Gales Point Wildlife Sanctuary

Planning for a

Community-Managed Sustainable Fishery



Planning for a Sustainable Fishery - Gales Point Wildlife Sanctuary

Contents

Introduction

As with many developing countries, Belize is faced with the challenge of ensuring successful community management of traditional fisheries resources in protected areas. Crooked Tree, Aguacalienete, Corozal Bay and Gales Point Wildlife Sanctuaries are all cases in point where sectors of the population are dependent on extraction of the local fisheries resources, yet resources are not managed for sustainability. Inappropriate resource use has depleted fish stock in all these locations, and in some, local extinctions have occurred (the small tooth sawfish (*Pristis pectinata*)), while other species are reaching critical levels (the goliath grouper (*Epinephelus itajara*). In all these communities, guidance is needed on how best to achieve long term sustainable management of the resources for the benefit of future generations, through collaborative management by the resource users themselves.

This project focuses on Gales Point, and identifies the first steps to be taken towards achieving a sustainable fishery within the Gales Point Wildlife Sanctuary. This is in line with the National Protected Areas Policy for community use and benefit from natural resources, and is highlighted as a priority strategy under the Gales Point Wildlife Sanctuary management plan. Gales Point, as the only community traditionally utilizing the fish resources of Southern Lagoon[1], is ideally situated for developing sustainable management of these resources, and providing a model for other communities and community-managed protected area managers to follow.

The following steps have been implemented in collaboration with the Gales Point Wildlife Sanctuary Community Management Committee (GPWSCMC) and Wildlife Trust, to provide the information necessary for developing a successful community based sustainable fisheries plan:

- Review of management plan and relevant literature on community management of sustainable fisheries and integration into planning

- Preliminary meeting with Gales Point community (February, 2009) to introduce planning process and identify and engage primary stakeholders

- Focal meeting with key stakeholders (May, 2009) to define current fishing activity – fishing effort (spatial and temporal patterns of fishing activity, home-use, commercial and sport fishing. Introduction to development of baseline information required and methodology

- Site visit (October, 2009) focused on consultations with commercial fishermen from Gales Point, identifying and mapping priority nursery and fishing areas, with the

[1] 'Southern Lagoon' is the local name given to the Gales Point Wildlife Sanctuary and is synonymous with the Wildlife Sanctuary. Specific areas within the lagoon system are also known as 'Southern Lagoon'

development of appropriate zoning and regulations of the Wildlife Sanctuary for fishing and management purposes. The site visit also provide further details on catch effort, boat activity and initial landing data – with sampling of the catch and species

This framework provides a route forward and recommendations on which to base the creation of a comprehensive community-based Sustainable Fishery Plan, towards the sustainability of the fisheries resources of Southern Lagoon, within the National Protected Areas Policy and System Plan framework. It also includes recommendations on the development of a baseline and ongoing monitoring plan, to measure the performance of the Southern Lagoon fishery over time.

Part I: The Traditional Gales Point Fishery

1.1 Context - Gales Point Wildlife Sanctuary

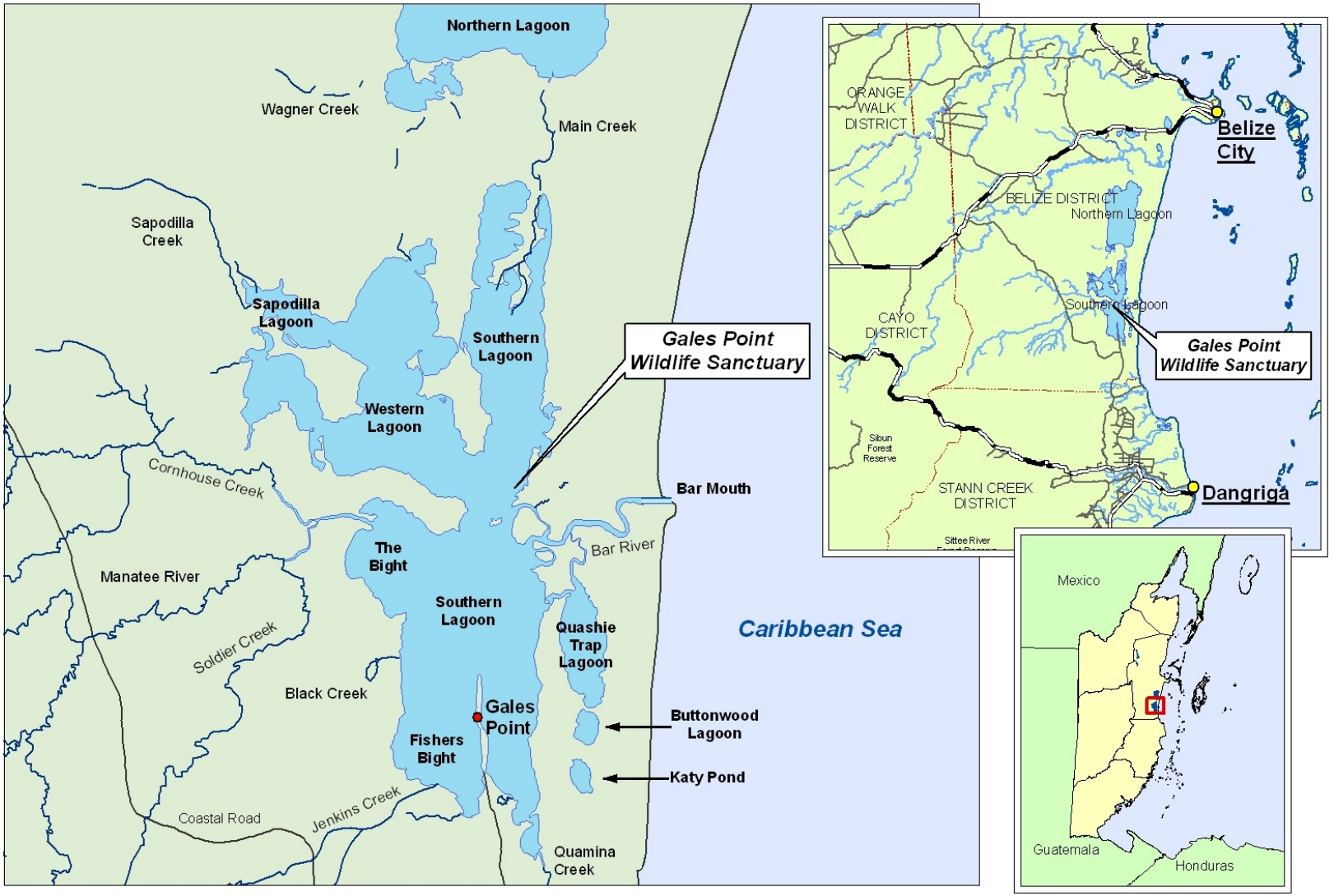
Gales Point Wildlife Sanctuary is centered on one of two connected large lagoons on the central coastal plain, and covers a complex matrix of brackish lagoons, creeks and mangrove mudflats, encompassing Sapodilla, Western, Southern and Quashie Trap Lagoon (including the Bar River and the Quashie Trap tributary). It also includes a portion of the Manatee River, from its estuary upriver for an approximate distance of 2,286 meters, and 1,287m of Cornhouse Creek up river from its confluence with the Manatee River (SI 92 of 1998). Also included is the 66' shoreline along all the lagoons and waterways within the Wildlife Sanctuary, with the exception of the shoreline of the Gales Point peninsula. Private land lines the majority of the shorelines of the lagoons and coast.

Location

The Wildlife Sanctuary is situated in the Belize District, approximately 30 km south-south west of Belize City (the largest population centre in Belize, with a population estimated at 59,400 (CSO, 2004)), and 34km north of Dangriga (the district capital of Stann Creek, with a population estimated at 10,400 (CSO, 2004)). There is one community located adjacent to the Wildlife Sanctuary – Gales Point, with a population estimated at approximately 250 (Walker and Walker, 2007), consisting of households lined along a narrow peninsular that extends northwards into the lagoon system (Map 1).

The Gales Point community has always been strongly tied to the natural resources, with a high dependency on fishing and hunting. The Gales Point Wildlife Sanctuary, whilst designated for its conservation value, has been an important natural resource for the community since it was first established. Quamina Creek, feeding into the lagoon system from the south, has traditionally been the freshwater source for Gales Point, and the fish stocks are considered one of the most important food resources.

Other communities that also impact the Wildlife Sanctuary include Belize City to the north, Dangriga, to the south – and even coastal communities of Honduras, primarily through fishing activities on the coastline by Bar Mouth.



Map 1: Location of Gales Point Wildlife Sanctuary

Management Context

The Gales Point Wildlife Sanctuary is managed by the Forest Department, in collaboration with the Gales Point Wildlife Sanctuary Community Management Committee. Whilst no formal co-management agreement currently exists, the Management Committee is considered the interim co-management agency, and has been active in lobbying for the protected area and its manatees, and also for the provision of benefits to the Gales Point community.

The Management Committee is building its capacity to effectively take on the co-management role, though still requires much of the infrastructure associated with protected area management. The GPWCMC has completed a five-year management plan for the area, for submission to the Forest Department for review and approval.

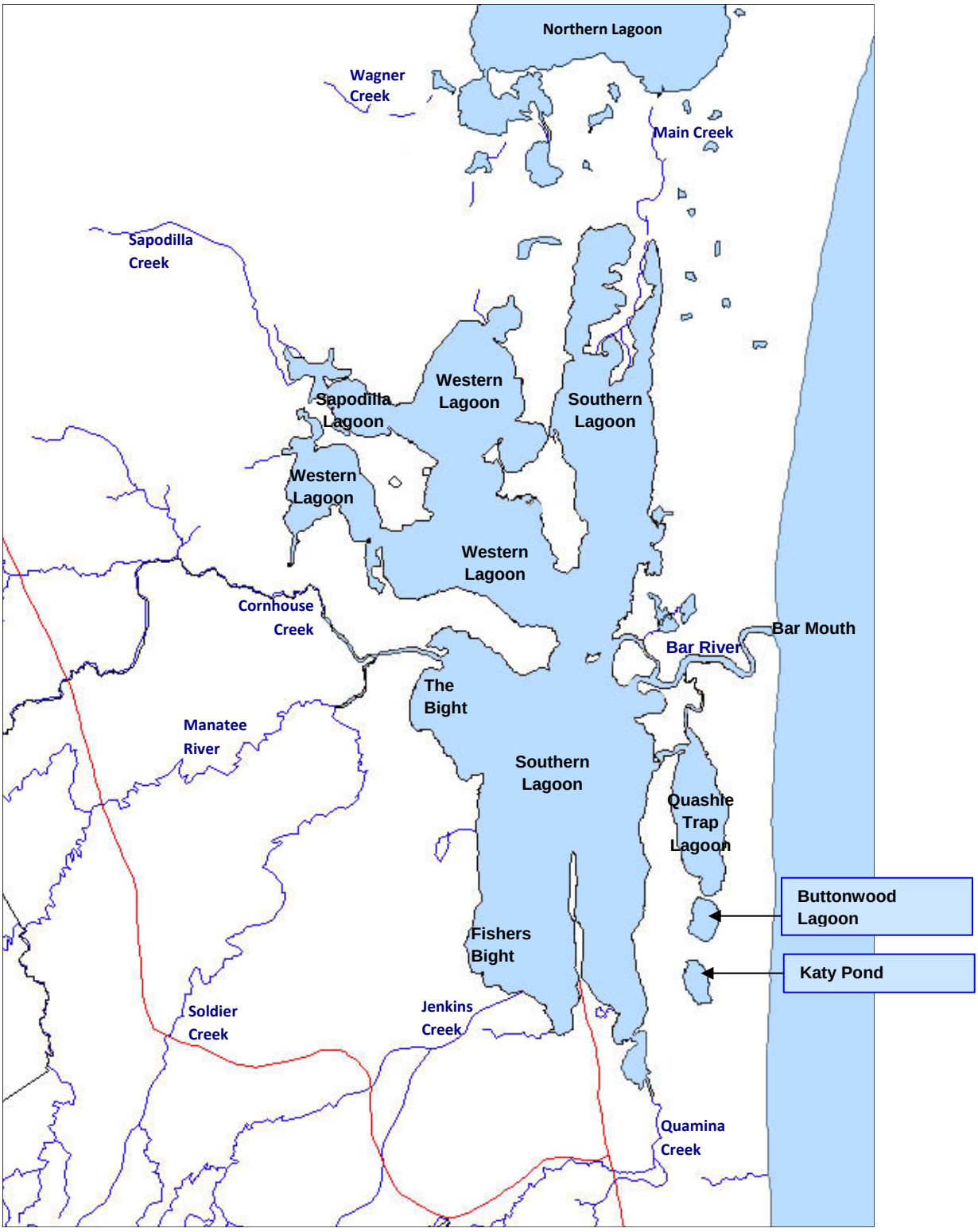
Environmental Context

Gales Point Wildlife Sanctuary is an enclosed coastal lagoon lying on the coastal plain and separated from the Caribbean Sea by a narrow coastal bar. The convoluted nature of the shoreline of Southern Lagoon has led to the naming of bays and bights within the system – Western Lagoon, Sapodilla Lagoon, and Southern Lagoon all being within the main water body of Gales Point Wildlife Sanctuary, whilst Quashie Trap Lagoon, Buttonwood Lagoon and Katy Pond lie to the east, separated from the main lagoon by an old coastal bar, and from the sea by the most recent beach deposits (Map 2). These three smaller lagoons are linked north to south to each other, and flow northwards out through Quashie Trap Lagoon and tributary into Bar River to the north and Southern Lagoon to the west.

