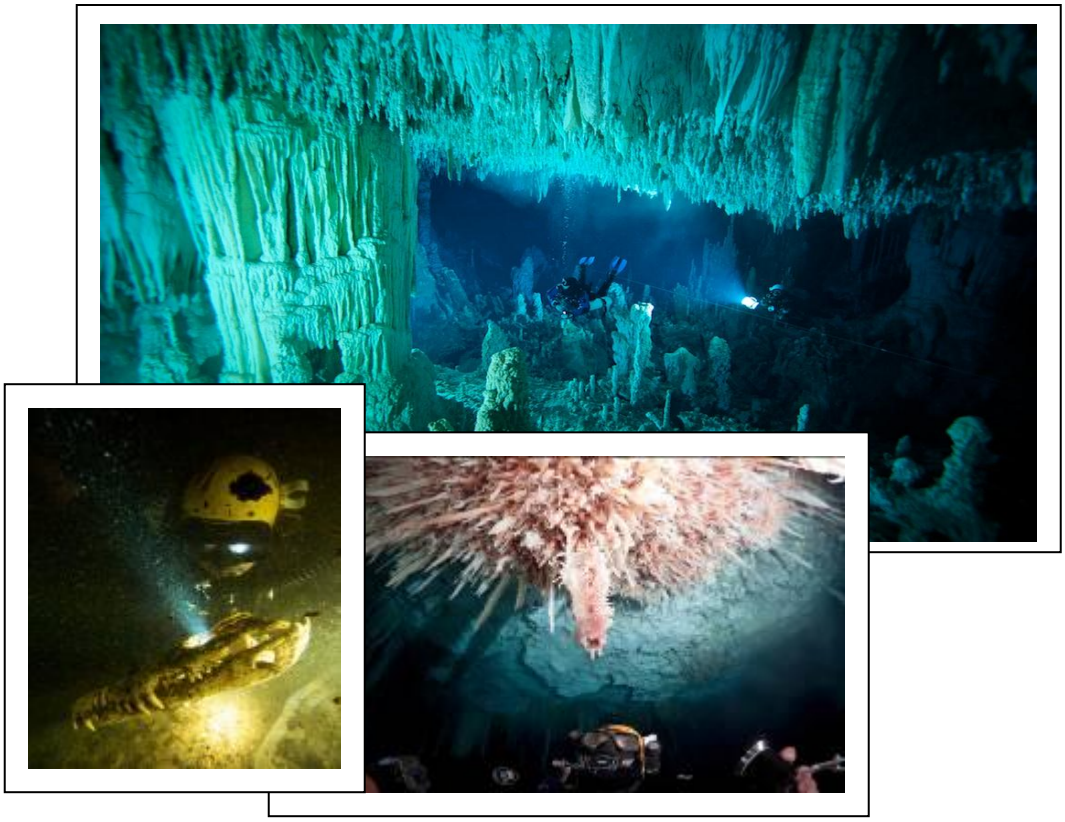
South Abaco Blue Holes Conservation Area

A Proposal to protect an extensive series of Blue Holes and Underwater Caves on Southern Abaco Island, Bahamas.



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Bahamas National Trust

By:
The Bahamas Caves Research Foundation, Antiquities Monuments and Museums Corporation, and Friends of the Environment

South Abaco Blue Holes Conservation Area: A Proposal to protect a large series of blue holes and underwater Caves, 2010.

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Friends of the Environment (2010)

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Executive Summary

In the interest of long-term conservation planning for Abaco, The Bahamas Caves Research Foundation, The Antiquities Monuments and Museums Corporation, Friends of the Environment and The Bahamas National Trust are proposing the protection of a series of inland and off shore blue holes and underwater caves located on crown and treasury pine lands between South Bahama Palms Shores residential area and Crossing Rocks Settlement on South Abaco on the eastern side of Ernest Dean Highway.

Working from past experience in protected areas proposals, as well as with the advice of protected area managers and researchers, this proposal is being developed with consideration not only for the environment, but has included local stakeholders and has evolved with significant community input.

Within the proposed conservation area boundaries, lay four inland blue holes/sinkholes as well as thirteen (13) off shore blue holes. These combined systems currently represent more than ten and a half (10.5) miles of some of the most intricately decorated and scientifically significant underwater passages on earth (National Geographic Magazine, Kakuk pers. communication) with hundreds to thousands of feet of new passages being discovered every month. The inland sites have become world renowned for their amazing scientific value including new species of cave adapted animals, but even more fascinating, the location of pre-historical remains of animals never before known to science, currently being studied and cataloged by the Antiquities Monuments and Museums Corporation/National Museum of The Bahamas in conjunction with several international research institutions, including the Florida Museum of Natural History, New Mexico Museum of Natural History and others.

The caves within this area are now recognized by top explorers as the worlds most highly decorated underwater caves, with massive crystal columns over 30 feet in height and diameter, and millions of tiny crystal stalactites, stalagmites and very rare helictites (long, curly crystals that only form when the cave was above sea level) found throughout the systems. Underground rooms, the size of baseball fields are found throughout the

systems. These immense underground rooms are some of the largest in the world and they consistently leave cave diving tourists, scientists and explorers alike in awe of their sheer size.

Over the last five years, divers have explored more than 60,000 feet of underwater passages here with one site, Dan's Cave, breaking all records for an island cave at well over 30,000 feet in length. Dan's cave is now the longest cave system in The Bahamas. Local entrepreneurs have begun both land and underwater tours, taking advantage of the area's new-found notoriety. Nearly 200 cave divers from all over the world have now been to these sites and more have already booked with local tour operators for 2010/2011.

Introduction

This proposal is part of an effort by The Bahamas Caves Research Foundation (BCRF), The Antiquities Monuments and Museums Corporation (AMMC), The Bahamas National Trust (BNT) and Friends of the Environment (FRIENDS) to increase awareness and protection of the Bahamian environment. All information following in this proposal has been collected by The BCRF, AMMC and FRIENDS on behalf of the BNT in anticipation of an official Bahamas National Trust proposal being submitted to the Government.

General Location

Located on South Abaco Island, on the west side of Ernest Dean Highway, the northeastern boundary would start in the area of the "Fire Tower" located atop a large road cut and south along the west side of Ernest A. Dean Highway just south and west of Bahama Palm Shores South residential area. From there the eastern boundary line would be the highway itself, traveling south past Crossing Rocks Settlement. From there the boundary line would head due west out in to the "marls" of Chalk Sound, on the western side of Great Abaco Island. The western boundary line would be off shore in Chalk Sound, encompassing 13 significant off shore marine blue holes. The northern boundary line then heads east back to the starting point at the fire tower on Ernest Dean Highway.

