

Socio-Economic Assessment of Marine Resource Utilization in the U.S. Virgin Islands

Prepared by:
Hinds, Unlimited

In collaboration with:
University of the Virgin Islands

For:

Department of Planning and Natural Resources
Division of Coastal Zone Management
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List of Acronyms

APC	Area(s) of Particular Concern
BER	Bureau of Economic Research (VI)
BBD	Black Band Disease
BUIS	Buck Island National Monument
CBO	Community-based Organization
CBRS	Coastal Barrier Reef Systems
CFMC	Caribbean Fisheries Management Council
CLWUP	Comprehensive Land and Water Use Plan (VI)
CZM	Division of Coastal Zone Management (VI)
DEP	Division of Environmental Protection (VI)
DFW	Division of Fish and Wildlife (VI)
DPNR	Department of Planning and Natural Resources (VI)
EEMIS	Energy Economics Management Information System (VI)
EPA	United States Environmental Protection Agency
ER-L	Effects Range Level
GIS	Geographic Information System
GTP	Gross Territorial Product
HOVENSA	Hess Oil Virgin Islands-Venezuela, S. A.
HOVIC	Hess Oil Virgin Islands Corporation
IRF	Island Resources Foundation
MCD	Marine Conservation District
MCL	Maximum Contaminant Loads
MIS	Management Information System
MLBB	Mangrove Lagoon and Benner Bay
MMM	Modified Mercalli Scale of Earthquake Intensity
MPA	Marine Protected Area
NOAA	National Oceanic and Atmospheric Administration
NGO	Non-governmental Organization
NPS	National Park Service (US)
NPSP	Nonpoint Source Pollution
PCB	Polychlorinated biphenols
PR	U.S. Commonwealth of Puerto Rico
PWC	Personal Water Craft
REMIS	Recycling Economics Management Information System
SMMA	Soufriere Marine Management Area
SNA	Significant Natural Areas
SSEB	Southern States Energy Board
TEV	Total Economic Value
TBT	Tributyltin (a chemical)
USGS	United States Geological Services
USVI (or, VI)	Territory of the United States Virgin Islands
UVI	University of the Virgin Islands
VIERS	Virgin Islands Environmental Research Station
VITAAL	V.I. Tourism Awareness and Advancement Link
WBD	White Band Disease

EXECUTIVE SUMMARY

Background

This Report is a product of the V.I. Marine Park Project. The project is an initiative of the Government of the U.S. Virgin Islands, being implemented as part of the *U.S. National Action Plan to Conserve Coral Reefs*.

The *U.S. National Action Plan to Conserve Coral Reefs* was developed to guide the sustainable use of coral reef ecosystems within the jurisdiction of the United States, including its territories and commonwealths. "Sustainable use" means that coral reef ecosystems should be used and managed in such a manner as to ensure the security of the economic, cultural, social, and environmental values and benefits of such ecosystems in perpetuity.

The overall goal of the VI Marine Park Project is to establish the objectives, policies, and procedures for the management of marine resources within the territorial waters of the U.S. Virgin Islands through the development of marine protected areas.

The VI Marine Park Project involves the development of four major documents:

- A Resource Description Report prepared by Island Resources Foundation;
- A Socio-Economic Assessment prepared by Hinds, Unlimited;
- A Management Framework for a System of Marine Protected Areas, prepared by Lloyd Gardner; and,
- A Management Plan for the East End Marine Park, St. Croix, prepared by The Nature Conservancy.

Objective of the Marine Protected Area (MAP) Project Socio-Economic Assessment

The primary objective of the socio-economic assessment component of the VI Marine Park project ("Marine Protected Area" or "MPA" project) was presentation of the findings from document review and a stakeholder process; to-wit, review of existing studies and data to further understanding of marine resource utilization in the following areas: Both historic and current uses and use conflicts; stresses and threats to the marine resource; and the perceived, actual, and projected social and economic impact of resource utilization within marine protected areas. A stakeholder process was completed to update information.

A secondary objective was to identify gaps in data sets and/or inadequacies of data gathering efforts, and to suggest areas for primary research on which to base a comprehensive socio-economic assessment.

The objectives and scope of service are contained in the *Terms of Reference, Appendix I*.

Approach

The socio-economic assessment of the VI Marine Park Project was to rely extensively on existing documents and data. Identification of relevant studies, reports, data, and data-gathering efforts was accomplished through literature review and consultation with government and non-governmental agencies as described in Chapter 2 of this Report.

As there were only three key areas where activity and limited expenditure data were available for analysis, i.e., fisheries (commercial and recreational), boating (private recreational and commercial term charter boats/yachts), and tourism activities, a preliminary economic analysis was completed.

The "stakeholder process", a tri-island process consisting of Community Briefings/Meetings, Focus Groups, and two-part written Surveys. The process was designed to bring together project principals and stakeholders to gather and update information. A non-random sampling method and written surveys were used. There was no provision for primary research.

The approach to stakeholder involvement was process oriented, i.e., the process of engaging stakeholders was considered to be as important as was the information gathered, and was selected because it tends to foster productive dialogue and trust. This approach was chosen over a product-oriented direction because of the need to replace the mistrust and confrontation that has characterized the interaction between the government and the public on marine management issues.

The approach used for this component of the MPA project is more consistent with *rapid* socioeconomic assessment than with the standard or comprehensive socioeconomic assessment described in the Socioeconomic Manual for Coral Reef Management (Bunce, et al., 2001), The Marine and Coastal Protected Areas Guide for Planners and Managers (Salm and Clark, 2000), and as described in Collected Essays on the Economics of Coral Reefs (Cesar, 2002).

A specific goal for MPA management, e.g., development/conservation, policy development, monitoring, etc., is articulated in the preparatory phase of a socioeconomic assessment and determines the focus. The timeframe for preparation and planning, implementation, and analysis ranges from two to five years based upon the availability of reliable data and decision support tools, the level of marine valuation, and the funding allotted to the assessment team. The above-referenced manuals provide, in great detail, the socioeconomic assessment process.

Key Findings

- The response from a diverse, though small, sampling of user groups (stakeholders) reflected consensus on major MPA issues, such as the need for MPAs, the crucial importance of effective management, and the need to address the impacts of potential relocation/dislocation of use and user groups;
- Land-based activities including, but not limited to, point and nonpoint source pollution, sewage discharge, poor design and construction practices, etc. are uniformly identified as the bane of a healthy marine resource in previous studies and by the present-day stakeholders;
- Significant gaps exist in the data sets that are critical to social or economic assessment of an MPA;
- Although numerous marine resource studies have been completed over the last 20 years, most contain descriptive - not quantitative - information, address specific areas or activities, and direct uses of the marine resource. (National Park Service sites have been studied in the most detail);
- In all of the reviewed reports where reference was made to user and use conflicts, those conflicts either continue to exist or are perceived as continuing to exist. The conflicts include the actual or perceived infringement on the rights of “locals”, i.e., native-born residents, by the policies of the federal and local governments, and by private property owners; incompatibility of methods and landings of commercial and recreational fishers; and a growing dislike for jet skis by all other user groups;
- There is concern for the need for research, including a) the impact of a high volume of divers, snorkelers, and use of protective skin oils on the health of the reefs (as cited in early studies as well), b) identification and protection of underwater archaeological sites and resources; c) stresses and threats at each phase of the lifecycle of marine species.
- There will continue to be gaps in marine management if the efforts of the federal and local governments, and other agencies and organizations involved in all aspects of marine management, cannot be harmonized within the MPA process.

Conclusions

This Report offers a preliminary review of information that must eventually be treated in greater depth if MPAs are to be successfully managed in the USVI. Stakeholder response indicates that users can and will make valuable contributions to MPA management.

The literature review and communication with agency representatives suggest no indication that the need to gather and organize baseline data has been identified by, or assigned to, any

public or private agency. The absence and/or inadequacy of supportive data did, however, make it possible to identify areas in which additional research and data are needed.

