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Cover photograph –Barn Owl (*Tyto alba*) at Owl’s Hole Pit Cave courtesy of Elyse Vogeli

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**REVIEWING A MODEL FOR DEVELOPING A NATURAL RESOURCE
ZONE FOR SAN SALVADOR ISLAND, BAHAMAS**

**“FOUNDATION TO FOUNDING
A REVIEW OF THE HISTORY”**

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ABSTRACT

This paper is an outline for and current progress toward a comprehensive natural resource allocation zone(s) on San Salvador Island, Bahamas. There continues to be utilization pressure on the natural resources of the island along with island development and changing physical factors, concerned parties are indicating a need and an opportunity to develop a comprehensive plan of allocation and administration of the island marine and terrestrial ecosystems. Issues of resource utilization and allocation have not been included in the planning activities of this island's environment and resources as this model plan suggested here. This is the initial step in better defining and preserving the natural environment and resources. An all inclusive plan for zoning of resource allocation would permit the total administration of the Island resources for best utilization and monitoring. The total resource zoning could bring all interests into a common administration and forum that would best serve the diverse interests in sustaining resources and their utilization. A review of the current status of the preservation activities will be present that will include the areas of interest, administration and financial support for a conservation effort.

INTRODUCTION

The impetus for this project stemmed from two sources, an island meeting of a few natural scientists from the Bahamian Field Station (BFS) with the concerned citizens and interested business persons of San Salvador. The topic of this gathering was in regard to the state of the environment and the various related problems, held during mid January 1996. This environmental concern and the need for a Bahamian Student at Albright College to develop a senior project and paper coincided. The time between the meeting in 1996 and early 2000 little progress had been made in the clean up, utilization and resource conservation. There needed to be a more comprehensive design, organization or plan for the management of the natural resources for the island. Sensing that need and having the opportunity for a citizen of the Bahamas to participate in that design plan, started the process of placing in the public view through a presentation and publication a model that could become the foundation for the management and maintenance of the island ecosystem.

The basic concepts for the development of a model of a natural resource preserve, park or zone developed when Khalile Francis traveled to the BFS now the Gerace Research Center (GRC) with an ecology class from his college in January 2000. His trip was sponsored by the BFS and Albright College for the purpose of researching the possible methods for protection and utilization of some or all the natural environment on the island. Mr. Francis had the academic back ground and interest to undertake the project as well as the need for producing a senior project. He met

with the advisors for the project Professors Dougherty and Hall and Mrs. Dougherty to gain more understanding about the general needs and basis for the protection of the environment. During the year that followed Mr. Francis, with the aid of his project advisors developed a model plan that could become the basis for further discussions and actions with respect to the implementation of a natural resource zone plan for San Salvador, Bahamas.

The project was presented to the 9th Symposium on The Natural History of the Bahamas by the authors (Francis, et al, 2003). The plan generated debate about its suitability and timeliness before the gathered scientists. The plan remained as an unused document until late 2005 into early 2006 when an island environmental action group formed a new organization, The Living Jewels Foundation. They obtained the document (Francis, et al, 2003) as a guide to be used as the foundation for a formal application to be submitted to the Bahamian Government. The application, submitted in early 2007, was a petition for the establishment of a marine park on San Salvador.

DELINEATION OF THE PROJECT

The original project and its presentation had as its objective the stimulation of debate, constructive discussion and implementation of a task force or group to explore the possibilities and advantages of developing of plan similar to the plan presented here. Originally it was presented as a model plan with the recognition that it had received limited review and input. The first presentation intended to initiate wider and more open

discussion that would result in group planning before implementation of such a plan. The basics of the proposal and its need came from within the Bahamas, originally and currently, with the assistance and expertise of other interested scientific and public minded persons who have supported the ideas of the need for a comprehensive environmental planning process.

The second issue that needs some attention is the rationale for the scope of the model suggested here. San Salvador is a relatively small and isolated island by most standards (Figure 1). Island ecosystems are limited in scope but probably more interdependent. The effort at including the whole of the island in a natural resource plan would be little more than working out the plan for a smaller section with the results being projected as far more beneficial. San Salvador also is different in that its land mass is small relative to the total area of the island because of the large and numerous inland lakes. The land therefore could be viewed as integral to the marine environment as the lakes are mostly tidal fluxed and have various levels of salinity. That is to say damage via pollution of an inland lake could have a direct effect on the near shore marine environment and conversely the pollution or alteration of the marine environment could affect the island lakes (Figure 2). Therefore, the prudent plan would include both terrestrial and near shore marine environments in a comprehensive management plan for maximum benefit. The model developed was for the whole of the island is practical and probably prudent in its reasoning.

ZONE DESIGNATIONS FOR NEAR SHORE MARINE RESOURCE

The marine environment could be classified into four zones, based upon resource preservation, utilization and location. The distance from the shore for defining the marine zones has not been defined or specified. This aspect of the plan would require further, more in-depth study to determine the practicality of a specific distance from shore designation. The designation could be a fixed distance, i.e. two, three, or more kilometers from the shore, or defined by physical features such as barrier reefs, chains of Cays or location of various Cays. The designation has to be practical from the stand point of user identification and enforcement. The achievement of the distance criteria has not been accomplished. The suggested zoning designated areas and their preservation level are illustrated with the off shore distance from the island left undetermined (Figure 3). The definitions of the four zones are as follows:

Zone Type Class One (1)

This zone classification (Zone 1) would be the least restrictive regarding activities and the removal of natural resources. The objective of the administration of this zone could be monitoring the resources removed, environmental assessment and monitoring population variations in targeted marine species. The imposed controls for this zone would be the least restrictive of the four zones. Examples of this zone are illustrated in Figure 4 and Figure 5. The zone designation, in its various locations would be the largest shore line and off shore area of the

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designated zoned areas in and around the island.

