

**PHASE I REPORT
ENVIRONMENTAL SURVEY OF NAVASSA ISLAND**

August 24, 1981

Prepared For:

**ATLANTIC DIVISION
Naval Facilities Engineering Command
Norfolk, Virginia**

NAVY review
completed.



ecology and environment, inc.

195 SUGG ROAD, P.O. BOX 0, BUFFALO, NEW YORK 14225, TEL. 716-632-4491

International Specialists in the Environmental Sciences

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	PROJECT OVERVIEW	1-1
2	SURVEY METHODOLOGIES	2-1
	2.1 MARINE SURVEY	2-1
	2.2 VEGETATION SURVEY	2-1
	2.3 WILDLIFE SURVEY	2-2
	2.4 CULTURAL RESOURCES	2-2
3	SURVEY RESULTS	3-1
	3.1 MARINE BIOLOGY	3-1
	3.1.1 General Description of Marine Environment	3-1
	3.1.2 Coral Reefs	3-1
	3.1.3 Submerged Wall	3-2
	3.1.4 Fish	3-2
	3.1.5 Plankton and Benthic Communities	3-3
	3.2 VEGETATION	3-3
	3.3 WILDLIFE	3-5
	3.3.1 Birds	3-5
	3.3.2 Mammals	3-7
	3.3.3 Reptiles	3-7
	3.4 CULTURAL RESOURCES	3-7
4	CONCLUSIONS AND RECOMMENDATIONS	4-1
5	BIBLIOGRAPHY	5-1

LIST OF TABLES

Table

	<u>Page</u>
3-1 Preliminary Cultural Resources Site Information	3-8

1. PROJECT OVERVIEW

The firm of Ecology and Environment, Inc., (E & E) of Buffalo, New York, was retained in July of 1991 by the Atlantic Division, Naval Facilities Engineering Command to conduct an environmental survey of Navassa Island in the West Indies. This survey was intended to be a one time field investigation of the existing physical, natural, and cultural environment of the island. The survey was to be sufficient in detail to satisfy environmental documentation requirements should potential Navy use of the island require the preparation of an environmental assessment or environmental impact statement.

Navassa is a small (approximately 1,100 acres) uninhabited island in the Caribbean Ocean located about 90 miles south of Cuba and 30 miles west of Haiti. Navassa is under the jurisdiction of the United States Coast Guard which maintains an unmanned lighthouse on the island. For the purposes of this study, the consultant's field team reached the island via charter boat from Port Antonio, Jamaica, a distance of about 95 miles.

The field investigation team was composed of the following individuals:

- Richard T. Heiderstadt - Project Manager
- Laurence M. Brickman, Ph.D. - Marine Biologist
- Andy Szilagyi - Marine Biologist
- Craig R. Ferris, Ph.D. - Wildlife Biologist
- James Griffis - Botanist
- Carmine A. Tronolone - Archaeologist
- Linda A. Robinson - Archaeologist

The consultant's team was accompanied in the field by three civil engineers from the Atlantic Division: Richard Jarvis, William Gibbings, and Charles Walker. The entire team was supported on Navassa by the Second Topographic Platoon under the command of CW0-2 Steven D. Borgeson, without whose support the successful completion of E & E's field investigations on Navassa would not have been possible.

The consultant's field team members were on Navassa for varying periods, depending on the time required to complete the particular survey. The periods of survey were as follows:

Marine Biology: July 18 to July 22, 1981

Vegetation and Wildlife: July 18 to July 25, 1981

Archaeology: July 18 to August 6, 1981

Upon their return to Buffalo, the survey team members reviewed the field data and the available literature and prepared this report. The intent of this report is to briefly summarize the results of the literature review and field survey, and provide recommendations concerning the need for further environmental documentation should the Navy decide to proceed with a project on Navassa Island.

2. SURVEY METHODOLOGIES

The harsh environment of Navassa had a significant effect on the character and extent of field investigations on the island. The difficult terrain and rough seas were the primary controlling factors in the design of survey methodologies; however, it is believed that the surveys completed were sufficient to achieve the objectives of the study.