At this stage the US Virgin Islands has stated a general goal of MPA management, but lacks critical data, data-gathering processes, and decision support tools to complete a comprehensive socioeconomic assessment or standard marine resource valuation. Therefore this socioeconomic assessment component completed constitutes a rapid assessment. It presents findings that are intended to inform the MPA policy planning process in the future and, hopefully, stimulate interest in, and commitment of funds for, a needed comprehensive socioeconomic assessment in the not-too-distant future.

1.0 INTRODUCTION

1.1 THE SOCIO - ECONOMIC COMPONENT OF AN MPA PROJECT

The management of marine areas requires more than the implementation of strategies that sustain or restore the biological resource. Humans in close proximity to the marine resource impact and are impacted by actions taken to sustain the biological resource. Restrictions on time, space, place, and activities are critically linked to social, economic, and political realities, and may be included in marine management strategies as a way to protect marine resources. Coral reef health is a most important concern in marine management because the death of a coral reef can lead to a decrease in biodiversity and make recreational areas less attractive.

The completion of a comprehensive socio-economic assessment of a marine protected area project can help planners understand the social dynamics, economic dimensions, and the conditions of the people, organizations, and politics that will impact and be impacted by the MPA. From that understanding, planners are then able to develop a management approach and plan that appropriately address the ecosystem requirements and the social elements. A *rapid* socio-economic assessment, such as this report, develops preliminary descriptions and understanding of the areas in need of further study, and can begin to engage stakeholders whose involvement and support affects the effective implementation of MPA strategies.

1.1.1 Background

The actual starting point for a new international focus and attention to environmental issues was the 1972 Stockholm Conference on the Human Environment. Due to greater visibility and publicity, the Rio Conference in 1992 is most often afforded that recognition. Within the environmental movement in the 1990s, global attention to coral reefs increased and led to the understanding that coral reefs are like underwater rainforests, are second on the list of the world's richest ecosystems, and have a central role in supporting biodiversity within marine environment.

By the closing day of the 1993 Conference "Rio to the Capitols: The States Respond to Rio '92", scientists and environmental activists had debated "sustainable" versus "regenerative" approaches to environmental remediation and management of land and marine resources. Representatives from the Pan American Health Organization, the V.I. Governor's Energy Office, and others posed questions linking carrying capacity and sustainability to the regeneration of the terrestrial and marine environments. Where sustainable use may only require implementation of protective measures, regenerative approaches usually require a greater commitment of resources and a determination of the carrying capacity. The consideration of carrying capacity, as determined by social and economic choices and by environmental constraints, broadens the parameters of marine management strategies.

The 1994 International Coral Reef Initiative directed global attention to the rapid decline in coral reefs and attracted the attention of non-scientists. The increased awareness of the critical status of coral reefs worldwide led to the designation of 1997 as the "International Year of the Reef", and to the U.S. 1998 Coral Reef Protection Executive Order (US EPA, 2001).

Until recently, marine management strategies for mitigation of ecological and biological stresses focused on keeping environmental conditions within acceptable ranges for coral reef health. While scientific testimony and media report that an estimated two thirds of the world's global reefs are in decline or threatened, the idea of building coral reef survivability based on patterns of resistance and resilience is new to management strategies for marine protected areas (MPA) (Salm, 2001). In 2002, the marine management strategies routinely consider biology, ecology, and socio-economic impacts by and to the human community.

Marine Valuation and Assessment

Valuation is a means of justifying the existence of marine protected areas (Salm, Clark, 2000) and is used in the development of marine management strategies. Marine planners obtain information on social and economic values, practices, and conditions of nearby communities and attempt to address sustainable/regenerative issues and carrying capacity with quantitative and qualitative data.

In their report on the human factors of reef management, Bunce, Gustavson discuss the lack of research on rapid quantitative and qualitative techniques for assessing the sociology and economics of reef use. The report presents various methodologies for conducting socioeconomic assessments as can be adapted from a range of techniques, including classical social, anthropological and economic approaches. In addition, it notes the challenge of conducting primary research in this area due to the relative infancy of research and the lack of evaluation criteria on the socio-economic context of reef management (Bunce, Gustavson, et al., 1999).

According to the Socio-Economic Manual for Coral Reef Management (Bunce, et al., 2000), a socioeconomic assessment is a way to learn about the social, cultural, economic, and political conditions of individuals, groups, communities, and organizations. There is no fixed list of topics examined in a socioeconomic assessment, but the most commonly-identified topics include: gender, resource use patterns, stakeholder characteristics and perceptions, market attributes for extractive and non-extractive uses, market and non-market use values.

On the social side of a socio-economic assessment, considerations include social acceptance, public health, recreation, culture, aesthetics, conflicts of interest, safety, accessibility, research and education, public awareness, conflict and compatibility. The importance of socioeconomic information was stressed as early as 1969 by the US National Environmental Protection Act which stated that there is a need to assess, in advance, the social consequences that are likely to follow from specific governmental or policy actions. (Bunce, and Gustavson, 1998).

On the economic side of a comprehensive socio-economic assessment, there are economic values that can be measured directly, such as revenues and expenditures related to marine activities, tourism, etc., and costs associated with nature-based or anthropogenic threats. There is also an attempt to ascribe monetary value to intangibles such as the pleasure derived from a scenic view or “the quality of life”. The issue of carrying capacity - “How much of which use is too much?” - is important, allowing consideration of both scientific assessment and personal preference in assigning a value to the resource.

As of 2002, there was not a well-developed methodology or approach to socio-economic assessment as has been noted by Bunce (among others) who suggests that, “Due to the relative infancy of research considering the socio-economic context of reef management, socio-economic criteria specific to evaluating activities affecting reef resources are only beginning to be explored (Bunce, Gustavson, 1998). Because the concept of carrying capacity has yet to appear in USVI public policy, or in the lexicon of public discourse, the effort to complete the needed comprehensive assessment may be tasked with furthering the understanding of the concept and developing criteria for determining the carrying capacity of marine protected areas.

A socio-economic assessment can be structured to the management goal, and to support decision-making, e.g., no MPA at all, MPA with/without no-take zone, MPA for protection purposes only, etc. (See *Appendix VI* for information on socio-economic assessment in marine management)

Assessment and Management

The findings from a socio-economic assessment can lead to an understanding of what is and what is not acceptable, among other things, and should influence management decisions. Most management goals will include limits on the numbers of users, spatial and temporal restrictions of usage, education programs, and research and monitoring programs (Bunce, Gustavson et al., 1999). Limits on use usually lead to conflicts that can be anticipated and addressed in the management plan.

The scope of this component of the MPA project and the available data were limited; however, it does appear that a supportive public policy framework is under construction. The Rapid Socio-Economic Assessment of Marine Resource Utilization in the USVI calls attention to the elements required to achieve a solid understanding of marine resource valuations, and to implement public policy that fosters effective and successful management of marine protected areas.

Note on Underwater Cultural Heritage Resource

A United Nations convention regarding the protection of the underwater cultural heritage resources came to light late in this MPA project. Several MPAs around the world exist for the protection of cultural as opposed to natural resources. These MPAs, often designated around historic shipwrecks, present some unique challenges for managers (MPA News, Vol. 3, No 3 (September 2001). While the underwater cultural heritage resources in the USVI have not been researched for this Report, the presence of at least two historic shipwrecks in Christiansted Harbor must be noted (IRF, Christiansted, 1993). Such an as-yet untapped potential compels an examination of USVI waters to acknowledge or dismiss the importance of this unique type of cultural marine resource.