Zone Type Class Two (2)

Zone 2 would have the fewest restrictions as administered for the marine environment around the island. The activities would have minimum restrictions which would direct and control the use of resources in the zone. Selected activities might have a seasonal restriction and use licensees could be required for special recreational use or harvesting marine resources within the zone. The resource administration would support the recreational use and activities as well as maintain a history of resource removal. The administration should actively assess the effects of use and resource removal from the zone. The use permit(s) could be required and obtained for activities. This type of zone would be designed to accommodate and support the near on shore resorts and businesses. An example of this zone type is illustrated in Figure 6, where most of the intense near shore activities are directed and supervised by Club Med.

Zone Type Class Three (3)

The recreational and fisheries use of this zone would be restricted and controlled with use permits and license required for all activities by those using or taking the natural resources. This zone could be designated for a specific use or activity and limits/restrictions on resource removal and activities would be in effect for this zone. All activities would be by permit or license with the activity accountable to, monitored by, and reportable to the administration. The resources and environment in this zone

type could be sensitive to excessive use and unrestricted resource removal.

A resource administration would assure the safety and accessibility for those using this zone. The administration would promote the responsible use of the zone 3 type and not view the area as a strict natural preserve. Enforcement of the zone and its use would be by the park administration or its designated representatives. There would be support and participation in development of suitable uses of resources and activities within this zone.

Examples of the activities that could occur would be selected and controlled SCUBA dive sites that have a number restriction on the divers, so that the full experience of the activity could be enjoyed by the divers. Selected fishing and taking of shell fish could occur to maintain suitable population and supply the sport fisherman or professional with a more certain catch. Guides and activity directors could be available to better aid persons in having a fuller experience when using the zone. Two areas of this type of zone designation are suggested and illustrated in Figures 7 and 8.

Zone Type Class Four (4)

This zone would have the highest level of restriction and this classification would be reserved for the most impact sensitive marine environments. The activities in this zone type would have to be of low impact in relation to all aspects of the zone. Taking of any of the species of animal or plants would not be generally permitted, except in the case where a species was damaging or changing the ecological balance within

the zone such as an invasive species. The zone should have the highest level of monitoring and control for all aspects of the marine environment. The administrating authority would keep inventories of all marine species where ever practical. The only use that should be encouraged in this high restrictive zone designation would be selected scientific investigations and monitoring of the life forms in and near the zone. All activity in the zone would be closely monitored with possible onsite supervision of activities. Use permits and/or restrictive license would be required and displayed by the user. The activities and removal of natural resources would be accountable and reportable within strict guidelines.

This zone would be the breeding ground and protected maturation area for reproducing species. The various species in this zone are expected to replenish the renewable resources in other zones around the island. The replenishment effect and effectiveness of the highly protected resources would be accounted for as a function and rational for developing zoning for the whole of the island. Limited activities such as low impact SCUBA diving and snorkeling could occur in this zone if evidence from monitoring indicates that these activities, when done in a manner that is none invasive, may have negligible effect upon a marine environment. At least one type of this zone is proposed and shown in Figure 9.

TERRESTRIAL AND INLAND LAKES ZONE DESIGNATIONS

The use of the natural resources on the terrestrial and inland lakes segment of the island should follow a similar pattern

of classification as the zone classifications for the off shore/near shore areas. The use designations in some terrestrial areas and inland lake could be as small an area (a hundred square meters) as an entrance to a cave, a building of significance or a significant larger land area, Cay, and lake that would be of interest for protection or regulation of all or selected activity. The natural resource administration for the island would have the same oversight responsibilities for the activities in these zones, as in the off shore/near shore zones. The zones are designated by letters to distinguish the terrestrial zone from the off shore/near shore zone designation. The illustration of this zone is not a comprehensive categorization or list of possible sites, only examples of the type of area that would fit criteria established for the classification of the zone, Figure 10.

Zone Type Class A

The Class A Zone would be the most general class with the minimum or no use restrictions of the natural resources. The regulation of use in this zone would be directed by local construction and land use codes and regulations as established by the regulating governmental body. The natural resource administration would not have control or regulate use, building or taking of resources in this classification. The land use or natural resource utilization could be noted by the administration and used to assess the affects of the use or removal of the resources on other more restrictive zones. The general Class A Zone would include but not be limited to towns and settlements, businesses, docks and

marinas, farming and other various land uses.

The Class B Zone would be a designation for permitted resource removal or land use requiring a permit at specific locations. The natural resource administration would monitor the activities and assist in the evaluation and use of the resources to assure that the use of the resource was returning the appropriate monetary value for the resource exploited or used. The administration of the removal of the resource would direct the renewal of the removed resource if possible or assure that the removal of the resource would not adversely affect the ecosystem in and around the area of resource utilization. Examples of the removal or use of natural resources would be the use of limestone products, fresh and brackish water, agricultural use on large scale (five or more acres), timber and mineral extraction from inland waters or the geology of the island. The sanitary landfill should be placed into this classification. The land fill removes and then replaces the geology for sanitary purposes. The land fill should be monitored and supported as it is central to maintaining the environmental quality of the populated areas by reduction and elimination of pests. Monitoring and reporting by the permit holder would be part of the permit use and reportable to the zone administration.