Figure 1. Google Earth image of Abaco indicating sites and proposed boundaries of the South Abaco Blue Holes Conservation Area.

Proposed Boundaries

The formal proposed boundaries for the South Abaco Blue Holes Conservation Area have been established taking into consideration not only the entrance sites of the underground cave systems, but the entire foot print of each cave which represents the extent of the underground passages and known recharge areas (area where these systems get their water from the surface, saline lake or area of flats/marls). It is of utmost importance that this foot print is included within any conservation area as the introduction of pollutants or destruction of the land mass above any associated passage will essentially "kill" the entire cave eco-system.

Therefore the following proposed boundaries have been deemed necessary for efficient conservation efforts. The area within the proposed area (land and sea) can be broken down into the following categories via GIS data:

Individual Ecosystems

Pinelands: 104644 acres, 42348 hectares

Dry Broadleaf Evergreen (Coppice):	14803 acres, 5991 hectares
Human Altered land:	147 acres, 59 hectares
Mangroves:	5003 acres, 2024 hectares
Swamp:	24215 acres, 9799 hectares
Data not available via GIS:	7 acres, 3 hectares
or	
Total land:	148,819 acres, 60,225 hectares
Total Sea:	19,945 acres, 8,072 hectares
Total sea and land area:	**168,764 acres, 68,297 hectares**

The total area proposed above would most effectively protect all of the different scientific and aesthetic properties of these highly vulnerable resources.

Proposed Boundary Markers (Figure 2)

North East: N26° 14.948 and W77° 09.996

North West: N26° 16.050 and W077° 13.228

South East: N26° 06.560 and W077° 12.680

South West: N26° 07.947 and W077°19.309

Figure 2. Google Earth image of proposed borders of South Abaco Blue Holes Conservation Area.

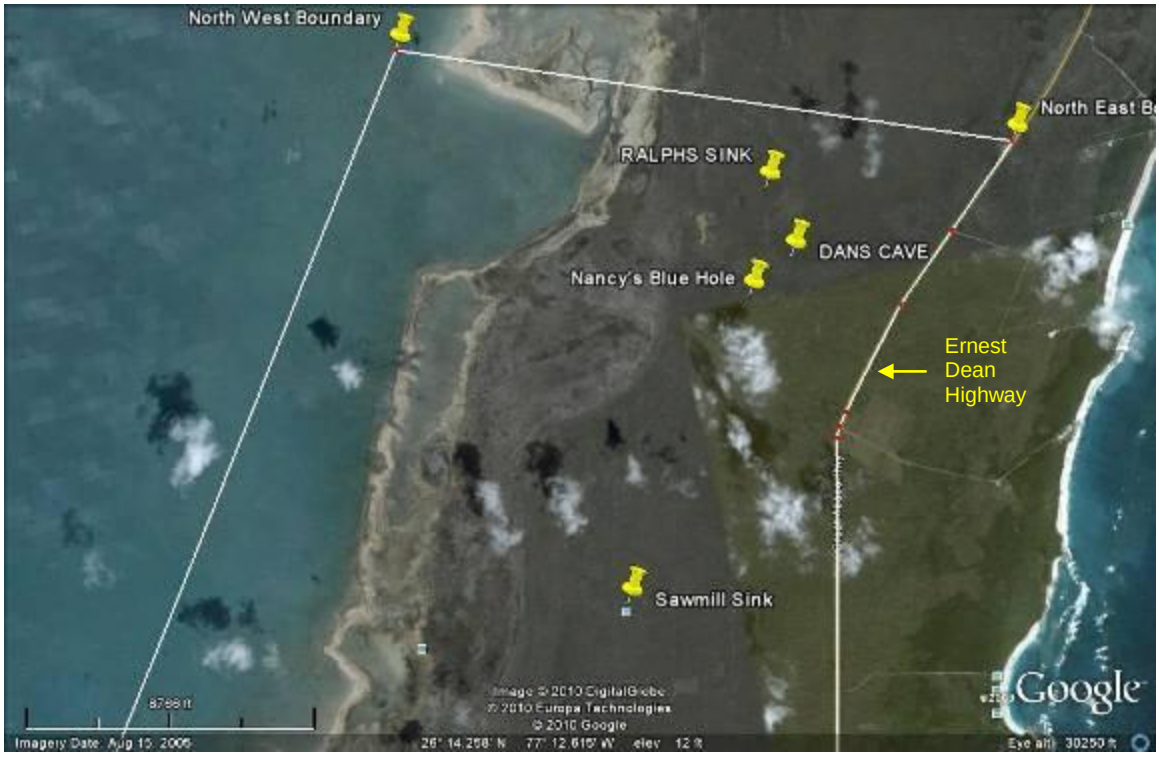


Figure 3. Google Earth image with push pins indicating significant features within the northern (predominantly inland) portion of the proposed conservation area boundaries.

Figure 4. A Google Earth image showing the southern proposed boundaries (predominantly off shore) blue holes.

