other incursions.	
To increase educational uses of the Sanctuary	Introduce schools outreach	
To increase awareness of the value of Swallow Caye Wildlife Sanctuary locally, regionally and internationally	Information dissemination to stakeholders to build community support and awareness Targeted Communications to members to solicit more involvement and support Increase interpretive facilities and activities	

4.5.4 Public Use Programme

Public Use Programme						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
D1	Strengthen relations with ABC communities to fully implement activities requiring their participation	Community participation is limited to few activities	ABC communities participating in selecting methodologies for improving plan and implementing all activities planned for public use	Y1-3	CO, M, ABC	Needs minimal staff and resources; collaborate with UB and other PA managers
Improve the framework for Eco-tourism						
D2	Position SCWS and the manatee as a major natural heritage attraction in the country's plans and promotions	Minimal efforts	Systemic sustained effort is being maintained	Y1-3	CO, BTB, MoT	Position within the implementation of the 2030 Tourism Plan
D3	Establish partnership with creative arts sector	No plan	Mutually beneficial plan is in place	Y1-3	CO, artists, NICH, artisans,	Aim for creative ways to communicate manatee protection and raise funds
D4	Train tour guides in specialized manatee tour guiding	Curriculum available but no deliver of training for years	Scheduled delivery of training at least annually	Y2-3	M, CZMI, FD, fisheries	
D5	Enforce compliance with regulations and zones at SCWS	Some illegal fishing and too much speeding	Sanctuary fully No Take and No Wake	Y1-3	R, FD, Fisheries, Port Auth, BDF, Coast Guard	
D6	Agree standards for users of the Sanctuary:	Compliance with 15 regulations and	Phase in all 2 stroke engines;	Y2-3	Tour Operators,	Identify and agree standards with ABC communities

		entrance fee	all guides specialized for manatee guiding; Anti-fouling paint; Propeller guards; 2 Poles;		Tour guides, R, CO	
D7	Select and apply VIM and/or VERP	Visitor count available	Data collection and analysis is informing management	Y1-3	RO, CO Ad	Develop tools

To stop illegal activities in SCWS						
D8	Provide SCWS legislation booklet to users	Only brochures available	Legislation booklet detailing rules and penalties widely circulated	Y2-3	R, CO,AD	Especially identify the users who are not in compliance
D9	Improve conviction rate	Illegal fishing and speeding	End to illegal fishing and no new manatee scars evident	Y1-3	R, FD, Fisheries, Port Auth, BDF, Coast Guard	Link complaints and convictions to tour operator, tour guide and captaincy licensing;
D10	Collaborate closely with regulatory agencies	Minimal collaboration	Effective surveillance and enforcement for no take no wake SCWS	Y2-3	R, M, Authorities	

To increase educational uses of the Sanctuary						
D11	Develop and deliver audio-visual presentation for Std. 5 and 6	Draft on File	Finalize presentation and deliver to at least 12 ABC schools annually	Y2-3	CO	Use to orient to Belizean Natural Heritage including manatee and habitats
D12	Inaugurate Manatee	None	Facilities being	Y3	BoD, Staff,	

	Museum and Training center with travelling exhibits and e-learning capability		utilized fully		Partner	
D13	Collaborate for field research	Minimal instances	SCWS is one of the official field research venues for UB and other universities	Y1-3	RO, R, M	
To increase awareness of the value of Swallow Caye Wildlife Sanctuary locally, regionally and internationally						
D14	Utilize free media Radio, TV,	No plan for this	Annual plan implemented	Y2-3	M, CO	
D15	Host SCWS/manatee Awareness com-petition and field trip	None	Organize for Earth Day	Y2-3	CO, Ad	Work with ABC communities
D16	Update website and social media	Schedule updates	Schedule weekly, monthly quarterly, releases;	Y2-3	M, CO, Ad	Time consuming needs staff
D17	Quarterly newsletter	None	E-Newsletter published	Y2-3	M, CO, Ad	
D18	Participate in all BTB free promotional initiatives	Live Twitter, Specialty releases	Increase submissions to BTB	Y1-3	M, CO	
D19	Host international media and photographers	Benefitting from various	Maintain or increase interest and exposure	Y1-3	BoD, M, CO, FD, CZMA, BTB	
D20	Update marketing campaign	Campaign on file	Campaign implemented	Y2-3	BoD, M, CO	Need staff
D21	Publish Research	Minimal	Publish through credible agencies	Y1-3	M, RO	
D22	Sell merchandising	Items are in storage	Sell Items	Y2-3	CO,Ad	If no paid staff, volunteers can inventory and commission through travel agencies and gift shops