Zone Type Class C

Administration

The sanctioning of the authority and administration of a Natural Resource Zone for San Salvador Island is the function of the central government for

the Bahamas. The government could create a department or assign primary jurisdiction to an independent organization i.e. The Bahamian National Trust (BNT) or Nature Conservancy to provide policy and leadership for the Natural Resource Zone. The department or operating organization would administer the various zones for the best use and conservation interests on the island and for the national interest, and as a first priority to function in the general best interest of the region and the country.

The governing body would establish a policy making board of directors. A suggested membership of ten members elected by a method to be determined by the sanctioning agency or governing body. The board of directors should be diverse, interested persons: the first three of the ten directors would be comprised of three local persons with no vested interests, that is local persons with no monetary gain to be made from the natural resources that they would direct. The second group on the ten person board could be natural resource experts holding three of the seats they would advise from a scientific perspective. The government or designated official(s) could appoint two members to the board who would be the liaison to the government or responsible organization. The remaining two directors could represent businesses that use the natural resources in whole or part as a foundation for their businesses interests. This board of directors would be a self governing policy making group that would promote the best use and conservation of the natural resources within the Natural Resource Zones.

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The Board of Directors would appoint a professional natural resource manager to direct the various operations of the natural resource zones on the island. The manager could be the convening chair and nonvoting member of the board of directors. The manager would have the responsibility for the management of the resources as directed by the Board of Directors via their policy's, the direction of operational personnel, enforcement of the various zones and their regulations, public relations, safety and funding to name a few of the activities of the position.

Operations Structure

The director would have the authority to meet the demands of staffing with qualified, responsible and interested personnel for the various departmental functions within its administration. The departments may initially be combined and as the work or the demand of management and maintenance increased the staff and the departments can be expanded as needed.

The position of activities coordinator could direct the allocation, permits and licenses for the use of the resources within the park. Use of resources would include both the removal and activities that occur. The coordinator could also assist in developing activities and educational programs that would use the resources under its administration.

Public/business relations position could have two important functions, the advertising and promotion of the natural resources for economic and preservation reasons, and aid in developing positive and profitable relations with businesses and commerce. This position could

develop cooperative activities for fund raising and conservation as part the department.

The enforcement/monitoring director should have a background or knowledge in the skills needed for law enforcement. The basis for developing the zoning and its success would be the maintenance of the proper activities within each zone, and the enforcement of the zone boundaries. The enforcement director could also collect the information for the monitoring of the use and removal of the natural resources. This operation would be compatible with the enforcement duties assigned to this office within the park structure. Beyond the collection of the monitoring data this office would also maintain the historic records based upon the monitoring data. This activity becomes valuable as a gauge of the population and diversity of the plant, animal and marine species in the natural resource zone. This information would them become the foundation for the changing or creation of new zones, limits on resource use or the promotion of use of the resources.

The physical maintenance would be directed by a coordinator that could provide the necessary structure and signage needed to maintain the order between and within the various zones. It is noted that most of the activities would involve informational signs, boundary markers, dive site markers, trail maintenance and assistance in managing the zones for easy and proper use of the resources. The park may have a few administrative structures, land, and vehicles and boats that would need management and maintenance that would be part of the work within this division of the operational structure.

NATURAL RESOURCE ZONE FUNDING

The main funding objective that should be achieved by the board of directors in cooperation with the managing director of the park is financial independence apart from government or tax revenue sources. The operational goal of the natural resource zone concept should be, with the proper financial structure, financial autonomy. Therefore the decisions that govern the operation would be free of governmental and special interest monetary consideration and operate in the best interest of sustaining the natural resource and environment on and about the island.

A financial source could be private and corporate grants that would support the general operation or a specific special interest within the operation. The grants could be internal or external to The Bahamas as the resources could be of interest beyond the local island and often impact or are of regional concern and interest. The director should have the ability or staff to search out and work at obtaining the grants from funding sources that support the mission and purpose of the park.

Those persons and businesses that benefit from the use of the island resources should be part of the support for the operation and maintenance of the natural resource zones. A use fee would be charged for those who use the areas of the natural resource zone and do not remove any of the resources. Use fees, although nominal, for recreation within the park should be levied on those who diver, snorkel, and watercraft operators in most of the marine zones of the park even though they do not remove

resources. The fees could be set for a use period and activity as deemed appropriate by the director and collected from tour operators or charged to the individual users.

Those interests that remove resources from selected sections of the natural resource zone would purchase a license to remove the resource and the license could have restrictions regarding the zone, type and quantity of resource being removed. The license within the marine zones would apply to the harvest of fish and other marine animals and plants that have commercial value. The license granted in the terrestrial zones could include removal of geological materials, wood, plants, landfill use and water. The license fee could be rated as a portion of the commercial value of the resource and/or scaled to the market value, which could fluctuate.

Educational activities would provide an introduction to the resources and as another method of funding the operation. Those activities could provide an introduction to the understanding of some portion of the resources of the island. This type of activity could be directed by personnel from within the administrative staff or by outside resources. Examples of the activities could be boating, diving, or ecology courses. The activities could build skills for use and harvest of resources or for education and boost the responsible use of natural resources.

Cooperative educational activities with nature or ecology organizations, high schools, and colleges could also provide funds for the park. These activities would be using the facilities of the park in cooperation with another group where

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the programming is generated and directed by the outside group using the resources for a share of the fees or tuition. Again this type of activity could promote natural resource conservation activities.