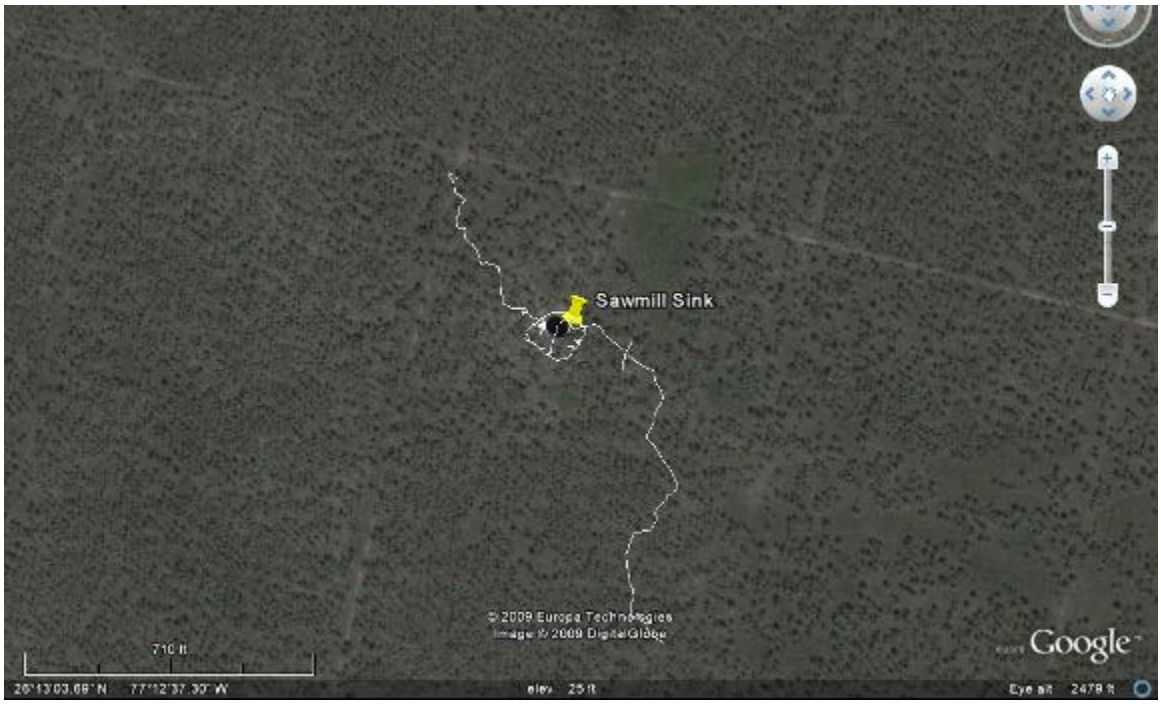


Figure 5. Google Earth image of surveyed cave passages overlay (Sawmill Sink).

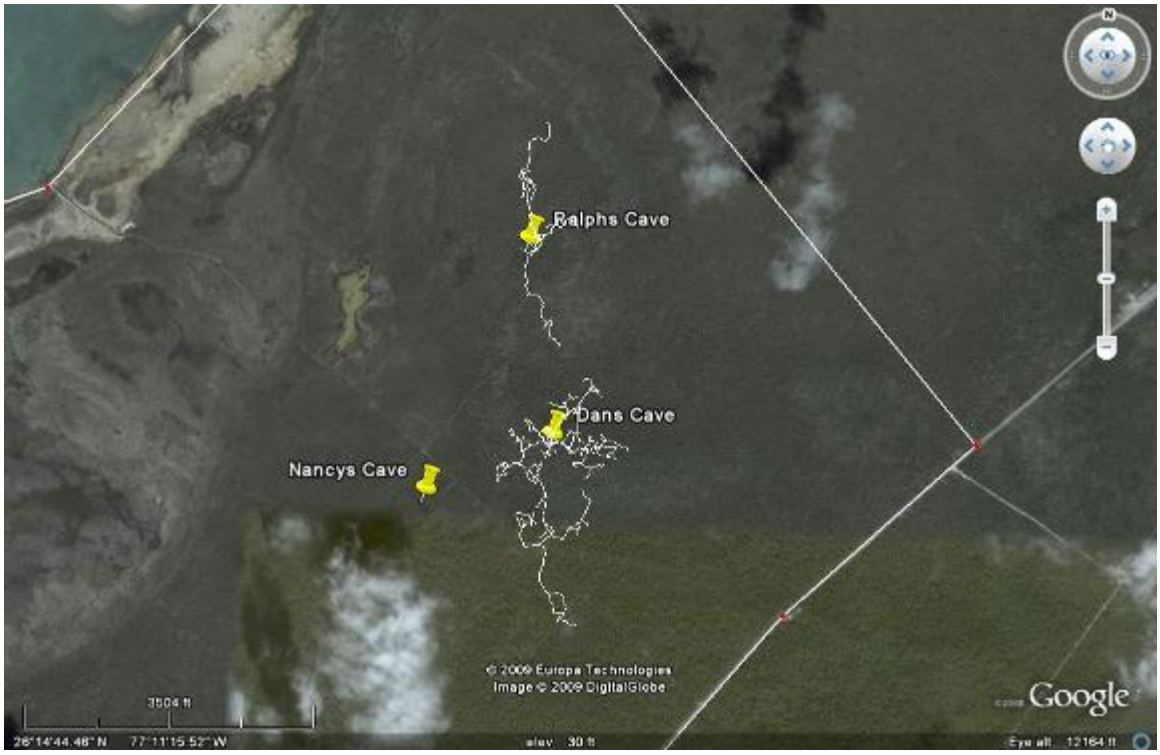


Figure 6. Google Earth image of surveyed passages overlay (Dan's and Ralph's Caves).

Importance of Inland Blue Hole Systems on Abaco's Fresh Water Reserves

Although offshore marine cave systems carry seawater; they are geologically intertwined with their fresh water, inland counterparts. It is the inland blue holes that are directly related to each island's potable freshwater supplies. The inland blue holes are virtual reservoirs of fresh drinking water and the destruction or degradation of one system (be it marine or inland), directly affects the other. The extraction of fresh water from surrounding underground aquifers directly impacts the levels of fresh water present within the cave systems and their fragile ecosystems.

The inland blue holes found within the proposed conservation area are literally windows into Abaco's potable fresh water supplies. Cave divers can assist in sampling water throughout the systems in order to establish depth, health and extent of the fresh water lens within this area. Held in reserve, this site may very well be called upon in the future for supplementary fresh water well fields as Abaco's business and residential requirements expand with continued growth of the island.

Inland karst features (dry caves, sinkholes, banana holes, blue holes, underwater caves) are highly specialized systems from a biological, archaeological and paleontological standpoint. The fresh water lenses of the islands support systems of unique stygobitic (cave adapted) marine life found nowhere else in the world. Tiny white or translucent crustaceans of many different class, order, family, genus and species are found throughout the Islands of The Bahamas, but the caves found within the proposed Abaco conservation area hold some of the highest densities of these animals found anywhere on earth.

Many of these animals are found in only one particular cave system, indicating how isolated and specialized these systems truly are. Due to the unique chemical properties of water in the inland systems (hydrogen sulfides and sulfur reducing bacteria) there are areas that have reduced oxygen levels (anoxic), creating a natural preserving environment for archaeological and paleontological remains. Many artifacts continue to be discovered

in these systems, largely because of the protection of this unique chemistry. The anoxic areas are not only natural storehouses for Bahamian history, but are also host to strange groups of stygobitic life that have adapted to living in the low oxygen environments. How the animals survive in waters where there is no detectable oxygen level is a mystery that is currently being unraveled by researchers working in concert with The Bahamas Caves Research Foundation. This amazing sulfur-based ecosystem has high significance to the scientific community.