4.5.5 Infrastructure Programme

Vision Friends of Swallow Caye keeps upgrading its infrastructure for management effectiveness of Swallow Caye Wildlife Sanctuary

Objective	Activity Area	Actions
To have the required infrastructure to successfully manage SCWS	- Lobby for buffer zones - Monitor compliance of shipping with MARPOL - Lobby for navigation routes to be reduced in SCWS - Develop plan for Interpretation center in Belize City, Aquarium/Manatee Museum	

4.5.5 Infrastructure Programme

Infrastructure Programme						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
E1	Lobby for buffer zones	No Buffer	Coastal Master Plan includes Buffer with enforceable development guidelines	Y1-3	BoD, FOSC, CZMA&I, GoB, stakeholders,	Long overdue activity by CZMA&I and requires acceptance by Cabinet
E2	Lobby for connectivity corridors	No corridors	Coastal Master Plan includes connectivity corridors with enforceable development guidelines; Index of Biotic Integrity and River continuum measures ongoing;	Y1-3	BoD, FOSC, CZMA&I, GoB, stakeholders, Riverkeepers	Long overdue activity by CZMA&I and requires acceptance by Cabinet
E3	Monitor compliance with MARPOL and local waste management	Minimal monitoring	Monitoring key Environmental Parameters – water temp, dissolved Oxygen levels, suspended sediment loads, nutrient availability, physical habitat structure, solid waste,	Y1-3	RO, FD, Fisheries, DoE, Health Dept. CZMA&I	Needs lead agency such as Coastal Zone for national data management and storage;
E4	Re-route navigation around SCWS	SCWS wide open except for few hours when ranger is present	Voluntary compliance with alternate routes and speed controls	Y2-3	Port authority and FD; BoD, R,	Underlying conflict needs to be resolved at Ministry and GoB level;

E5	Develop investment plan for Interpretation Center in Belize City – Aquarium/Manatee Museum	Initiative ratified in Business Plan	Develop investment plan and implement	Y2-3	BoD, M, FOSC, investors	Component of FOSC long-term sustainability and outreach plan
E6	Provide Security for Ranger Station	Harbouring anybody in absence of Ranger with equipment loss from such unauthorized use	Increase hours of surveillance and enforcement at SCWS	Y2-3	Enforcement agencies, R,	Premises cannot be used to store or support FOSC activities unless it is secured
E7	Improve and maintain signage at SCWS	4 boundary markers; 1 dozen manatee protection signs Experience weathering and vandalism; Interpretive and navigation signs are in storage	Install 9 boundary markers; install navigational and interpretive signs; Signs refurbished and replaced;	Y1-3	Port Authority, FD, R, Bod	Ongoing
E8	Identify source of solid waste and other waste and bring convictions	No system in place	Implement System to collect, identify, dispose of and source waste	Y2-3	RO, R, Ad	Dispose of garbage in Belize City

4.5.6 Administrative Programme

Vision Friends of Swallow Caye is always in the position to maintain the full complement of administrative structure and capacity for management effectiveness at Swallow Caye Wildlife Sanctuary

Objective	Activity Area	Actions
To provide the administrative framework for the effective management of Swallow Caye Wildlife Sanctuary	- Renew co-management agreement - Appoint Local Advisory Committee - Strengthen FOSC BoD - Strengthen the Institution	
To secure adequate staffing for effective management	- Recruit qualified staff - Complete Operations Manual - Train staff and volunteers - Supervise and motivate staff	
To ensure acceptable performance of all management functions	- Implement Business Plan - Generate Income - Improve management systems	

