SALT RIVER BAY NATIONAL HISTORIC PARK AND ECOLOGICAL PRESERVE

GEOLOGIC RESOURCE MANAGEMENT ISSUES

SCOPING SUMMARY

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Geologic Resource Evaluation
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INTRODUCTION

The National Park Service conducted a Geologic Resources Evaluation scooping meeting at Salt River Bay National Historic Park and Ecological Preserve on April 6, 2004. The purpose of the meeting was to discuss the status of geologic mapping in the park, the associated bibliography, and the geologic issues in the park. The products to be derived from the scoping meeting are: (1) Digitized geologic maps covering the park; (2) An updated and verified bibliography; (3) Scoping summary (this report); and (4) A Geologic Resource Evaluation Report which brings together all of these products.

Salt River Bay National Historic Park and Ecological Preserve (SARI) was established by Congress on February 24, 1992 to protect and preserve an astounding array of natural and cultural resources. The park includes fragile coral reefs, a submarine canyon, and the largest remaining mangrove forest found in the Virgin Islands. The National Park Service and the Government of the U.S. Virgin Islands jointly manage this 1,015 acre park and preserve.

Salt River Bay National Historic Park and Ecological Preserve is not identified as an inventory and monitoring park, and therefore, significant time was not spent addressing the geologic inventory and monitoring needs. However, the scoping meeting participants identified the following as the most significant geologic resources management issue at the park:

1. Complete structure and bedrock maps to compliment existing benthic habitat maps.

SARI MAPPING PRODUCTS

Salt River Bay National Historic Park and Ecological Preserve has “quadrangles of interest” (or “QOI’s”) at the 7.5’x7.5’- *(1:24,000) scale.* It is desired to obtain DIGITAL geologic map coverage for all identified 7.5’ qoi’s.

While numerous “paper” maps at suitable scale have been published for this park, complete DIGITAL geologic map coverage is not known. It is hoped that through the scoping meetings and discussions with park staff , USGS and state geological surveys that gaps in DIGITAL coverage can be resolved for areas not currently known to have digitized geologic maps. These meetings lay the foundation for a plan to accomplish this task

The contents of this document reflect what is known regarding published geology as of September 6, 2005 from searches done by NPS-GRD staff as discerned from the USGS on-line geologic maps database found at
http://ngmdb.usgs.gov/ngmdb/ngm_compsearch.html

All comments and suggestions to improve this understanding are most welcome at this time and will be summarized in a summary report following from this meeting.

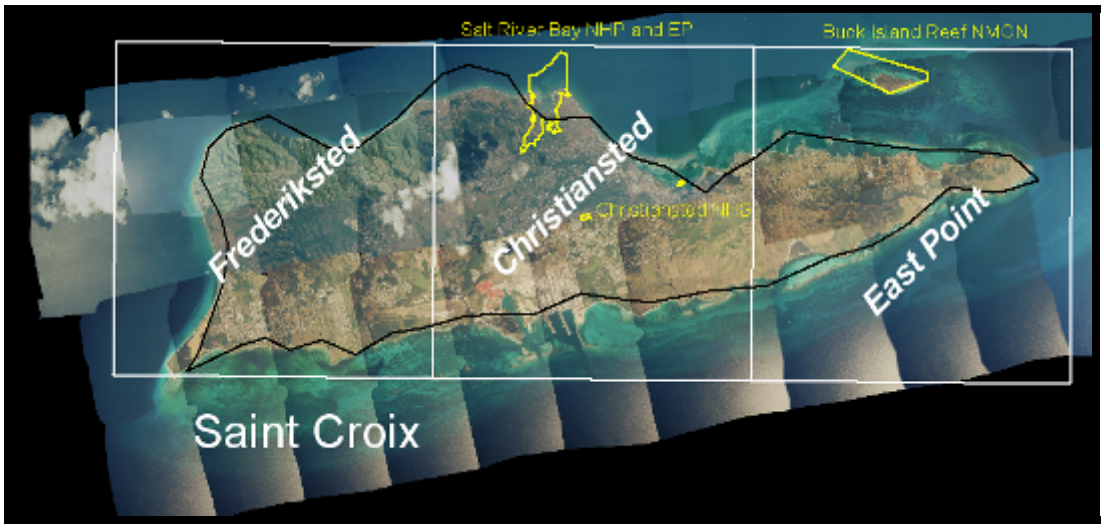
In short, it appears a few maps do give coverage for the island of Saint Croix as follows:

- NOAA Benthic Habitats map
- Whetten, J.T., 1966, Geology of St. Croix, U.S. Virgin Islands, Geological Society of America, Memoir 98, 1:31,680 scale