As noted previously, the fresh water held within the surface pools of the inland systems is of vital importance to The Bahamas, as they act as natural reservoirs for our fresh drinking water. On Andros Island for example, there is so much fresh water (and thus blue holes) that millions of gallons are exported daily due to the fact that the natural fresh water reserves on New Providence are incapable of supporting the ever-increasing population of that island. If the fresh water lens on Andros were to be damaged by overuse or pollution, the impact would be felt nation wide. Deforestation and development in the areas of high blue hole concentrations on Abaco would have a very similar effect and would severely impact the relative large surplus of fresh water Abaconians have enjoyed throughout the islands developed history.

Chalk Sound and Off Shore Blue Holes

A minimum of 13 off shore marine blue holes are located within the proposed boundaries in the area of Chalk Sound (Figure 4). The blue holes were at one time dry caves during lower sea levels and contain speleothems (cave formations such as stalactites, stalagmites, flow stones etc.) throughout many of the sites. All submerged cave systems in The Bahamas are filled with vast amounts of sea water that

Divers hover over Glen's Blue Hole near Crossing Rocks. Photo by Wes C. Skiles

move both in and out of the caves during rising and falling tides. Since The Bahamas has semi-diurnal tides, the water is drawn into and then expelled from these caves at a rate of several thousand gallons per minute twice per day. On occasion, the sea is drawn into some of these caves with such ferocity that the surface water above the entrance is turned into a massive whirlpool. As surrounding seawater is siphoned into these systems, it carries with it an enormous amount of planktonic marine life and detritus that is used as food by thousands of cave dwelling animals both in the entrances of the caves as well as thousands of feet into the dark passages.

Some of the cave dwelling animals dependent on the food bearing currents are lobsters, crabs and shrimp. Many creatures such as sea stars, sea cucumbers and cowries graze the walls and floors of these dark, but life filled conduits. Further into the reaches of both marine and inland caves are specially evolved fish and crustaceans that have adapted to the very fragile existence in a world of eternal darkness. Many of these species are completely new to science, found nowhere else in the world, and some are specific to only one particular cave. Others are closely related to species that live in abyssal depths of the open ocean.

All of these organisms rely on clean, plankton filled seawater being concentrated into a very small area (the cave passage) to support their unique ecosystem. It is this concentration of the seawater into such a small area that can indicate a change in water quality (i.e., the introduction of pollutants). Nitrogen rich water caused by human waste, surface run-off, and siltation from dredging projects and agricultural chemicals leads to a vast increase in algal growth, especially in harbors, creeks, and bays. Once this water is concentrated into the areas of the cave entrances by the tidal currents, the increase in algae growth appears to be dramatic. The algae soon smother corals and other filter feeding organisms in the entrance areas. These algae also retain accumulated sediments in the areas of the caves. As more sediment is introduced into the interior of the cave, the passages slowly begin to fill with fine mud that eventually reduces the passage size and water flow, thus increasingly reducing the flushing effect of the tidal water.

When water flow is reduced, the amount of food being introduced to the passages is also reduced. This polluting process begins a systematic collapse of the cave ecosystem with the result being a "dying" cave system. The Author believes that, due to the large amounts of water being concentrated into the systems (in the case of marine caves), these features would be one of the first ecosystems to be affected by local pollution, thus making the cave's fringing entrance reefs and passages, excellent indicators of "things to come" for nearby coral reef systems. In the case of inland systems, the entrance pools are virtual windows into the fresh water lens of the islands, allowing us to view the health of the local water supply. The direct effects of nitrogen rich water on the far interior of the caves are still not understood. Ongoing research and baseline data are now being collected by researchers in an attempt to better understand these effects.

Cave Species Found in the Proposed Conservation Area

Figure 7

Thermosbeanacean, Dan's Cave
Photo by Dr. Thomas Iliffe

***Lucifuga spelaeotes* Blind Fish**
Photo by Brian Kakuk

A Remipedia, Dan's Cave
Photo by Dennis Williams

Danielopolina ostracod, Dan's Cave
Photo by Dr. Thomas Iliffe

Oligopus *grahmani*
Photo by Brian Kakuk

Espeleonaushonia (new species)
Photo by Brian Kakuk

Ogilbichthys *kakuki*
Photo by Dr. Thomas Iliffe

Parhippolyte *sterrei*
Photo by Dr. Thomas Iliffe

Significant Systems within the Proposed Boundaries

Dan's Cave

This extensive, inland lens cave has been explored for nearly 15 years by various explorers. Dan's Cave is considered by most explorers and researchers as the most extensively decorated cave in the world.

A diver swims through the snow white tunnels of the Badlands in Dan's Cave.

Photo by Jill Heinerth

Presently this cave has revealed more than 30,000 feet of explored underwater passages and is very close to being connected to Ralph's Sink adding an additional 10,000 feet of mapped passage to the system. Even without the Dan's Cave/Ralph's Cave connection, this system is now the longest underwater cave in The Bahamas and is the longest island underwater cave in the world.

Significant archaeological and paleontological material has been found within this cave system and more material continues to be found on a routine basis by The Bahamas Caves Research Foundation.

Biological collections by Dr. Jill Yager of Antioch College and Dr. Thomas Iliffe of Texas A&M University have revealed an extremely diverse troglobitic (cave adapted) ecosystem. This cave is the only place on earth where larval Remipedia (specialized-cave adapted crustacean) have been routinely found and studied (Stefan Koenemann et. al 2007). Local dive operators currently use this cave as a tour dive destination for certified cave and cavern tourist divers.

Divers hover in the massive "Cascade Room" of Dan's Cave. Photo by Wes C. Skiles

Current Threat(s):

Development. The biodiversity in this cave is one of the top 5 in The Bahamas. All measures should be taken to protect the habitat above and life within the cave from development related pollution.

Dive Guide Program: Use by unqualified divers could lead to destruction of habitat and possibly fatalities. The use of popular underwater vehicles currently used by cave divers will drastically increase the amount of damage caused to unique and delicate formations. The use of underwater vehicles should be allowed for specially permitted exploration projects only and not for general touring.

Ralph's Cave

An extensive underwater cave, Ralph's Cave is currently the second longest underwater cave in The Bahamas at over 10,000 feet in length. There is a high probability of Ralph's Cave and Dan's Cave being the same interconnected cave system, but the passages that link the two systems together have eluded explorers to present.