With rivers and creeks draining into the lagoon from the west, water then flows to the east, the lagoon being connected to the Caribbean Sea through Bar River, a channel that cuts through the coastal bar of the east coast of Belize. Direction of water flow through Main Creek and Bar River changes depending on the tides, whilst water level within the lagoon system, primarily influenced by tidal patterns (with a variation of between 6 and 10 inches), is also affected by changing wind directions. As with many of the coastal lagoons in Belize, the average water level drops with the strong north winds that blow from November to April, and increases later in the year with the strong easterly trade winds. Bathymetry of the system clearly highlights the shallow nature of the enclosed lagoon system, with deeper water to the western portion of the system, favoured by the commercial fishermen (Walker and Walker, 2007).

Salinity within the Wildlife Sanctuary is moderated by the freshwater flowing into the system, and is highly variable, being impacted by surface run off and the reversal of several of the creeks with the tides. It also varies seasonally as rainfall fluctuates throughout the year.

Sapodilla and Western lagoons lie in the north west of the Southern Lagoon system, and are fed primarily by Sapodilla Creek, and by sheet run off from the adjacent short grass savanna and low-lying dwarf mangroves. Western Lagoon in particular is favoured by local fishermen, who use hand lines, cast nets, and occasionally set-lines. Gill nets stretching from Tiger Point across the entrance to the lagoon are used by commercial fishermen. This part of the lagoon has the greatest algal growth and greater



Map 2: Gales Point Wildlife Sanctuary lagoon system

rugosity, with *Dasycladaceae* and other algae growing on the majority of the exposed stones, providing much greater cover and habitat complexity than other more open areas of the lagoon, with a corresponding apparent increase in fish diversity and abundance.

The fish species assemblage in the lagoon itself is predominantly of euryhaline species, able to withstand the daily and seasonal shifts in salinity. A number of the more saline-tolerant freshwater species are present in areas of lower salinity where rivers and creeks enter the system.

Conservation Context

From a conservation standpoint, the Gales Point Wildlife Sanctuary's primary importance within Belize's protected areas system lies in the protection of the West Indian Manatee (*Trichechus manatus*), a species listed as 'vulnerable' (IUCN, 2009), which congregates within the lagoon system. Two other species of conservation importance have been recorded within the protected area - the goliath grouper (*Epinephelus itajara*), and the regionally endemic Central American river turtle (*Dermatemys mawii*). Both are considered 'critically endangered' (Table 1; IUCN, 2009).

IUCN Rating	Species
Critically Endangered	Hawksbill Turtle
	Goliath Grouper
	Central American River Turtle
Vulnerable	West Indian Manatee
	American Crocodile
	Cubera Snapper
Lower Risk / Near Threatened	Morelet's Crocodile
	Southern Stingray
	Cow-nosed Ray
	Lemon Shark

Table 1: Gales Point Wildlife Sanctuary: Species of International Concern

Southern Lagoon, whilst not supporting a high juvenile population of goliath grouper, is considered a critical 'growing-out' habitat for sub-adult /young adults that no longer need the protection of mangroves (Graham et. al. 2007). Preferential use of different areas of the lagoon based on bathymetry showed that groupers may aggregate in - 'holes' - areas of deeper water that are thought to provide shelter and protection.

The smalltooth sawfish (*Pristis pectinata*), restricted to shallow coastal lagoons such as Southern Lagoon, was once present in large numbers, but was extensively fished to the point of becoming locally extinct in the lagoon system in the early 1960's (D. Myers, pers. com.). This species, which is considered 'critically endangered' (IUCN, 2009), has since disappeared from the majority of the shallow coastal lagoons in Belize, and is now considered ecologically extinct in Belize (R. Graham, pers. com.).

Another focal point of conservation interest lies to the east, outside the Wildlife Sanctuary, on the sand bar facing the Caribbean Sea. Originally identified as one of the most important nesting beaches within the Western Caribbean, the 'critically endangered' hawksbill turtles (*Eretmochelys imbricata*) return here each year to nest.

1.2 Review of Past Initiatives

A number of past initiatives focused on the Southern Lagoon area provide background information for guiding the development of the Sustainable Fisheries Plan.

- A major planning initiative was implemented in 1994, with a series of baseline research activities for the Gales Point area, as part of the Gales Point Natural Resources Project, to provide background for the designation of the area as a Special Development Area (whilst designation did take place, the Special Development Area plan was never implemented)

- A Community Development Plan was produced in 2008 following a survey of households in Gales Point in October 2007. 49 households (96% of the total occupied households in the community) participated in the survey, representing a minimum of 216 resident community members. Survey questions included information on the fish and current fishing practices, and perceptions on the status of the resource.

- A Biodiversity Assessment was completed in 2006, contributing towards the Gales Point Wildlife Sanctuary Management Plan, which was itself completed in 2007, and is currently awaiting approval from the Forest Department. Several strategies and actions in the Management Plan are focused on developing a Sustainable Fisheries Plan, to provide the Gales Point community with a mechanism to lobby with the Forest Department to permit continued traditional use of the fish resources of the lagoons and creeks, on a sustainable basis.

All assessments for the above reports were undertaken in participatory processes, in partnership with the Gales Point Wildlife Sanctuary Community Management Committee, the local fishermen, and Wildlife Trust.

A rapid assessment of goliath grouper and Elasmobranch populations in Southern Lagoon was also conducted in 2007 (R. Graham and R. Polonio, 2007), providing information on these species for the management plan, with recommendations for improved management of these resources.

1.3 Socio-Economic Context

Introduction

It is important to understand the local social, economic, and environmental context in which the fishery is being conducted for the development of an effective sustainable fisheries plan for Southern Lagoon. Southern Lagoon was declared as the Gales Point Wildlife Sanctuary by the Government of Belize in 1998 (SI 92 of 1998). Under Belize law, wildlife sanctuaries are non-extractive, with any fishing considered illegal, unless by ministerial consent. In cases such as Southern Lagoon, fishing has been a

continuous traditional activity, the fishery being an essential resource for the community, though there has been no move to seek ministerial consent to legalize the activities.

Traditional use by stakeholder communities, however, is recognized under the National Protected Areas Policy and System Plan (NPAPSP, 2005), which seeks to harmonize the Belize protected areas system with international criteria that

> "…Allow for the full range of management options under international designations including those allowing managed extractive use (in whole or in zones) and other approaches aimed at harmonious integration of human activity and conservation at landscape level"

The NPAPSP also takes into account that:

> "…Management of protected areas shall respect, preserve and maintain the traditional knowledge, innovations and practices of indigenous peoples and local communities provided that these do not conflict with the ecological integrity of the protected area and the various conventions and multi-lateral environmental agreements signed by the Government of Belize"

Management Goals of the Gales Point Wildlife Sanctuary Management Plan (2007)

1. To protect and maintain the natural resources of the Gales Point Wildlife Sanctuary as an integral part of the National Protected Areas System
2. To protect and maintain West Indian Manatee and other globally threatened species present within the Gales Point Wildlife Sanctuary
3. To promote sustainable use of the Gales Point Wildlife Sanctuary for tourism and traditional fishing activities, for the benefit of the Gales Point community
4. To promote and facilitate active research and biodiversity monitoring activities towards provision of information for adaptive management
5. To provide recreational and educational opportunities for Belizean and international visitors in a manner that is compatible with the natural environment
6. To strengthen management capacity and community participation in management decisions, and develop mechanisms to ensure long term financial sustainability

Figure 1: Goals of the Gales Point Wildlife Sanctuary Management Plan

The Gales Point Wildlife Sanctuary Community Management Committee has recently produced a management plan for the Wildlife Sanctuary, with a series of management goals (Figure 1). Within these goals is the recognition of the need to "promote sustainable use of the Gales Point Wildlife Sanctuary for tourism and traditional fishing activities, for the benefit of the Gales Point community".

Importance of the Local Fishery

Gales Point, the primary stakeholder community has historically been a small, subsistence fishing, farming, hunting and logging village, located on a narrow peninsula that extends into the Gales Point Wildlife Sanctuary. Whilst still predominantly dependent on subsistence fishing, in the last fifteen years Gales Point has also built on its cultural traditions and natural resources to create a small-scale tourism base.

The reliance on the natural resources of the area is highlighted by a recent survey, 88% of participants indicating that fishing, both for subsistence and financial return: the ability to catch and / or eat freshly caught fish, is considered the factor of greatest importance to quality of life within the community (Figure 2; Community Development Plan (Walker and Walker, 2008). 81% of respondents fish within the lagoon, whether for subsistence use, commercial or recreational purposes. When assessing sources of income for the community, fishing was identified as the most common primary source, providing funds for 21% of the households (Figure 3).

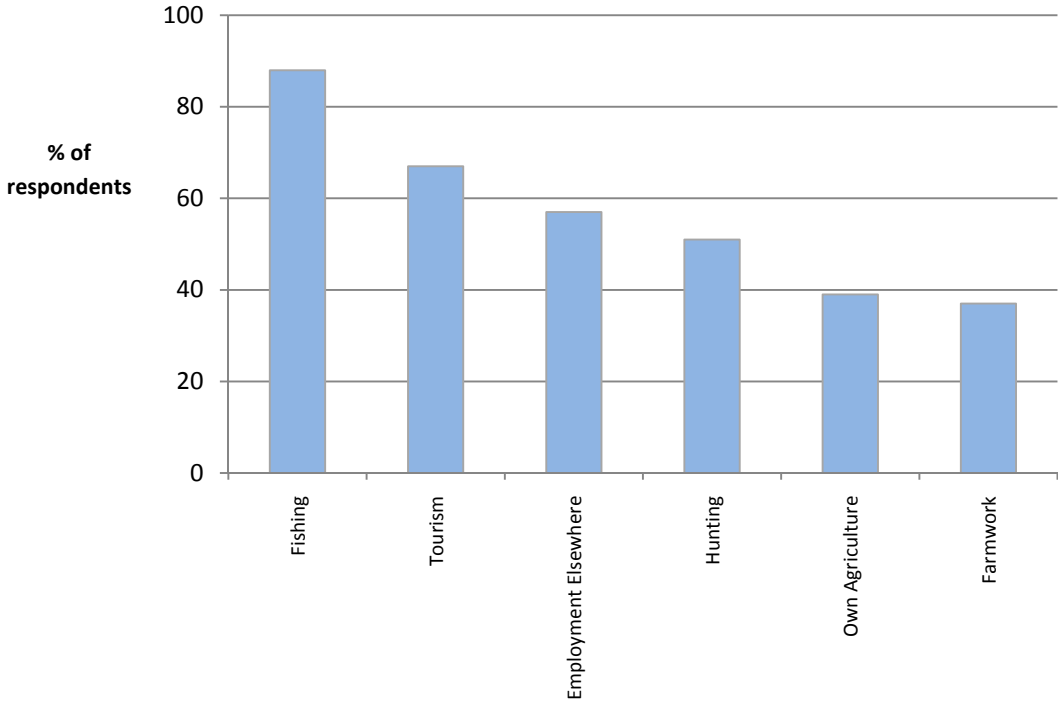


Figure 2: Factors considered important for the maintenance of households in Gales Point - October, 2007

