

ST. CROIX EAST END MARINE PARK USE ASSESSMENT

All previous STXEEMP data sets and literature were reviewed and summarized. Anecdotal information and qualitative data on public use of the park 's resources were found and it was concluded that direct sampling was required in the field. A rigorous sampling protocol was developed and data was collected 12 times between 28 October 2010 and 15 December 2010. This data establishes a baseline for use on weekdays, weekends and nights for 2010 levels. Various other data sets are also included in this final report, including previous activity surveys and a phone survey of tour operators. Several recommendations are provided, primary among them is that this protocol be employed again periodically, especially after the marker buoys are installed.



Geographic Consulting
Natural Resource Management

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1. Introduction

The St. Croix East End Marine Park (STXEEMP) was established in 2002 making it a relatively new protected area. The STXEEMP boundaries were defined and the mission described in Act No. 6572, Bill No. 24-0308 (USVI 2002) and a management plan for the STXEEMP was also adopted in the same year. A significant aspect of the management involves the establishment of use zones. These areas were developed to protect areas of significant natural resources, but also to establish areas for recreation and fishing. The boundaries for these areas were chosen based on numerous stakeholder meetings and input from natural resource professionals. Enforcement of the STXEEMP regulations will only go into effect once marker buoys are installed to delineate the boundaries of the park and the use zones therein, and a 30-day public notice period has passed upon completion of the installation of marker buoys. From a management perspective it is highly desirable to know if installation of marker buoys will have an effect on the behavior of park users. In order to quantitatively measure such a change in behavior, baseline data must be established using a regimented, repeatable method. After installation of the buoy, park use can be re-measured using the same methodology and the results compared.

The goal of the project is to collect and analyze all available data sources pertaining to St. Croix East End Marine Park user activity and to collect additional data to address identified gaps in knowledge. Results and analysis are intended to assist STXEEMP managers with the implementation of the 2002 STXEEMP Management Plan while considering current user activity.

Geographic Consulting was contracted to complete five distinct tasks during the allotted time period.

1. Review and collation of existing data
2. Identification of data gaps and recommendations of ways to fill gaps
 - discussion of recommendations with STXEEMP resulting in decision on if and how to move forward in addressing gaps under the scope of this project
 - if pursuing new data collection activities might include development of schedules for observational data collection, assistance/facilitation with focus groups, etc.
3. Collection of new data as appropriate (see item #2)
4. Data analysis
5. Reporting including production of maps depicting various uses and areas within park

The results of these tasks are described in order throughout the remainder of this document.

2. Existing Data

A. Literature Review

Our first step in reviewing existing data and identifying gaps in information was an extensive literature review. As other studies have found, there is plenty of general information on the interaction of the public and marine resources in protected marine areas, but little information specific to the STXEEMP. Several reports provided information relevant to this study, including the following four primary documents that guided the process:

- “Resource Description Report,” prepared by Island Resources Foundation (2002);
- “Socio-economic Assessment,” prepared by Hinds, Unlimited (2003);
- “Management Framework for a System of Marine Protected Areas,” prepared by Lloyd Gardner of Environmental Support Services, LLC;
- “Management Plan: East End of St. Croix Marine Park,” prepared by The Nature Conservancy

These four documents were the primary planning tools in creating the STXEEMP and together, provide the most comprehensive review of available data relating to the STXEEMP. A more recent review of biophysical data in and around the STXEEMP (Mayor 2006) is also an important resource for interpreting the potential effects of recreational use on natural resources. The following is a review of these documents including information from each that is relevant to this study. A list of the other documents reviewed is included in Appendix 1.

The Resource Description Report (2002) prepared by the Island Resources Foundation begins with an extensive review of the history of the establishment of Marine Protected Areas in the Virgin Islands. The report then developed a set of criteria to rate potential areas in the Virgin Islands for designation as a Marine Protected Areas. The primary features identified by IRF as important factors in evaluating potential sites include:

- The known presence of endangered, threatened or commercially important species for some significant life stages or functions (breeding, feeding, nursery areas, *etc.*)
- Significant habitat, especially reefs, sea grass beds and algal plains, and mangroves judged to be superior quality by experts or local users
- Habitats which supply special services such as coastal buffering and amelioration of impacts on both land (*e.g.*, reefs that act as breakwaters) and in coastal and nearshore waters (*e.g.*, filtering effects of salt ponds and mangroves).

Based on these criteria, several areas of the STXEEMP including Chenay Bay/Southgate, Great Pond Bay, Jack Bay/Isaac Bay, East Point/Point Udall and Coakley Bay were all identified as priority areas for protection. Of these, Great Pond Bay and Chenay Bay were identified as uniquely filling most of these criteria at a higher level than the other areas. However, all areas but East Point/Point Udall were rated as having high ecological significance. This report also identified gaps in information such as the lack of long term biological monitoring and mapping products.

The Socio-Economic Assessment of Marine Use in the Virgin Islands (2003) prepared by Hinds Unlimited also includes an analysis of all three major Virgin Islands. The authors' initial review of existing literature for the socio-economic survey came to much the same conclusion that we did: There is little quantitative data on public use of STXEEMP resources, and existing data is not spatially explicit enough to be used for targeted management. Given the time and resource constraints of their study, the authors chose to fill this gap with extensive stakeholder input. Stakeholders were invited to multiple meetings and asked to fill out surveys on a variety of marine resource uses. Stakeholders identified common activities at specific areas throughout the territory and the perceived impact of these activities on the resources. The following is a list of areas and the activities that occur at each location as identified by stakeholders:

- Chenay Bay – bird watching, swimming, kayaking, camping, snorkelling
- Green Cay- recreational swimming, diving, sailing
- Between Chenay and Teague Bays – fishing, swimming, hiking, ecotourism
- Teague Bay- yachting, hiking
- Pelican Rock – needs protection; barely hanging on
- Cottongarden Bay- swimming, personal watercrafts, camping
- Point Udall- to Great Pond Bay- hiking, ecotourism
- Jack and Isaac bay- snorkelling, swimming, lobstering
- Turner Hole- small boat-recreational, camping, hotel
- Rod Bay – possible hotels/golf course
- Great Pond Bay- camping, kayaking, launch

This provides a good overview of all of the perceived uses of each the major bays within the STXEEMP, but the authors acknowledge they were not able to make direct field measurements or collect data on the extent of each activity.

The Management Plan for the East End Marine Park (2002), prepared by The Nature Conservancy gives a comprehensive overview of the background of the STXEEMP, the resources being protected and managed, the potential threats to these resources and a plan for managing the park within this context. Six primary management targets were identified: Sea Turtles, Parrot Fish, Aggregating Fish Predators, Seagrass Communities, Mangroves/Salt Ponds,

and Coral Reefs. Complete reviews of the status, threats and management suggestions for each of the targets are described.

The authors identified a number of recreational activities that could negatively affect the marine ecosystem including boating, snorkeling, diving and swimming. The authors also briefly mention fishing as a potentially damaging activity, however they acknowledge this is an extremely complex issue, the scope of which is beyond a document intended as an overview of issues. A number of activities were listed as currently occurring in the park (in 2002, at the time the report was submitted). There was no indication as to how this list was generated:



Small anchored boat off the south shore of the STXEEMP

- **Commercial Fishing:** Netting, trapping, hook and line, spear fishing, diving for conch and lobster
- **Recreational Fishing:** Hook and line, spear fishing, diving for conch and lobster
- **Diving:** Both tour operators and private boats
- **Snorkeling:** Both tour operators and private boats
- **Jet Skiing:** Privately owned
- **Wind Surfing:** Both rented and privately owned
- **Kayaking:** Both rented and privately owned
- **Sailing:** Both rented and privately owned
- **Motor Boating:** Both rented and privately owned
- **Anchoring:** All boat types
- **Beach Camping:** Primarily local residents

Of particular relevance, is the authors' comment that the details of these activities "need to be quantified and synthesized". In fact, at several points throughout the document, the need for resource use/user monitoring is cited as a necessary component of park management and a priority for implementation.