Areas within Ralph's Cave are considered the most intricately decorated passages of any caves on earth, wet or dry, with clear, crystal formations of every shape and description.

Current Threat(s):

Development: The biodiversity in this cave is one of the top 5 in The Bahamas. All measures should be taken to protect the habitat above and life within the cave from development related pollution.

A diver back lights a large crystal stalagmite in Ralph's Cave. Photo by Agnes Milowka

Dive Guide Program: Use by unqualified divers could lead to destruction of habitat and possibly fatalities. The use of popular underwater vehicles currently used by cave divers will drastically increase the amount of damage caused to unique and delicate formations. The use of underwater vehicles should be allowed for specially permitted exploration projects only and not for general touring.

Crystal soda straw columns in Ralph's Cave. Photo by Brian Kakuk

Significant concentrations of ancient Sahara dust is found in deeper sections of the cave system, having accumulated over hundreds of thousands of years during major dust events in the earth's history. The dust is currently being studied by scientists at the University of Miami with the support of The Bahamas Caves Research Foundation and the Antiquities Monuments and Museums Corporation.

Current research activities at this site include:

Global climate change studies using speleothem formations that hold information on past climatic conditions.

Paleontological studies on crocodile, tortoise, bird and bat fossils found near the cavern area.

Water movement studies, tracing tidal movements of sea water through this system and others within the proposed boundaries

Saharan dust – dating dust from various areas of the cave, showing major dust events in The Bahamas past.

Dog tooth spar crystals in an ancient pool in Ralph's Cave.
Photo by Brian Kakuk

Biological Assessments- New species and genus of cave adapted animals are found within this site on nearly every biology focused expedition. Cataloging of these species is very important in understanding the mechanism of this unique, sulfur-based ecosystem.

Nancy's Cave

Ancient Crocodile Skull in Nancy's Cave. Photo Brian Kakuk

Nancy's Cave, though only recently discovered; has revealed an extensive and significant gathering of both archaeological and paleontological material. The first bones found within this site were Lucayan in origin and the Antiquities Monuments and Museums Corporation is attempting to retrieve carbon date data for this material.

This cave currently has 1,400 feet of explored passages with a large area of speleothem formations approximately 500 feet from the entrance. The floor of the large, subway like passage is littered with bones from ancient crocodiles (see image of crocodile skull above), tortoise, birds and bats. This site continues to reveal new discoveries to The Bahamas Caves Research Foundation and Antiquities Monuments and Museums divers on a routine basis.

This cave is undoubtedly hydraulically linked with Ralph's and Dan's cave and it is not impossible that these three cave systems will be physically linked together in the near future.

Sawmill Sink

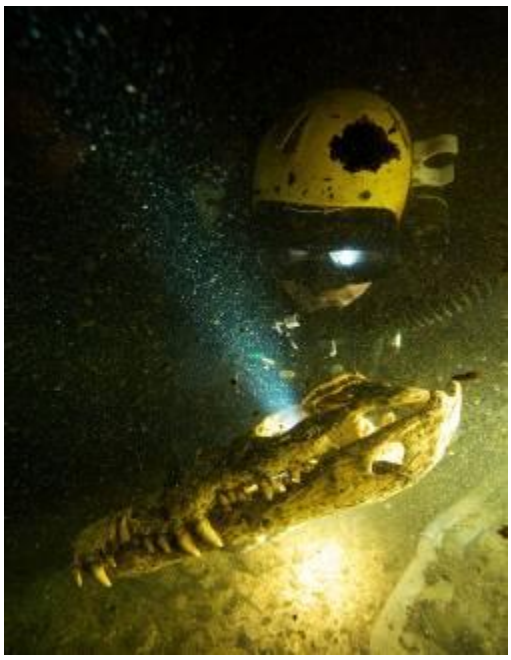
Scientists have dubbed Sawmill Sink, "the most significant fossil find in the history of the West Indies". Due to the nature of this site's unique water chemistry, this classic inland blue hole holds a vast, highly preserved cache of fossil material that is currently re-writing the known history of The Bahamas. More than 54 individual crocodile skeletons, 13 extinct tortoises (completely new to science), hundreds of birds (some new to science), bats, snakes lizards and fish have been discovered in the deep ancient peat deposits on the bottom Sawmill Sink.

Sawmill Sink. Photo by Wes C. Skiles

The Antiquities Monuments and Museums Corporation has been funding ongoing research at this site for more than 5 years. This research has revealed a Bahamas never before known to science (Steadman et al, 2007), showing us how drastically our environment has changed over the last 20,000 years. The site boasts the oldest direct human bone dates in the Bahamas with AMS radiocarbon (14C) date of 1040 ± 40 yr BP of a 13 year old individual, assumed to be Lucayan Indian.

A diver in the hydrogen sulfide layer. Photo by Wes C. Skiles

This site holds 4,235 feet of underwater passages, some to depths of 180 feet. The specialized water chemistry that protects the valuable fossils at Sawmill Sink is also responsible for an unprecedented number



Ancient Crocodile Skull. Photo by Wes C. Skiles

of cave adapted marine life that thrive in the sulfur and bacteria filled layers within the sinkhole. Many of these animals have proven to be new to science and one new shrimp in particular (seen above) has only been found at Sawmill Sink and nowhere else on earth.

Scientists at Pennsylvania State University have begun an extensive investigation into the specialized microbial communities that have established themselves over the aeons within the waters of Sawmill Sink (Dr. Jennifer Macalady pers.com.). These microbes and bacterial colonies have been deemed to be representative of first life forms on earth and potentially resembling life on planets other than earth.

Sawmill Sink's extensive contributions to science are on-going. The Antiquities Monuments and Museums Corporation has partnered with the University of Florida at Gainesville's Florida Natural History Museum in cataloging, preserving, researching and archiving the extremely fragile and valuable material being brought to light from Sawmill Sink.

These high-profile finds have been highlighted in documentaries by National Geographic/Nova and will be part of a feature/cover article in the highly esteemed National Geographic Magazine in August of 2010.

This article is the largest that National Geographic has done in 3 years, and between the documentary and the magazine, more than 40 million people world wide will be exposed to the treasures being found in Bahamian Blue Holes.