4.5.6 Administration Programme

Administration Programme					
Management Actions	Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Institutional Strengthening					
F1	Strengthen Board of Directors of FOSC	Minimally active	BoD active in its policy and planning role	Y2-3	BoD, membership	Illness and crises; no alternates;
F2	Develop and institute Code of Conduct Manual for Board of Directors	None	Code of conduct developed and adopted	Y2-3	BoD, M	
F3	Complete Company Procedures Manual	Sections are drafted	Completed and ratified Company Procedures Manual	Y 3	BoD, Staff	
F4	Effect changes to and implement national legislation to increase manatee protection and penalties	Prioritize this activity in management plan	Changes effected	Y3	ALL	
F5	Analyze and use daily Ranger logs for enforcement and status reports of SCWS	Logs are in archives	Process to electronic file, analyze and utilize for adaptive management	Y1-3	R, RO, BoD, M	Needs administrative support
F6	Set schedule for BoD meetings	Few meetings convened in 2012 as absolutely necessary	Productive meetings convened on regular schedule	Y1-3	BoD, M	
F7	Hold Semi-annual	Last meeting Sept	Semi-annual meetings	Y2-3	BoD	Needs administrative

	membership meetings	4, 2011	scheduled GM and AGM			support
F8	Establish administration structure for support to ongoing programs at SCWS	Structures are in place	Improve and upkeep all structures	Y2-3	BoD	Administrative staff needed
F9	Acquire and maintain office and operations equipment	Physical structure and items are in place	Staff the positions	Y2-3	BoD	
F10	Organize all linkages and networks to effect programme success	Lots of linkages but not being used to advantage	Staff positions to work the linkages	Y2-3	BoD	
F11	Adhere to all reporting requirements as per donors, GoB, Company's act, NGO Act, and as agreed with BoD, FOSC and co-manager	Some commitments being met by volunteer BoD and project staff	Full compliance being kept up to date by paid staff	Y2-3	BoD	Compliance improving every year
F12	Conduct annual Management Effectiveness Assessment and submit to co-manager	Recently conducted by NPAS	MES conducted annually	Y2-3	BoD and Staff	
F13	Prepare Annual Operational Plan	Prepared for 2012	Plan prepared annually	Y2-3	M, BoD	
F14	Maintain all real estate to standard – at SCWS, at Caye Caulker, at Belize City and on the www	All upgraded in 2012	Keep improving	Y1-3	Staff	
F15	Continue developing	Business Plan	Continue	Y1-3	BoD, M, Staff	

	Image and Branding of Swallow Caye Wildlife Sanctuary and FOSC	ratified	implementing			
F16	Establish the Local Advisory Committee including the ABC communities	No LAC	Local Advisory Committee appointed from ABC communities	Y2-3	BoD	

Administration Programme					
Management Actions	Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Personnel Administration					
F17	Recruit and maintain staff for successful implementation of programs	1 full-time employee	2 Rangers 1 Research Officer 1 Research Assistant 1Outreach Officer 1 Administrative Assistant 1 Manager	Y2-3	BoD	This is minimum to maintain all the NPAS required protected areas management duties and responsibilities;
F18	Orient, train, motivate, supervise staff and evaluate performance	Done by volunteer BoD and project staff	Occurring routinely	Y2-3	Manager	
F19	Compile organization administrative procedures for staff	Some sections being used	Complete Staff Manual	Y2-3	Manager	
F20	Provide uniform Tops for staff and replace routinely	Design and money in storage	Place the order	Y1-3	volunteers	
F21	Recruit and train	ECOSUR Interns	More programs	Y1-3	BoD, Manager	

	interns to assist with administration and protected area operations	accommodated	advanced by intern efforts			
F22	Strengthen Board and staff knowledge and skills in manatee conservation and management	Couple BoD members remaining up to date as time and energy permit	All BoD mostly involved	Y1-3	BoD, staff, co-manager GoB	
F23	Take advantage of the NPAS Protected Areas staff training coordinated by UB	Available in 2013	Ranger trained	Y2	BoD, R	
F24	Develop staff and consultants contracts, job descriptions/terms of reference and maintain accurate records	Job Descriptions developed for CO, RO, R, research assistant, project manager, and independent auditor	Job Descriptions developed for all positions	Y1-3	Project manager	
F25	Develop contracts for volunteers	No contracts	job descriptions developed for Interns and volunteers;	Y2	M	