The document produced by Lloyd Gardner: "Management Framework for a System of Marine Protected Areas" (2002) was not directly relevant to our analysis of public use of the EMMP. The

document primarily provides a theoretical framework for creating and running a marine protected area, but has little site-specific information that is required for a use assessment project.

A 2006 report on the biophysical properties of the STXEEMP provides an extremely useful and comprehensive analysis of existing data and ongoing data collection methods used by a variety of agencies as they can be applied to the STXEEMP (Mayor 2006). As with each other document, Mayor points out the need for monitoring and data collection specifically geared to the STXEEMP and its needs. In this analysis, fishing data and distribution in the park was pulled from commercial catch reports submitted to DPNR –DFW and from a NOAA Biogeography Project. Drawing conclusions from the catch reports is difficult because catch locations are not limited to STXEEMP boundaries. Based on his analysis, Mayor identified queen conch and red hind groupers as biological indicators to be monitored for management effectiveness of the STXEEMP.

In an analysis of water quality standards found in the same report, Mayor found that minimum water quality standards were not always met within the park. This conclusion was based on monitoring conducted by DPNR-DEP's. Reasons for the occasional poor water quality were not clear and Mayor points to the need to connect water quality monitoring to the public's use and activities within the STXEEMP.

After our literature and resource review, the essential gap in the data that was clear to us and was also expressed by the other reports was a quantitative, repeatable, spatially explicit study of the public's use of the resources within the STXEEMP.

B. St. Croix EEMP Activity Survey

An earlier project began the process of describing the type and frequency of stakeholder activity within the St. Croix East End Marine Park borders in 2008. The project was performed with funding from NOAA, by STXEEMP staff, The Nature Conservancy (TNC) staff and local volunteers. The goal of the project was twofold, to engage motivated volunteers in a meaningful activity that would benefit the park managers and also to obtain observational data on an on-going basis.

Data sheets were developed for recording observations and volunteers were trained in data collection methods. A copy of the Activity Survey Data Sheet appears in Appendix 2 of this

document. Emphasis was placed on recording observations; any interaction/confrontation between observers and subjects was discouraged. Volunteers recorded various activities observed within the park between the dates 9 January 2009 – 28 April 2010. Seven volunteers made a total of 262 unique observations in 12 general locations. Geographic Consulting was not involved in the process, but has summarized the data sheets here as a preliminary step in describing park user activity and identifying data gaps.

Before analyzing the Activity Survey data, it is important to make a statement about some of the limitations resulting from the data collection method and the qualitative nature of the data. The Activity Surveys are useful in describing what type of activity was observed at certain locations and may have also been effective in motivating the volunteers to get involved in STXEEMP activities. However, the information was not gathered using a repeatable method and sampling was uneven in both space and across time. In general, the observations recorded tended to be qualitative and varied between data collector. Some examples of the unquantifiable data are statements such as “lots of jet skis” and fishing activity “mostly on weekends”. The *ad hoc* nature of the data collection means that there were uneven numbers of observations, some areas were not sampled and the sampling was conducted by multiple individuals at varying times. For example, some bays received no observations, while Coakley Bay has many observations and Hugh’s Point has almost daily observations, but only for a three week period. This means there was no unique sampling method for each area, therefore, the data may not be used to compare which bays have more or less activity, nor may it be used to extrapolate monthly/annual totals for any one area or for the park as a whole. As a result, no baseline numbers could be established. Perhaps more importantly, the method was not repeatable. This means that the data cannot be used to indicate levels of activity before and after the installation of the marker buoys.

Despite the drawback of the data set, we derived some meaningful information based on actual field-recorded observations. In this analysis an observation is defined as a recorded observation by an individual of an activity in a unique location on a unique date. An observer may record several activities (such as walking, swimming and fishing) in a single observation. All activities are described here as either Land Activity or Sea Activity, depending on how the people arrived at the STXEEMP. Observation data sheets varied greatly in their level of detail, so we created general categories of activities into which observations could be grouped.

In Appendix 3, data is divided by location and the “Observation Number” indicates the unique dates at each location where activity was recorded. The four land activities are: 1- Fishing: by line, cast netting, spear fishing, and diving for lobster and conch, 2- Camping: by groups or individuals, usually with tents, with or without bonfires, 3- Recreation: including swimming,

soaking, snorkeling, sunbathing and surfing, 4-Walking: individuals, couples and groups of mostly adults taking walks, frequently accompanied by dogs. For the majority of these observations the number of individuals was reported while in other cases the data sheets simply note “2 families”, “large group” or other non-numeric measures. Sea Activities include people arriving by boat. The four Sea Activities are: 1- Anchored Recreational Boats: with people swimming, snorkeling, surfing or socializing, 2- Fishing: by line, cast netting, or drift diving for lobster, conch or an unknown purpose, 3- Boats underway: includes fishing boats, sailboats, and motorboats that do not stop within view of the observer, 4- Jet Skis: all personal watercraft underway, anchored or otherwise. Individual people were generally not counted in these observations, but number of boats frequently was. Observing boat activity from shore is notoriously difficult to discern, with or without binoculars. In this study the activity type was sometimes recorded as ‘transitional’ or ‘fishing’ but frequently no activity was specified. The number of boats was often recorded, but usually not the number of people. Where the observer recorded an activity, but not a number of people/boats, a minimum number was entered (one person per boat).

Observations in Coakley Bay, Jack’s Bay and Smuggler’s Cove account for the vast majority (101 of 126) of observations. The “totals” line in the table in Appendix 3 indicates that from land, fishing was the most frequently observed activity, but done by relatively few people, whereas the three forms of recreation were seen slightly less frequently, but in larger groups accounting for roughly triple the amount of people observed to be engaged in fishing activity. Sea Activities data was more general, but observations appeared equally distributed between fishing and recreation. The 266 Jet Skis observed on 81 dates indicate this activity is likely ubiquitous in the bays where it occurs. Additional interpretation of the data is not recommended.

3. Methods

An initial assessment of the existing data describing resource use at the STXEEMP was conducted to identify gaps in information (See 2A. Literature Review for details). It was determined that the primary information gap in park user activities was the lack of regular, systematic direct sampling of the public’s use of the park’s resources. Several reports described recreational hotspots based on anecdotal accounts or stakeholder meetings, but did not include quantitative data, including the St. Croix East End Activity Survey discussed above. Survey questions also tended to be open- ended making it difficult to quantitatively describe activities. To address this information gap, a new use-assessment survey was developed with a regimented protocol for regular data collection. The goal of the assessment was to accurately gauge the type of activities being conducted within the STXEEMP, the time (day/night, weekday/weekend, summer/winter) and frequency of the activity as well as its spatial distribution. The use-assessment was supplemented with phone surveys to businesses that use the park’s resources for tours.

A. EEMP Use Assessment Survey

In order to accurately characterize the use of the park's resources by the public and to document any changes in use patterns after installation of marker buoys, a use-assessment survey was developed by Geographic Consulting. The goal of the use-assessment survey was to systematically collect spatially explicit data in a uniform, repeatable, unbiased fashion. The STXEEMP Management Plan calls for the development of a "resource use/user monitoring protocol...specific to the Marine Park that will ensure regular data collection intervals and consistent methodologies." The protocol developed for this project directly addresses this need (Appendix 4). It was developed to be straight forward and repeatable so that STXEEMP staff could continue conducting the surveys with minimal interruption to other regular duties and so data collection could continue after the installation of the marker buoys. This activity is identified in the management plan as a "high priority activity" that "will establish baseline data" and "determine the direction of management practices".