SUMMARY OF THE ORIGINAL MODEL FOR A NATURAL RESOURCE ZONE

The previous presentation of this model had as its purpose the stimulation of dialogue and activities. This result could be viewed as slow in developing, however after four years a group gathered with the intent of organizing an effort to evaluate and possibly protect critical environmental aspects of San Salvador. The initial model presented the outline of a possible conservation plan and program foundation from which a formal and functioning program could develop. The work provided a variety of possible terrestrial and marine environments that should be considered for protection and/or monitoring with the criteria set forth for various levels on monitoring and protection. The first presentation was without any outside support or input and was independent of external influences. It remains a visionary model that outlines the structure and monetary support systems that could be used upon the designation of island areas of concern and preservation. The model remains an open and flexible plan that can act a template for a more general consideration outside of the setting of San Salvador because of its basic concepts.

CURRENT STATUS OF IMPLEMENTATION

The current status and background for the implementation of a protective program for a portion of San Salvador was given by two papers at *THE 12th SYMPOSIUM ON THE NATURAL HISTORY OF THE BAHAMAS*, by two authors Elizabeth Brill and Sandra Voegeli, following this presentation. The details of which should be published in this volume.

The formation of the Living Jewels Foundation has provided the organizational structure for the formulation of a formal proposal for area preservation on the island. Since the formation in 2005 the foundation has gathered the resources, information and support of local and national interests laying the foundation and submission of a formal plan for the establishment of a marine/terrestrial preservation park focusing on the areas designated in Zone 3 and Zone 4 (Figure 3) and other near and/or select areas. The source of the scientific basis was found in the studies on San Salvador and the Caribbean region by Caribbean Coastal Marine Productivity (CARICOMP) AND Earthwatch Bahamian Reef Survey. The strength of the park plan is the extensive scientific data base that was generated by the variety of and long term studies provided by the visiting scientists and staff at the GRC and its predecessor BFS since its founding in 1971. The GRC will remain important to an established park with its on going support of research and monitoring of the ecosystem under protection. Educational components could originate at the GRC supporting the mission of education for the benefit of various educational systems in place at all levels and as a guide for eco-tourism.

San Salvador Park Proposal was submitted to the central government on behalf of the Living Jewels Foundation by BNT in May 2007 for consideration and adoption. The BNT is working with the Living Jewels Foundation by virtue of a special grant given by the Jerry Taylor and Nancy Bryant Foundation. The areas included in the plan are less extensive than suggested in the formation of a total Natural Resource Zone Plan because of the private interest and ownership of large land tracts on the island. However, the coastal zones and beaches are under the control of the government and significant sensitive tracts of land are under government ownership and will be included. With governmental approval significant resources are expected to be under care and protection of a park administration upon implementation of the pending draft plan for a park on San Salvador, Bahamas.

SUMMARY

The concern and interest of the GRC scientists and local parties that had a meeting in January 1996 initiated a process that is now receiving the attention and care of a local organization. That organization, Living Jewels Foundation, has used in part the structure and vision of the original presentation of the concepts of preservation for the partial and important preservation of island eco-systems. The indication is, that with government approval and implementation, the resources of San Salvador will be protected and provide the economic resources through various commercial ventures such as fishing, dive operations, recreation and tourism that will advance the island economically, as well as

supporting education and scientific research while preserving the foundational resources.

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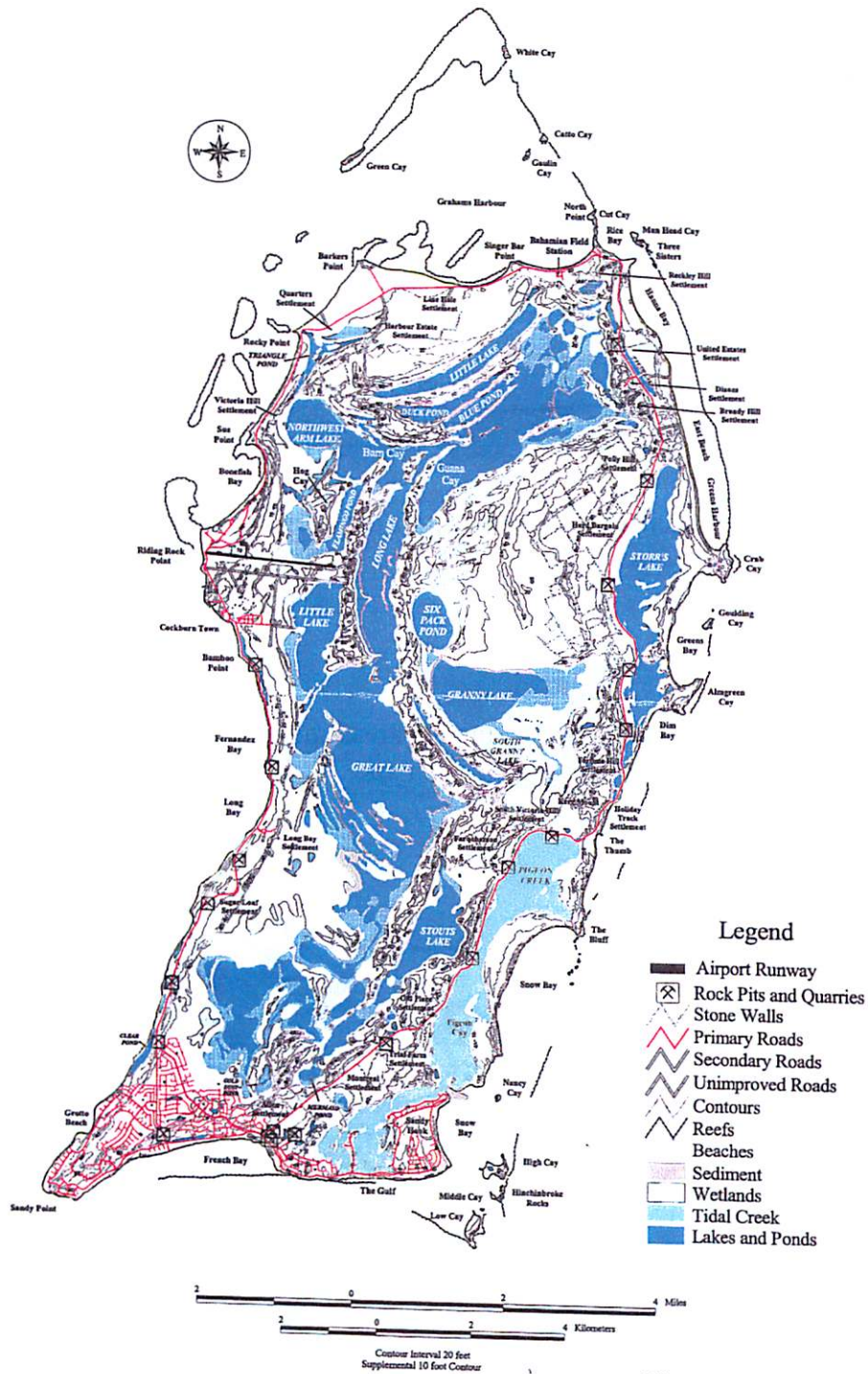
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Figure 1, Map of San Salvador, Bahamas.