2.1 MARINE SURVEY

The purpose of the survey was to obtain an overview of the major marine communities that are found in the inshore waters of the island, including their distribution, composition, and relative health and productivity. The survey entailed conducting visual reconnaissance of the inshore waters of the island using both snorkeling and SCUBA, documenting the relative health of the reefs using the plotless line technique, and obtaining samples of the plankton and benthic communities around the island. In addition, a photographic record was made during the course of the surveys.

2.2 VEGETATION SURVEY

The survey method consisted of an extended walkover of the majority of the island in an attempt to observe all existing habitat types. Nested quadrats, consisting of 10 meter squares for trees, 4 meter squares for shrubs and 1 meter squares for herbaceous material, were used to quantify vegetation in each habitat type. Locations of

Approved For Release 2008/05/05 : CIA-RDP86-00178R000100060009-5
the quadrats were chosen based on initial observations of the immediate area within each habitat type.

2.3 WILDLIFE SURVEY

The wildlife survey was composed primarily of walking tours of all parts of the island in order to observe birds, mammals, and reptiles. In addition, the coastline of the island was observed from a boat, and snap traps were set for small mammals and reptiles.

2.4 CULTURAL RESOURCES

The survey of the island's cultural resources was designed to identify and evaluate both historic and prehistoric resources. Historic resources were identified from aerial photographs and early maps. Prehistoric resources were identified by a comprehensive walking survey of the island. The walking survey utilized both interval transects and random walking, depending upon terrain and the extent of previous disturbance due to phosphate mining.

3. SURVEY RESULTS

3.1 MARINE BIOLOGY

3.1.1 General Description of Marine Environment

The inshore waters of Navassa Island do not exhibit the typical coral reef-lagoon structure found around most Caribbean islands. With the exception of the northwest shore, the sheer cliffs descend to a depth of about 50 to 60 feet below the water surface. The cliffs are undercut at the water surface and large boulders broken from the rock face are found at their base, especially along the more exposed shorelines. The bottom slopes gently to about 80 to 90 feet away from the cliffs. It consists primarily of bare sand interspersed with coral encrusted rock and patches of algae. At the northwest point and along the northwest shore a small fringing reef system is evident. This reef system exhibits grooves incised in the reef oriented with the wave action and currents. The exposed reef indicated on the navigation chart no longer exists, possibly a result of Hurricane Allen.

Water visibility was in excess of 70 feet, except adjacent to the cliffs near the eastern shore where it was reduced to 30 to 40 feet as a result of wave action. Surface water temperature during the survey was 28.5°C, and surface salinity was 33.5 parts per thousand (ppt).

3.1.2 Coral Reefs

At depths of less than 30 to 35 feet, the small fringing reef system is practically devoid of living coral. Coral coverage in this area is estimated at less than 5% and consists of small scattered

Approved For Release 2008/05/05 : CIA-RDP86-00178R000100060009-5

colonies of encrusting forms, small sea fans, and sponges. The grooves contain bare sand and coral fragments including many abraded heads of brain coral. With increasing depth, the coral colonies become more abundant and larger. Similarly, the size and density of sponges, sea fans, and sea plumes markedly increase with depth. The transect data indicate that these reefs are in poor condition compared to those in Vieques or the Virgin Islands. Live coral coverage averaged less than 25% on Navassa as compared to 46% and 50% in the Virgin Islands and Vieques, respectively. No live branching colonies of elkhorn coral or staghorn coral, typically associated with shallow Caribbean reefs, were observed. These reefs are indicative of severe storm damage and although prior information is not available, the passage of Hurricane Allen just north of Navassa could account for their relatively poor condition.