Reel Breaker Blue Hole and Off Shore Sites

This proposal also includes at least 13 off shore blue hole sites found throughout the area of Crossing Rocks and the adjacent Chalk Sound. The off shore area is an extensive network of mangrove channels, blue holes and flats known locally as "the marls" on the west side of Abaco Island. Although each of these off shore blue holes is significant in it's own right, either biologically or geologically, one particular site, Reel Breaker Blue Hole stands out as a representative of the group.

Reel Breaker Blue Hole is located only 100 feet off shore from the community dock and boat ramp in the Crossing Rocks area. The passages of this blue hole extend both north and south toward other blue holes within the high mangrove areas on the outskirts of the Crossing Rocks Bay.

A diver swims between stalagmites in Reel Breaker Blue Hole.
Photo by Curt Bowen

This particular blue hole holds more than 5,500 feet of circuitous passages that intertwine with each other throughout parts of the cave. All of the off shore blue holes are tidally affected as water courses through the passages on incoming and outgoing tides. These sites are considered "lake drain" caves, helping the water keep in time with the tides throughout the day, filling and draining the large expanse of

flats or local bays

Reel Breaker Blue Hole is one of only a hand full of marine caves in the world that is long enough to have a unique "zoning" of marine life within its passages.

A boat hovers over a Chalk Sound Blue Hole. Photo by Curt Bowen

As water is siphoned into the cave on lowering tides, it brings planktonic food to the billions of small animals that cling to the walls, ceilings and floors of the cave. These unique animals have no need for light as all of their food is brought to them on the flowing tides.

Many of these unique sponges, tunicates, hydroids and bryozoans have developed specialized chemical defenses to other colonies of animals in the cave, establishing a sort of "chemical warfare" among the competing groups of animals. It is these unique chemicals that scientists are investigating for their anti-bacterial, anti-microbial and anti-cancer properties, making these caves vitally important not only to Bahamians, but possibly to the entire world.

The further from the entrance the water goes (further into the cave), the less nutrients are found in the water, and less of this highly adapted marine life is found on the surface of the cave. It is here that the cave takes on an entirely different ecosystem, and more closely resembles the inland (anchialine) blue holes, with more "cave adapted" marine life taking up residence.

Threats

Development

Current threats to the proposed area are real and impending. Large scale development to the east of the proposed conservation area, though necessary for Abaco's economic growth, will eventually lead to the need for more land in order to support the infrastructure necessary for those developments. The Authors and many other Abaco

residents feel that since the proposed land is currently vacant and "unused" by anyone other than tour operators, hunters, fisherman and researchers, the need for additional land for nearby development will eventually lead to the proposed area being granted for expanding development purposes. Therefore, this proposal is a preemptive effort to ensure that the land above these sites will never be destroyed nor modified as this will inevitably lead to the collapse of the fragile ecosystems within the blue holes as well as possible physical destruction of the systems themselves.

Constructing buildings on top of what is known to be massive underground voids (cave passages and rooms) would quite probably lead to eventual passage collapse, building and property damage and even possible fatalities in a worst-case-scenario.

Deforestation

All cave life, fossil preservation, and archaeological material preservation is directly dependent upon the unique water chemistry of Bahamian Blue Holes. As organic matter (generally vegetation and small animal life) falls into or leaches down into the underwater cave systems, they begin the biological process of degradation. Bacteria play the major role in this process, and the by-product of the "rotting" process is hydrogen sulfide gas. Other sulfur reducing bacteria in turn use the hydrogen sulfide gas which also uses up all of the available oxygen within the water nearby water column creating an anoxic or oxygen-free zone. The anoxic layer then stratifies around the fresh and salt water interface, known as the halocline or "mixing zone".

It is in the oxygen free zone that any bone material or archaeological artifacts are preserved so well that humans cannot duplicate the process on a long term basis. This is also why many artifacts found at these sites are left in place and studied in situ.

The entire cave adapted ecosystem of these caves is based on the organic matter (and associated hydrogen sulfide) as the basis of life underground. Millions of cave adapted crustaceans, and other life, many found no where else on earth, gather at the "feeding trough" of the bacterial layers which support all life in the caves.

Since the organic surface matter is the building block of the entire biological process, it is of utmost importance that all vegetation found near the entrances to blue holes, as well as vegetation found above the underground passages, be kept in a pristine condition. Once

vegetation is stripped away, even on the smallest level, it has a significant impact on the ecosystem below. Deforestation on any level will ultimately result in reduction in hydrogen sulfide out put, and therefore in the eventual destruction of fossils and artifacts, as well as the complete collapse of the sulfur-based communities thriving underground.

Ground Water Contamination

Where people go, their trash (or effluents) will follow. Ground water contamination from septic systems, "deep" well injection systems, land fill leachates and other methods of discarding human waste have immediate consequences when exposed to the extremely porous nature of Bahamian limestone. These contaminates easily move vertically and horizontally through the limestone and thus underwater cave systems are highly susceptible to contamination as the tidal currents move through the island from one side to the other. All of the cave systems, both inland and off shore within the proposed boundaries are affected by diurnal tides, meaning they each have two high and two low tide tides per 24 hour period. Tidal movements and heights are nearly as strong as those off shore with nearly a meter of difference between high and low tides. When subjected to nearby contaminants, underwater cave systems simply become conduits of sewage and other chemical pollution, with the tidal movements providing a "conveyer belt" mode of distributing the contaminants.

Proposed Protection

Taking into consideration all of the preceding information in this document, one can easily see that these amazing resources are in dire need of some level of conservation. Working with local stakeholders which include hunters, bone fishing guides, land and dive tour operators and researchers, one consistent theme has continued to resonate. All agree that this land should be set aside and kept exactly the way it is right now.

We believe that all stakeholders should continue to be able to make use of the land as they have for generations. There have been no conflicts between any of the user groups, and in fact, they compliment each other as long as each is given the space to pursue their own particular activity.

We do not feel that a "no take" management plan is necessary. Legal, traditional hunting and fishing should be able to continue. We also feel that tour operators should continue to bring tourists in from all over the world to personally experience what is easily one of The Bahamas' most stunning natural resources, and that this type of tourism should be pursued by local Bahamian entrepreneurs.

The one aspect of conservation that should require additional regulation and protocols is the use of these sites by visiting cave and cavern divers. We believe that these caves are too fragile to allow unregulated diving activities to be conducted at these sites. We feel that these sites should be visited by divers under the guidance of certified and qualified cave diving tour operators who are either Bahamian or hold legal status in The Bahamas.