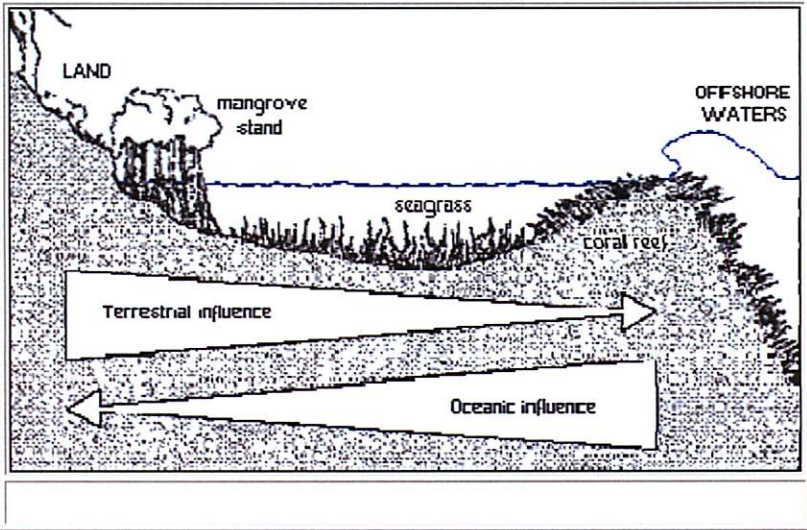


Figure 2. Schematic representation of interactions between the principal marine ecosystems of the Caribbean.

Figure 3. Suggested examples of how the marine areas surrounding the island could be zoned within a Natural Resource Zone Park.

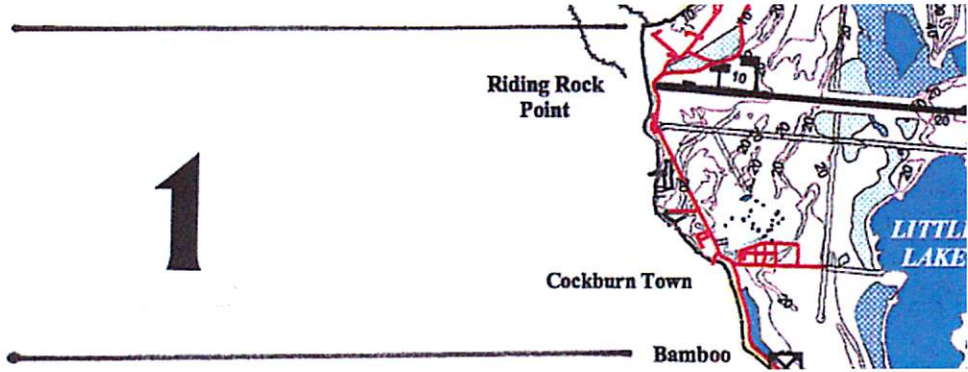


Figure 4. The area marked here is the type of marine area that would be included in Zone 1. This is an area of heavy ship and boat traffic and this would have to be less restrictive for use as the entrances for marinas and docking facilities are in this region.