Administration Programme					
Management Actions	Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
Financial Administration					
F26	Keep updating financial plans	Financial plans ratified	Implement by phases for short and long term investments and	Y1-3	BoD, M, staff	Need staff

			income generation			
F27	Increase income generation	Grant Funds Entrance Fee Membership Dues Donations Merchandising is in storage	Formulate and submit at least 10 proposals per year; Increase Entrance Fee if indicated by visitor expenditure surveys Increase visitation to SCWS Increase Donations Collect membership dues annually Sell the merchandise Phase in other income generation short and long term	Y1-3	BoD, M, Staff,	
F28	Continue financial policies and procedures to audit ready international standards;	Separation of responsibilities, expenditures approved by BoD decisions, signed vouchers, 2 of 3 signatories required to effect payments; and financial data management and record keeping on electronic system; no co-mingling of donor funds;	Paid staff doing the upkeep to electronic system; Work with APAMO to get funds for annual independent audit; Continue record keeping;	Y1-3	BoD	Currently only volunteers available and no money for annual audit
F29	Facilitate Sales	Buyers must pay cash or deposit to FOSC account	Increase payment methods – credit card, online sales,	Y1-3	BoD, M	

Financial Resources						
F29	Financial Reports Preparation	Prepared electronically for program and project reporting	Prepare monthly for BoD and LAC in addition to donor requirements	Y1-3	Ad, M	Ongoing
F30	Reconcile Bank Statements	Monthly for all accounts	Monthly for all accounts	Y1-3	Ad, M	Ongoing
F31	Evaluate and select new investment opportunities	Some ideas tabled for consideration	Invest	Y1-3	BoD, M	

Health and Safety						
F31	Ensure security of personnel, equipment and property on land, sea and cloud;	Some procedures are in place for personal, financial, equipment and building security; Emergency plan and insurance coverage is in place to comply with tour operator license requirements;	Improve current plans, complete plans; Renew for licensing;	Y1-3	BoD and staff	Ongoing
F32	Pay Social Security	Complying with SS	Complying with SS payments	Y1-3	BoD, Staff	Ongoing

Monitoring and Evaluation						
F33	Periodic review of	Quarterly and end	Continue	Y1-3	BoD, Staff and	Ongoing

	measures of success	of project review for all projects as per donor requirements			project staff	
F34	Evaluation of Annual Operating Plan	Not current	Implement Evaluation for all program activities and adjust new plans for greater success	Y2-3	BoD, staff	
F35	Re-evaluate this management plan annually	Current	Assess, update and revise entire management plans as indicated	Y1-3	BoD, FOSC, Staff, LAC, co-managers	

4.5.7 Management Policies

Vision Friends of Swallow Caye is a strong institution with all corporate policies and procedures documented and with transparency and accountability.

Objective	Activity Area	Actions
Enhance the Company's efficiency	- Complete the operations manual	G1

Management Policies						
Management Policies						
Management Actions		Present Status	Desired Status	Year	Responsible Parties	Limitations/Requirements
G1	Policies formulated for Personnel, Communications, Computer, Motor Vessels, Procurement, Fixed Assets, Emergency, Finance and Intellectual products	Already in place: Personnel Job Descriptions, Motor Vessel procedures, Finance and Emergency	Completed Operations Manual	Y 2	BoD, M, Staff	May require facilitator

4.6 Management Actions

Management actions are as detailed from 4.5.1 to 4.5.7 for each of the Programmatic Areas functioning at Swallow Caye Wildlife Sanctuary.