This type of diving requires specialized equipment and training and it is paramount that any tour operator be well qualified in protocols and equipment that will allow them to safely bring tour divers into these amazing systems safely and with due regard to the fragile nature of the caves and their irreplaceable contents.
Protection should concentrate on keeping the pine woods, blue holes, tidal creeks, logging roads and mangrove areas as they currently are, while promoting them to the tourism industry as one of Abaco's great natural wonders.

Local and International Support

On July 5th, 2010, a request for letters of support was sent out to the local and international communities. These requests were sent to persons who have visited, are concerned with, or have scientific or recreational knowledge of these sites. Within 72 hours, 175 letters were received via e-mail from the following countries: Bahamas, United States of America, Japan (2 letters), Greece (1 letter), Spain (1 letter), Italy (2 letters),United Kingdom, China (1 letter), Canada (3 letters), Brazil (1 letter), Germany (2 letters).

There is no lack of support for this proposal from either Bahamian or the international communities and more letters of support continue to come in as word spreads of our request.

Town Meetings

Table 1. List of Community meetings held in Abaco to discuss the South Abaco Blue Holes Conservation Area proposal. (see Appendix "Community" for details of all meetings).

Date	Time	Location	Attendance	Meeting Type
14 December, 2009	7 PM	Marsh Harbor-Friends of the Environment Office	12	SABHCA Proposal
13 January, 2010	7PM	BNT Retreat Office Nassau	40	SABHCA
5 March, 2010	6:30 PM	Sandy Point School	15	10 minutes during local govt. meeting.
25 March, 2010	7 PM	Cherokee Sound Community Center	1	SABHCA Proposal
30 March, 2010	7 PM	Sandy Point School	19	SABHCA Proposal
31 March, 2010	7 PM	Casuarina Point Volunteer Fire Dept	5	SABHCA Proposal
13 April, 2010	7 PM	Treasure Cay Community Center	40	SABHCA Proposal
27 April, 2010	7 PM	Cherokee Sound Community Center	9	SABHCA Proposal
TBD	TBD	Crossing Rocks School	?	SABHCA Proposal

Proposal Development

Community Consultation

Friends of the Environment organized a meeting in December 2009 to assess the community's interest in protecting the proposed area of blue holes, pinelands and mangrove creeks. Since that time, seven (7) additional meetings have been held throughout Abaco and one at The Bahamas National Trust Retreat in Nassau. All of the

one hundred and forty-one (141) of community members who have attended meetings thus far have been in favor of some sort of protection. One additional meeting is still to be scheduled in the settlement of Crossing Rocks which will finalize our first round of surveys concerning this proposal.

In addition to town meetings, Mr. Michael Pateman, of the Antiquities Monuments and Museums Corporation will be conducting random, individual interviews with various South Abaco community members concerning this proposal. These interviews will be conducted concert with data being collected for Mr. Pateman's Doctoral dissertation and this data will be incorporated into the final proposal document.

Land Ownership

During interviews with local stakeholders, all inquiries as to the ownership of the proposed land responded that this land has reverted back to Crown Land after the logging companies moved operations to Freeport, Grand Bahama in 1945. A formal request for proof of land ownership has been requested by the Antiquities Monuments and Museums Corporation to the Department of Lands and Surveys, as to the current legal status of the proposed land, though any change in assumed status is not expected.

Surveys

A survey was created to assess usage of the proposed area. The survey gathered data on demographics, activities taking place within the proposed conservation area lands, what time of the year are these activities conducted, level of protection the user would like to see for the proposal, how long each person has been using the land described, what infrastructure (if any) the users would like to see installed at the site(s), and willingness to pay a user fee. To date 35 of these surveys have been collected, and more have been compiled and due for delivery to the Friends office in Marsh Harbor in the near future. Details on survey data will be applied to the final draft of this proposal.

The Bahamas National Parks System

The Bahamas National Trust has the mandate and authority to build and manage the National Park System of The Bahamas. Created in 1959 by an Act of Parliament, The

Bahamas National Trust Act defines the leading role of the organization by stating, The Bahamas National Trust "shall be established for the purpose of promoting the permanent preservation, for the benefit and enjoyment of The Bahamas, of lands and tenements (including buildings) and submarine areas, for the preservation (so far as practicable) of their natural aspect, features and animal, plant and marine life".

The Bahamas National Trust has earned a national and international reputation of excellence. The Trust has an outstanding track record in conservation and resource management. It has set conservation examples and provided protected area models for similar organizations around the world, the Exuma Cays Land and Sea Park being a notable example.

The Bahamas National Trust currently manages 26 national parks throughout the country, covering over 700,000 acres of land. The Trust prides itself in working co-operatively with groups around the country to accurately and effectively establish the needs of our environment in order to best manage our national resources. The Trust aims to maintain, rehabilitate and perpetuate the inherent integrity and biodiversity values of our ecosystems.

Future Plans/Park Management

Once the protected area is established, a management plan will be created by The Bahamas National Trust in consultation with The Bahamas Caves Research Foundation, Antiquities Monuments and Museums Corporation, Friends of the Environment and with local stakeholder communities. Decisions concerning the management plan as well as any potential future changes to the management plan will not be made without first consulting stakeholder communities. The management plan will include:

- Park Sustainability

  Income generation strategies and uses for revenues generated. Some current suggestions include:

  - User Fees (individuals)

    - Impact fees (businesses)/eco-tourism operator licenses
- Enforcement strategies
    - BNT presence in park
    - Community watch
- Education and Awareness
- Zoning

Park Sustainability

The goal of revenue generation through activities in the Protected Area is to create a self-sustaining park. Those conducting business in blue holes: eco-tours or bonefishing charters for example, could pay an environmental impact fee. Visitors to the park could also pay a "user fee". User fees could be voluntary or enforced.

Funds generated will be used to properly manage the park, enforce park regulations and to add and maintain amenities that will benefit the community, like boat ramps and visitors' centers. This will make the Park sustainable over the long-term without requiring additional support from the Government.

Enforcement

Part of the management plan should focus on a partnership with The BNT, Antiquities Monuments and Museums Corporation and the Ministry of the Environment and Department of Marine Resources to establish a protocol for the public to report infractions in this and other Bahamas National Trust land and marine parks. Even though these agencies may not have adequate man-power to patrol all park areas, there are many locals who spend a lot of time within the proposed conservation area. If provided with a method for reporting, they could supply a lot of information on lawbreakers. There are locals who are motivated to do this, but they have been discouraged in the past because of the lack of action and accountability.