3.1.3 Submerged Wall

The submerged walls around the island are encrusted with a wide variety of marine life. These include many different types of sponges, tunicates, algae, and hydroids along with corals, sea plumes, and sea fans. Sheet coral (Agaricia lamarcki) is the dominant coral, and many overlapping colonies were observed on the walls, particularly along the northern portion of the lee shore. The marine life on the walls increased with depth and was most abundant along the lee shore where wave action is less, permitting the attachment of the animals. The wave cuts at the surface contained many chitons, small gastropods, and algae.

3.1.4 Fish

The fish life around Navassa reflects the relative lack of habitat diversity and the island's oceanic setting. Many types of reef fish, including wrasses, parrotfish, squirrelfish, butterflyfishes, angelfishes, and damselfishes were observed during the survey. They were present in limited numbers and exhibited only weak territorial behavior compared to typical Caribbean reef fish associations. Few juvenile fish were noted during the survey. A number of large grunts,

groupers, and many barracudas were observed around the island. Oceanic or pelagic fishes were common. These included several species of jack and triggerfish, and bermuda chubs. Porpoises were also seen on several occasions.

3.1.5 Plankton and Benthic Communities

The plankton samples contained many species of copepods along with arrowworms, radiolarians, cladocera, small jellyfish (siphonophores), pelagic polychaetes, larval crustaceans and echinoderms, and fish eggs. A bloom of bluegreen algae was also noted in the plankton samples. The relatively high diversity and low density of the plankton are typical of the subtropical waters that are not influenced by land runoff.

The fauna inhabiting the sand bottom consisted of polychaetes, amphipods, cumacids, and nematodes. They were present in relatively low numbers in the bare sand substrate, as would be anticipated.

3.2 VEGETATION

The physical characteristics of Navassa have produced a flora in striking contrast to other West Indian islands. The vegetative pattern over the vast majority of the island is generally the same, with minor physiological differences attributed to soil conditions and the amount of exposure to the prevailing winds and salt air. The island's topography eliminates any kind of normal beach communities even along the northwest coastline where the rocky seawalls of 30 to 50 feet that surround the rest of the island diminish, and the steep slope from the upper plateau merges directly into the sea.

The island's upper plateau, for the most part, is covered with an evergreen woodland forest comprised mainly of four species: Ficus citrifolia, Sideroxylon foetidissimum, Coccoloba diversifolia, and Metopium Brownei. These four species form a generally mixed forest; however, there are patches where pure stands of the F. citrifolia, S. foetidissimum, and M. Brownei exist over limited areas. Another tree, Columbrina arborescens, exists within the forest but is uncommon. The plateau forest is generally well developed with the canopy obtaining heights of 20 to 30 feet. However, no shrubs and very little herbaceous growth were observed under the forest canopy. The herbaceous

growth that does occur is well scattered and generally confined to open, unmined areas growing on the limited pockets of soil between the rock.

The evergreen woodland forest extends down the steep slopes to and over some of the lower shelf, although the physical appearance of the species changes somewhat. Along the south side of the island, the evergreen woodland covers the steep slopes almost entirely as well as the better part of the lower shelf. Progressing easterly from the landing area and then northward along the eastern face of the island, the steep slopes from the plateau and the shelf become less and less densely vegetated. The vegetation on the steep slopes of the northern face and shelf is even less dense. Three of the four major tree species dominate the vegetative cover over the steep slopes and lower shelf, with the M. Brownei reduced in numbers. The characteristic growth patterns of the tree species change dramatically. The canopy cover over the slopes and lower shelf is greatest on the southwest quadrant of the island but the trees reach heights of only 15 to 18 feet. Progressing counter-clockwise around the island, these species are rapidly reduced to mere shrubs, and in many cases are less than three feet high. A shrub (Erithalis paraviflora) is scattered along the steep slopes and lower shelf, especially along the northern and eastern faces.