4.7 Monitoring and Review

This management plan is organized for straightforward monitoring of progress. In addition, Friends of Swallow Caye is answerable to many regulatory agencies all of which mandate compliance. These wide-ranging perspectives all intersect with programmatic aspects of the organization. This means that on a routine and ongoing scheduled basis, sound management of SCWS can be scrutinized by many agencies and can be reviewed and verified by as many. To be legally and contract compliant Friends of Swallow Caye must meet performance levels and adequate management effectiveness.

Co-management Compliance: - mid-year and end-year program and financial reports; other interim reports as demanded by regulatory agency;

A. Reporting Requirements

The following constitutes the minimum reporting requirements that the Manager for the protected area must adhere to when submitting their mid and end of year "status of management" reports to the Regulatory Agency. (mid-year report due 1 month after end of mid-year and end of year report due 2 months after end of year)

Both Mid and End of Year Reports are based on the Annual Plan of Operations developed for that year and the most current medium-term management plan for the area, and should contain concise and comprehensive descriptions updating on the following:

1. Institutional Management and Strengthening
2. Administration
3. Natural Resources Management
4. Research and Monitoring
5. Protection and Surveillance
6. Infrastructure Management
7. Public Use Planning and Recreation Management
8. Visitor Safety and Control
9. Community Development and Education

In addition, End of Year Reports shall contain a section on "Assessing Management Effectiveness" and it shall be developed based on the following indicator categories:

1. Resource Information
2. Resource Administration, Management and Protection
3. Participation, Education, and socio-economic benefits
4. Management Planning
5. Governance
6. Human Resources
7. Financial and Capital Management

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B. Further Guidance for End of Year Reports

Assessing Management Effectiveness

1. Assessing management effectiveness is to be done in accordance to the methodology by Young et al in 2005, "Monitoring Package for Assessing Management Effectiveness of Protected Areas".
2. Managers only need complete the summary card as outlined in pages 13 to 45 of the Young et al 2005 methodology and this will constitute the full report for the section on "Assessing Management Effectiveness"

Guidelines for Financial Reporting

C. Reporting Requirements

The following constitutes the minimum reporting requirements that the Manager for the protected area must adhere to when submitting their mid and end of year financial reports to the Regulatory Agency.

(i) Both Mid and End of Year Reports shall contain the following:

10. Statement of Financial Position
11. Statement of Financial Operations/Activities
12. Statement of Cash Flows
13. Statement of Changes (present year and previous year statements)

14. Notes to financial statements

(ii) *In addition, End of Year Reports shall contain the following information disaggregated for each Protected Area under the control of the Manager:*

8. Statement of Financial Position (on site assets; grant funds for a project exclusive to a particular protected area; liabilities incurred on site)
9. Statement of Financial Operations/Activities
10. Statement of Cash Flows (operating activities; investing activities; financing activities)
11. Statement of Changes (present year and previous year statements)

D. Reporting Standards

Co-management AGreement

The Manager shall ensure that the reports are prepared in accordance to International Financial Reporting Standards the purpose of which is the preparation and fair presentation of financial statements that are free from material misstatements. Where the Manager is under an obligation pursuant to Section 15 and 16 (1) a, b of the Non-Governmental Organization Act, Chapter 315, it should employ the services of a duly registered/recognized independent auditing firm the purpose of which is to provide an audited financial report in accordance with International Standards on Auditing. Only end of year reports need be audited reports after this manner. Where the Manager, pursuant to Section 2(h) of the Non-Governmental Organization Act, Chapter 315, is under no such obligation to provide audited financial reports, they are permitted to submit the same statement of accounts prepared by its bookkeeper/accountant as under Section 2(h) so long as that statement broadly contains the information solicited in the minimum reporting requirements under section A (ii) of this schedule.

E. Further Guidance for End of Year Reports

Further guidance is provided below for the disaggregated reports for individual protected areas under A (ii).