The overall structure of the use-assessment survey involved collecting resource usage data at 36 survey points along the shorelines of the STXEEMP. These points are the traditional access points for park users to the shoreline by motor vehicle. During an initial drive-around with STXEEMP staff, all access points were identified, mapped and relevant information describing each spot was recorded. Based on this information, a driving route was established in which observers would visit each of the designated 36 access points and collect data on a predetermined set of variables both on-shore and off-shore. A total of 34 survey points were established within the park. Two boat launches outside the park were identified as likely launch points for boats entering the park for both fishing and recreation (Figure 1). At these two boat launch sites (1-Altona Lagoon boat launch and 2-Castle Nugent boat launch) the only metric recorded was the number of boat trailers. Once observers became familiar with the route, the entire route could be surveyed in approximately 4 hours.

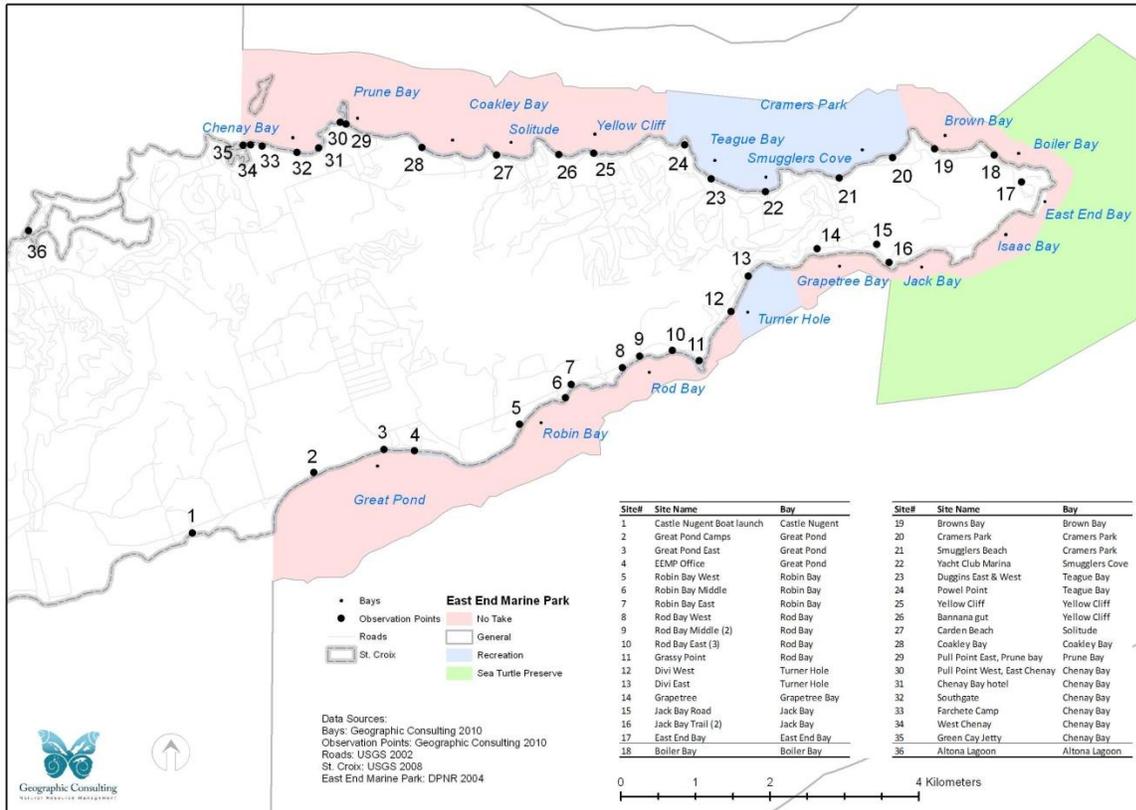


Figure 1. Data sampling points relative to their bay location and the proposed STXEEMP resource use zones.

At each survey point, the observer recorded the number of cars and boat trailers, the number of people participating in various shoreline activities, and the number of boats observed. A standardized protocol for data collection was developed and a comprehensive set of data sheets was created to aid observers in recording the correct information at each of the 36 sites. An example of one of these data sheets appears in Appendix 5, and the entire digital set of 36 unique pages of data sheets was submitted along with this report. Digital and paper copies of the blank sheets are also available from Geographic Consulting.

Although surveys are intended to be ongoing, at the time of this report’s submission, the driving route survey had been conducted a total of 12 times: four daytime weekdays, four at nighttime weekdays and four weekend days, between the dates of 28 October 2010 and 15 December 2010.

B. Vendor/Tour Operator Phone Survey

The Socio-Economic Assessment of Marine Resource Utilization in the U.S. Virgin Islands (Hinds Unlimited 2003) listed one of its key findings as the presence of significant gaps critical to social or economic assessments of MPAs. Specifically, the report cites an “absence of complete data on boating expenditures and numbers and types of boats...” and a “lack of detailed information on local industry/activity purchase patterns...”. To begin to address this

gap within the limited time-frame available, we created a list of natural resource/tourism businesses that may utilize portions of the STXEEMP. A number of these businesses use the park's resources on a regular basis for recreational activities and tours. Many of these businesses may not have been captured in the use-assessment survey but have the potential to significantly impact the park's resources, particularly as tourism grows on St. Croix with increased visitation by cruise ships.

A list of the businesses that potentially use the park's resources was generated from tourism websites, the phone book and word of mouth. Each of these businesses was contacted and a short phone interview was conducted to determine their frequency and scale of use of the park's resources, and locations within the park that activities occurred. Business activities included jet-ski rentals, kayak tours, kite surfing, SCUBA and snorkeling tours, sunset sails and fishing tours.

4. Results

Results of this study identify several trends in park user activity, both spatial and temporal. First and foremost, when all of the activities are combined within each bay and compared with other bays, there is an obvious uneven distribution in data, indicating several spots with peaks in the number of users. Chenay Bay, Coakley Bay and Cramers Park are popular sites on the north shore that receive far more park visitors than all other bays (**Error! Reference source not found.**). The infrastructure associated with these three bays is predictably far more developed than most other sample sites. Cramers Park has a large paved parking lot and covered picnic areas that attract large numbers of people on the weekends. Likewise, the Chenay Bay Hotel parking and facilities also attract visitors and the Green Cay Marina creates a high degree of boat traffic coming in and out of Chenay Bay. The table at the bottom of Figure 2 also provides a detailed description of the total area of various benthic habitat types present inside the boundaries of the STXEEMP.