2.0 METHODS

2.1 REVIEW OF EXISTING DOCUMENTS AND DATA

Project principals conducted a thorough review of materials, including reports and records of local government departments, census data, related surveys, and academic and consultants' reports, and made preliminary determinations of usefulness and reliability. Documents we collected for the project were submitted to the VI Department of Planning and Natural Resources. (The complete listing of reference documents, including those obtained from the archives of DPNR archives is contained in *Works Cited* following Chapter 12).

The task of identifying and obtaining relevant documents and materials was protracted and only moderately successful. The absence of a government or community-based library, or even a basic cataloging of relevant documents within Agencies, complicated what would otherwise be a straightforward task. At project start-up, there was minimal response by members of the MPA Advisory Committee to a request for information regarding documents, studies, and data. Also, there appeared to be competing demands for the time of agency personnel who might have been able to assist in the identification/provision of documents, and contact with them was usually unproductive.

It is strongly suspected that important documents completed by government agencies or the University of the Virgin Islands over the years were inaccessible or lost as a result staff turnover. There were instances in which staff were aware of relevant studies or projects but could not locate the documents; for example, only the cover page remains of a survey on public attitudes completed by the Department of Conservation and Cultural Affairs in the 1970s. Similarly, the University of the Virgin Islands' Eastern Caribbean Center Research Institute Publications website listed a substantial number of unquestionably relevant works that could not be found notwithstanding the best efforts of staff.

Many of the reviewed documents written between 1960 and 2001 contained extensive bibliographies, references, and citations of primary research. In some instances, primary documents were obtained and reviewed; however, it was not possible to locate many of the primary documents within the project's timeline.

Most of the previous studies focused on user-specific research and did not address or develop standard indicators for assessing the socio-cultural basis of marine uses. As a consequence, it was to be expected that examination of the direct and indirect benefits associated with USVI marine resources would have little data on which to base an analysis.

During the roughly four-month literature search for this USVI MPA project, the economic data located was limited to commercial and recreational fishing and boating activities, and aggregated data for commercial and recreational tourism activities. No document was identified that quantified non-use values, e.g., benefits of preservation of natural scenery, cultural resources, recreation, or user-defined "quality of life" criteria.

2.2 STAKEHOLDER PROCESS

The stakeholder process was generally conducted along the lines of non-random sampling, i.e., there was outreach to selected individuals and groups whose viewpoints, roles, ownership, etc., would contribute to an understanding of issues and conditions. Information generated by this non-random method is not statistically representative because it is not representative of all users. Non-random methods are typically used when resources - time, money, and people - are not available to support a full, statistically representative sample. (See *Appendix VI*)

The "stakeholder process", a tri-island process consisting of community briefing meetings, focus groups, and surveys, was designed to bring together project principals and stakeholders to facilitate information exchange on a three levels: Community briefings, Focus Groups, and two-part Surveys.

The stakeholder process was implemented to engage residents in the MPA planning process in a manner that would be accepted and understood as meaningful and relevant to the long-term MPA process. The process was completed between November and December 2001.

Participation in the stakeholder process was open to any individual who received a letter of invitation and/or who responded to notices in the media. The survey instrument - distributed at the meetings - was designed to capture basic demographic and descriptive information from those in attendance.

In the community briefings, the MPA rationale, process, and status were explained, and participants were invited to discuss the perceived pluses and minuses of MPAs and to express their concerns. The method of organizing focus groups combined elements of strategic planning and creative problem-solving in a timed agenda format that was structured to obtain more detailed input than could be elicited in the setting of the larger community briefing.

Participants in community briefings and focus groups were invited to complete a survey (see Chapter 3.2.2, and *Appendix III*) that contained general questions for all respondents as well as items that were specific to their individual user group. The social, racial, and ethnic diversity in the USVI invites cultural competency in the MPA public processes and reader-friendliness of materials. There was some preparation for facilitating participants who had limited literacy skills and/or those who were bi-lingual; however, more resources could be directed in this area in the future.

The literature addresses the consequence of inadequate attention to the social and cultural dynamics. The 1985 Cernea study concluded that failure to consider the social and cultural context of a project invited inappropriate design, at best, and user hostility, at worst. "It usually leads to projects that are ultimately ineffective, wanted neither by their supposed beneficiaries nor by the investing public agencies." (Cernea, 1985).

2.2.1 The Stakeholders

Every resident of the USVI was viewed as a primary stakeholder in the MPA process. Visitors were considered as secondary or “indirect stakeholders”. The input of these stakeholders was valued as a way of gaining an understanding – beyond the available data sets of standard indicators – of what was important to them relating to the marine resource.

Letters of invitation to the community briefings and focus groups were sent to approximately 200 individuals representing a broad range of user groups. The invitees included the University of the Virgin Islands, US National Park Service, VI Division of Environmental Protection, other federal and local government agencies, local environmental groups, and other Non-governmental Organizations (NGOs).

For purposes of MPA stakeholder analysis, the stakeholder groups were identified as commercial and recreational boaters, divers and dive tour/shop owners, commercial and recreational fishers, hotel, tourism, and real estate interests, and supportive businesses. Representatives from government agencies assigned themselves to groups based on personal interest or professional responsibilities. Participants were allowed to assign themselves to their primary user group category and other categories of interest as well. Some participants assigned themselves to the hotel/tourism category based on interest as opposed to ownership.

The individuals, agencies, and organizations participating as stakeholders in the community briefings, focus groups, and/or questionnaires are contained in *Appendix IV*.

2.2.2 Community briefings

The public was invited to attend community briefings to “learn about the marine protected areas planning process, propose solutions to their concerns, and to offer ideas for increasing the chance of success for the USVI MPAs.” The meetings were held on St. Croix on November 12th, 2001, at the Department of Education Curriculum Center; November 15th, 2001, on St. John, at the Legislature Conference Room; and November 26th, 2001, on St. Thomas, at the University of the Virgin Islands Sports and Fitness Center. All meetings began at 6:30 p.m. and employed a meeting format developed by Hinds, Unltd., that has been effective in community outreach projects for the University of the Virgin Islands, the VI Housing Authority, the VI Health Professions Institute, among others.

All components of the MPA project were presented at the meetings, which opened with a video on the Soufriere Marine Management Area (SMMA) on St. Lucia¹. The large number of fishers in attendance responded favorably to the segment of the video in which their counterparts on St. Lucia described their initial resistance to but subsequent support for a marine managed area. The video appears to have been an effective tool for initiating constructive dialogue between government and user groups.

¹ The case represented by the Soufriere Marine Managed Area in St. Lucia was chosen as a good example of process and outcome for MPA planning. The stakeholder process was well defined and maintained over time, the fishers' strong resistance was overcome by the process and the outcome, i.e., better fishing, and the Caribbean location was one with which USVI stakeholders easily identified.

At the St. Croix community briefing, 36 individuals signed the register. In attendance were representatives of environmental groups - the St. Croix Environmental Association, The Ocean Conservancy, Ecotech Inc., and The Nature Conservancy. Representatives of federal and local government agencies attended, including the VI Division of Coastal Zone Management, and the National Park Service. Others participating were the UVI Cooperative Extension Service, the UVI Marine Advisory Services, Office of the VI Delegate to Congress, divers, educators, businesspersons, and the news media. By far the largest group consisted of commercial fishers.

On St. John, 15 people attended the meeting, including representatives of the National Park Service, VI Division of Environmental Protection, University of the Virgin Islands Conservation Data Center, Friends of the Park, Island Resources Foundation, the St. John Administrator, businesses, and divers. As on St. Croix, the largest group represented was commercial fishers.

On St. Thomas, there were 16 participants from the University of the Virgin Islands Center for Marine and Environmental Studies, and UVI's Division of Math and Science, the St. Thomas Fisheries Advisory Council, VI Division of Environmental Protection, businesses, divers, and two commercial fishers.

The data and recommendations gathered at the community briefings appear throughout this Report and the participant list appears in *Appendix IV*.