<u>Statement of Financial Position</u>

Assets:

(i) Itemized listing of assets *on site* and their current value at year of reporting

Liabilities, grants, and fund balances:

(i) Itemized listing of grant funds exclusive to the protected area
(ii) Representations in (i) above should include the initial grant amount and the amount remaining at the time of reporting
(iii) Liabilities directly incurred by activities in the protected area to date

<u>Statement of Financial Operations/Activities</u>

(i) Revenues generated on site
(ii) Expenditures incurred on site

<u>Statement of Cash Flows</u>

(i) Operating activities
(ii) Itemized listing of purchases and other investments made directly into the protected area
(iii) Itemized listing of financing activities

<u>Donor Agency Compliance: schedule of reporting, monitoring and evaluation is for each and every project</u>

Inception meeting
Quarterly Financial and Program Reports
Interim and Ad Hoc Reports
Interim Audit
Final Financial and Program Reports
Final Project Audit and Evaluation

<u>Membership Compliance: FOSC operates as representative of its members and is answerable to its members</u>

Board of Directors Meetings
Membership Meetings including profit and loss accounts; balance sheets and reports giving true and fair view of the state of the Company's affairs
Annual General Meeting including Program and Financial Reports

<u>Non-Governmental Organization Registration Compliance: due within four months after the end of each financial year</u>

Statement of accounts (duly audited by an independent auditor)
Certified copy of financial statements
Report dealing generally with the programme of activities and policies of the non-governmental organization during that financial year

Belize Port Authority Compliance: required annually at start of year

Boat Licence
Captain Licence

Belize Tourism Board: required annually at start of year

Tour Operator Licence

Company's Act Compliance:

Proper books of accounts ongoing to give true and fair view of the state of the Company
Appointment of Auditor
Annual Independent Audit

4.8 Timeline

Primary Cross-cutting Strategies	Year 1	Year 2	Year 3
Institutional strengthening of SCWS: Governance Improvement, Human Resources Development and Financial Sustainability			
Renewal of Co-management agreement with Forest Dept.			
Improve in management effectiveness by implementing management and business plans			
Further develop member recruitment and retention programs			
Public Awareness and Communications			
Conduct public awareness programs			
Conduct educational programs			
Expand Outreach Activities for the public			
Conduct educational activities with all schools in Belize			
Strategic Alliances: Advocacy, Networking, Alliances			
Increase networking with BMMSN, NMWG and CZMA&I			
Partner with UB & international Universities on research and other activities			
Expand collaboration efforts to Fisheries and Forest Dept for enforcement activities and ongoing staff training			
Protected Areas Management: Integrated Management, Surveillance and Enforcement, Research and Monitoring			
Lobby for legislation to Increase Penalties for collisions with manatees and injuries to manatees			
Enforce existing legislation reference mangroves, and 66 ft			

river reserves			
Increase patrolling and enforcement			
Explore and introduce Alternative Livelihoods initiatives			
Conduct Research on mangrove, seagrass, manatee			
Monitor water and air quality			
Fine tune Zoning within SCWS			
Communities agree to identify and establish alternate Navigation Routes outside of SCWS			
Communities agree for the Creation of Buffer area around SCWS			
Communities agree for the creation of Manatee safe zones along the entire coastline			

4.9 Financing

Income generation by Friends of Swallow Caye is from a couple sources and the company's business plan further details other opportunities.

1. Entrance Fee
The co-management group, Friends of Swallow Caye, by Statutory Instrument No. 74 of 2003 gazetted 31st May, 2003 an entrance fee is prescribed for Swallow Caye Wildlife Sanctuary as follows: Belizean Nationals BZ$2.00 Non-Belizean Nationals BZ$10.00
Since that time, this entrance fee contributes a small portion of the budget and, more important, is successfully used to leverage grant funds.

2. Grant Funds
Project proposals are submitted from time to time to support some programs.

3. Merchandising
Souvenir items about SCWS are for sale including postcards, DVD's and stickers.

4. Tour Operation
FOSC achieve tour operator status for commission income.

5. Membership Dues
FOSC undertakes a membership drive from time to time with non-Belizean members paying double the fee that Belizeans pay;

6. Donations
Supporters make cash donations from time to time.