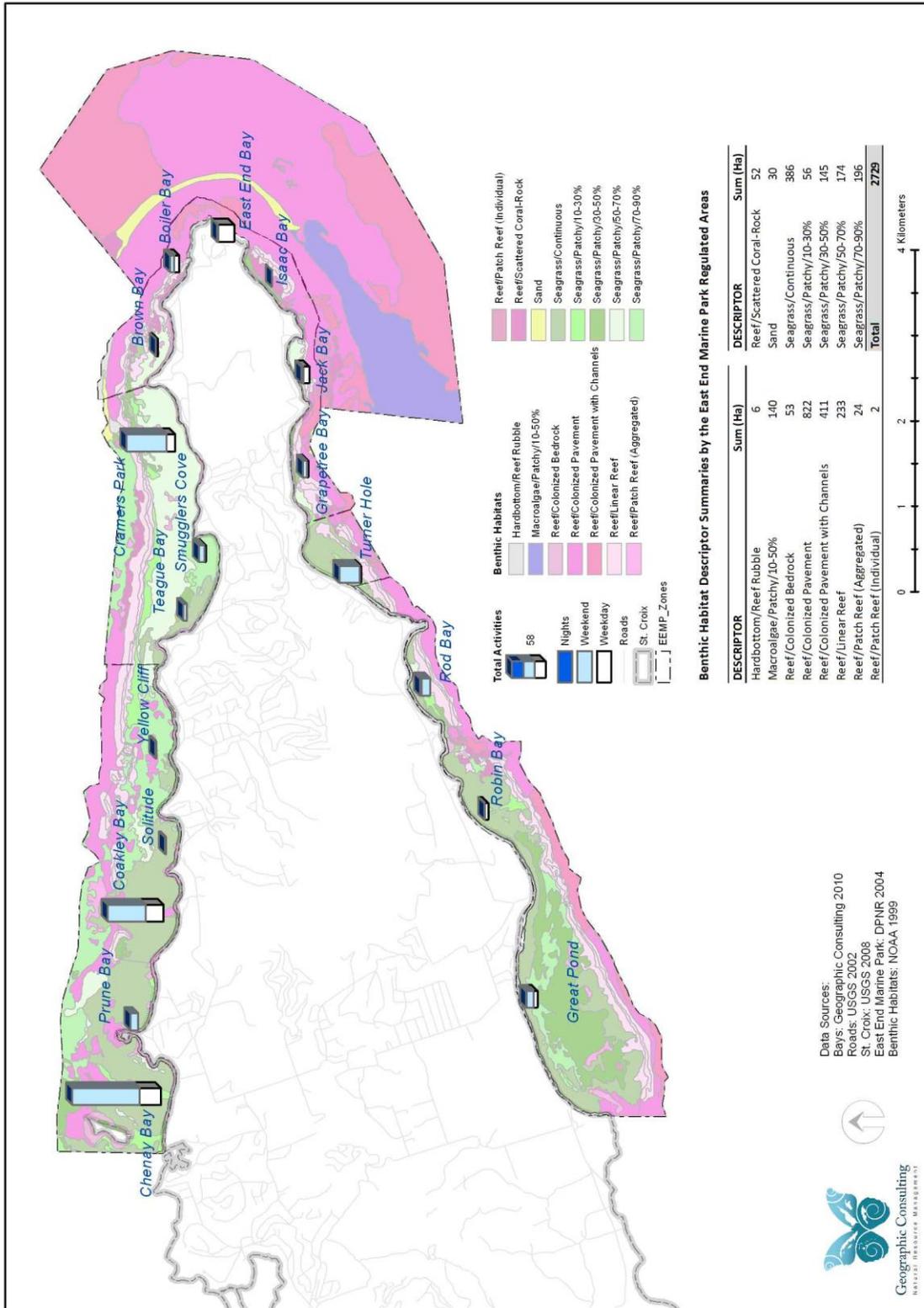


Figure 2. The spatial distribution of all activity types in each of the 18 bays and the time of the day/week when activity occurs.

In these three popular bays and in other bays around the park, data also indicate a trend in when activity occurs. Weekends see from two to five times more activity than weekdays in the popular sites, while evening activity is relatively absent (Figure 4). Weekend totals ranged from 65 to 116 observed users for the 12 data collection dates while the next closest bay, Turner Hole, had only 35 observations.

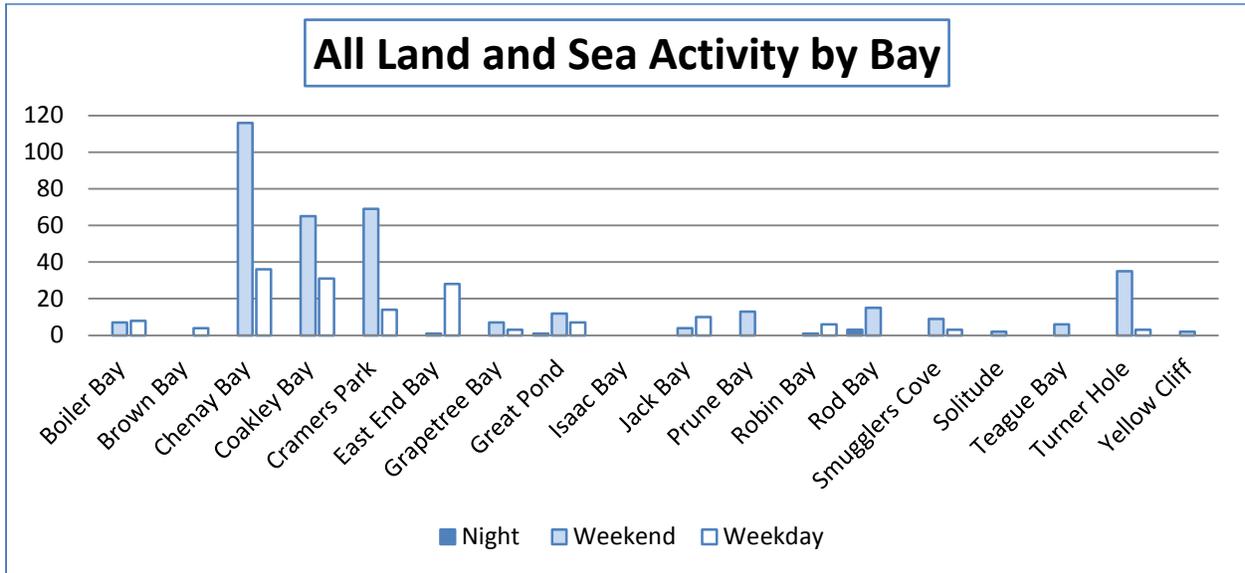


Figure 3. Summary of all land and sea activity from the 12 sampling dates, subtotaled by bay and time of the observation.

When the three most popular sites are removed from the analysis, interesting land use trends for the remaining bays also emerge. Five of the fifteen less frequently used bays experienced more activity during weekdays than they did on weekends (Figure 4). Many of these sites have only limited parking and the beaches are rocky and more suited to fishing than they are to recreation. Night time activity is more difficult to observe, but little to no nighttime recreation was observed. Fishing is the primary nighttime activity within the park boundaries but was also observed relatively infrequently.

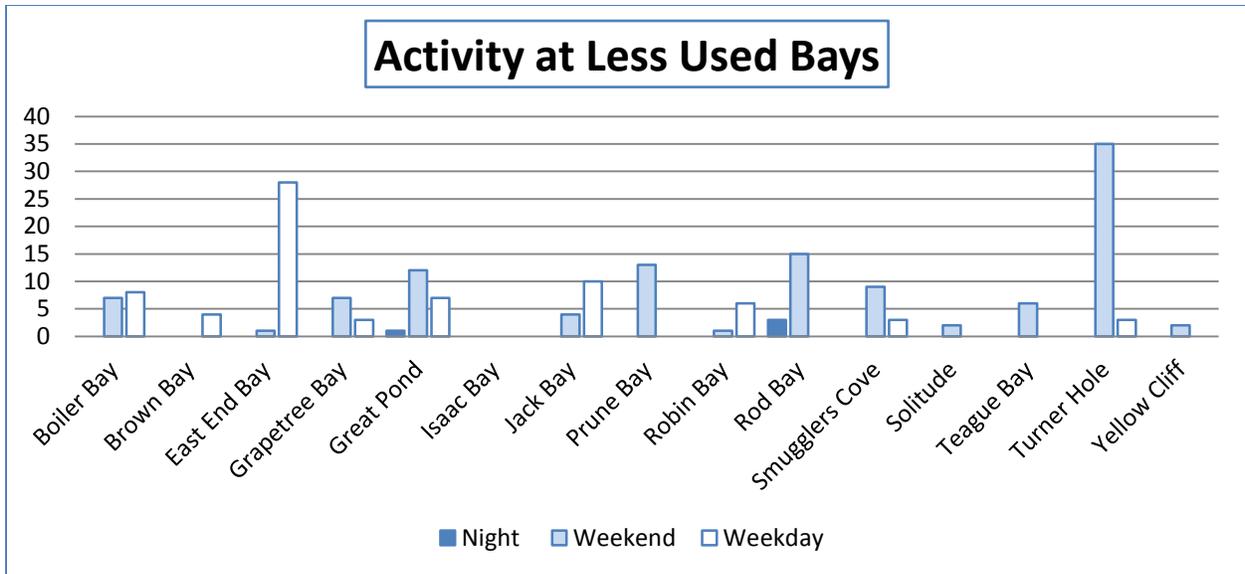


Figure 4. Total shoreline and sea activity observed in the 15 less frequently used bays