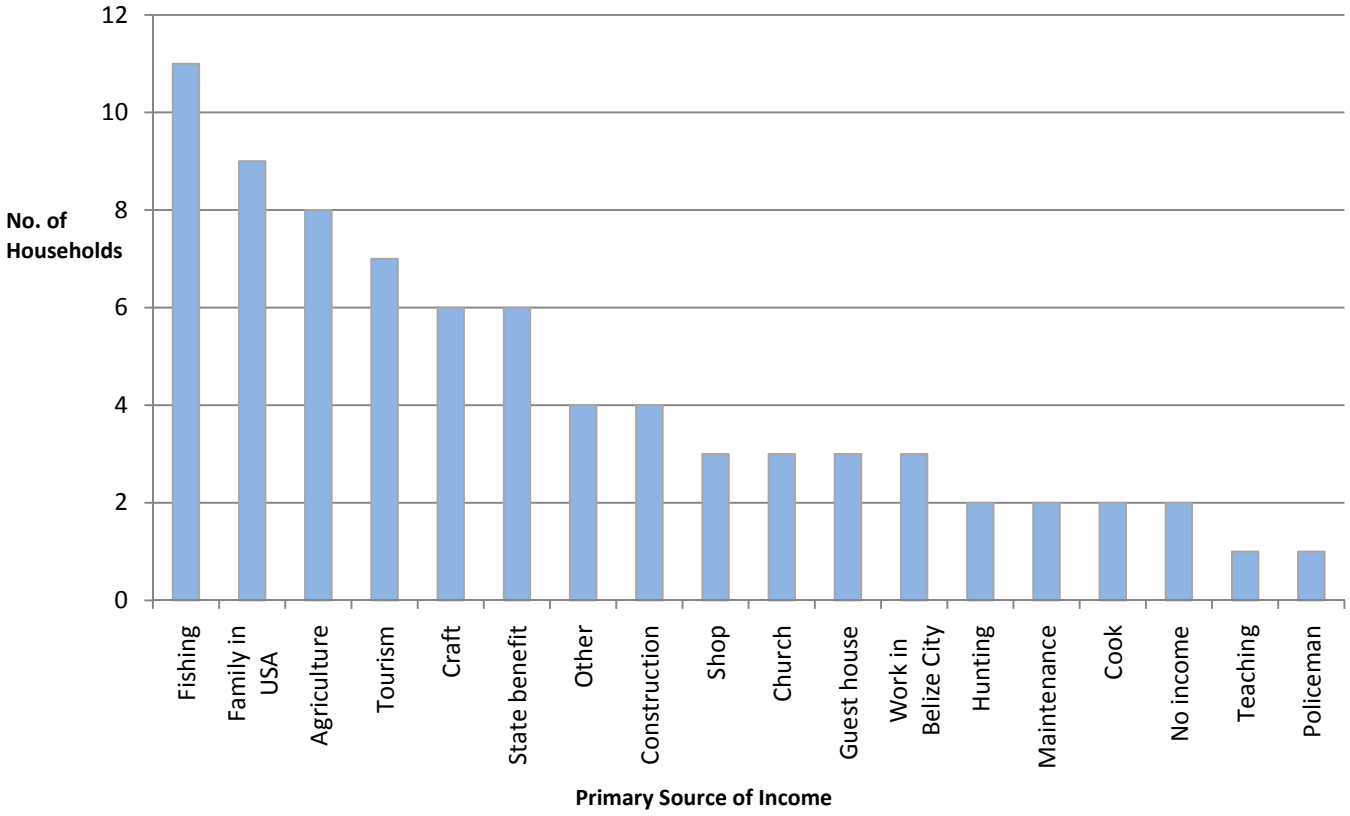


Figure 3: Gales Point Community Survey: Primary Income Source per Household October, 2007

1.3 Profile of Fishing Activity in Gales Point

The community survey provided extensive information on fishing activities within the Gales Point Wildlife Sanctuary, including data on the number of years respondents have been using the lagoon for fishing, what percentage of their total catch is from the Lagoon, and how regularly they fish (Table 2; Walker and Walker, 2008), the type of fisherman, fishing methods employed, boat/gear types, and the preferred fish species targeted (Figure 4, Table 3), emphasizing the importance of this activity for the majority of community members. A focal group meeting in Gales Point on 9th April, 2009 added to the information in specific areas – classifying the types of fishermen for use in the frame surveys.

No. of years respondents have used the Lagoon for fishing	
Years	***% of households***
<5 yrs	7%
5-10 yrs	10%
>10 yrs	83%
Total	100%

Frequency of fishing	
Frequency	***% of households***
every 1-5 days	43%
every 1-2 weeks	30%
Once a month	10%
< 1 x month	17%

Table 2: Survey Results (October, 2007)

The majority of respondents (83%) have been fishing in the lagoon for longer than 10 years – in fact, most have fished the lagoon since childhood (which for many is over 50 years). The catch is primarily for household use, and may be limited to less than a bucket of fish a day, caught by hand line, though there are also a number of commercial fishermen active in the lagoon, extracting larger quantities. 43% of respondents will fish in the lagoon at least once a week – and many of these fish every day.

Local 'home-use' fishermen generally fish by line, though more than 20% also use cast nets. A limited number of gill nets are set by the commercial fishermen in the lagoon (though this is illegal under the Fisheries

Type of fisherman	Description
Local 'Home Use' Fishermen (81% of Gales Point, with 15-16 fishermen who fish every day)	Use hand line, some cast net use. Dory and sail.
Local Commercial Fishermen Fish for business (6 main commercial fishing teams of 2 to 4 fishermen)	Gill net, cast net, set lines, hand line trolling, fish trap. Use fibreglass skiffs with outboards.
Outside Commercial Fishermen	Fishermen from Yarborough (Belize City), Placencia and Honduras - use gill nets and baited long lines, and are mostly present in the Bar Mouth area – but sometimes come into the lagoon.
Sport fishing (tourism) 3-4 Gales Point people. Some from outside	Rod and reels, cast net for bait. Use fibreglass skiffs with outboards. Gales Point, Belize City (Action Belize), Hopkins. Mostly catch and not release – especially those from Belize City

Table 3: Types of Fishermen utilizing Southern Lagoon (Community meeting, May 2009)

legislation), though their use is largely restricted to the lagoons, and within the community (and through law) across creek mouths.

Most people limit their fishing to the lagoon and associated creeks (over half the respondents catch 75% or more of their total catch from the lagoon). Those who catch part of their catch from outside the lagoon generally fish the coastline by Manatee Bar.

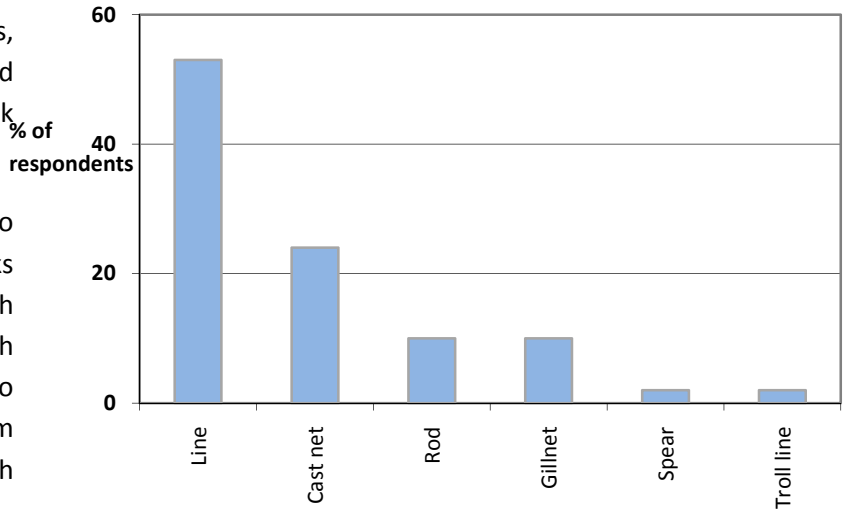


Figure 4: Fishing Equipment used in GPWS

1.4 Target Species and Trends

Three families of fish were highlighted as preferred targets – snapper, jacks and stone bass / mojarra (Table 4; Figure 5; Community survey, 2007).

Preferred Fish	% respondents	Species	
Snapper (Lutjanidae)	53	Grey Snapper	*Lutjanus griseus*
		Schoolmaster	*Lutjanus apodus*
		Cubera Snapper	*Lutjanus cyanopterus*
Jack (Carangidae)	49	Crevalle Jack	*Caranx hippos*
		Horse-eye Jack	*Caranax latus*
		Permit	*Trachinotus falcatus*
		Pompano	*Trachinotus carolinus*
		Leatherjacket	*Oligoplites saurus*
		Lookdown	*Selene vomer*
Stone Bass (Gerridae)	37	Silver Mojarra	*Eucinostomus argentus*
		Slender Mojarra	*Eucinostomus jonesi*
		Flagfin Mojarra	*Eucinostomus melanopterus*
		Striped Mojarra	*Eugerres plumieri*
		Brazilian Mojarra	*Eugerres brasilianus*
		Yellowfin Mojarra	*Gerres cinereus*
Barracuda (Sphyraenidae)	18	Great Barracuda	*Sphyraena barracuda*
Snook (Centromopidae)	14	Common Snook	*Centropomus undecimalis*
		Tarpon Snook	*Centropomus pectinatus*

Table 4: Preferred Target Species (Biodiversity Assessment, 2007, Community consultations, May 2009)

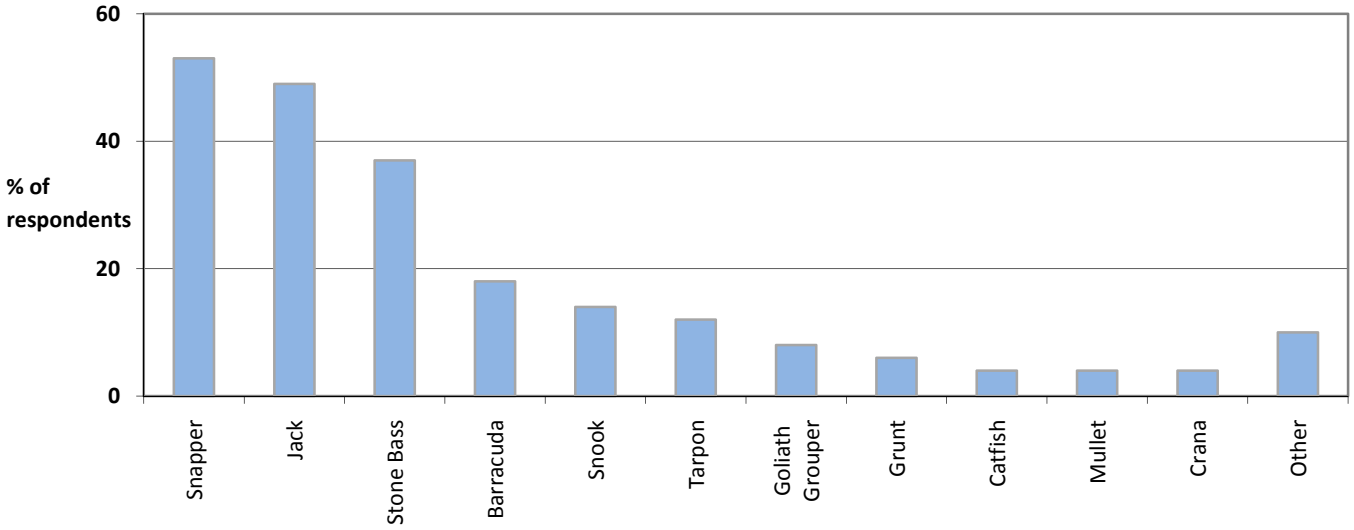


Figure 5: Preferred Fish Targeted in GPWS (Community survey, 2007)

Information on the use of Southern lagoon by the key targeted species is also important in guiding the development of temporal and/or spatial zoning within the lagoon system (Table 5). There is also seasonality in the availability of some fish species (goliath grouper, tarpon and permit) within Southern Lagoon, primarily tied to the salinity levels (Figure 6). Local reports suggest that the strong east trade winds in April and May increase water depth and salinity, resulting in a change in the species composition, with the appearance of large numbers (shoals of hundreds) of stone bass (striped mojarra (*Eugerres plumieri*)) (community consultations, 2006). This influx has traditionally been targeted by local fishermen, using cast nets. There is a valid concern among Gales Point fishermen that illegal gill net activity could rapidly deplete these seasonal congregations.