The second habitat type found on Navassa is related to the presence of a fan palm forest. The palm (Thrinax sp.) appears to have formed a moderately dense forest prior to the arrival of Hurricane Allen in 1980. Substantial amounts of this habitat type were destroyed by the storm and the areas are presently exposed. New growth has begun and is evident throughout the island. The fan palm forest is generally restricted to pockets along the northern half of the plateau and encompasses the major portion of the northwest point. There appears to be no clear cut separation between the fan palm and evergreen woodland forests where the two habitat types merge. The palms are also sparsely distributed within the evergreen woodland forest previously described and are well mixed with the evergreen forest species on the steep slopes between the plateau and the lower shelf. Herbaceous growth under the palms is generally greater than in the evergreen forest, with Catharanthus rosea the predominant weed.

The magnificent frigatebird was the third large seabird on the island. It numbered approximately 75 to 100 individuals, most of which (80 to 90%) were immature. Small numbers (three to five) of adult females were observed on several occasions, and a single adult male was seen on two occasions. Frigatebirds were most often observed hovering high in the air along the southwest side of the island (primarily near Northwest and South Points) or perched in trees with the boobies along the forested slope.

Two species of terns were present on the island in small numbers; the brown noddy and the bridled tern. There were fewer than 20 individuals of each species. Both species were found only along the lower cliff face from an area just west of Lulu Bay, east to South Point. It is possible that a few sooty terns were also present, as reported by Ekman (1929), but all those observed were bridled terns.

Of the seven species of land birds observed on Navassa, the white-crowned pigeon and black-whiskered vireo were most abundant. They were found throughout the entire island where forested vegetation or scattered trees were present. It was difficult to determine their abundance, but several hundred of each species would be a conservative estimate.

Ground doves were common but not abundant, as they were limited by the availability of habitat. They prefer open treeless areas, with some bare ground, and a few (three to five) individuals could be found around almost every opening.

The remaining species of land birds were uncommon. The yellow-billed cuckoo was observed on three occasions, all in the vicinity of the landing or the lighthouse. None were heard calling, and their shy retiring behavior made it difficult to estimate their abundance. A single crow was observed from a distance, northeast of the lighthouse. It was tentatively identified by voice as a palm crow, but this was not confirmed. The grassland area near the northwest tip of the island supported two additional species: the gray kingbird (two observed) and the yellow-faced grassquit (two pairs observed). These were limited by habitat availability.

Cacti (Opuntia Nashii and Melocactus communis) are also fairly common and are showing signs of recovery from extensive storm damage.

Grassland or savanna as a habitat type exists only in the west central portion of the plateau. This habitat type is locally extensive and convoluted with grassy areas projecting into the surrounding forested area. The major grassland area is broken by scattered clumps of trees consisting of three of the four major species. Metopium Brownei was not prevalent within the grassland area. Patches of thrinax palm and cacti (Opuntia Nashii and Melocactus communis) are also present. The present savanna area shows no sign of human disturbance; it is possible this habitat was more common in other areas of the island prior to mining activities. •

3.3 WILDLIFE

3.3.1 Birds

Birds are the most conspicuous feature of the wildlife on Navassa. Twelve species of birds were observed: five species of seabirds and seven species of land birds. The red-footed booby was the most abundant species observed, numbering perhaps 1,000 to 2,000 individuals, of which approximately 90% were subadults. The largest concentration was on the forested slope along the southwest side of the island. A smaller concentration was located on the upper plateau northeast of the lighthouse, near and beyond the end of the railroad. Scattered red-footed boobies were found throughout the upper plateau in forested cover types, and in the scattered trees in the grassland area.

Brown boobies were much less abundant than red-footed boobies, numbering only about 100 to 200 individuals. As with the red-footed booby, most brown boobies observed were subadults. The subadults were mixed with the red-footed boobies along the forested slope, whereas the adults were most often observed flying near the edge of the lower cliff along the southwest shore, particularly near South Point. One female brown booby was observed incubating an egg on the lower shelf at South Point, and other adults showed particular interest in the observer as he walked through this area, probably indicating that this was the location of a nesting colony.