Due to the logistical challenges of observing nighttime activity and specific activities occurring far from the observation point, we developed a proxy measure to indirectly observe activity. After consultation with STXEEMP staff it was determined that park users were only arriving at sites in vehicles, not by foot. Therefore, counting unattended cars and boat trailers is an indication of the level of activity at the site. Figure 5 demonstrates the distribution of observed cars and boat trailers at the 18 bays within the STXEEMP boundaries and two additional boat launch sites outside of the park. Not surprisingly, Chenay Bay, Coakley Bay and Cramers Park again have the three highest numbers of observed cars. The number of boat trailer observations at boat launch sites was naturally higher than all other sites, but an interesting trend can be seen on the south shore. Great Pond, Robin Bay, Rod Bay and Turner Hole are four consecutive bays on the south shore with rugged dirt road access and are utilized by fishers and as long-term, multi-generational family camp sites. These four sites and Teague Bay/Smugglers Cove were observed to occasionally have boat trailers and vehicles (both during the day and at night) presumed to be associated with fishing.

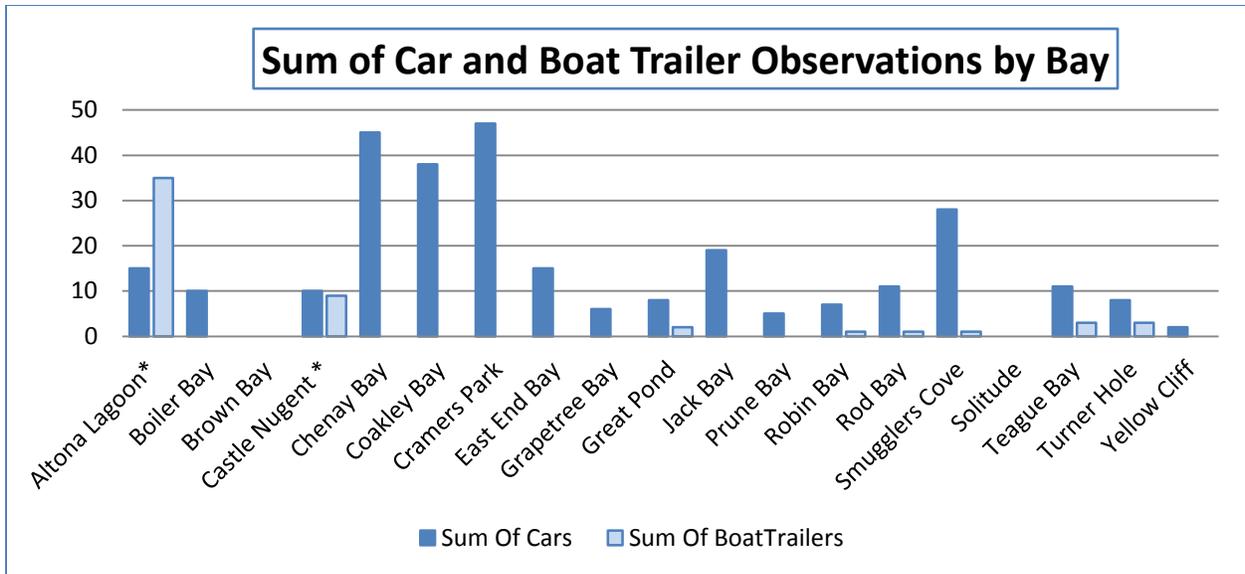


Figure 5. All observations of cars and trailers at 36 sampling sites in 18 bays

All forms of resource extraction are referred to here as fishing, including; line/nets/traps from shore and from boats, diving for lobster, conch and spear fishing. Figure 6 shows that observations of people actively fishing were relatively infrequent and tended to be concentrated in a few bays. Shoreline fishing activity was observed in only six of the 18 bays, with no more than five observations per bay. Figure 6 also shows the total number of observations of fishing from boats.

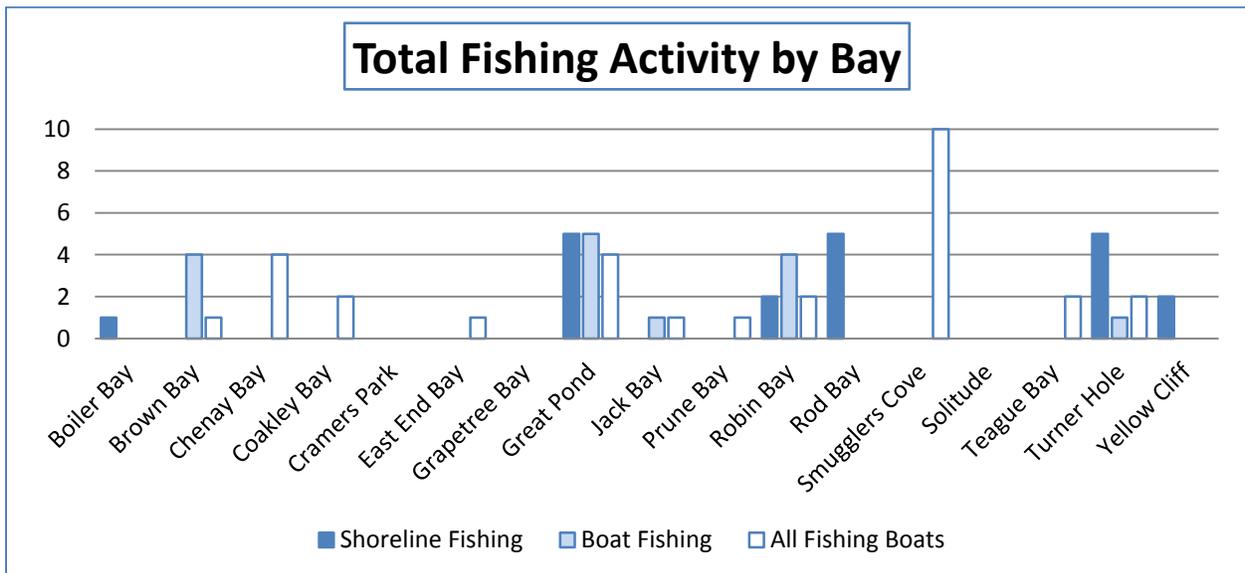


Figure 6. Summary of three types of fishing metrics; shoreline fishing, fishing from a boat and the presence of fishing boats (fishing or unattended).

In addition, a third variable “all fishing boats” includes unattended fishing boats (moored, anchored or docked) and can also be considered a proxy measure of potential fishing in the area.

The boat trailer data from Figure 5 corroborate the results depicted in Figure 6 and show fisher activity to be concentrated on the four consecutive bays along the south shore. Outside of these four bays fishing activity was observed only occasionally, even at well-know, long-established fishing spots. The high number of unattended fishing boats in Smugglers Cove is due to the presence of the Yacht Club.