Type of fish	J	F	M	A	M	J	J	A	S	O	N	D
Stone bass			Spawning season									
Goliath Grouper							Mainly juveniles					
Tarpon												
Permit												
Snook												
Higher numbers	Lower numbers											

Figure 6: Seasonality of key species (Community consultations, 2009)

Fish Species	What do we know about them?
Snapper (Lutjanidae)	Larger individuals are found in the more saline Manatee Bar area. Smaller individuals are found in the shade, among the mangrove roots – fishermen set nets around mangrove in dry season. Snappers are also found in Cornhouse, Main and Quamina Creeks . Cubera snapper use the deeper holes within the lagoon system.
Jack (Carangidae)	Adults and juveniles are found throughout the system, in both the creeks and lagoon.
Stone Bass (Gerridae)	Juveniles are found in the shallow lagoons – Sapodilla, Quashie Trap and Buttonwood Lagoons, under mangrove. In dry season, with the increasing salinity, stone bass run in Main Creek, Manatee Bar and Sibun Bar, through Northern Lagoon and then fill the whole of Southern Lagoon, coming into the system to spawn
Barracuda	Found throughout the Southern Lagoon system. Juveniles are known to frequent Western Lagoon, and other lagoons
Goliath Grouper	This species can be found in the deeper manatee holes, Bar Mouth, Cornhouse Creek, Main Creek, Quamina Creek - primarily when salinity increases (dry season). Juveniles can be located under the mangrove on the banks of Manatee River
Tarpon	Congregates in the warm springs, like to be under the mangroves, deep holes. When lagoon gets too hot, they will move up rivers. Some juveniles seen in Cornhouse Creek – nursery area? Larger tarpon (7ft) are found in the warmer water near Manatee Hole. Presence of larger tarpon suggest that the area may be important for spawning.
Permit	Primarily adults in dry season in Southern Lagoon in the side branches of side of Main Creek and in Sapodilla Lagoon. No young permit have been reported within lagoon – mostly observed out in the sea.
Snook	Found throughout the lagoon system – particularly in Manatee River, under the mangroves, and at Manatee Bar, particularly in holes. Juveniles shelter in mangrove-lined areas of the river
Crana / tuba (Cichlids)	Freshwater areas such as Katy Pond, Quamina Creek, Manatee River, Cornhouse Creek. Crana (*Cichlasoma uropthalmus*) can take some salinity, but tuba (*C. synspilum*) is generally restricted to freshwater
Tilapia	Invasive species found in Buttonwood lagoon – some people like this species, but there is a limited market locally.

Table 5: Target Species Use of Southern lagoon (Community consultations, May 2009)

Fish stocks within the Gales Point Wildlife Sanctuary are considered to have fallen significantly since the arrival of gill nets between ten and fifteen years ago. Whilst there has been a recent recovery in some species, following a community agreement to ban gill nets across the mouths of creeks and rivers in the area, the general perception within the community is that stocks are still depleted from previous levels. The declining number of fish has led to increased retail sales value within the community, and a general perception that fish are 'not available' and 'too expensive' for community residents to buy, especially elderly people on low incomes. When caught in commercial quantities, fish are generally sold to wholesalers, with a single major buyer.

The general consensus among fishermen of Gales Point is that the fish resources have declined significantly over the last five to ten years, reducing effective income from this resource (Graham et. al, 2007; Walker and Walker, 2008). The socio-economic survey (October, 2007) provided baseline data and input on community perception of the state of the fishing stocks:

- 79% of respondents believe the condition of fishing has decreased over the last 5 years
- 21% think it has stayed the same
- 0% believe it has improved

Fisheries condition	2002	2007
Very good	30%	0%
Good	64%	15%
Not good	3%	42%
Bad	0%	24%
Very bad	3%	18%

Table 6: Perceptions on condition of Fisheries (Community survey, 2007)

When asked to rate the fisheries resource in 2002, only 30% rated fishery as 'Very Good', the majority rating it as 'Good' (Table 6). By 2007, no respondent considered the resources 'Very Good', and the majority (42%) rated the fisheries condition as 'Not Good' to 'Bad'.

The majority of respondents believe that over-fishing, largely caused by the use of gill nets, is the main reason for the decline in fishing resources (Figure 7). Also cited was the destructive effect of shrimp trawlers on the sea grass beds contiguous to the coast, destroying benthic habitat and depleting juvenile fish stocks that would otherwise enter the lagoon. In Buttonwood Lagoon, invasive tilapia is considered to have more or less replaced crana (*Cichlasoma uropthalmus*), stone bass (*Eugerres sp.*) and snapper (*Lutjanus sp.*).

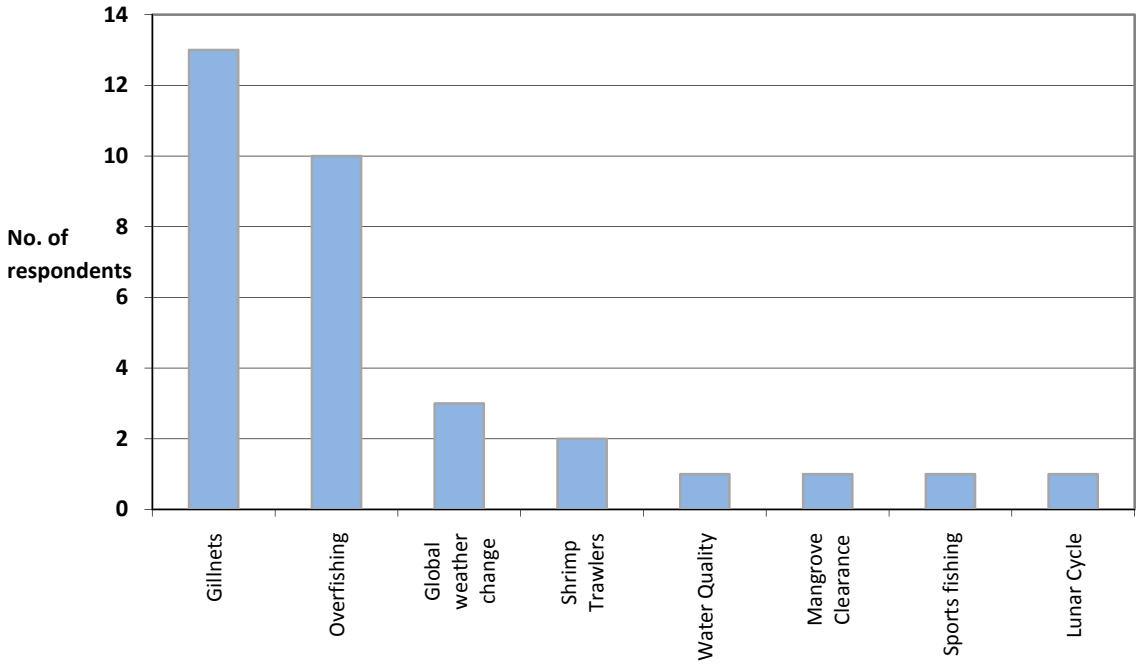


Figure 7: Reasons Cited for Decline in Fish Stocks (Community survey, 2007)

When asked to provide possible solutions, respondents suggested the following:

- 33% suggested a ban on gill nets
- 12 % suggested placing limits on fishing times and number of fish caught
- 9% suggested increasing the enforcement of community fishing regulations in Southern Lagoon
- 9% suggested setting aside non-fishing zones
- 9% suggested provision of alternative livelihoods
- 9% suggested establishing a fishing moratorium

1.5 Fishermen Categories

Four types of fishermen have been identified as affecting the fish stocks of Southern Lagoon The traditional, local 'Home Use' fishermen target species that can be caught primarily on lines or by cast netting, whereas the Commercial Fishermen, using a wider range of fishing equipment, are able to target a wider range of the commercial fish species in the lagoon.

Sport fishermen are far more selective, with a narrower range of target species, primarily focused on tarpon, snook and permit, driven by market demand from the sport fishing industry.

The 'Outside Commercial Fishermen' are primarily from Belize City and Honduras, and are considered a threat to the viability of the fishing industry within the lagoon. Whilst seldom entering the area, they

place nets over the mouth of Bar River, indiscriminately reducing the stocks entering and leaving the lagoon system. As recommendations are focused on enforcement activities against use of the lagoon by illegal incursions by this sector, they are not included within the catch assessment activities.

The different fishing sectors use the lagoons at differing times, with 'Home Use' fishermen tending to fish on their own, considering early morning preferable to later in the day. Commercial fishermen generally work in small groups of between two and four people, and fish throughout the night, primarily using gillnets and lines (Table 7).

Type of fisherman	When do they fish?	What do they catch
Local 'Home Use' Fishermen	Early morning. May catch 1 bucket of fish (at the most).	Drummer, tuba, crana, tilapia, sheepshead, snapper, jack (crevalle, other jacks), shad, barracuda, tarpon, goliath grouper snook, permit, grunt, 'skate', bonefish, stingray (for fins) (don't like catfish). Stone bass and mullet only caught by cast net.
Local Commercial Fishermen	6 groups of between 2 and 4 commercial fishermen per group, who leave for fishing at 4:00pm, and fish until early morning. There are 5 to 6 fishing teams who supply a wholesaler from Corozal on Wednesdays, refrigerating fish until it is collected. If a team has 200lb fish or more, they can call the wholesaler to collect, or take it to Belize City or Dangriga to sell.	All commercial species, including shark. Some sold by the pound, and some as fillet
Sport Fishermen	Generally start fishing in the early morning - 6:00am...and fish for either a half or whole day, targeting specific sport species	Tarpon, snook, goliath grouper, permit, barracuda, jack, bonefish, snapper. Sprat for bait

Table 7: Fishing Sectors (Community consultations, May, 2009)

Part II: Developing a Plan for Sustainable Traditional Fishing Practices

2.1 Sustainable fishing

For fishing to be termed "sustainable", it must meet the following criteria:

- Be from a well managed fishery with scientifically based quotas
- Be using responsible fishing methods
- Be species that are not regarded as threatened

...and can be described as:

- ...using resources in such a manner that they will continue to be available to future generations.
- ...fishing conducted over the long-term at an acceptable level of biological and economic productivity without leading to declines that close options for future generations.

Sustainable management can only be achieved through effective quotas based on scientific information from Catch Per unit Effort (CPUE) monitoring and stock assessments, and through provision for zoning to allow protection of spawning and nursery grounds. This Plan seeks to provide the foundation for the development of effective sustainable management, based on these principles

2.2 Current Status of Stocks

Conservation planning is a key part of management planning, and was conducted at community level for Gales Point Wildlife Sanctuary, following the national Management Planning framework (Level One). Under this framework, an assessment was made of the status and viability of the fish stocks, based on community input (Table 8). The Native Fish population was considered to be **FAIR** (requires urgent human intervention to restore numbers to viable levels), based on the reductions seen over the years in the fish populations (particularly in goliath

Native Fish Populations – Current Viability Rating		
Current Rating	**Goal**	**Justification for Rating and Goal**
Fair	**Good**	***Justification:*** Importance of traditional fisheries resource to Gales Point. Reduced fish populations due to non-sustainable fishing practices. Competition from invasive species - *Tilapia* - within the system
		Goal: Improved fisheries resource within Gales Point Wildlife Sanctuary, with a community-managed sustainable fishery

Table 8: Current Viability of Native Fish Populations (adapted from GPWS Management Plan, 2007)

grouper populations), non-sustainable fishing practices, illegal fishing incursions by 'outsiders', and the presence of invasive *Tilapia* within the system (Table 8).

The conservation planning process also identified two primary threats facing Native Fish population viability (Table 9). The first, unsustainable fishing (generally through gill net use, whether local or incursions by Belizean or Honduran fishermen) is the highest ranked threat for the system. It occurs throughout the area (rating a 4), is happening now, and therefore is considered urgent (rating a 3), and is reported to be having a substantial effect on the local fish populations, though currently is unlikely to eradicate the target species entirely (unlike the historical eradication of the small tooth sawfish (*Pristis pectinata*), despite its high density twenty years ago or more (rating a 3).