2.2.3 Focus Groups

Five Focus Group meetings² were conducted in 2001:

Island	Date	Number in Attendance	Meeting Place
St. Croix	November 29 th	7	All were held at the
	December 3 rd - morning session	5	UVI Cooperative
		- afternoon session	3
St. John	November 16 th	5	Guy Benjamin School
St. Thomas	November 27 th	7	UVI Small Business Center

Despite the small numbers, the process reaped useful information, identified unique conflicts and concerns, and gathered strong recommendations.

² Originally, eleven focus groups were anticipated: four on St. Croix, four on St. Thomas, three on St. John. Delays in the release of funds caused more than one rescheduling, and scheduling the final meeting was beset by conflicts with November-December holidays and the Caribbean Fisheries Management regional hearings. Notably, however, although of lesser scope, the five focus groups completed for the USVI equate to the five focus groups per country completed for a World Bank-sponsored comparative survey of socio-economic and management issues of thirty-one coastal communities. (Cesar, 2000)

All comments made in the focus groups were recorded on flipcharts, transcribed, and organized for interpretation and analysis. The questions that guided the process are included in Section 10.1 of this Report; stakeholder input and recommendations gathered in the focus groups appear in Sections 7 and 10 and in *Appendix IV.*, A complete listing of focus group participants appears in *Appendix IV.*

2. 2. 4 Survey

The survey instruments were structured to capture descriptive information on uses and values. Distribution of the user-specific surveys and the supplemental surveys was limited to participants in the community briefings and the focus groups. The 100 surveys completed and analyzed are comparable to the number of surveys used for pre-test of survey design for similar socio-economic assessments in Jamaica and Curacao. (Cesar, 2001). MPA project design and budget did not support development of more detailed instruments or for random-sampling methods. Samples of the survey instruments appear in *Appendix III.*

The survey instrument was two-tiered. User group questions and demographic information were captured on a brief primary survey distributed in the community briefings. A supplemental survey was placed in user group folders and participants were asked to answer questions on values, extent of user involvement, and some of the economics of use. The fact that participants responded to virtually all the questions on the primary survey is encouraging, and indicates that future assessments of this type, i.e., written surveys, could be used effectively.

There was discreet, on-the-spot assistance for those with limited literacy; however, Thomas Daly, a St. Croix fisher, suggested that the survey be read aloud to ensure that everyone understood what was being asked. Literacy became a non-issue as this approach opened opportunities for questions, explanations, and expressions of concerns. Only the fishers' survey was conducted in this manner and the productive exchange appeared to edify staff from government agencies and other groups who had previously heard only the “frustration” of the fishers.

In all, 100 stakeholder surveys were conducted. Summary and analysis developed from the surveys are incorporated throughout this Report.

2.3 Interagency Consultation

Interagency consultation was attempted more often than it was achieved. More than fifteen (15) agencies and organizations, and departments and divisions of local and federal government, and representatives from University of the Virgin Islands were invited to contribute to the socio-economic assessment a) by identification or provision of materials, reports, data; b) by participation in the stakeholder meetings; and 3) through personal communication.

A request for information (reports, data sets, groups with relevant expertise, contact persons, etc.) was distributed at project start-up to the members of the Marine Park Advisory Committee and others attending project-related workshops. Of the 25 forms distributed at the September 21, 2001, Orientation Workshop conducted by The Nature Conservancy for the MPA project, and in

subsequent meetings, only three (3) forms were returned. They contained little helpful information.

The Divisions of Fish and Wildlife, Environmental Protection and Coastal Zone Management, the U.S. Geological Services, the National Park Service, and staff of the University of the Virgin Islands provided documents and participated in the stakeholder process (the participant listing is in *Appendix IV*). Late in the process, meetings with the VI Division of Environmental Protection resulted in the release of a number of relevant documents, e.g., the 303(d) and 305(B) Reports for 1996 and 1998, and the Year 2000 Water Quality Assessment Report.

2.4 Data Analysis

Data required for socioeconomic assessment and valuation include, but are not limited to, reef use patterns, non-market and non-use values, market attributes for extractive and non-extractive uses, stakeholder characteristics and perceptions and (see *Appendix VI*)

Analysis of data for purposes of policy and decision-making can be facilitated by use of decision-support models. There is no single model that answers specific and relevant marine management policy questions.³

Review of primary and secondary documents and data from the National Park Service "Visitors Services Report", VI Bureau of Labor Statistics, and VI Department of Planning and Natural Resources was extensive but not exhaustive. Data is reported here as presented in source documents.

Personnel in the Department of Planning and Natural Resources provided the report cover for a Department of Conservation and Cultural Affairs (precursor of the Department of Planning and Natural Resources) report that measured public attitudes on the marine environment in the early 1970s; however, the body of the report could not be located. There is no indication that public attitudes on marine management have been measured.

The 1979 "Economic Impact and Analysis" for the VI National Park (Posner, Cutherbertson, et al., 1981), and "The Rapid Socio-Economic Evaluation of the Proposed Marine Conservation District on St. John" (Downs, Petterson 1997) were an important sources of data for the VI National Park on St. John. Comparable research and data were not obtained for St. Croix or St. Thomas.

Other assessments of social and/or economic aspects of the USVI marine resource have ranged from those that meet accepted standards of social scientific research, e.g., Olsen and Towle (1979), or Downs and Petterson (1997), to those that were less sophisticated yet yielded useful information, e.g., Cader (1980).

³ Information on decision support models for marine management can be found in Cesar (2000) and in Rietbergen-McCracken and Abza (2000).

Following a preliminary identification of data needs for this assessment, a thorough review of reports and interagency communication was completed to determine whether data existed, and if so, where it could be obtained. The availability of existing data was taken into account in the design of the survey instruments and the formats for the community briefing and focus groups.

The Bureau of Economic Research data on tourism and the Department of Planning and Natural Resources data on boating and fishing were the most complete and useful data sets. There were significant gaps in revenue and expenditure data for diving, specific water sports, and marine supportive businesses. Data on prices, revenues, and willingness to pay for marine resource use was also not available. The Bureau of Economic Research and the Bureau of Internal Revenue will need to disaggregate the expenditure data for use in marine valuation and, with the Department of Licensing and Consumer Affairs, they will need to begin to collect new types of data in categories more fully suggested in the SocioEconomic Manual for Coral Reef Management (Bunce, 2000).

In rendering this Report, descriptive data from stakeholder input was analyzed in two ways:

1. A spreadsheet model was used to report summary results of the surveys;
2. Information from the community briefings and focus groups was organized and interpreted to arrive at qualitative data.

2.5. ECONOMIC VALUATION METHOD

The values associated with marine resources have been measured in many different ways – depending upon the expected use, analysis to be undertaken, and the extent to which data is available. "Valuation" is described the means of justifying the existence of marine protected areas (Salm, and Clark, 2000). For this study, an all-inclusive approach was used. All marine-related goods and services, support systems, and functional diversity were identified, followed by attempts to gather the necessary information to quantify the total economic value. This “total economic value” (TEV) approach helps ensure the full benefits of the marine system are accounted for. The Reitbergen-McCracken and Abaza (2000) work provides description, explanation, and applications of a full range of environmental valuation techniques. A detailed explanation of TEV methodology, use of USVI data in TEV, and quantification of uses for the USVI precedes the findings in Chapter 6.

3.0 USVI Demographic and Economic Background

3.1 Overview

The U.S. Virgin Islands are a series of inhabited and uninhabited islands and cays covering 133 square miles in the Lesser Antilles between the Atlantic Ocean and the Caribbean Sea. The largest inhabited island is St. Croix (83 square miles), followed by St. Thomas (32 square miles) which is home of the Territory's capital city, Charlotte Amalie, and St. John (20 square miles).

Geological studies suggest that the Virgin Islands were once underwater and that the land was pushed up from the bottom of the ocean by volcanic action. The land areas are carved out by bays and inlets and surrounded by coral reefs (World Resources Institute, 1998).