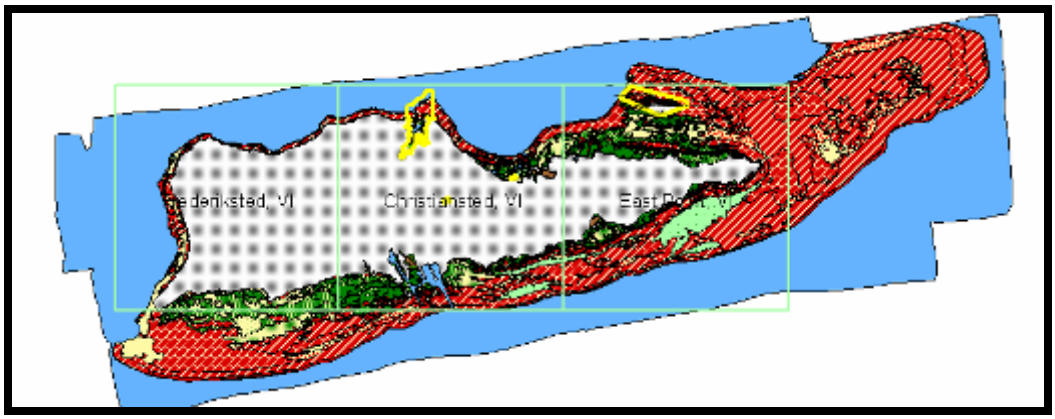
During the scoping sessions held in April 2004 for BUIS, SARI and CHRI, it was decided that the Whetten map would be the best available source to give the bedrock geology of the island of Saint Croix, as it would also encompass the three NPS areas present. NPS-GRE staff will acquire the original map and convert it into a digital user-friendly GIS product.

The NOAA benthic habitat maps will accompany the bedrock map of the island and is already available digitally. NPS-GRE staff will incorporate it as well into a final geologic map of the island. A summary table follows along with explanatory graphics.

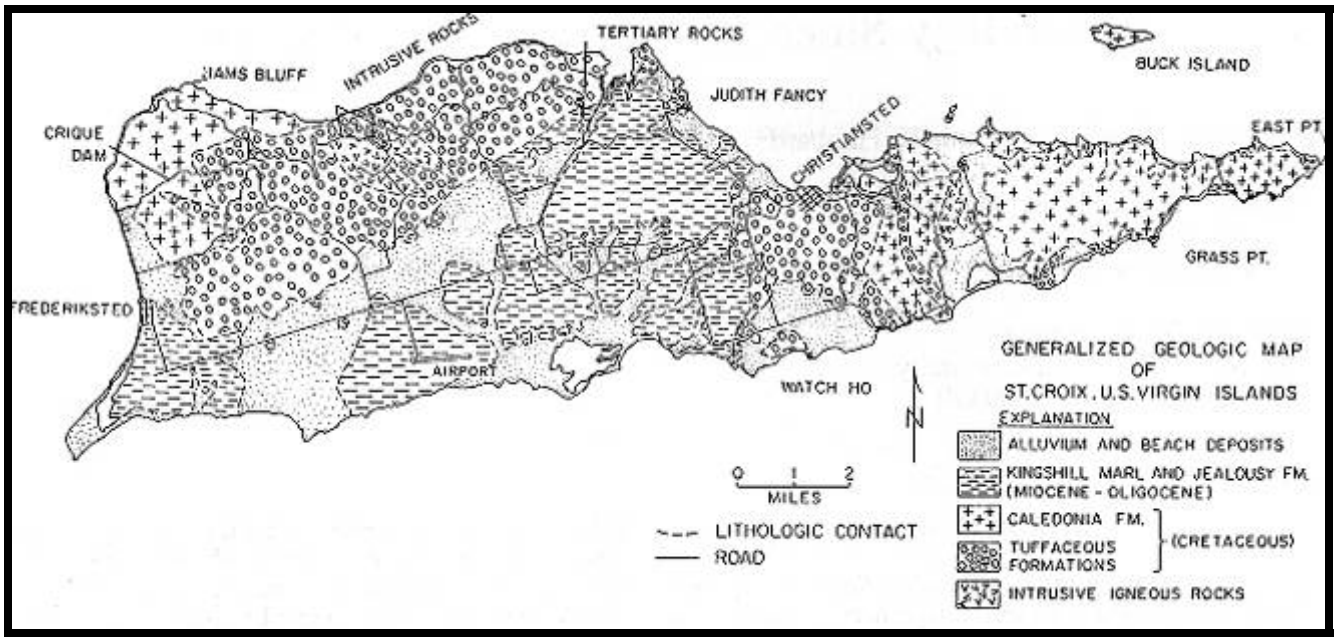
Extent of Coverage	Published Map Citation	Paper	Digital	GRE Plan
Entire island of Saint Croix	Whetten, J.T., 1966, Geology of St. Croix, U.S. Virgin Islands, Geological Society of America, Memoir 98, 1:31680 scale	yes	Unknown	Acquire paper copy and convert to digtal
Entire island of Saint Croix	Kendall, M.S., M.E. Monaco, K.R. Buja, J.D. Christensen, C.R. Kruer, and M. Finkbeiner, R.A. Warner, 1999, Benthic Habitat Maps of the U.S. Virgin Islands-St. Croix; Prepared by Visual Interpretation from Remote Sensing Imagery Collected by NOAA in 1999, 1:6000 scale	Unknown	Yes, from NOAA	Convert NOAA digital version to NPS format