Threats to Native Fish populations of Gales Point Wildlife Sanctuary	Criteria Ratings			Total Ranking
	Area	Severity	Urgency	
Unsustainable fishing	**4**	**2**	**3**	**24**
Water contamination through pollution and sedimentation	**3**	**1**	**3**	**9**

Table 9: Identified Threats (Management Plan, 2007)

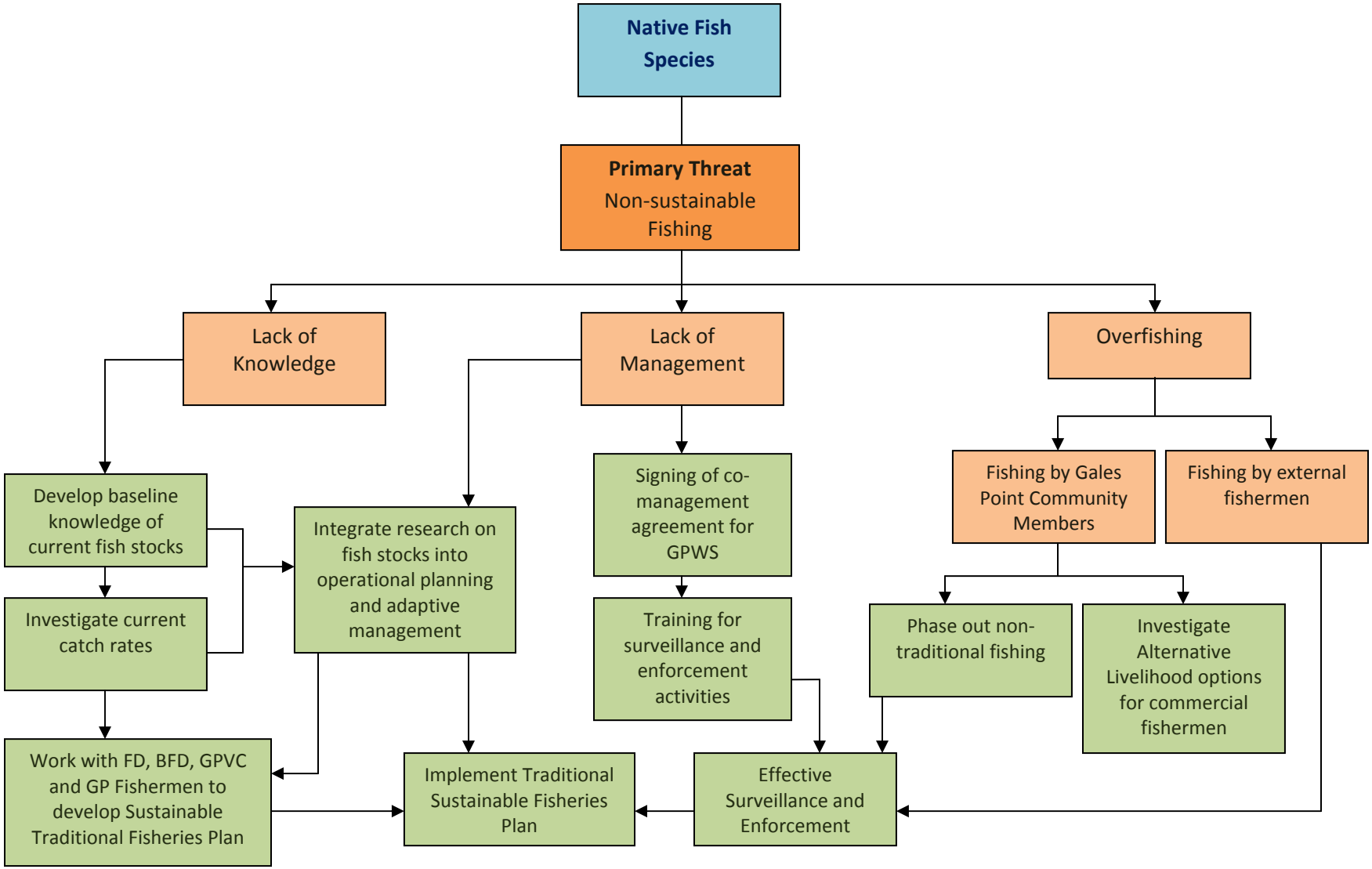
Threat: Unsustainable Fishing	
Unsustainable fishing	***Threats:*** ▪ Traditional fishing with cast nets and line; ▪ Fishing with gill nets in the lagoon system; ▪ Fishing with gill nets across creek mouths ▪ Fishing by non-traditional fishers from outside of the Gales Point area (including Honduras); ▪ Poor sport fishing practices (not catch and release) ▪ Potential for gill net by-catch (particularly manatee, crocodile, hicatee)
	Management Strategies: **Strategy 1:** Zonation of Southern Lagoon to allow fish stocks to recover in identified nursery and retreat areas **Strategy 2:** Develop Sustainable Fisheries Plan **Strategy 3:** Develop agreement between Gales Point Community, Gales Point Wildlife Sanctuary Community Management Committee, local fishermen, the Forest Department and Belize Fisheries Department for a community-managed sustainable fishery **Strategy 4:** Effective enforcement against illegal incursions, with the participation of community fishermen

The second identified threat is water pollution and sediment load, primarily from clearance of the 66' riverine vegetation, and agrochemicals used in farms upstream of the lagoon. This, too, needs to be addressed to increase the sustainability of the fish stocks. Contamination at critical levels is considered to generally be confined to specific areas within creeks, rivers and the lagoon system, with dilution of pollutants with increasing distance from source. However, with connectivity between water systems, any major contamination has the potential to spread through the entire lagoon system. There are also a number of human health concerns associated with the levels of pesticides and herbicides thought to be entering the system, with the potential to concentrate in fish species, particularly predators such as barracuda.

Threat: Water Pollution	
Water Pollution	***Threats*** *(Direct)* ▪ Agrochemical runoff from farmland ▪ Washing of chemical spray tanks in creeks and rivers ▪ Washing of vehicles next to creeks or rivers ▪ Oil spills (particularly from Coastal Road) ▪ Increased sedimentation from gravel mining, land use change and dredging activities ***Source*** (*Indirect*)*:* ▪ Poor agricultural practices ▪ Clearance of riparian buffer ▪ Poor gravel extraction methods with limited mitigation
Water Pollution	***Management Strategies:*** **Strategy 1:** Raise public awareness of health risks (human and environmental) associated with agrochemical pollution **Strategy 2:** Increase awareness of land owners of water-edge properties of the importance of maintaining the 66' water-edge riparian, littoral and mangrove ecosystems, and work towards maintenance through collaborative agreements **Strategy 3:** Work with relevant authorities to enforce regulations and policies relating to clearance of riparian buffer vegetation, clearance of any vegetation within the Sanctuary, safe use of agro-chemicals, and best practices **Strategy 4:** Work with Geology & Petroleum Dept. to ensure adherence to regulations and policies relating to gravel and sand extraction

With the assistance of the above assessments and situation analysis (Figure 8), a number of management strategies and actions were developed towards restoration of the fish stocks to previous levels – one being the development of a Sustainable Fisheries Plan.

Figure 8: Situation Analysis for Native Fish Species of Southern Lagoon



2.3 Conditions Required for a Community-managed Sustainable Fishery

A number of conditions are required for a Sustainable Fishery initiative to succeed. These include agreements with the relevant agencies for development and management of such an initiative within the Wildlife Sanctuary, the identification and engagement of key stakeholders

2.3.1 Relevant Legislative Framework

Within Belize there is a strong legislative framework supporting natural resource management, and any sustainable fishery initiative needs to work within this framework, developing collaborative partnerships with the relevant Government agencies - the Forest Department with the mandate for management of Wildlife Sanctuaries within Belize, and the Fisheries Department, with the mandate to manage fisheries resources within Belize.

Forest Department Legislation

National Parks System Act

- Under the National Parks System Act, the Wildlife Sanctuary category is non-extractive. It is therefore currently (theoretically) not permissible for anyone to fish within the Southern Lagoon Wildlife Sanctuary. However, the National Protected Areas Policy and System Plan recognizes the need to permit certain traditional uses of natural resources by local communities

- Under the National Parks System Act, ministerial permission can be given to a community for access to specific natural resources, such as fish.

- Therefore, the following strategies should be implemented at the start of the development of a sustainable fishery:

    - a Memorandum of Agreement is required between the Forest Department / Minister of Natural Resources and the Gales Point Wildlife Sanctuary Community Management Committee to permit community co-management of the Southern Lagoon fishery, following the development of a mutually approved sustainable fishery plan

    - a Memorandum of Agreement would be required between the Gales Point Community Sanctuary Community Management Committee and each of the local fishermen (commercial and non-commercial) for development and implementation of the sustainable fishery plan

        - Gales Point Wildlife Sanctuary Community Management Committee would be required to agree to ensure effective surveillance and enforcement - particularly against non local fishermen, and in the enforcement of zones

        - Local fishermen would be required to agree to follow the regulations of the management zones, the Sustainable Fishery Plan and Fisheries Regulations

Fisheries Department Legislation

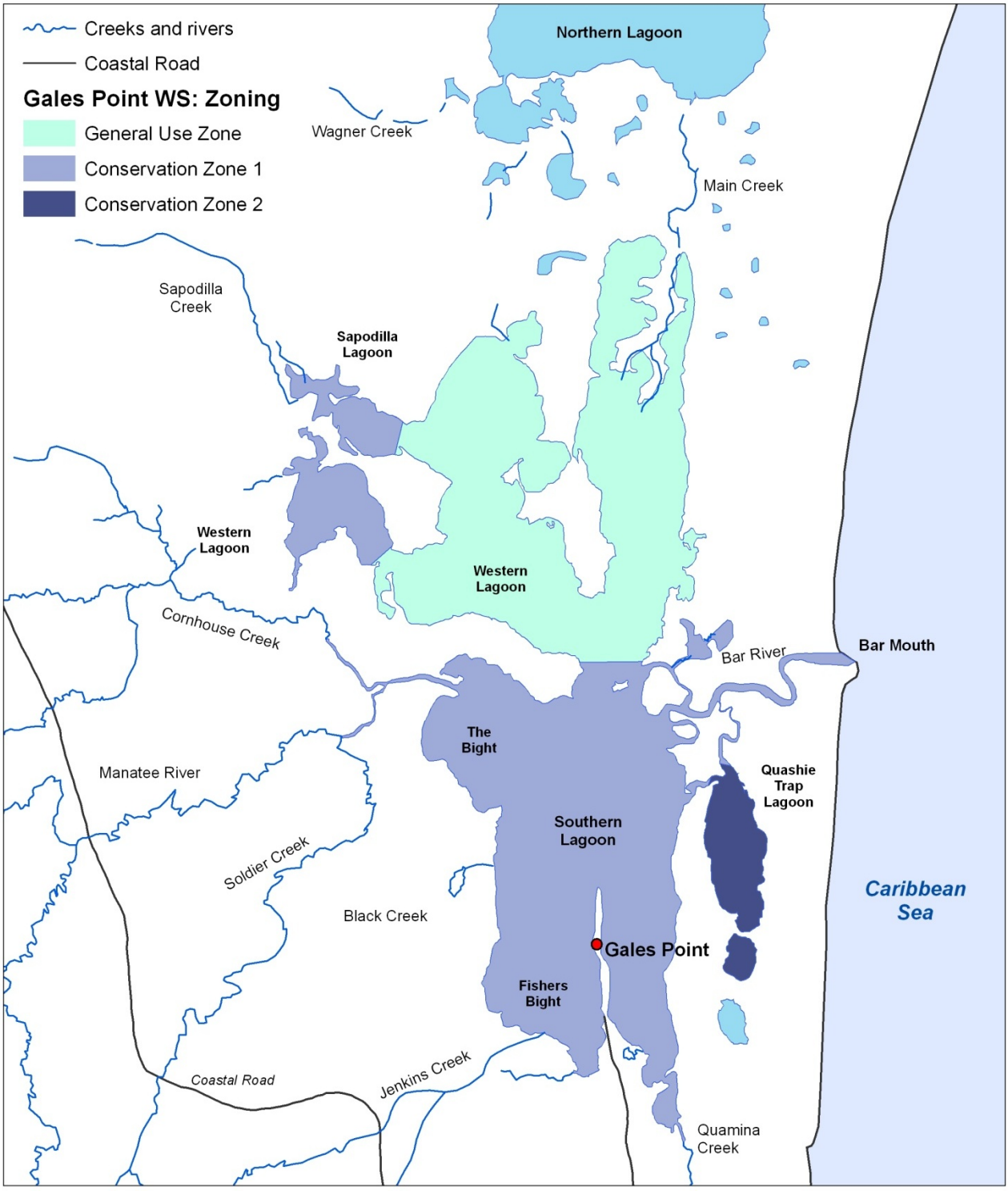
- Fisheries Act
    - The Gales Point Wildlife Sanctuary Community Management Committee would need to develop a Memorandum of Agreement with the Fisheries Department for support of the community-managed fishery, and limit the setting of nets to within the Western Lagoon portion of the Wildlife Sanctuary.
    - This should stipulate that community managed fishing will follow the regulations under the Fisheries Act:
        - all fishermen need to be in possession of a valid fisherman's license
        - all boats and boat captains need to be in possession of the relevant valid licenses
        - no fisherman can use poison or explosives in fishing
        - all nets should have a minimum mesh size of 3" (preferably 4"), and be set following the Fisheries Department restrictions, which prohibit setting of nets in the following localities:
            - at river and creek mouths
            - within a mile of any community
            - in a channel
            - in spawning areas

2.3.2 Provisional Zoning Recommendations

Following consultations with the Gales Point Wildlife Sanctuary Management Committee and local fishermen (commercial and traditional), three provisional zones have been recommended for effective management of fishing within Gales Point Wildlife Sanctuary (Table 10; Map 3). These zones need to be approved by the newly appointed Sustainable Fishery management group, the Village Council and Forest Department.