Approximately 75% of USVI residents are Caribbean-born (from the U.S. Virgin Islands or other islands, and of African heritage; approximately 13% , from the U.S. Mainland, are Black Americans and Americans of European descent; approximately 8% are from Europe or Latin America; approximately 5% identify themselves as Puerto Rican, whether born in the Virgin Islands or in Puerto Rico. Native-born U.S. Virgin Islanders have comprised less than 45% of the population since the 1980s.

As a Territory of the United States of America, the U.S. Virgin Islands has emerged from a history of agriculture and trade to the present-day economy based on tourism. The 108,000 residents (Bureau of Economic Research, 2001) are joined by between one to two million visitors annually (The Nature Conservancy, 2000). The tourist sector accounts for more than 70% of the gross domestic product (World Resources Institute, 1998).

The largest private sector employer and generator of economic activity is the Hess Oil Venezuela-Virgin Islands Corporation, S.A., successor of Hess Oil Virgin Islands Corporation (HOVIC). HOVENSA is the largest petroleum refinery in the Western Hemisphere. In addition to petroleum products, other items manufactured in the Territory include rum, watches, textiles, and pharmaceuticals. (VI Energy Office, 1994).

The fledgling financial services industry was dealt a blow with the end of the U.S. Foreign Sales Corporation program in the 1990s, and it is anticipated that the Economic development Authority will succeed in attracting financial services and high technology businesses to stimulate the economy. A review of Bureau of Economic Research information for 2001 shows that USVI has lost most of the watch factories and pharmaceutical companies that contributed to the economy until the 1980s. St. Croix Alumina (formerly Martin Marietta) ceased operations as an aluminum processing plant, 1999.

Tourism is the primary economic driver. In 1995, the Territory hosted more than 562,000 overnight visitors, and 1,171,000 cruise-ship passenger arrivals. Tourism accounts for more than 70% of the gross domestic product (World Resources Institute, 1998). Approximately 32% of all paid employees are engaged in retail sales or in service provided by recreation, hotels, guesthouses, and restaurants (Encarta, 2000).

In 1977, the U.S. Virgin Islands Department of Commerce reported that the population had more than doubled in the decade between 1960 and 1970, growing from 32,000 to 75,171.

According to the latest figures available, as of June 2001, the USVI civilian work force was 48,240, including a nonagricultural labor force of 42,930, with an unemployment rate of 6.9% (V.I. Department of Labor, 2001).

In the last 20 years there has been a significant rise in the number of inhabitants due to the influx of immigrant labor for the tourism industry, and the “discovery” of the Virgin Islands’ affable climate, especially by "Continental", or people from the U.S. Mainland. The USVI’s population density of 244 persons per square mile in 1960 increased more than 100% to 557 persons per square mile by 1970. By 1991, the density reached 741 persons per square mile (VI Energy Office, 1994).

Participants in the stakeholder process noted that social and economic conditions are negatively impacted by the absence of: a growth management policy, an approved comprehensive land and water use plan, a rational zoning process, and standard planning tools such as those used for more than 30 years throughout the U.S. One important tool that could be of benefit is a public policy and provision for development extraction fees to be used to create financial resources to mitigate the negative impacts of greater intensities and densities of terrestrial and marine development.

3.2 Population and Annual Economic Indicators

Over the last thirty years there have been significant changes in the socio-economic indicators and census data for the USVI. During the 1960s the success of efforts to expand the economy brought aluminum processing, oil refining, and numerous employment opportunities that spurred population growth. Post-1970 data is more reliable and less sketchy than pre-1970 data; the quality was improved by work of the Office of Policy Planning and Research, Tri-Island Economic Development Corporation, Inc., and others.

Table 3 – 1 USVI Economic Indicators 1960 – 2000 (all values in year 2000 dollars)

INDICATOR	1960*	1970	1980	1990	2000
Population	33,000	75,151	96,569	101,809	108,612
St. Croix		35,945	49,725	50,139	53,234
St. John		1,921	2,472	3,504	4,197
St. Thomas/Water Island		37,285	44,372	48,166	51,181
High school graduates	214('61)	558	1,081	1,314	1,289('98)**
Civilian labor force		35,580	43,130	48,260	47,280
Civilian employment		35,120	40,530	46,930	44,050
Unemployment rate (percent)		1.3	6.0	2.8	6.9
University of the V.I. graduates		56	132	239	313
Non-agricultural employment		30,450	37,320	43,140	42,050
Private Sector		21,090	23,880	29,560	29,020
Construction and mining		5,130	3,480	3,750	1,950
Manufacturing		3,190	3,190	2,450	2,480
Transportation/public utilities		1,970	2,060	2,330	2,450
Wholesale and retail trade		5,530	7,460	9,660	8,950
Finance, insurance, real estate		1,580	1,580	2,140	1,950
Services		4,220	6,110	9,230	11,240
Federal Government		360	660	880	860
Territorial Government		9,000	12,790	12,700	12,170
GTP (in millions of dollars)			1,363	1,962.1	2038.7
Per capita income (\$)	5,299		11,674	15,814	16,569
Annual average gross pay (\$)			21,146	26,045	27,500
Tax Collections (in millions)					484

Source: Bureau of Economic Research *Annual Tourism Indicators* and *Annual Economic Indicators* 2001, Annual Report Dept. of Education 1967-68, Boyer 1983. * Earlier figures not found; **later figures unavailable. The inflators (used to inflate BER current dollar years to year 2000 constant dollar values) are derived from U.S. Bureau of Economic Analysis website GDP data.

3.3 Summary of Fishing-specific Economic Data

Data on fishing activity is among the strongest of the data types made available for this assessment. Record-keeping and reporting for commercial fishing has improved markedly in recent years. Further efforts to develop a comprehensive database on fishing activity would support marine valuation research. From data that are available, it appears that much more is known about commercial activity than is known about recreational activity. Existing baseline data does not include complete information on the quantity, quality, and impacts of various activities in a format that can be used for valuation and assessment, to develop effective solutions, or respond to the perception of negative impacts.

At each stakeholder meeting, participants stated that so-called "recreational catches" (not for commercial purposes) are often sold to hotels and restaurants, or to consumers at roadside stands. The extent of this alleged conversion of recreational catch to commercial product is not documented, and suggests that there may not be a clear separation of commercial and recreational activity. Fishers challenged the preliminary commercial and recreational fishing data as being "too low". This may reflect a discrepancy between their first-hand knowledge of activity levels and the accuracy in record-keeping and reporting. A better understanding of this activity will enable an accurate assessment and response to impacts from fishing.

3.3.1 Commercial Fishing Economic Data

According to the "Three-Year Summary Report, April 1997– March 2000" prepared by the VI Division of Fish and Wildlife, there were 349 commercial fishers, of whom 336 fulfilled the reporting requirements. Fishers reported landings of just over 1.9 million pounds of fish with a direct monetary value of \$4.8 million. The average price per pound was higher on St. Croix at \$4.10 than the \$3.93 per pound on St. Thomas/St. John, for a total economic value of \$8 million.

Table 3 – 2 Commercial Fishing Data Year 1999

	St. Croix	St. Thomas/St. John	Total
Registered Commercial Fishers	206	143	349
Reporting Commercial Fishers	200	136	336
Total Trips (Reported)	7,670	5,099	12,769
Reported Landing			
Pounds	607,665	583,788	1,191,453
Direct Monetary Value	\$2,488,843	\$2,294,526	\$4,783,369
Average Price per Pound	\$4.10	\$3.93	\$4.01
Output Multiplier			1.67
Total Economic Value			\$7,972,282
Average Landing per Fisher			
Pounds	3,038	4,293	3,546
Monetary Value	\$12,444	\$16,872	\$14,236
Notes: All data from "Three Year Summary Report, 1 April 1997 - 31 March 2000," Cooperative Fishery Statistics Program, Bureau of Fisheries, Department of Planning and Natural Resources Division of Fish and Wildlife, August 2000. The estimated monetary value is in year 2000 dollars, and is based on analysis that assumes the catch is marketed at average commercial price.			