Quadrangles of Interest (QOI's) for BUIS, SARI, and CHRI (7.5' shown in white outline; park boundaries in yellow outline; MrSID image of Island of Saint Croix as background).



NOAA Benthic Habitats of Saint Croix Island



Scan of Generalized Geologic Map of Saint Croix (after Whetten 1974, in Hubbard SP8)

GEOLOGY AND STRATIGRAPHY OF SARI

Salt River Bay consists primarily of two geologic units - the Miocene Kingshill Formation and the Cretaceous Judith's Fancy Formation (Justus et al 1975, Gill et al 2002a, Gill et al 2002b, Kendall et al 2005). The Kingshill Formation is predominantly composed of limestone. This unit underlies much of the Salt River drainage basin and the area south of the park. The northern portion of the basin and the exposed bedrock around Salt River Bay are composed of the Judith's Fancy Formation. This unit consists of volcaniclastics, sandstone, mudstones, and a few small gabbro and diorite intrusions (Kendall et al, 2005).

The Salt River Bay National Historic Park and Ecological Preserve encompasses an estuary and a submarine canyon that are separated by a narrow coral reef. The estuary is divided into three embayments including Sugar, Triton and Salt River Bays. Sediment cores taken within the park demonstrate a fining-upward in estuarine deposition, most likely reflecting the gradual enclosure of the estuary due to reef accretion, and the corresponding decrease in open marine conditions (Hubbard, 1989).

The accretionary reef at Salt River Bay has effectively created a depositional barrier between the estuary and submarine canyon. Sediments within the upper estuary are terrigenous, containing mollusk and *Halimeda* fragments. Seaward of the reef, sediments rapidly coarsen and reef components become increasingly important. Sediments within the canyon are almost exclusively carbonate in composition due to bioerosion. The canyon floor is composed primarily of medium to coarse grained carbonate sands (`0.27 – 0.99 mm), becoming increasingly finer down canyon (Kendall et al 2005).

Salt River Canyon is believed to be related to a previous lowstand of sea level. The Salt River Canyon extends to a depth of 80-100 meters at its seaward edge. Due to sedimentary deposition and reef accretion, the canyon is in a constant state of transition and is most likely vastly different from its original topography.

Currents within Salt River Canyon rarely exceed 10-15 cm/sec. However, currents greater than 50 cm/sec were observed down canyon during storm events (Hubbard, 1989). In addition, suspended sediment loads within the canyon are normally high, and increase dramatically during storm events. It is estimated that 66,000 kg of sediment enter the canyon annually, with approximately one third of the total introduced during storm events. In contrast, only ~18,000 kg of sediment are removed from the system each year, creating a gradual net increase within the canyon. The long term build up of sediments is periodically purged during storm events and hurricanes (Hubbard 1989, Kendall et al 2005).

In general, sediments move from east to west on the shelf adjacent to the submarine canyon. This movement creates highly different characteristics on the east and west canyon walls. The eastern wall is characterized by a gradual slope, covered in cobbles and sparse corals. Organisms that can tolerate high sediment influx and scouring such as gorgonians and sponges are dominant. In contrast, the western canyon wall is steep with many overhangs and caves. Numerous grooves and tributaries cut into the canyon wall, and abundant fracturing and slumping are evident. Primary organisms found on the western wall include antipatharians, scleractineans corals and plexaurids.

The most common corals include *Mantastrea annularis*, *Siderastrea* sp. and *Agaricia* sp. (Hubbard 1989).

SIGNIFICANT MANAGEMENT ISSUES

Salt River Bay National Historic Park and Ecological Preserve is not identified as an inventory and monitoring park, and therefore, significant time was not spent addressing the geologic inventory and monitoring needs. However, it was discussed that if possible, structure and bedrock mapping should be completed to compliment existing benthic habitat maps. Once complete, the geologic framework may help park managers to understand modern coastal dynamics and morphology by defining which areas are predisposed for more rapid change and/or evolution. Surface and subsurface lithology should be included.

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