Zone	Value and Concerns	Regulations
Conservation Zone 1	Area favoured for commercial fishing by gill net fishermen No current measure of impact of commercial fishing on fish populations – general feedback is that fish populations are declining. Generally considered to be due to fishing by outsiders placing nets over mouth of Bar River	▪ Gill net fishing allowed under permit from GPWSCMC, as per Memorandum of Agreement with Forest and Fisheries Depts. ▪ Gill nets must conform to Fisheries legislations (> 3" mesh size, not located over creek mouths), and be attended ▪ Traditional fishing (cast nest and line) allowed under permit from GPWSCMC as per Memorandum of Agreement with Forest and Fisheries Depts. ▪ Catch and release sport fishing allowed under permit from GPWSCMC, with associated tour guide and boat captain permit and boat license ▪ No fishing of Goliath or Nassau Grouper ▪ No harvesting of hicatee (Central American river turtle)
Conservation Zone 2	Traditional fishing area (cast nets and lines) – important culturally and nutritionally. Important tourism resource: ▪ manatees, ▪ sport fishing, ▪ scenic values	▪ Traditional fishing (cast nest and line) allowed under permit from GPWSCMC as per Memorandum of Agreement with Forest and Fisheries Depts. ▪ Catch and release sport fishing allowed under permit from GPWSCMC, with associated tour guide and boat captain permit and boat license ▪ No gill net fishing permitted ▪ No fishing of Goliath or Nassau Grouper ▪ No harvesting of hicatee (Central American river turtle)
Conservation Zone 3	Area highlighted by fishermen as an important fish nursery area Enclosed smaller lagoon systems linked by creeks easily impacted by: ▪ nets over creeks ▪ development impacts ▪ water pollution	▪ No fishing permitted (of any type)

Table 10: Provisional Zone Regulation Recommendations



Map 3: Provisional zoning recommendations

2.3.3 Identification and Engagement of Stakeholders

A number of stakeholders have been identified as important to the success of any effort to develop a sustainable fishery in Southern Lagoon. These have been assessed as to the role each plays, and how they may impact any efforts towards a sustainable fishery (either positively or negatively). Engagement of these different sectors – both public and private – will be critical for successful management of fish resources in the future.

Community understanding of, and involvement in, any sustainable fishery initiative will be essential in the development of sampling and monitoring strategies, and understanding of the medium-term benefits will assist in encouraging greater support of general management strategies for the Gales Point Wildlife Sanctuary.

The Village Council needs to be engaged as a partner in the project, with support for regulations developed to build sustainability of fish resources. Engagement of the Forest Department as an active partner in the initiative is important as a first step, with development of the agreements for continuation of traditional fishing within the Wildlife Sanctuary. Engagement of the Fisheries Department towards collaboration and technical input is also important, with the wealth of experience available that can contribute towards sound project design.

Person /Organization	Role and Potential Impact
Gales Point Wildlife Sanctuary Community Management Committee	▪ Leading agency for implementation of the Sustainable Fishery Plan, with the goal of increasing fish stocks within the Wildlife Sanctuary for the benefit of the community ▪ Responsible for engagement of other stakeholders – fishermen, sport fishermen, fish merchants, Forest and Fisheries Departments ▪ Responsible for enforcement of regulations outlined in the Sustainable Fishery Plan (in collaboration with Forest and Fisheries Departments) ▪ Responsible for development of baseline and monitoring of fish catch, in collaboration with fishermen
	Impacts: Positive ▪ Long term sustainability of the Wildlife Sanctuary fish stocks ▪ the sustainable fishery will act as a positive focus to unite the community ▪ GPWSCMC will gain credibility, trust and support of the community for other conservation and resource management projects ***Impacts: Negative*** ▪ May result in conflict with some fishermen (both Gales Point and external)

Person /Organization	Role and Potential Impact
Commercial Fishermen	▪ Need to take on collaborating role with GPWSCMC on management of fish stocks within the Wildlife Sanctuary ▪ Participants in fish capture monitoring ▪ Rely on the Wildlife Sanctuary fishery for their income ▪ Have one of the greatest impacts on the resources
	Impacts: Positive ▪ Will benefit from increased fish resources ▪ Will have greater control of resources, and more motivation in maintaining them ▪ Will benefit from greater organization as a stakeholder group ▪ Closure of previous fishing areas to gill net fishing ▪ Enforcement of regulations to prevent Honduran and other non-local fishermen from fishing within the Wildlife Sanctuary will reduce competition for resources ▪ Enforcement of regulations re. netting over mouth of creeks and rivers (especially Bar River mouth) will increase available fish stocks ***Impacts: Negative*** ▪ Fishing area will be restricted to Conservation Zone 1 for net fishing within the Wildlife Sanctuary
Traditional Fishermen	▪ Rely on fish resources of the Wildlife Sanctuary as an important protein source and contribution towards subsistence income ▪ Need to be represented on any fishing committee or group established to assist with management of the fisheries resources ▪ Need to be engaged as community rangers – with mechanism for reporting fishing-related issues within the Wildlife Sanctuary ▪ Participants in fish capture monitoring
	Impacts - Positive ▪ Will benefit from increased fish resources ▪ Will have greater control of resources, and more motivation in maintaining them ▪ Enforcement of regulations to prevent Honduran and other non-local fishermen from fishing within the Wildlife Sanctuary will reduce competition for resources ▪ Enforcement of regulations re. netting over mouth of creeks and rivers (especially Bar River mouth), increasing available fish stocks ***Impacts - Negative*** ▪ Closure of Quashie Trap Lagoon system to traditional fishing

Person /Organization	Role and Potential Impact
Sport Fishing Guides	▪ Rely on sport fish species of the Wildlife Sanctuary as an important tourism resource, providing income and employment within the community ▪ Need to be represented on any fishing committee or group established to assist with management of the fisheries resources ▪ Need to be engaged as community rangers – with mechanism for reporting fishing-related issues within the Wildlife Sanctuary ▪ Potential participants in fish capture monitoring (focus is currently on commercial and traditional fishermen)
	Impacts - Positive ▪ Will benefit from increased fish resources Will have greater control of resources, and more motivation in maintaining them ▪ Enforcement of regulations to prevent Honduran and other non-local fishermen from fishing within the Wildlife Sanctuary will reduce competition for resources ▪ Enforcement of regulations re. netting over mouth of creeks and rivers (especially Bar River mouth), increasing available fish stocks ***Impacts - Negative*** ▪ Enforcement of catch-and-release fishing
Non-local Fishermen	▪ Reportedly primarily from Honduras and Belize City ▪ Considered prime offenders in placing nets over creeks and river mouth ▪ Will not have permits for fishing within the Wildlife Sanctuary, with active enforcement against illegal incursions ▪ Reduction of netting over Bar River mouth, reducing impacts on fish resources ▪ No access to fish resources of the Wildlife Sanctuary, with related loss of income
Gales Point Village Council	▪ Composed of leaders of the Gales Point community and have mandate to manage village activities ▪ Support of the Village Council for the development of a sustainable fishery is critical to the success of the initiative
Forest Department	▪ Have mandate for management of Gales Point Wildlife Sanctuary ▪ Provide training for Special Constables and provide back-up support for enforcement ▪ Have identified the GPWSCMC as the potential co-management agency for Gales Point Wildlife Sanctuary ▪ Have ability to grant or refuse permission for development of a sustainable fishery within the Wildlife Sanctuary ▪ Successful implementation will provide Forest Department with a model for use in other similar situations ▪ Successful implementation will provide Forest Department with a working example of the benefits communities can derive from protected areas through conservation management

Person /Organization	Role and Potential Impact
Fisheries Department	▪ Have mandate for management of fish stocks in Belize ▪ Have potential for back-up support for enforcement against offences committed under the Fisheries Act ▪ Have technical expertise and experience in management and monitoring of fish stocks that can strengthen project design and implementation ▪ Monitoring of the fishery in Wildlife Sanctuary will provide data on coastal fish populations ▪ Successful implementation will provide Fisheries Department with a model for use in other similar situations
Wholesale Buyer (Mr. Rosado)	▪ The primary wholesale market for the fishermen ▪ Regulates the wholesale price paid for the fish ▪ Regulates numbers of fish purchased when large numbers of fish congregate to spawn (eg. stone bass in March) ▪ Has a long-term (10 year) business relationship with the Gales Point fishermen, built on trust ▪ Willing to provide total catch data per fishing team per week ▪ Willing to participate in community discussions for the development of a more sustainable fishery

Fishermen, whether commercial or traditional, and whether from Gales Point, from other communities in Belize, or from elsewhere in the World, are considered a particularly difficult sector to engage. This is partly as a result of the characteristics that led to them selecting fishing as an occupation. The fishing lifestyle – self-employed, relatively little structure, outdoors – is very different from the organizational structure that seeks to meet indoors at set times to conceptualize and discuss ideas. Many fishermen also have limited education and literacy skills, and are uncomfortable speaking in public.

Engaging fishermen is as a long term process, though a number of mechanisms can be used to facilitate the process:

- Meetings should be held by the GPWSCMC on neutral grounds
- Informal meetings / discussions should be held with individual fishermen and small groups to start the process – generally in the street or at the homes of fishermen, to discuss interests and concerns
- More structured meetings should not clash with fishing schedules – these meetings, too, can be held outside and should be relatively informal
- Meetings should be reliable and prompt, regardless of turn-out, and finish on time
- Any visual aids used during meetings should be heavily image focused
- Meetings should focus on the fishermen's needs
- There should be active and rapid follow-up on ideas put forward during meetings to show results

- Informal training can be used to build capacity for articulating ideas for those fishermen interested in playing a more active role in fishery management
- The formation of a management group for the Sustainable Fishery needs to come out of initial meetings as a requirement voiced by the fishermen, who should also participate in defining the structure and role of the management group (number / type of participants)
- Meetings should be facilitated so that fishermen direct the outcomes, through asking leading questions, and listening to the answers. Fishermen should also lead the management process as much as possible, with GPWSCMC providing assistance and guidance
- Suggest a start-up project for the management group – something small with achievable outcomes (eg. lamination and distribution of zone map for posting in community; distribution of copies of map to fishermen; erection of Fishermen's notice board (with map). Whilst GPWSCMC would produce and laminate the map, fishermen would take the lead in deciding where to put up the notice board, how to locate materials, construction of the notice board and distribution of maps.
- Not all fishermen can be engaged at the start of the process – work with those willing and interested in more effective management of fish resources, then reach out during the baseline development process
- Ensure fishermen benefit in outputs – eg. through stipends for participation as volunteer rangers, training, access to resources etc.

2.3.4 Establishing a Fishery Management Structure

There needs to be full participation from stakeholders through an organized management structure – a sub-committee of the GPWSCMC or a separate committee, composed primarily of representatives of the commercial, traditional and sport fishing sectors, on which the GPWSCMC and Village Council also have a seat. It would also be beneficial for the wholesale buyer to also be included on such a group, to provide input from a buyer's perspective, and assist in the development of monitoring mechanisms.

Whilst it would be ideal to have both the Forest and Fisheries Departments on the management group, realistically, in view of human and time constraints, both agencies may find it hard to commit to frequent meetings. It would therefore be better to invite their input as technical advisors to the group.

2.4 Planning for a Sustainable Fishery

Co-management of a small-scale fishery such as that of Southern Lagoon is not a new concept. Globally, community based management of natural resources is considered one of the best options for achieving sustainable natural resource management and economic benefit – goals sought by the National Protected Areas Policy and System Plan (NPAPSP, 2005).