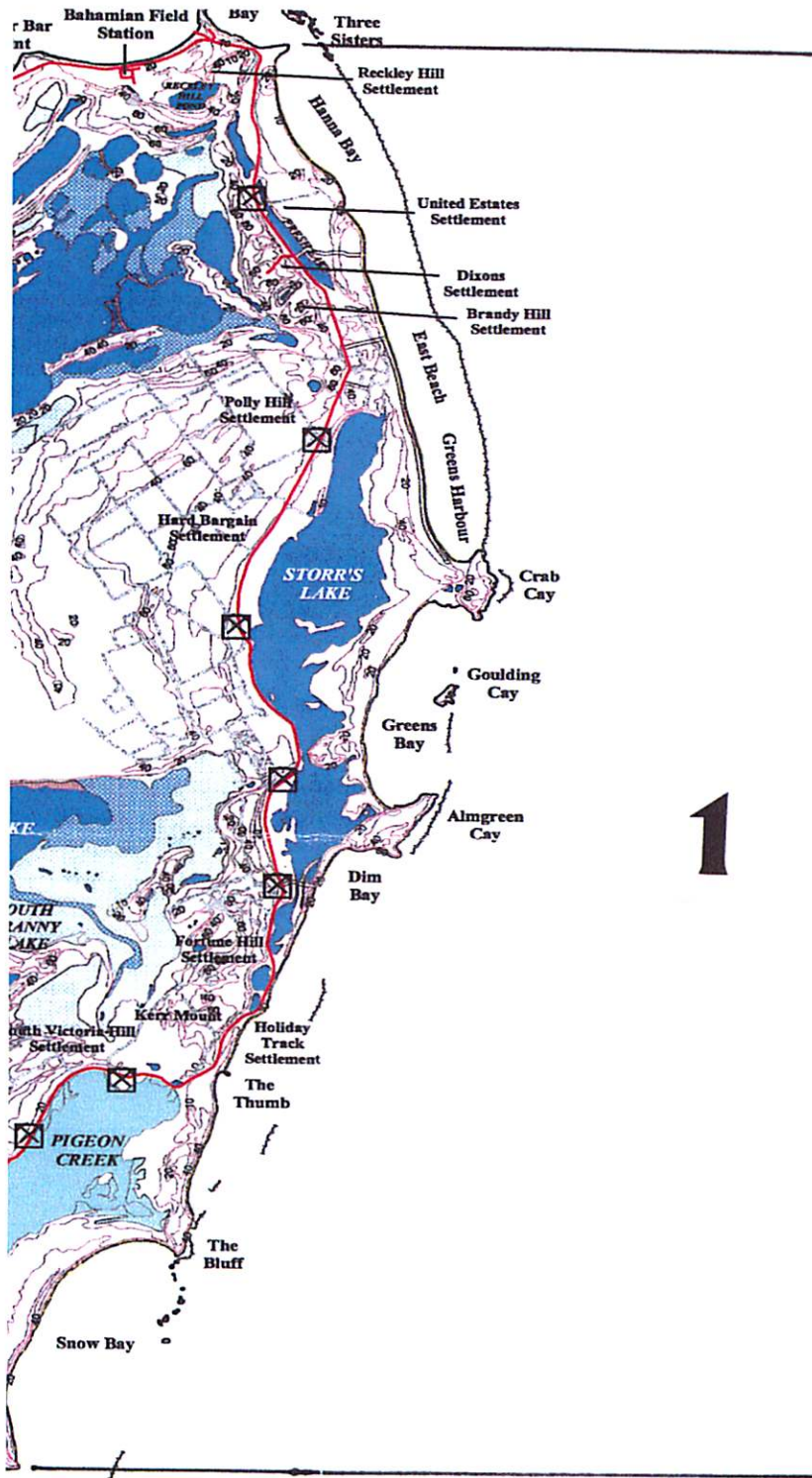


Figure 5. The east side of the island from about the east entrance to Rice Bay south to about Nancy Cay could also be designation in the Zone 1 classification.

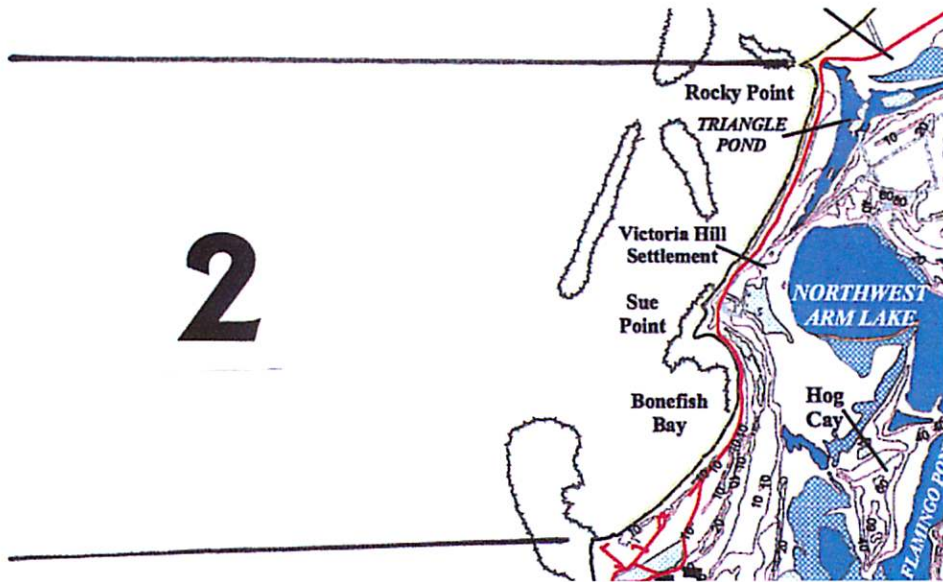


Figure 6. Zone 2 classification would be well suited for the area from the Riding Rock north along the west side of the island to Rocky Point. This would include Bone Fish Bay an area where Club Med has intense activities and uses the area almost exclusively.