5. Discussion and Conclusions

Given the large amount of data collected and the number of variables involved, there are many ways to examine the results of the use-assessment survey. We have summarized the most relevant conclusions and the potential effects on natural resources and associated management implications.

A. Shoreline Activities

Not surprisingly, areas with easy access to the shoreline, such as Chenay Bay, Coakley Bay and Cramer's Park all had high usage based on both the numbers of user activity (**Error! Reference source not found.**) and number of cars recorded (Figure 5). Turner Hole, the site of the Divi Resort, is also a weekend hotspot for recreational users. These areas are potential candidates for over-use and high impact on natural resources and may be good focal points for ongoing biological and recreational-use impact monitoring. Recommendations for biological monitoring can be found in Mayor 2006.

Chenay Bay's proximity to the Green Cay Marina, its many easy beach access points and the presence of a resort make it one of the most visited areas in the STXEEMP. As mentioned earlier in this document, it is also one of the most important areas in terms of natural resources, with an important sea turtle nesting beach, seagrass beds, patch reef, mangroves and a large salt pond providing diverse habitat for all life stages of many marine organisms. This is a potential area of conflict between recreational users and natural resources and is a good target for more intense monitoring and management.



Typical shoreline recreation activity on the north shore of the STXEEMP

At all other locations around the STXEEMP, shoreline activity was generally at a low level with few people seen at each location, both weekdays and weekends (**Error! Reference source not found.**). Though often at low levels, we found that shoreline activity occurred at all but two survey points. Further breakdown of recreational activity indicated the majority of shoreline activity occurred on land including activities such as walking, sunbathing or picnicking, rather than activities in the water such as swimming or snorkeling.

We did not observe any camping, but the survey period did not encompass any of the major holidays that are traditional camping and beach-going days. It would be useful to conduct the use-assessment survey during these holidays. The sheer volume of people on the beach and in the water during these holidays has the potential to have a large impact on the natural resources. Damage from improper trash disposal, noise pollution, waste oil from generators, and increased water turbidity are all potential threats to marine resources from camping.



Truck and trailer at a typical beach access along the south shore of STXEEMP

Most fishing activity that we observed occurred on the south shore, although there were no areas that could be considered “hotspots” (**Error! Reference source not found.**). Fishing involved little take, although take was not quantitatively assessed. In contrast, a 2006 review of the biophysical characteristics of the STXEEMP found that 1/3 of all finfish and 1/4 of all lobster and conch caught by commercial fishers in St. Croix came from the STXEEMP (Mayor 2006). Our surveys did not capture this. All observations from our use-assessment survey occurred from vantage points on land and even with binoculars, it is

impossible to tell the volume of fish caught on a boat or in fish traps from a distance. To monitor the volume of take from the STXEEMP, staff can work with DPNR-DFW to mine the commercial catch report data.

We observed a high degree of stewardship at south shore access points. At one location in Rod Bay, a group was observed picking up trash, caring for landscaped trees, cutting grass and maintaining a small shelter (shanty). Many of the beaches along the southshore are cared for year-round by multi-generational families that have been camping in the same location for

decades. This could be a useful opportunity for the STXEEMP to increase stakeholder involvement in the park by encouraging the maintenance of shorelines and access points. It also provides a great opportunity for outreach and education as family members of all ages were observed assisting in stewardship activities.

A socio-economic survey conducted in 2003 found that SCUBA was not a common activity in the STXEEMP; most SCUBA diving occurs in western St. Croix (Hinds Unlimited 2003). During the use-assessment surveys, no SCUBA activity was recorded and interviews with Tour Operators confirmed there is still little commercial SCUBA in the STXEEMP. We observed a few snorkelers, but only rarely. According to tour operators, snorkel tours that once regularly visited the STXEEMP have shifted to other locations outside of the park. Generally, SCUBA and snorkeling does not appear to be a significant activity within the STXEEMP. However, with increased tourism and the desire for new and different dive sites, this could change. There are several shipwrecks within the STXEEMP that could become more popular dive sites under those conditions (Appendix 7).

B. Boating Activities

Our results show two areas that have high levels of boat traffic: Chenay Bay (near the Green Cay Marina) and the St. Croix Yacht Club. Although both of these areas have coral and seagrass, Chenay Bay has been singled out as having especially high ecological significance for both Biological Services and Coastal Protection Services (IRF 2002). Coral reefs and seagrass beds are vulnerable to damage caused by anchors and boat groundings. In other areas of the Virgin Islands, damage to reefs from boat groundings and anchors has been severe (Rogers and Beets 2001) and coral has not recovered from the damage (Rogers and Garrison 2001 as cited in Rogers and Beets 2001). Even small boats anchored in seagrass and coral can cause damage. Chenay Bay contains priority habitat for adult marine organisms and important nursery, nesting and spawning habitat. In addition, Chenay Bay plays an important role in supporting priority endangered species and commercially important species (IRF 2002). This is an especially important area to maintain safe and functional mooring buoys to prevent anchor damage.



The dock at the St. Croix Yacht Club consistently had the highest average number of boats per site

There were two sites at which multiple stationary boats were observed: The St. Croix Yacht Club (at Smugglers Cove) and Chenay Bay. The number of stationary boats at Chenay Bay was relatively low, averaging only two per survey. The Yacht club, on the other hand, averaged 45 stationary boats per survey. This large number of boats can have negative effects on water quality through water contamination from fluid leakage and improper disposal of sewage. Additionally, regular boat maintenance activities (repair, painting, etc.) can add additional harmful pollutants to the marine ecosystem (Hinds Unlimited 2003). There is seagrass and coral reef in the waters surrounding the Yacht Club that are vulnerable to damage caused by these pollutants. DPNR – DEP collects water quality information at eight sites in the STXEEMP, including a site at the Yacht Club. The results can be accessed online through STORET, an EPA maintained database. This is a good resource for STXEEMP managers to use to monitor long term changes in water quality. It will not necessarily capture any changes in water quality due to finite events unless sampling happens to occur immediately after the event.

The two major boat launches: Altona Lagoon on the north shore and Castle Nugent on the south shore were, not surprisingly, the points with the most boat trailers (**Error! Reference source not found.**). Neither of these boat launches is actually within the STXEEMP but each is viewed as an indicator of boat traffic within the park. It is likely that boats launched from these points either travel to the park, or travel through the park to reach Lang Bank, a major fishing area off of eastern St. Croix. There were triple the amount of boat trailers at Altona Lagoon than there were at Castle Nugent. A few boat trailers were observed at small access points (undeveloped points with no facilities), primarily on the south shore. Access to the water along the south shore beaches is exclusively by rugged, unimproved dirt roads. Several of these roads are deeply rutted as a result of erosion and others traverse sensitive coastal habitat. From the fishers' perspective access can be difficult, especially during periods of high rain and the road take a toll on vehicles and trailers. **Error! Reference source not found.** shows some of the field conditions encountered on the south shore during this project. While accessing the water at these spots, vehicles and boats can potentially cause resource damage by driving on the beach, contributing to shoreline erosion, and launching into seagrass beds.



Figure 7. (A) Vehicle access across sensitive, flooded coastal habitat and (B) an eroded dirt road used to access the beach

Many of the south shore access points involved a dangerous re-entry to the South Shore Road. During the course of the survey, we observed a traffic accident in which a vehicle with a boat on a trailer could not see oncoming traffic and was hit by another vehicle. The creation of a well maintained, south shore boat launch at a spot of STXEEMP’s staff’s choosing (i.e. not in an ecologically sensitive area) with safe access to the road might reduce accidents, reduce beach and shoreline driving (thus reducing shoreline erosion) and allow STXEEMP staff to better monitor boat traffic and impacts on natural resources.