Gales Point, as the primary community utilizing the fish resources of Southern Lagoon, is ideally situated for developing sustainable community management of these resources, with the participation of the traditional and commercial fishermen in both planning and implementation, providing a model for other community management organizations.

For effective planning, implementation and monitoring, it is necessary to develop a baseline of current fish catch and fishing effort in order to identify the criteria for achieving sustainability. A snapshot of fisheries information has been collated on catch effort, boat activity and landing data as part of this assessment. The output has provided basic data on which to base the baseline and sampling recommendations for fisheries catch monitoring, in order to measure the performance of the Southern Lagoon fisheries over time, and develop strategies to promote sustainability.

2.4.1 Sampling methods for Community Sampling

The small scale and single landing site of the fishery at Gales Point provides the potential for a census approach, with data collection from all catches. However, a sampling approach is more realistic with the human and financial resources available, and more easily replicable in other communities in similar situations.

These recommendations focus on the commercial and traditional fishing sectors, and do not currently address the sport fishing sector.

Baseline Development

The following information is required for the development of an accurate baseline:

Step 1: Fishing effort: Data collection of information on days each fishing team / traditional fisherman are fishing during the month

- Completion of **Survey Form A** per month, for one year to provide data on the number of days of fishing activity
- Completion of **Survey Form B,** twice a month, to provide data on fishing gear and team size
- Data to be collected when sampling catch (two times a month)
- This will provide the complete and mean number of days spent fishing per person, per sector, and for Gales Point as a whole

Step 1: Fishing effort: continued

- It will also provide information for the probability that any one team / local fisherman will be fishing on any one day
- Accuracy level will be high as the majority of the commercial fishing team catches will be sampled
- Accuracy for traditional fishermen will be lower, as a lower percentage will be sampled, but should still provide significant data

Step 2(a): Sampling of the Commercial Catch

- Sampling of commercial catch should be set at 2 samples per month per fishing team – 1st and 3rd Wednesday of each month, timed to coincide with wholesale buyer, and conducted through 52 weeks of the year

- The commercial fishery of Gales Point is largely supplying one wholesaler who has a single collection day per week (Wednesday), travelling to Gales Point to pick up the fish. This provides an excellent opportunity for catch data collection whilst minimizing impacts on the fishermen.

  - Data requirements per sample:
    - Total catch weight per fishing team
    - Species in catch
    - Per species catch weight
    - Number per species
    - Price per lb

- Completion of **Survey Form C** per fishing team

- Additional valuable data can also be collected during landing sampling – the number and weight per species catch, for example, will provide information on seasonality of specific species over the year, and in the longer term, will show population trends that can be used for monitoring success of sustainable fishery strategies.

- Catch per species can then be estimated - however, current capture and sales methods do not separate the catch per species

- a mechanism needs to be developed for separating the catch during the baseline surveys, in discussion with the fishermen and buyer. This needs to take into consideration the need of the fishermen to keep the fish as cool as possible to maintain freshness.

Possible options:

Separation at point of fishing

- purchase of extra cool boxes and a budget for ice per fishing team to allow for catch separation during fishing,
- bagging per species within cool boxes at point of capture, with a budget for bin bags per fishing team

Separation at point of sale

- separation at point of sale to commercial buyer – selection of individuals per species from total catch. May take too much time for both the buyer and the freshness of the fish. Requires participation of buyer
- separation at point of retail – would require extensive participation from wholesaler.

- Species Values can be calculated from the above, using the first-sale price of each landed species, multiplied by the estimated per Species Catch.

Step 2(b): Sampling of the Local Fishermen's Catch

- Sampling of local catch should be set at 2 samples per month per fisherman, for the ten participating fishermen (ten fishermen should be selected for their interest in participating through the year). Sampling should take place at point of landing, and (if possible) all sampling should take place over two consecutive days

  - Data needed per sample:
    - Total catch weight per local fisherman
    - Species in catch
    - Per species catch weight
    - Number per species
    - Price per lb

- Completion of **Survey Form D** per fisherman

Step 3: Data Management and Reporting

During the first year:

- A database needs to be developed to manage and analyse the results (using Access / Excel)

- Data for each month should be entered into the database from the survey sheets, and a summary result report produced for discussion by the fishery management group at the end of each quarter, looking at species presence / absence and trends

- These meetings should also be used to discuss mechanisms for improving data accuracy and data collection, whilst further minimizing impacts on the fishing and sales activities themselves.

- If data for further parameters are available (rainfall, salinity, water temperature, water quality), these too can be analysed as to their impact on species trends

- At the end of the year, a baseline report should be prepared on the current state of the fish resources, with a review of the mechanisms used to produce the baseline, and recommendations for improved mechanisms for continued monitoring of the catch.

Step 4: Development of Regulations for Sustainable Management of the Fishery

- During the quarterly meetings, the management group should discuss additional regulations (whether permanent or temporary) that could improve the sustainability of the fishery – either through changes in fishing gear, limits or seasons for target species, or other mechanisms, with group commitment to adhering to the regulations

- High priority areas and times for surveillance and enforcement activities against fishing incursions should be identified by the management group, and training and funding for fuel and stipends located to encourage local participation in enforcement activities

- At the end of the year, regulations should be reviewed and amended by the management group where necessary, and presented within a Sustainable Fishery Plan for Gales Point

Step 5: Seek Mechanisms to Reduce Waste

- During the quarterly meetings, the management group should also discuss mechanisms to reduce waste – for example, locating funding for a group pig-rearing unit to provide additional meat for group members, with feed supplemented by fish waste

- The management group should also investigate mechanisms for reducing by-catch through adaptations to fishing gear, fishing times or management of catch

Step 6: Seek Assistance for Identified Alternative Livelihood opportunities

- During the quarterly meetings, the management group should identify viable alternatives to fishing, and work with the Gales Point Wildlife Sanctuary Community Management Committee to locate skills transfer and funding opportunities to implement identified options.

Step 7: Development of a Sustainable Fishery Plan for Gales Point Wildlife Sanctuary

- The results of Steps 1 to 6 need to be incorporated into a Sustainable Fishery Plan for Gales Point Wildlife Sanctuary, with finalized zones and regulations, and produced in full collaboration with the management group, the Gales Point Village Council and technical advisors

- The Sustainable Fishery Plan should be presented to the Forest and Fishery Departments for approval

- Funding should be located through GPWSCMC to implement the first year of the Sustainable Fishery Plan

2.4.2 Current Estimation of Catch – a Snapshot

Total catch, defined as all species harvested from the lagoon over a given time period, by a specific fisherman type, can be estimated from sample CPUE (amount/weight of all targeted fish caught per boat day) multiplied by estimated effort (number of days (or nights) of boat activity).

Five of the 6 commercial fishing teams (9 fishermen) participated in the initial survey, providing data for the catch assessment. All five teams set nets for between one and four nights a week in Western Lagoon. In general, nets used in the lagoon have 4" mesh[2], and are between 150 and 250 yards in length, with one net per team. Hand lines and set lines are also used during the fishing period to supplement the catch.

[2] Fishermen also have nets with 6" mesh, but use these primarily for fishing at sea

All catches were mixed, with a range of 17 commercial species (Figure 9). A further 3 species were also caught but not sold (goliath grouper, and two species of catfish). Goliath grouper, a critically endangered species, is not accepted by the wholesaler, and catfish is considered a by-catch, and used for bait for hand line fishing.

Commercial Species in Catch

Horse-eye Jack	*Caranax latus*
Crevalle Jack	*Caranx hippos*
Permit	*Trachinotus falcatus*
Bonefish	*Albula vulpes*
Common Snook	*Centropomus undecimalis*
Sheepshead	*Archosargus probatocephalus*
Lane Snapper	*Lutjanus synagris*
Cubera Snapper	*Lutjanus cyanopterus*
Grey Snapper	*Lutjanus griseus*
Schoolmaster	*Lutjanus apodus*
Yellowfin Mojarra (Shad)	*Gerres cinereus*
Striped Mojarra (Stone Bass)	*Eugerres plumieri*
Great Barracuda	*Sphyraena barracuda*
Southern Kingfish	*Menticirrhus americanus*
Mountain Mullet	*Agnostomus monticola*
White Mullet	*Mugil curema*
Bull Shark	*Carcharhinus leucas*

Figure 9: Commercial Species in Catch 7/10/09

Based on sampling data for the 7th October, 2009, the average CPUE for a commercial fishing team was estimated at approximately 100lb (45.4kg) per boat-day, with one to three boat-days per week (between Sunday and Tuesday night) for the majority of weeks throughout the year (estimated at 48 weeks). All species were valued at Bz$1.50 per pound (Table 11).

Team	Number of Team Members	Number of Nights per Week		Equipment	Number of lbs of fish	Total Value (at Bz$1.50 per lb)
		nights	man nights			
One	2	3	6	25ft skiff, 60hp	500	$750.00
Two	2	3	6	20ft skiff, 40hp	190	$285.00
Three	2	1	2	23ft skiff, 15hp	75	$112.50
Four	2	2	4	15ft skiff, 15hp	100	$150.00
Five	1	1	1	Dory[3], 4hp	150	$225.00
Total	**9**	**10**	**19**		**1015**	**$1,522.50**
Average	**4.5**	**2**	**3.8**		**203**	**$304.50**

Table 11: Fishing Effort and Catch for the week of October 7th, 2009

Based on the sampled catch and the fishing effort, the commercial fishery of Southern Lagoon produced approximately 1,000lbs of whole fish during the week sampled. This is considered a good catch – the per week commercial catch can range from 200 - 250lbs (a poor catch) to 1,500 – 2,000lbs, when the stone bass congregate in March. Regular catches are estimated at between 500lbs and 1,000 lbs a week

[3] Traditional dug-out canoe

(Rosado[4], pers. com.)). Taking the mid-value of 750lbs, with an estimated 48 weeks of fishing activity, the fishery would produce, on average, 36,000lbs of fish in a year, valued at Bz$54,000 when priced at $1.50 per pound. The price, however, fluctuates according to the species, and the wholesale buyer will also put restrictions on the number of pounds he will purchase when a single species is particularly abundant (eg. stone bass in March, when this species congregates in Main Creek).

Not all fish are marketed wholesale – some fishermen sell cleaned fish directly to consumers in Hattieville and Belize City, at a greater market value per pound (Table 12). However this entails extra expense on the part of the fishermen in terms of both transport and time.

Retail Value of Direct Sale of Commercial Species	
Species	**Value per pound Bz$**
Snapper	$4.00 – $5.00
Barracuda	$4.00
Stone Bass	$2.50 - $3.00
Black tip Shark	$2.50 - $4.00

Table 12: Retail Value of Direct Sale of Commercial Species (Consultations with fishermen, 2009)

2.4.3 Measuring Success of Fishery Co-management

A review mechanism should be integrated into the Sustainable Fishery Plan to measure success of the Plan on an annual basis for an initial period of five years. This can be through a simple review matrix, as is included for the assessment of implementation of this plan (Annex Two).

2.5 Implementation Plan

The following Implementation Plan covers the activities required to develop the baseline data and Sustainable Fishery Plan over a one year period.