3.3.2 Recreational Fishing Activity

Recreational fishing data is more difficult to capture. Data reported in this section is based on information obtained during Division of Fish and Wildlife "Angler Telephone Household Survey" and in a recent recreational fisheries report on the activity and harvest patterns in the USVI recreational fisheries between 1995-2000 (Mateo, et al., 2001).

Recreational fishing for data year 1999 shows that approximately 11,000 residents participated in recreational fishing, with total landings of 172,637 pounds, with landings on St. Croix (11) slightly lower than that of St. Thomas/St. John (18).

Table 3 – 3 Recreational Fishing Data Year 1999

	St. Croix	St. Thomas/St. John	Total
Residents' Recreational Fishing	3,294	7,705	10,999
Total Catch (pounds)	35,225	137,412	172,637

Notes: Fishing data from Mateo, I., *Annual Performance Report: USVI Angler Telephone Household Survey*, Department of Planning and Natural Resources, Division of Fish and Wildlife (1999).

In Mateo, et al. (2000) it is reported that between 1995–1999, the total catch (pounds) from shoreline fishing was twice as large on St. Croix at 65,000 pounds, than for St. Thomas/St. John, at 31,000 pounds. For offshore fishing there was an almost seven-fold difference during the same years: St. Croix, 42,000 pounds; St. Thomas/St. John, 270,000 pounds. In that same period, St. Croix hosted ten tournaments compared to thirty-six for St. Thomas/St. John. (see *Appendix II* for additional recreational fishing data 1995-1999).

3.4 Summary of Marine-Related Economic Data

The VI Bureau of Economic Research and other government agencies collect some of the data that would be useful in determining the economic impact of boating, watersports, and other marine activities. In most instances, however, activities are aggregated in a way that is not useful to the MPA analysis, e.g., the Bureau of Economic Research expenditure category titled “recreation” includes all forms of recreation/entertainment. At this time it is not possible to delineate detailed expenditures attributable specifically to fishing, boating, diving, and other water sports. Therefore, summary descriptions have been prepared.

3.4.1. Boating

Table 3 – 4 Boating Data

Assumptions		
All Registered Boats – 2000	2,462	
Average days per month used	7	
Months per year used	12	
Term Charter Boats	150	
Day Charter and Day Sail Boats	150	
Commercial Fishing Boats	349	
Total Registered Boats 2000 – non-commercial	1,813	
Expenditure Data - Year 2000		
Boats Analyzed	1,813	
	Daily Expenditures	Total Expenditures
Fuel	\$41.24	\$3,704,612
Refreshments	\$30.04	\$3,295,381
Fishing Gear	\$28.41	\$2,421,878
Travel to Boat	\$17.79	\$1,897,776
Ice	\$11.93	\$981,196
Bait	\$5.23	\$533,675
Total	\$134.64	\$12,834,517
	Monthly Expenditures	Total Expenditures
Slip Rent (29%)	69.47	\$11,592
Dingy Fee (15%)	29.69	\$1,786
		\$13,378
Total Direct Expenditures		\$12,847,895
Output Multiplier		01.67
Total Economic Value		\$21,413,159

Notes: Data derived from a number of sources including the Virgin Islands Charter Yacht League, the Department of Planning and Natural Resources Division of Fish and Wildlife, and existing studies on recreational boating and fishing. (See *Appendix II* for more details on source and methodology.)

3.4.2 Other Tourism-related Data

The Bureau of Economic Research maintains reliable information on tourism-related expenditures (e.g., lodging, food, transportation, etc.) For the expenditure category “recreation”, all forms of recreation or entertainment are combined. The following analysis offers detailed expenditure data attributable to specific fishing, boating, diving, or water sports activities.

Table 3 – 5 Tourism Data (in year 2000 dollars)

Category		Value		
Total Employment		44,050		
Total Private Sector Employment		29,020		
Total Visitors (thousands)		2,478		
Total Cruise Ships (thousands)		1,014		
Total Cruise Ship Passengers (thousands)		1,768		
Total Rooms and Units		4,997		
Occupancy Rate		59%		
Total Hotel/Lodging Guests		652,953		
Percent USVI residents		7%		
Percent Non-Residents		93%		
Total Gross Territorial Product (millions of dollars)		\$2,038.7		
Visitor Expenditures				
Sector	Visitor Expenditures (Millions of dollars)	Percent of GTP	Tourism Related Employment	Percent of Private Sector Employment
Hotels/Lodging	\$240	12%	3,980	14%
Food & Beverages	\$158	8%	2,100	7%
Retail (gift shops, etc.)	\$495	24%	2,010	7%
Transportation	\$89	4%	570	2%
Recreation	\$101	5%	N/A	N/A
Other	\$74	4%	N/A	N/A
Total	\$1,157	57%	8,660	30%

Notes: All data is derived from Bureau of Economic Research, *Annual Tourism Indicators* and *Annual Economic Indicators*, USVI Government Development Bank (2001), and Personal Communications with Bureau of Economic Research personnel. All monetary values are in current year dollars.

3.4.3 Diving and Water Sport Economic Data

In 2001, thirty dive school/shops and twenty-one water sport business licenses were issued for St. Thomas and St. John (Personal Communication with ("*per. comm.*") S. Fahie, Department of Consumer Affairs and Licensing, St. Thomas); six dive businesses and six water sport licenses were issued on St. Croix (*per. comm.* Pinney, Department of Consumer Affairs and Licensing, St. Croix). While these businesses may report Gross Receipts, participate in the V.I. Employment Security reporting, and exchange information within formal or informal business associations, the revenue data, gross receipts tax, employment, annual days of activity, wages, etc., are not analyzed by any government agency. Stakeholders report that on St. Croix and St. Thomas “informal” water sport businesses seem to start up and close down frequently.

Data on divers' "willingness to pay" as consumers is important for economic analysis of diving activity. Document review did not identify any studies that gathered that information.

4.0 User Groups

4.1 Description of User Groups

For purposes of this Report, the user groups are identified as follows:

Table 4 - 1 Identification of User Groups

Boaters	Commercial	Carry passengers for hire, e.g., ferries, charter boats, etc.
	Recreational	Personal watercraft used for fishing, diving, sailing, etc.
Divers	Dive Shops	Sell or rent equipment for diving; Tours for hire
	Divers	Personal, educational purposes.
Fishers	Commercial	Depend on fishing for livelihood full time or part time.
	Recreational	Subsistence and game fishing.
Hotel/Tourism		Owners or managers of hotels, inns, etc., or tourism-related services and businesses.
Real Estate		Property sales, rentals.
Supportive Businesses		Boat repair, re-fueling, ships' stores, fishing gear, bait

Note: Additional user group categories and description can be found in Bunce, et al. (2000), and Salm and Clark (2000).

4.2 Socio-Demographic Summary of User Groups Represented in the Stakeholder Process

Media announcements and letters of invitation attracted a diverse – if small – group of residents to the stakeholder process. Consistent with the non-random sampling method, the composition of the stakeholder groups participating did not appear to reflect the diversity of the general population. The survey instrument requested basic information, but did not, for the sake of brevity, include information on ethnicity, place of birth, specifics on employment, income, or age.

By observation of the Facilitator and review of sign-in sheets, it appeared that the *community briefings* on St. John and St. Croix were more racially diverse than on St. Thomas. A fairly even number of people of color and Caucasian attended the St. John meeting. At the St. Croix meeting, approximately two-thirds were people of color. In the St. Thomas meeting, there was only one person of color and two of French descent; the others were Caucasian. In all community briefings there was representation by government, NGOs, and the private sector.