C. Tour Operator Survey

The tour operator phone survey showed that most of the commercial tour group activity occurs on the north shore of the STXEEMP (Appendix 6). These activities include sunset sails, jet ski tours and rental, kayak tours, kite surfing and occasional snorkeling tours. All of these activities occur regularly on the north shore of the STXEEMP, but only kayak tours and kite surfing occur regularly on the south shore. These two activities are relatively low impact and do not pose the same threat of anchor damage, boat strikes and introduction of pollutants that motorized activities do. Several of the tour operators were not knowledgeable about the STXEEMP rules and regulations. Once the marker buoys are in place, it is recommended that the STXEEMP staff provide tour operators with maps of the use zones and sensitive areas to avoid. Included with this should be a fact sheet with “Best Use Practices” for operating within the STXEEMP.

D. Potential Future Impacts

There are a few projects on the horizon that may cause major changes in recreational use of the STXEEMP. The projects with the most potential impact include two proposed resorts that have received CZM approval. One at Great Pond Bay has been in the works for many years and is

currently stalled due to litigation. The other, larger resort project has been proposed for construction at Robin Bay. Both of these will greatly increase the number of recreational users and the activities conducted on the south shore.

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Appendices

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Appendix 2. St Croix EEMP Activity Survey Data Sheet

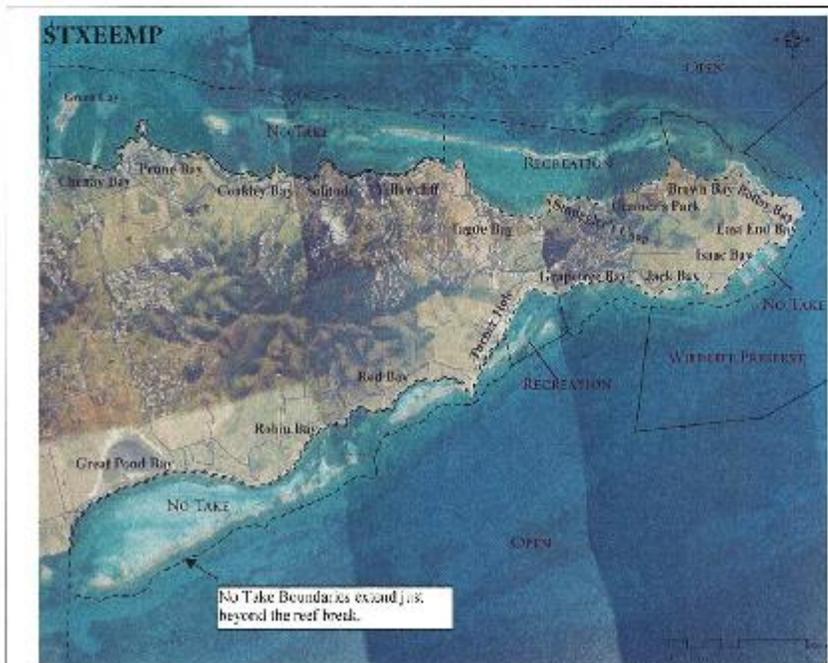


St. Croix East End Marine Park – Activity Survey Data Sheet (Observation only! Please do not approach users of the Park for information.)

DATE (note special events; e.g. regatta)		Examples of Activities Picking up trash; Littering; Deposit of any material brought into park (trash, debris); X activity on beach; Swimming; Snorkeling; Diving; Camping; Picnicking; Building fire; Walking; Hiking; Boating; Anchoring; Boat grounding; Fishing with appropriate methods in designated zone; Kayaking; Wind surfing; Kite boarding; Damage to and/or extraction of vegetation, markers (buoys, signs), historical or cultural resources, coral or live rock; marine life species, etc.
TIME		
OBSERVER + PHONE NUMBER		
OBSERVATION METHOD (e.g. roadside, from boat, etc.)		
AREA OF PARK OBSERVED (mark on map; e.g. Cramers Park to Point Udell)		

GENERAL ACTIVITY AND DESCRIPTION (see above for Examples)	SPECIFIC LOCATION (mark on map with number)	# of CARS / TRUCKS	# of ADULTS	# of YOUTH (0-18)	COMMENTS
	1				
	2				
	3				

BOATING ACTIVITY AND DESCRIPTION (e.g. recreational, transitory, anchored, moored)	SPECIFIC LOCATION (mark on map with letter)	# of BOAT / JETSKI	Potential PHYSICAL DAMAGE to coral or seagrass from boat? (mark on map)
	A		
	B		
	C		



Marine Park Zone Regulations

OPEN ZONE / PARK-WIDE - Restrictions include taking or injuring coral, altering the seabed, discharging materials, groundings, anchoring on hard bottom or coral communities, and diving without dive flag.

RECREATIONAL ZONE - Intended to provide areas for snorkeling, diving, boating, and shoreline recreational take-line fishing. Catch-and-release gulf-fishing and east-no. bay fishing are allowed with a Marine Park Permit. **ALL OTHER TRADITIONAL FISHING IS PROHIBITED** (i.e. spearfishing, lobster snares).

WILDLIFE PRESERVE ZONE - Intended to protect nesting female sea turtles using beaches in East End Bay, Isaac Bay, and Jack Bay to lay eggs. **FISHING WITH GILL AND TRAMMEL NETS IS PROHIBITED.**

NO TAKE ZONE - Intended to protect the near shore environments including coastal meadows, seagrass beds, lagoonal patch reefs, and linear reefs. **OPERATING A PERSONAL WATERCRAFT (JETSKI) IS PROHIBITED. ALL FISHING AND EXTRACTION IS PROHIBITED.**

Appendix 3. Summary of Results for Activity Survey

	Land Activity										Sea Activity								
	# Obs	# fishing	# Ppl	# campin g	# Ppl	# Recreation (Swimming snorkelin g, surfing)	# Ppl walking	# Ppl	# Anchored rec. boat	# Fishing from boat	# Boat, under way	# Boat, under way	# Jet Ski	# skis					
Cheney Bay, Southgate	6	4	4	4	1	?	1	1	3	7	0	0	0	1	1	2	0	0	0
Coakley Bay	61	4	7	0	0	0	0	0	0	0	1	1	10	16	4	11	60	197	
Cramer's Park	2	1	7	0	0	0	1	5	0	0	1	2	1	2	1	1	3		
Divl	2	2	4	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	
East End Bay	1	1	3	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	
Grapetree Bay	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green Cay	6	2	11	0	0	0	0	0	0	0	2	2	2	2	0	0	5	13	
Hugh's Point/ Jack's Bay	14	2	4	1	1	1	1	1	13	49	0	0	2	2	1	1	0	0	
Prune Bay	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	
Smuggler's Cove	26	16	32	6	19	21	103	13	41	8	10	3	3	3	15	29	15	53	
Teage Bay	1	0	0	0	0	0	0	0	0	3	4	0	0	0	0	0	0	0	
Turner's Hole/Grassy Point	5	6	8	0	0	0	0	0	0	3	3	1	1	0	0	0	0	0	
TOTAL	126	39	81	8	20	25	110	30	98	19	22	20	27	23	41	81	266		

Appendix 4. Data Collection Protocol for St. Croix EEMP Use Assessment

Geographic Consulting LLC

GIS * Forestry * Planning * Wildlife * EIR * Wetlands
210 Strand St, Frederiksted, VI 00840. www.vigeocon.com