Education and Awareness

Community outreach has been ongoing in an effort to sensitize the community to the proposed park and attempt to build community ownership. These meetings are also open

the discussion on a park management plan. In order to develop the management plan meetings will be held in communities adjacent to and directly affected by the park and will include but are not limited to: Cherokee Sound, Casuarina Point, Crossing Rocks, Sandy Point and Marsh Harbour. These community meetings will be accompanied by a series of targeted, discussion-based, stakeholder meetings. Stakeholder groups that will be approached will include, but will not be limited to: bone fishermen, tour operators, business owners, community recreation groups, scientists and cave divers. Special effort will be made to include individuals that participated in the proposal development process.

In addition, Bahamas Caves Research Foundation, Antiquities Monuments and Museums Corporation, FRIENDS and BNT will offer presentations at Abaco schools that inform about all Bahamas National Trust Parks in Abaco, their boundaries, and regulations. The pinelands, blue holes and wetlands outlined in this proposal provide excellent living examples of Bahamian ecosystems and could function as field trip destinations, a way to visually reinforce lessons taught in the classroom. FRIENDS has already established a working relationship with 25 Abaco schools and offers presentations and field trips to coral reef, mangrove and pine forest eco-systems. In the Fall 2008 term alone FRIENDS involved 1,306 Abaco students in environmental education. Teaching youths is one of the best long term investments that we can make in conservation for our country's future.
Signage will be placed at boat ramps and common park entrance areas.

Zoning

The concept of zoning has been introduced during the initial community outreach and will be discussed further during the development of the management plan as well as changes proposed within the latest Forestry Act by the Government. The zoning concept has already been used successfully in marine protected areas around the world (Great Barrier Reef MPA, Australia; Florida Keys National Marine Sanctuary, USA; Cape Peninsula MPA, South Africa; St. Lucia Soufriere, Virgin Islands). By incorporating zoning into the management plan we could mitigate impacts on the area by addressing existing threats and the need to balance the dynamic between recreation and conservation.

Potential zoning categories:

- Commercial Fishing
- Subsistence fishing only (e.g. Line fishing)
- Hunting
- Catch and Release (for creek interior, to allow bonefishing to continue)
- Recreational Zone
- No development/dredging
- Seasonal zoning (based on times of year species most vulnerable)

As previously noted, No Take zones are not warranted for this proposal.

Special emphasis shall be placed on mitigating activities with a large impact on mangrove wetlands, pinelands and any activities that would disrupt the subterranean ecosystem. These activities would include but are not limited to: any development including dredging, filling, logging, quarrying, dock building, mangrove removal, aquaculture, breakwaters, and groins. Because the proposed area abuts existing settlements, there are some existing waterways that may require some periodic maintenance due to natural shifting of sand or storm impacts. It is recommended that in those cases the permit applications be reviewed and set with stipulations, e.g., the use of silting screens to reduce the impact on surrounding areas.

Conclusion

This proposal represents a new concept for marine protected areas on Abaco. Similar examples have proven successful elsewhere in the world and research has shown that community support is vital in the success of protected areas. When communities have participated in proposal development they tend to have greater respect for the declaration. There is a sense of ownership which aids in community enforcement of protected areas.

On the whole, there is widespread community support for protecting these now famous blue holes and the surrounding pinelands and wetlands, but we emphasize that fishing and recreational use of the area are important parts of Abaco culture, so the community is

less favourable to seeing the marine area within this proposal closed to all forms of fishing. At this point, the community is amenable to conserving the habitat and allowing fishing with existing regulations stipulated by The Department of Marine Resources. The presence of a park warden and the structure of a park management plan will help to enforce that legislation within the proposed area.

The proposed area was chosen because it contains sensitive habitats which are representative of their eco-systems. The area holds unique life and historical data that is specific to Abaco and no where else on earth.

This proposal supports the Program of Work on Protected Areas and will help The Bahamas to appropriately fulfill international commitments to The Conservation of Biological Diversity and The RAMSAR Convention.

Due to recent occurrences, the Abaco community has come to realize that it can no longer stand idly by; that action has to be taken now in order to keep these blue holes, pinelands and wetlands as they are. In the past, the value of blue holes and associated habitats was not fully known, and they have been mistreated through dumping and sewage contamination. We now have a chance to take a step that is proactive, instead of reactive, in conserving these irreplaceable treasures.

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Appendix

1. SABHCA Survey Form

Proposed South Abaco Blue Holes Conservation Area Questionnaire

The Bahamas National Trust, Bahamas Caves Research Foundation, Friends of the Environment, and Antiquities Monuments and Museums Corporation are partnering in a proposed Blue Holes Conservation Area on South Abaco. The land is located on the west side of Earnest Dean Highway, between the "fire tower" and the dock at Crossing Rocks.

This area has revealed more than 8 miles of amazing underwater passages filled with crystal formations, unique scientific history, and new species of cave adapted marine life.

We would appreciate your input as we move forward in our proposal for this conservation area. Please complete this questionnaire below and submit to Friends of the Environment. Please indicate your answers by circling it.

Do you currently use the proposed site for any activities? Yes - No

If yes, which activities are you involved with at the proposed site:

1. Hunting
2. Fishing
3. Cavern Diving
4. Cave Diving
5. Birding
6. Hiking/Nature walks/tours
7. Other – Please write in activity here: _____

If you use this area, what months of the year do you conduct your activities:
(please indicate if you use the area all year round)

_____

What level of protection would you personally like to see for the proposed area:

1. No protection needed
2. As-is status; no development, but allow all other activities to continue in this area. including hunting, fishing, diving, birding, hiking etc.
3. No Take Zone; no hunting, or fishing allowed.
4. No Access for other than scientific use.

How long have you personally used this area to conduct your activities?
_____ years.

What kind of infrastructure would you like to see installed in this area (if any) for local and tourism use;

1. Road maintenance
2. Parking areas and maintenance
3. Hiking trails
4. Boat Ramp
5. Observation platforms at or near blue holes or other features in the area.
6. Trash bins.
7. No infrastructure – Leave it exactly as it is.

Would you be willing to pay a small user fee (either per visit or annual) for access to this site to help pay for any infrastructure? Yes - No

Please give us any other input that you feel you would like us to represent in our proposal:

_____
_____
_____
_____
_____
_____
_____
_____