[4] Mr. Arturo Rosado is the primary buyer of fish from Gales Point

Development of a Sustainable Fisheries – 1st year: Implementation Plan						
Management Actions		**Present Status**	**Desired Status**	**Quarter**	**Responsible Parties**	**Limitations/Requirements**
1	Establish a community management group for the fishery resources of the Wildlife Sanctuary	GPWSCMC working towards engagement of fishermen	Active management group for fish resources of GPWS formed, meeting at least once a quarter, as per guidelines presented in this document	1st	GPWSCMC	Needs to include fishermen, GPWSCMC, Village Council. Other members may include Mr. Rosado, the wholesale buyer. Technical input to be sought from Forest and Fisheries Dept.
2	Finalize and demarcate zoning for traditional fishing activities	Provisional zones discussed with fishermen and GPWSCMC, mapped and presented in this document, but need final agreement by Gales Point community and fishermen	Zoning of GPWS for traditional fishing activities implemented and enforced	1st	GPWSCMC GPVC Commercial and Traditional fishermen Forest Dept.	GPWSCMC is currently increasing its engagement of commercial and traditional fishermen to provide an environment where this issue can be discussed and agreed on.
3	Resolve resource use issue	Local fishermen are extracting fish from Southern Lagoon, in contravention of the current Forest Department legislation (and in the case of gill nets, in contravention of Fisheries Department legislation)	Recognition by the Forest and Fisheries Departments and GoB of a managed, sustainable fishery for local community members	1st – 2nd	GPWSCMC GPVC Forest Dept. Fisheries Dept.	Through discussion with the Forest and Fisheries Departments, and initiation of permitting process for identified commercial and traditional fishers
4	Develop a baseline and guidelines for sustainable, fishing within Gales Point Wildlife Sanctuary	No baseline exists. Guidelines for baseline development are presented in this document	Baseline and guidelines for sustainable fishing have been developed based on twice-monthly sampling of fish catch, and integrated into the Sustainable Fisheries Plan	1st-4th	GPWSCMC GPVC Forest Dept. Fisheries Dept. Commercial and traditional fishermen Consultant	Requires participation from commercial and traditional fishermen, agreement from the Forest Department and technical input from Fisheries Department

Development of a Sustainable Fisheries – 1st year: Implementation Plan						
Actions		**Present Status**	**Desired Status**	**Quarter**	**Responsible Parties**	**Limitations/Requirements**
5	Monitor fishing activity within the Wildlife Sanctuary	At present there is no formalized monitoring of fishing activity within GPWS. Guidelines are presented in this document for monitoring of commercial and traditional fishing activity.	Guidelines in place and implemented for monitoring of fishing activity.	1st – 4th	GPWSCMC Commercial and traditional fishermen	Establishment of final monitoring protocol by management group for integration of commercial and traditional fishing activity patterns and levels into the Sustainable Fishery Plan Development of
6	Effective surveillance and enforcement of regulations by GPWSCMC against illegal fishing activity	No surveillance or enforcement activities	Patrolling driven by knowledge of when and where patrolling needs to be carried out . Surveillance and enforcement plan for monitoring and addressing illegal fishing incursions	1st - 4th	GPWSCMC GPVC Commercial and traditional fishermen	GPWSCMC is limited by human and financial resources. Sustainable Fishery Plan can be used as leverage for funding to increase effective surveillance and enforcement activities, with greater participation from fishermen
7	Promote greater participation in surveillance and enforcement by commercial and traditional fishermen	Very few commercial or traditional fishermen are currently fully engaged in the protection of the fishery resources GPWS	Commercial and traditional fishermen actively protect their resources and assist GPWSCMC with surveillance activities	1st- 4th	GPWSCMC GPVC Forest Dept. Fisheries Dept. Commercial and traditional fishermen	Commercial and traditional fishermen need to take ownership of their resources, and contribute towards management – through participatory focal workshops towards development of a Sustainable Fisheries plan and formation of a community fishery management group
8	Liaise with Forest Dept. and Belize Fisheries Dept for assistance with enforcement activities	Limited liaison at present with Forest Department and Fisheries Department	GPWSCMC in constant liaison with Forest and Belize Fisheries Departments	1st -4th	GPWSCMC Forest Dept Fisheries Dept	Support from the Forest and Fisheries Depts. will assist community acceptance and recognition of need for enforcement

Development of a Sustainable Fisheries – 1st year: Timeline / 1					
Management Actions		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1	Establish a community management group for the fishery resources of the Wildlife Sanctuary				
2	Finalize and demarcate zoning for traditional fishing activities				
3	Resolve resource use issue				
4	Develop a baseline and guidelines for sustainable, fishing within Gales Point Wildlife Sanctuary				
5	Monitor fishing activity within the Wildlife Sanctuary				
6	Effective surveillance and enforcement of regulations by GPWSCMC against illegal fishing activity				
7	Promote greater participation in surveillance and enforcement by commercial and traditional fishermen				
8	Liaise with Forest Dept. and Belize Fisheries Dept for assistance with enforcement activities				

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Annexes

Annex One: **Data Survey Sheets**

Survey Form A: Fishing Activity

Survey Form B: Fishing Gear

Survey Form C: Species **–** Commercial Fishermen

Survey Form D: Species **–** Traditional Fishermen

Annex Two: **Monitoring Plan**

Annex Three: **Project Status**

Gales Point Wildlife Sanctuary: Survey Form A: Fishing Activity per Day																														
Month																**Recorder:**														
	Days of the Month																													
Team	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**
Commercial Fishermen																														
One																														
Two																														
Three																														
Four																														
Five																														
Six																														
Traditional Fishermen																														
1																														
2																														
3																														
4																														
5																														
6																														
7																														
8																														
9																														
10																														
Example	x	x	x	x	x			x	x				x	x					x	x	x	x		x	x	x	x	x			x

Gales Point Wildlife Sanctuary: Survey Form B: Fishing Team Composition and Equipment			
Month:	**Week:**		**Recorder:**
Commercial Fishermen			
Team	**Team Leader**	**Team Members**	**Fishing Gear**
One			
Two			
Three			
Four			
Five			
Six			

Reporting Notes:

Team Leader: The name of the person organizing the fishing team
Team members: Other people on the fishing trip
Fishing Equipment: The equipment used on that specific fishing trip – eg. gill nets, line, cast net etc.

Two forms should be completed for each sample – one for the trip completed, and one for the previous week

Gales Point Wildlife Sanctuary: Survey Form B: Fishing Team Composition and Equipment			
Month:		**Week:**	**Recorder:**
Local fishermen			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Reporting Notes:

Team Leader: The name of the person organizing the fishing
Team members: Other people on the fishing trip
Fishing Equipment: The equipment used on that specific fishing trip – eg. gill nets, line, cast net etc.

Gales Point Wildlife Sanctuary: Survey Form C: Catch Data (Commercial Fishing Teams)				
Month:		**Week:**	**Recorder:**	
Commercial Fishing Team:		***Location:***		
Species			**Number**	**Weight (lb)**
Snapper	Grey Snapper	*Lutjanus griseus*		
	Schoolmaster	*Lutjanus apodus*		
	Cubera Snapper	*Lutjanus cyanopterus*		
Jack	Crevalle Jack	*Caranx hippos*		
	Horse-eye Jack	*Caranax latus*		
	Permit	*Trachinotus falcatus*		
	Pompano	*Trachinotus carolinus*		
	Leatherjacket	*Oligoplites saurus*		
	Lookdown	*Selene vomer*		
Stone Bass	Silver Mojarra	*Eucinostomus argentus*		
	Slender Mojarra	*Eucinostomus jonesi*		
	Flagfin Mojarra	*Eucinostomus melanopterus*		
	Striped Mojarra	*Eugerres plumieri*		
	Brazilian Mojarra	*Eugerres brasilianus*		
	Yellowfin Mojarra	*Gerres cinereus*		
	Great Barracuda	*Sphyraena barracuda*		
Snook	Common Snook	*Centropomus undecimalis*		
	Tarpon Snook	*Centropomus pectinatus*		

Reporting Notes:

Commercial Fishing Team: The Name of the Leader or the Fishing Team ID number
Species / Species Groups: Where feasible, a breakdown per species (eg. number and weight of cubera snapper in catch). If not, a breakdown per species group (eg. number and weight of snapper in catch)
Number: Number of individuals per species / species group in catch
Weight: Weight per species / species group per catch in pounds (lbs)

Gales Point Wildlife Sanctuary: Survey Form D: Catch Data (Traditional Fishermen)				
Month:		**Week:**	**Recorder:**	
Local Fisherman:		***Location:***		
Species			**Number**	**Weight (lb)**
Snapper	Grey Snapper	*Lutjanus griseus*		
	Schoolmaster	*Lutjanus apodus*		
	Cubera Snapper	*Lutjanus cyanopterus*		
Jack	Crevalle Jack	*Caranx hippos*		
	Horse-eye Jack	*Caranax latus*		
	Permit	*Trachinotus falcatus*		
	Pompano	*Trachinotus carolinus*		
	Leatherjacket	*Oligoplites saurus*		
	Lookdown	*Selene vomer*		
Stone Bass	Silver Mojarra	*Eucinostomus argentus*		
	Slender Mojarra	*Eucinostomus jonesi*		
	Flagfin Mojarra	*Eucinostomus melanopterus*		
	Striped Mojarra	*Eugerres plumieri*		
	Brazilian Mojarra	*Eugerres brasilianus*		
	Yellowfin Mojarra	*Gerres cinereus*		
	Great Barracuda	*Sphyraena barracuda*		
Snook	Common Snook	*Centropomus undecimalis*		
	Tarpon Snook	*Centropomus pectinatus*		

Reporting Notes:

Local Fishermen: The Name of the Leader or the Fishing Team ID number
Species / Species Groups: Where feasible, a breakdown per species (eg. number and weight of cubera snapper in catch). If not, a breakdown per species group (eg. number and weight of snapper in catch)
Number: Number of individuals per species / species group in catch
Weight: Weight per species / species group per catch in pounds (lbs)

Annex Two: Development of a Sustainable Fisheries – 1st year: Monitoring Plan / 1							
Management Actions		**Present Status**	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	**Desired Status**
1	Establish a community management group for the fishery resources of the Wildlife Sanctuary	GPWSCMC working towards engagement of fishermen					Needs to include fishermen, GPWSCMC, Village Council. Other members may include Mr. Rosado, the wholesale buyer. Technical input to be sought from the Forest and Fisheries Dept.
2	Finalize and demarcate zoning for traditional fishing activities	Provisional zones discussed with fishermen and GPWSCMC, mapped and presented in this document, but need final agreement by Gales Point community and fishermen					GPWSCMC is currently increasing its engagement of commercial and traditional fishermen to provide an environment where this issue can be discussed and agreed on.
3	Resolve resource use issue	Local fishermen are extracting fish from Southern Lagoon, in contravention of the current Forest Department legislation (and in the case of gill nets, in contravention of Fisheries Department legislation)					Through discussion with the Forest and Fisheries Department s, and initiation of permitting process for identified commercial and traditional fishers
4	Develop a baseline and guidelines for sustainable, fishing within Gales Point Wildlife Sanctuary	No baseline exists. Guidelines for baseline development are presented in this document					Baseline and guidelines for sustainable fishing have been developed based on twice-monthly sampling of fish catch, and integrated into the Sustainable Fisheries Plan

Annex 2: Development of a Sustainable Fisheries – 1st year: Monitoring Plan / 2							
Actions		**Present Status**	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	**Limitations/Requirements**
5	Monitor fishing activity within the Wildlife Sanctuary	At present there is no formalized monitoring of fishing activity within GPWS. Guidelines are presented in this document for monitoring of commercial and traditional fishing activity.					Guidelines in place and implemented for monitoring of fishing activity.
6	Effective surveillance and enforcement of regulations by GPWSCMC against illegal fishing activity	No surveillance or enforcement activities					Patrolling driven by knowledge of when and where patrolling needs to be carried out . Surveillance and enforcement plan for monitoring and addressing illegal fishing incursions
7	Promote greater participation in surveillance and enforcement by commercial and traditional fishermen	Very few commercial or traditional fishermen are currently fully engaged in the protection of the fishery resources GPWS					Commercial and traditional fishermen actively protect their resources and assist GPWSCMC with surveillance activities
8	Liaise with Forest Dept. and Belize Fisheries Dept for assistance with enforcement activities	Limited liaison at present with Forest Department and Fisheries Department					GPWSCMC in constant liaison with Forest and Belize Fisheries Departments
Example: Effective enforcement		No enforcement in place	*Proposal written for funding 4 fishermen agree to participate*	*4 fishermen trained as Special Constable 1 patrol - 2 Honduran fishermen arrested*	*6 patrols – 2 per month. 4 nets confiscated from mouth of Bar River*	*12 patrols – 4 per month. 2 fishermen warned re. fishing in Quashie Trap*	Effective enforcement

Annex 3: Development of a Sustainable Fisheries – 1st year: Project Status					
Management Actions		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1	Establish a community management group for the fishery resources of the Wildlife Sanctuary				
2	Finalize and demarcate zoning for traditional fishing activities				
3	Resolve resource use issue				
4	Develop a baseline and guidelines for sustainable, fishing within Gales Point Wildlife Sanctuary				
5	Monitor fishing activity within the Wildlife Sanctuary				
6	Effective surveillance and enforcement of regulations by GPWSCMC against illegal fishing activity				
7	Promote greater participation in surveillance and enforcement by commercial and traditional fishermen				
8	Liaise with Forest Dept. and Belize Fisheries Dept for assistance with enforcement activities				
Example: Effective enforcement					

At the end of each quarter the management group should allocate a status to each activity:

☐ = On Target/Completed; ☐ = May have a delay; ☐ = Missed Deadline