The participants in the St. John *focus group* consisted of Caucasian residents from the private sector and from community-based organizations (CBOs). The St. Thomas focus group was racially diverse with NGOs, public, and private sector representation. Of the three St. Croix focus groups, one meeting was attended entirely by federal and local government personnel, including one person of color; the second group was diversely represented by race and sector; and the third, and smallest, group was also diverse by race and sector.

4.3 Summary of Findings from Survey

A summary of stakeholder demographics, marine interests, level of involvement in their areas of interest, and their opinions regarding MPA issues was prepared from surveys completed by an estimated 90% of the participants in the community briefings and focus groups. All respondents answered the non-economic questions, i.e., about their marine interests, and their level of involvement in marine activity. Few respondents shared economic details. The reluctance to provide economic information is understandable and suggests that, in order to obtain the necessary data, MPA planners must establish a level of trust and incorporate "ground rules" in the process that protect confidentiality. Future efforts can gather baseline information using a comprehensive, culturally competent instrument for a statistically representative sample, and a shorter, but more widely-distributed instrument for other information.

The values given to marine resources by the respondents are described in the valuation assessment in Chapter 7. The survey instruments appear in *Appendix III*, and stakeholder demographics in *Appendix IV*.

4.3.1 Description of Stakeholders' Marine Interests

Participants were asked to indicate all of their marine interests and involvement with marine resources. The data in Tables 4-2 and 4-3 represent the number of times the interest area was selected by stakeholders. Table 4-2 shows all interest areas; Table 4-3 shows the primary and secondary interest areas. Education, science, environment, property value, and quality of life appeared under the "Other" category.

Table 4 - 2 Stakeholder Interests

Interest	Commercial	Recreation	Education	Science	Environment	Property Value	Qual. of Life
Boating	19	37					
Ferry	9						
Charter	10						
Dive shop/ Diving	6	11					
Fishing	19	52					
Support Businesses	12						
Other areas			43	34	47	14	47

Source: MPA Stakeholder Survey 2001

Stakeholders were asked to identify their primary levels of interest and were encouraged to list as many interests as applicable. Table 4–3 shows the total numbers of stakeholders who selected each Commercial, Recreational, or Other (specific) interest area. The second column reflects the number of stakeholders who selected the particular interest area. The last column shows the percentage of stakeholders for whom the selection was a primary interest. For all users, the six recreational interest areas generated a total of 187 responses: 52 selected Diving, for 84% of

them, diving was their *primary* interest. Additional details on interest and level of involvement are provided in *Appendix IV*.

Table 4 – 3 Stakeholder Primary Interest

AREA OF INTEREST	# of Responses	% for whom was Primary Interest
1. Marine interest - Commercial		
Boats (Ferry)	8	50%
Boats (Charter)	9	50%
Boats (Repair, Fuel, Maintenance)	4	75%
Boats (Provisioning)	2	50%
Dive Shop	5	40%
Fishing	19	83%
Marina	4	0%
Other	12	100%
2. Marine interest – Recreational		
Swim/Camp	49	70%
Fish	27	58%
Dive/Snorkel	52	84%
Boat	37	60%
Parasail/Kayak	20	50%
Other	2	
3. Marine Interest - Other		
Educational	42	73%
Scientific	33	78%
Environmental	46	89%
Property Value	13	50%
Quality of life	46	86%

Table 4–3 Source: MPA Stakeholder Survey 2001

Information from the user-specific survey and the supplemental survey appear, generally, to be consistent, e.g., the number of stakeholders indicating their area of interest by self-assignment to a user group is similar to the numbers for the primary and secondary interest recorded on the supplemental survey. Limited, descriptive information was requested for the respondents' Level of Involvement in the selected interest area(s).

Table 4-4 MPA Benefits and Concern

User groups	Will MPA enhance your industry?			Benefits of an MPA				Concerns about MPA			
	Yes	no	don't know	Economic	Quality of Life	Environmental	Other	Size	Time	Management	Other
Boaters											
Commercial 2*	100% (2)**			25% (1)	25% (2)	50% (1)		0	0	100% (2)	0
Recreational 9	88% (7)			25% (2)	25% (1)	50% (7)		0	0	100% (7)	
Diving											
Divers 14	100% (14)			14% (3)	19% (4)	62% (13)	5% not specified	6% (1)	6% (1)	75% (12)	13% (2)
dive shops 1	100% (1)			33% (1)	33% (1)	33% (1)		0	0	(100%) (1)	(0)
Fishers											
Commercial 9	89% (8)	11% (1)		33% (5)	33% (5)	33% (5)		21% (3)	43% (6)	36% (5)	0
Recreational 3	67% (2)	33% (1)		20% (1)	40% (2)	40% (2)		17% (1)	50% (3)	17% (1)	17% (1)
Hotel/Tourism 6	100% (6)			21% (3)	35% (5)	37% (6)		0	25% (2)	75% (6)	0
Real Estate 5	100% (5)			25% (3)	17% (2)	33% (4)	25% not specified	0	33% (1)	67% (2)	0
Supportive Business 21	88% (18)	12% (2)		24% (7)	29% (8)	38% (12)	9% (3)	4% (4)	20 % (5)	58% (14)	0

Source: MPA Stakeholder Survey 2001

* Number of respondents

% represents % of total responses to the question

** represents total number of responses to the question

5.0 Description of Use Patterns

The information in this Chapter describes the various uses of marine resources, including frequency of use and seasonality, scale of dependency, and location of activity. Information may be indicative, but not conclusive, regarding use patterns.

A number of studies were completed between 1973 and 1997 describing uses of the marine resources in the VI National Park and the Biosphere Reserve. A 1979 "Socio-Economic Survey of Recreational Boating and Fishing in the USVI" (Olsen, 1979) appears to have been the only assessment to address the entire USVI.

The Year 2000 "Water Quality Assessment for the USVI" (Division of Environmental Protection, 2001) contains a summary of classified uses and an assessment of which water bodies support the designated uses. The report states that there are 65 beaches – but the specific beach site names and the activities enjoyed at those sites are not provided.

Information on uses such as diving, jet skiing, camping, etc., are included parenthetically in many of the studies, but no reports specific to these activities were identified in the document search. Therefore, a study to characterize specific marine uses may be fertile ground for a comprehensive assessment of use activities at the above-referenced 65 beach sites and the other non-beach marine sites referenced in the Year 2000 "Water Quality Assessment".

To add to the understanding of how the marine resources are currently used, participants in the community briefings were invited to write directly onto Marine Community Maps uses of the marine resources with which they were familiar. It may be important for the marine manager(s) to review this list and create other opportunities for residents to express their uses of the marine resources. There may well be more than a few surprises when the uses expressed by stakeholders are compared with information in various reports. The locations and uses identified by stakeholder participants are set forth *Appendix V*.

5.1 Major Commercial Uses of the Marine Resource

An effort was made to characterize the major uses of the marine resource, and to describe the frequency, scale of use, and location of use. Available data supported a preliminary description for most of the major uses. Location of uses identified by stakeholders is included in this section, and in *Appendix V*.

The impact of shipping and transport was not considered in the project design, but should be included in future work. The increase in inter-island ferry traffic – St. John/St. Thomas, and St. Croix/St. Thomas – may increase the stresses and threats on the nearshore fish and coral reefs. The close proximity of shipping routes – especially for oil transport – should be factored into marine management emergency response plans.

5.1.1 Commercial Boating

According to a Division of Fish and Wildlife report, in early 2000 there were 2,462 registered boats in the USVI, including both private and commercial boats (Uwate, Tobias, et al., 2001). The VI Charter Yacht League reports that there are 150 Term Charter Boats/Yachts (i.e., boats that take passengers for hire out for one week or longer), and a similar number of day sail and day fishing charter boats (i.e., vessels that depend primarily on cruise ships to book day tours) operating in the USVI (Chandler, 2001). Boating information from the recreational fishing survey (Mateo, et al., 2000) lists 499 commercial, recreational, and fishing boats.