TABLE 3-1 PRELIMINARY CULTURAL RESOURCES SITE INFORMATION

Site Number	Site Name	Period	Approx. Size	Condition	Significance*
12Hwd1-1	Navassa Phosphate Mining Company Facilities	ca 1860-1890	NA	Deteriorated	Yes
12Hwd1-2	Navassa Lighthouse Facilities	ca 1916-present	NA	Good	Yes
12Hwd1-3	Grassland 1	Prehistoric	700m ²	Disturbed	Marginal
12Hwd1-4	No Name	ca 1860-1890/ Prehistoric	NA	Good	Yes
12Hwd1-5	No Name	Prehistoric	8,000m ²	Good	Yes
12Hwd1-6	Grassland 2	Prehistoric	4,400m ²	Disturbed	Marginal
12Hwd1-7	Cavern 1	Prehistoric	8m diameter	Good	Yes
12Hwd1-8	No Name	Prehistoric	1,200m ²	Good	Yes
12Hwd1-9	Cavern 2	Prehistoric	6 X 10m	Good	Yes
12Hwd1-10	No Name	Prehistoric	1,500m ²	Good	Yes
12Hwd1-11	No Name	Prehistoric	7,500m ²	Good	Yes
12Hwd1-12	No Name	Prehistoric	1,960m ²	Disturbed	Marginal
12Hwd1-13	No Name	Prehistoric	7,850m ²	Disturbed	Marginal
12Hwd1-14	No Name	Prehistoric	7,050m ²	Disturbed	Marginal

*Appears to meet National Register Criteria

3.3.2 Mammals

Goats were introduced to Navassa Island some time in the past and are now the most conspicuous mammal. Small groups of 3 to 10 were observed at several locations on the upper plateau, and goat droppings were present nearly everywhere on the upper and lower shelves and on the forested slopes. It is difficult to estimate the number of goats present, but the "herds" of 40 to 50 that have been reported in the past were not evident. The abundance of goat droppings indicates that either a larger population exists than is at first obvious, or the droppings decompose slowly and accumulate over time. The latter is suspected, and it is estimated that there are not more than 50 to 100 goats on the island. A single rat was killed in the building near the lighthouse, and a large cat was seen on the railroad tracks near the lighthouse. Scats, presumed to be from a cat, were found in the grassland area and in the opening across the tracks opposite the lighthouse.

Bats are the only endemic mammals. Two species have been reported (Ekman 1929), and although bats were observed near the lighthouse, none were captured or identified.

3.3.3 Reptiles

Nine species of reptiles have been collected on Navassa Island, most of which are either unique species or subspecies. Two species (Cyclura cornuta onchiopsis and Leiocephalus eremitus) are now thought to be extinct (Schwartz and Thomas 1975; Thomas 1981). Of the remaining seven species, two are snakes and five are lizards. No snakes were observed on the island, but lizards were abundant. Four species of lizards were collected and preserved, and a partial specimen, perhaps an additional species, was also collected. Two species of lizards were very abundant, the others were only rarely encountered. A list of the species collected awaits positive identification.

3.4 CULTURAL RESOURCES

The results of the cultural resources survey are summarized in Table 3-1.

5. BIBLIOGRAPHY

Ekman, E.L., 1929, Plants of Navassa Island, West Indies, Arvik for Botanic 22(16): 1-12.

Schwartz, A., and Thomas, R., 1975, Check-list of West Indian Amphibians and Reptiles, Carnegie Museum of Natural History, Special Publication 1:216.

Thomas, R., 1981, Personal Communication, Department of Biology, University of Puerto Rico, Rio Piedro, Puerto Rico.

4. CONCLUSIONS AND RECOMMENDATIONS

The results of the various surveys conducted clearly indicate a need for further detailed evaluation of any construction project on Navassa Island of a magnitude that would significantly disturb the island's existing environment. Areas of concern include loss of endemic species of vegetation and wildlife, disruption of existing bird colonies, and damage to historic and prehistoric resources.

Specific additional work that will be required includes preparation of an environmental assessment of the proposed project, evaluation of alternatives, and development of mitigative measures to be implemented should the project proceed forward into the construction and operation phases.

*Appears to meet National Register Criteria