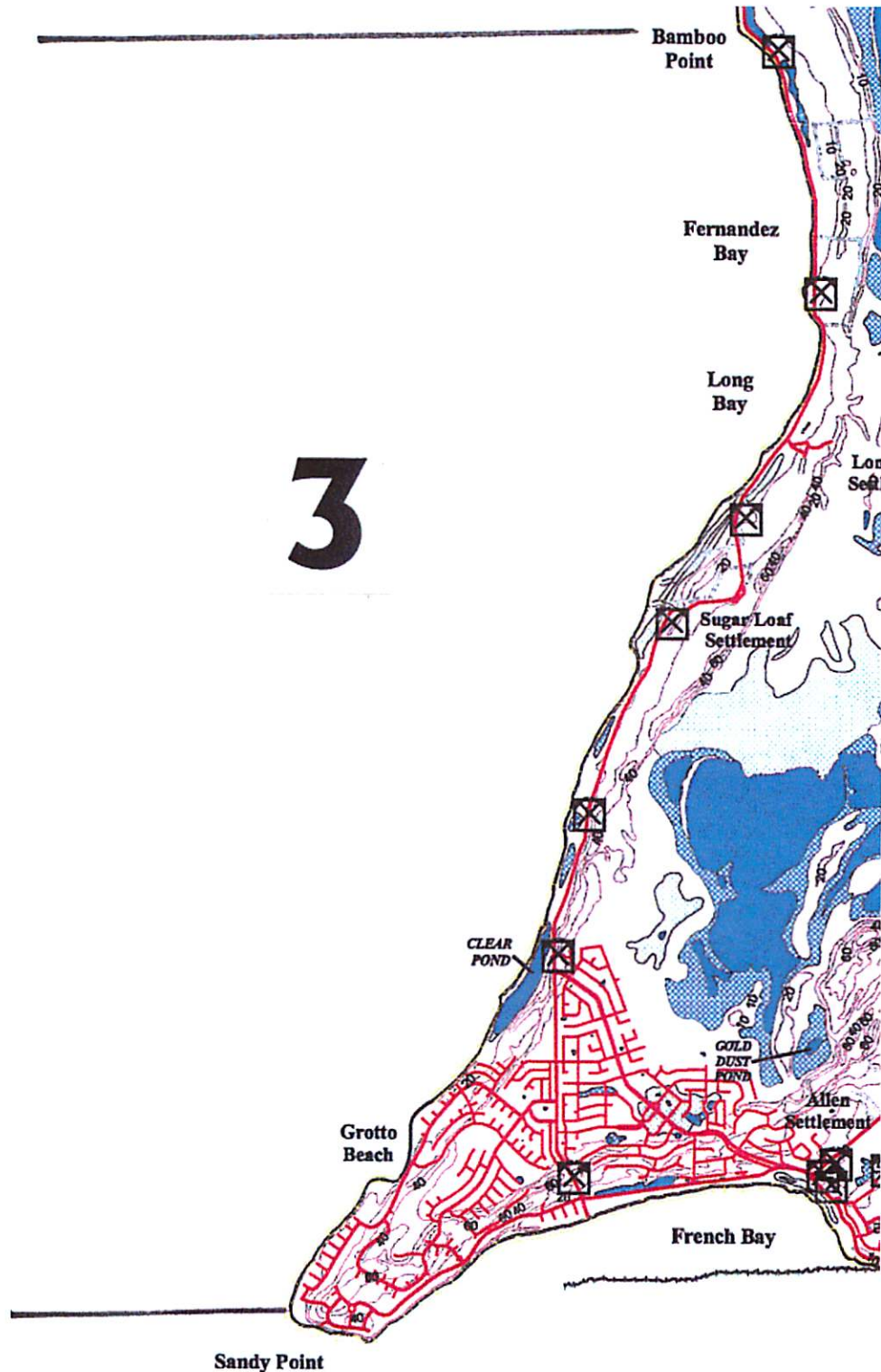


Figure 7. A more restrictive use as a Zone 3 classification would be along the west side of the island from Sandy Point to Bamboo Point. This is an area containing numerous dive and snorkel location and the traditional landing site for Columbus.

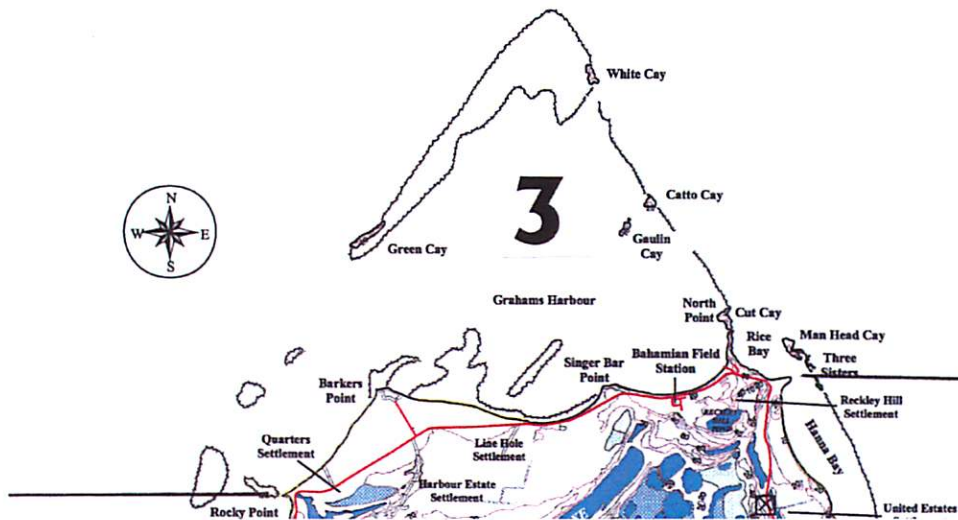


Figure 8. A Zone 3 classification would also be well suited for the area of Grahams Harbour including its various islands and numerous reefs.