East End Marine Park Data Collection Protocol for Land Use Assessment Study

- Surveys are conducted three times a week: weekday/day time, weekday/night time, and a weekend/ day or night.
 - There are a total of 36 numbered data collection points to be visited, preferably in numerical order. All activity observed at each location should be recorded. Exceptions are the first and last points, Castle Nugent Boat Launch (1) on the South Shore and at Altona Lagoon (36), which are outside the EEMP boundaries. Record **Boat Trailers Only** at these two points.
 - For the remaining 34 points,
 - Count cars and boat trailers and record the quantity in the appropriate line.
 - Record the number of people on the beach doing each of the activities listed on the "Shoreline Rec. Activities" section. Any other observed non-fishing activity should be recorded in the "other" line and a note should be made. Also note any dogs on the beach.
 - Record the number of people engaged in each of the types of shoreline fishing listed in the "Shoreline Fishing Activities" section. Any fishing activities observed, but not specifically listed, should be recorded in the "other" column and described in the notes.
 - Record each boat observed in the survey area. A separate column is dedicated to each boat and several observations should be made for each, including; the type of boat, if the boat is underway or stationary, attended or not and what the people are doing if any are visible.
 - Any other observations that might be relevant to the study should be described in the notes section. It's always better to record too much information than not enough.
 - These are four locations that have specific instructions:
 - **Castle Nugent (1) & Altona Lagoon (36)** – Record only the number of boat trailers.
 - **Great Pond Camps (2)** – This site was removed due to difficulty accessing the site and the disturbance it causes to sensitive bird habitat.
 - **Yacht Club Marina (22)** – Do not record the number of boats on land or the number of boat trailers. Count the number of cars. Record each boat that is underway individually. All other boats (ie. Stationary boats) should be counted together by group and recorded in the notes. Group the boats by their type, status (anchored, docked or moored), and whether they are unattended. For example, all boats that are Recreational sailboats, on a mooring, and unattended should be grouped in a single column and all Recreational Motor Boats, docked, and attended is another group, and so on.
-

Appendix 6. Tour Operator Phone Interview Results

Summary Sheet for the St. Croix Tour Operator Phone Survey

Vendor	Owner/contact	Activity	Location in ISMP	Numbers/frequency	Web address	Notes	Phone	Email	Contacted by	Contacted on	other
Jolly Roger		Scuba	East End Reef, but less and less since we started to go out to Back Island more	Estimated 6 in the East End Marine Park This Year (because of a bigger demand for back island). 100% of customers in years past.	www.jollyroger.com	Full or half day scuba trips; access reef via boat	553-3528		Marly	11/2/10	Sometimes fails occasionally, depending on winds.
Rig Beard's	John Macy	beach BBQ/Back Island trip	Beach on north shore w/in ISMP	50-70 customers a year. Beer/gale holds 17. Adventure holds 46. Hardly ever full.	www.rigbeards.com	Access beach by boat after Back Island trip	773-682	info@rigbeards.com	Marly	11/2/10	I talked to their staff when John Macy (aka Rig Beard) was out of town. If you want more specific numbers I can call John when he gets back.
Rig Beard's	John Macy	sunset sail	If on their sail boat they often go around Green Cay. If on Adventure they will generally go to yacht club and back.	About	www.rigbeards.com		see above		Marly	11/2/10	
Caribbean Sea Adventures		sunset sail	No tours in ISMP, just Back Island		www.caribbeanseaadventures.com		773-2628		Marly	11/2/10	
Caribbean Sea Adventures		snorkeling	Sail past Green Cay towards back island and back	Can hold 6-80 people. They go on average twice a week.	www.caribbeanseaadventures.com		see above		Marly	11/2/10	
St Croix Blue Water Adventures	Ed & Muffy Buckley	diving	DO NOT operate in ISMP. All their dives and snorkels are West of Chatham Island		www.stcroixbluewater.com		773-5884	info@stcroixbluewater.com	Marly	11/16/10	
Cane Bay - DHI		diving	They do not allow around DHI/ISMP. They pick up customers and take them to Cane Bay.				713-5529	info@stcroixbluewater.com	Marly	11/2/10	
DHI watersports center		watersports?	Turner Hole				877-773-8780 (toll free)		Marly	11/2/2010, 11/16/2010, 11/17/2010	no answer
Endred Spirit	Don & Julie Ferrer	snorkel/sail	Not Usually. They generally go to Cane Bay area and will very rarely do a sunset dinner to Green Cay		www.internationalwatersports.com		771-6451 or 718-5484	lyssa@earthlink.net	Marly	11/16/10	
Crosser Hires		kitesurfing	unknown		www.crosserhires.com		773-7102 or 626-6203	crosserhires@gmail.com	Marly	11/16/10	Numbers have changed, no other numbers are available, left voicemail
Island Flight Adventures		jet ski rental and tours	Straight line to Point Udall and back. Mostly inside of the reef, sometimes outside	Do daily tours, on average 3 customers a day for 250 days.	www.islandflightadventures.com	based in Cedar Harbor	773-7541		Marly		
Isle St. Croix	Bill Cook	kitesurfing/stand-up paddle boarding	Great Pond Bay (mostly in summer) and Coalley Bay	100 year	www.islestcroix.com	based in Cotton Valley	643-5824	1.heart@islestcroix.com	Marly	11/16/2010, 11/17/2010	No answer - cell phone off, left voicemail. Returned voice mail on 11/17/2010
See-Through Kayak Adventures	Craig Scott	kayak	depends on what customers request. Only tour this year was Craner Park.	2 customers in Craner Park in 2010		Most popular kayak locations are Altava Lagoon, Salt River and Point	244-8886	see@stcroixkayak.com	Marly	11/16/10	
Virgin Kayak Co.		kayak	Do not operate in ISMP often. They usually kayak from Great Pond to grassy point (Point Sitabow). On the way back they stop in Red Bay for lunch.		www.virginkayak.com	They added STDSMP onto their new brochures along with Altava Lagoon, Salt River, Sandy Point.	719-0071 or 514-0082 or 626-7775	virginkayak@virginwood.net or jf@virginkayak.com	Marly	11/16/10	
Fish with Carl	Carl Holley	snorkeling	Not in the Park		www.fishwithcarl.com		277-4042		Brian	10/9/10	message
Tao-tao tours	Wave	swimming/snorkeling	Do not operate within the ISMP. The only tours they do on the reef and is diving up to great hill for the views of Back Island, Jacks and Isaac etc.		www.taotaotours.com		773-7041 or 473-6485	www.taotaotours.com	Marly	11/16/10	
St. Croix Water Sports Center	Yvonne	jet ski guided tours, single file with guide	Hotel on the Key toward Craner. Stop at sand bar and Green Key Island for photos and each, but mostly just ride.	2 trips/day, 3-5 people ea., mostly 3 hr.	www.stcroixwatersports.com	He would like to see fish population come back and thinks catch are overfished	773-7060	stcroixwatersports@stcroixwatersports.com	Brian	10/9/10	he sounded nervous on the phone, "told" me the other operator and Silverman and said he loves the environment
Blinda charters	Dee O'Connell	1/2 day, private Scubaled Tours for 1-4 people. Sunset sails do not stop	Teague Bay 90% of the time	1-4 people, 80-80 tours a year	www.blinda.com	she would like to see more web-maintained meetings to offer clients more safe options for visiting the park	554-2270		Brian	10/9/10	10 MINUTE PHONE CALL
Dive experience	Michelle Pugh	diving	Not in the Park		www.diveexperience.com		773-8807	diveexperience@gmail.com	Marly	11/16/10	
Lewislyn Tours	Cynthia Hill	Back Island tour	Anchorage in park	Do not operate in ISMP. Only Back Island Tours		based at Yacht Club	773-9027		Marly	11/16/10	left message left message
							773-9141		Marly	11/16/10	

Appendix 7. Locations of shipwrecks as indicated by DPNR