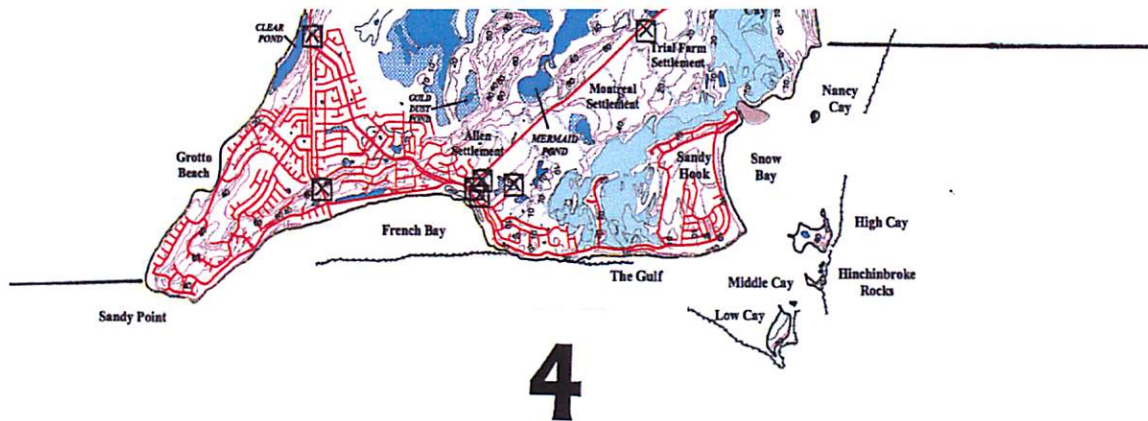


Figure 9. An area that is a highly sensitive area and includes spawning and juvenile marine life habitat is the southern region of the island from Sandy Point east to Nancy Cay. The entrance to Pigeon Creek and Pigeon Creek need the type of protection of a Zone 4 classification. Pigeon Creek is the maturation area for the basic marine life found around the island.

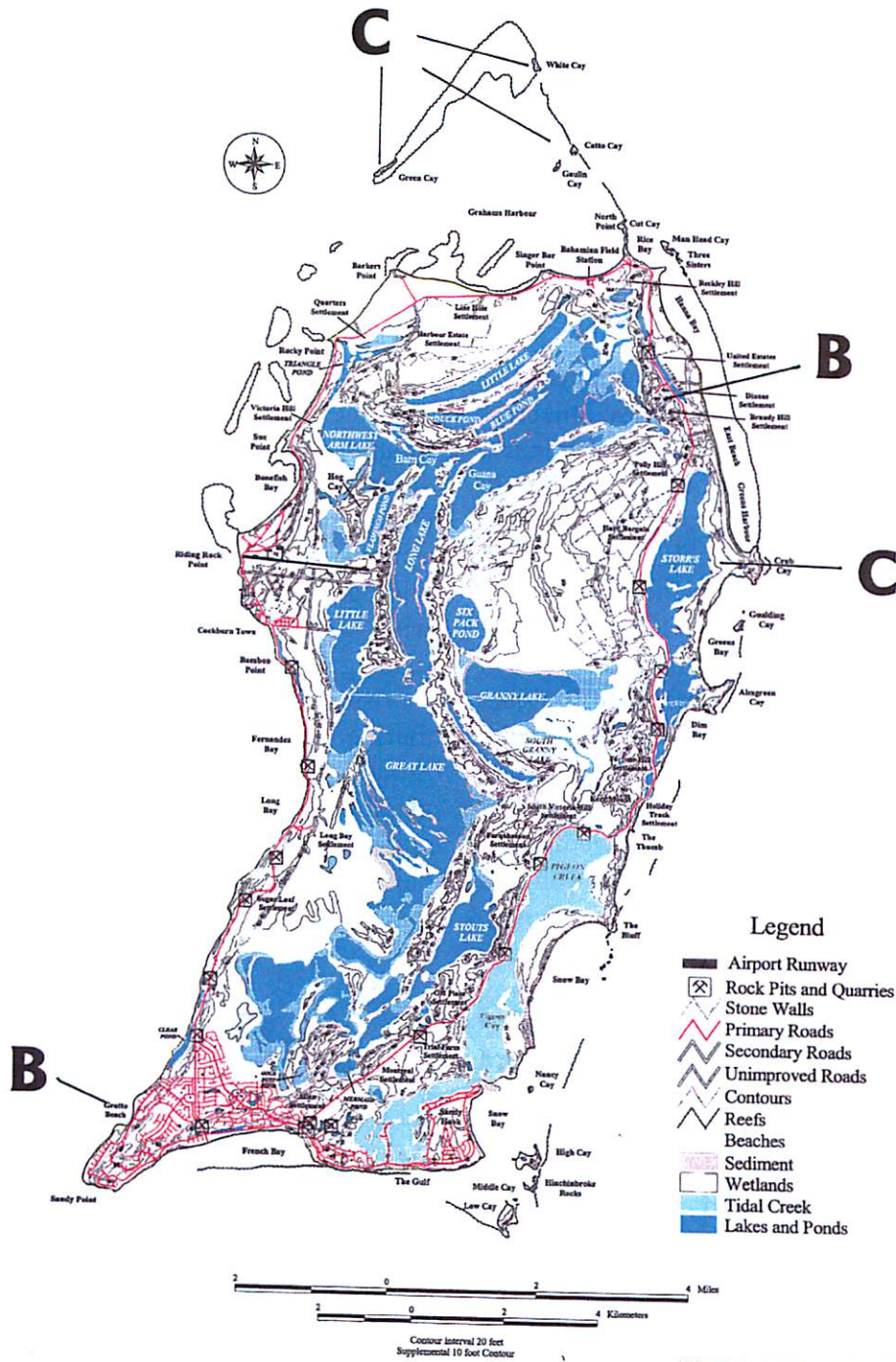


Figure 10. Examples of terrestrial zone classifications are illustrated here. Zone B classification designates the caves that have maternity colonies of bats, Alter Cave and the historic site of the light house and Light House Cave. Zone C would be the Cays that have unique bird nesting and roost habitats or rock iguana colonies. Zone C could include inland lakes that have Stromatolites such as Storr's Lake.