Frequency/ seasonality

The "Socio-economic Survey of Recreational Boating and Fishing in the USVI" (Olsen, 1979) reported no significant difference in boat use between the "summer" and "winter" months. No information was found for recent years.

Scale of Dependency

In 1979, less than 2% of the registered vessels carried passengers for hire and there were estimated 200-300 boats in the charter business (Olsen, 1979).

Based on 2001 data that appears in Table 3-4 and in *Appendix II*, provided by Uwate, Tobias, et al. (2001), Chandler (2001), and Mateo, et al. (2000), it appears that 26% of registered boats are engaged in commercial activities.

Locations of stakeholder- identified boating use

St. Croix	St. John	St. Thomas
Frederiksted beaches Frederiksted Harbor Christiansted Harbor Cane Bay to Annaly Bay Beauregard Bay, Teague Bay	Cruz Bay	Hans Lollick, Saba Island Flamingo Point, Sprat Bay Bolongo Bay Charlotte Amalie Harbor

5.1.2 Commercial Boating: VI National Park and Proposed Marine Conservation District (MCD) on St. John

The VI Resource Management Cooperative reported that boating increased from about ten boats a day in 1968 to more than eighty boats a day in 1986 (Rogers, McInain, Zullo, 1988). No recent data were found.

Locations of stakeholder- identified boating use

The VI Resource Management Cooperative lists the location of boating activity on St. John as follows:

Francis Bay	24.1%	Maho Bay	15.8%	Hawksnest Bay	04.7%
Caneel Bay	38.0%	Leinster Bay	17.3%		

(Rogers, 1988). Recent data was not found.

5.1.3 Commercial Fishing

Frequency/ seasonality

In a final report on sport fishing restoration, commercial fish landings increased from 11,913 in 1996-1997, to 16,499 landings in 1997-1998, representing an increase of 38%. Fish landings fell to 12,769 in 1998-99, representing a 23% decrease (Tobias, et al., 2000).

Reef fish such as Nassau Grouper (nearly extinct in the USVI), Red Hind, and Mutton Snapper form breeding aggregations at certain times of the year during which they are vulnerable to exploitation from fishing pressure. A closed season exists annually for Red Hind from December through February off the south coast of St. Thomas, and at the head of Lang Bank on St. Croix. There is a closed season for Mutton Snapper off the southwest coast of St. Croix from March through June each year (Division of Fish and Wildlife brochure, undated). Additional information on seasonality was not found in the Division of Fish and Wildlife reports, nor in other available materials.

Scale of the Dependency

Changes in the dependency on commercial fishing between 1930–2000 have been documented:

- Fiedler and Jarvis (1932) completed the earliest economic fisheries survey of the USVI in 1930. They reported 405 active fishermen (33% of the labor force) landing a total catch of 616,000 pounds, concluding the resource to be approximately 50% under-fished;
- Dammann, et al. (1969) reported that USVI fishery resources supplied approximately 60% of local consumption;
- McElroy (1978) reported that commercial fishers were less than 1% of the population.

The number of registered commercial fishers in the Territory has not changed significantly in recent years. The Division of Fish and Wildlife reports that commercial fishers numbered 343 in 1996, 369 in 1997-98, 342 in 1998-99, and 349 in 1999. The latter was the most recent year for which reliable data was available (Tobias, et al., 2000).

Table 5-1 Registered Fishers 1996 – 1999

Years	Registered fishers			Reporting fishers			Landings		
	'96-'97	97-'98	98-'99	'96-'97	97-'98	98-'99	'96-'97	97-'98	98-'99
St. Croix	212	216	206	210	208	200	7,192	10,465	7,670
St. John/ St. Thomas	131	153	143	124(95%)	138(90%)	6 (95%)	4,721	6,034	5,099
USVI	343	369	342				11,913	16,499	12,769

Source: Developed from Division of Fish and Wildlife information (Tobias, et al., 2000)

Location of commercial fishing activity

The locations are shown as reported in a 1997-2000 summary report by the Division of Fish and Wildlife (Tobias, et al., 2000).

St. Croix

- Pot fish: majority caught south of the island ('97); east and northeast ('97-99)
- Nets: nearly equal landings in northeast and southwest ('96-97, and '97-99)
- Spearfishers, lobster/conch: highest landings in eastern half ('96-97)
- Conch: eastern half of island ('96-97); northeastern ('97-98); southern ('98-99)
- Pelagic: northeast ('96-97); western and northeastern ('97-99)
- Lobster: eastern half ('96-99)

St. Thomas/St. John

- Majority of total catch is northwest, southwest, and northeast of St. Thomas
- Pot Fish: southwest of St. Thomas ('96-98)
- Nets: northside of St. Thomas

It is noted that in the 1994 "Description of the Fishing Activity in the Proposed Marine Conservation District South of St. John", fourteen of the fifteen fishers interviewed reported fishing for Yellowtail Snapper (Lutjanidae), and Hardnose/Blue Runner, (Carangidae) in the waters southeast of St. John. Citing gaps in data, the report further states that between July 1992 and June 1993, landings south of St. John accounted for 12% of the total landings reported to Caribbean Fisheries Management Council, and concluded that, "The fishing activity in the areas seems to be higher than previously reported." (CFMC, 1994).

5.2 Major Recreational Uses of USVI Marine Resources

5.2.1 Boating

Recreational boating in the USVI occurs in two categories: 1) residents and tourists who own and use their own boats, and 2) residents and tourists who rent or charter yachts/boats for fishing, pleasure cruises, sailing, diving, or other marine or pleasure-related activities. In the St. Thomas community briefing, it was stated that data from government agencies and boating organizations are now being shared and could result in a more accurate picture of this area. There has been no confirmation of formal or informal exchange of data.

Frequency/ seasonality

Data to support economic valuation of recreational boating is not compiled or collected by the Bureau of Economic Research or the Department of Consumer Affairs and Licensing. The data gathered by the Division Fish and Wildlife is not sufficient to complete the valuation work, although anecdotal references appear in the literature reviewed for this report.

Scale of the Dependency

Private recreational boats reportedly total 1,183 registered boats (Mateo, et al., 2000). According to the Division of Fish and Wildlife, in early 2000 there were 2,462 registered boats in the USVI. This figure included private and commercial boats (Uwate, Tobias, et al., 2001).

In 1978 the Department of Conservation and Cultural Affairs reported a total of 1,789 registered boats, 75% were registered as recreational. Earlier counts may have included commercial boats (Olsen, 1979).

Using the 2001 figures, recreational vessels are down from 75% in 1978, to less than 50% of the registered boats in 2001.

Locations of stakeholder-identified recreational boating use

St. Croix	St. John	St. Thomas
Green Cay, Beaugard Bay Annaly Bay to Cane Bay Sprat Hall, Sandy Point Cottogarden Bay Teague Bay, Turner Hole	[None identified]	Hans Lollick

5.2.2. Virgin Islands National Park – St. John

The Virgin Islands National Park has long enjoyed the attention of tourists as well as the scientific community. Numerous studies and reports have been completed over the last 30+ years that provide what may be the most detailed descriptions of any marine resource area in the USVI.

Frequency/ seasonality

Recreational uses of the waters and beaches of the Virgin Islands National Park and Biosphere have increased dramatically from less than 100,000 persons in 1967, to more than 750,000 in 1986, to 802,000 in 2000 (Virgin Islands National Park Summary, 2001). The recent reports include such specific present uses as day trips, camping, and water-based sports and activities.

5.2.3. Buck Island National Monument

Boating information was not found in the materials.

5.3 Recreational Fishing

In early studies by Olsen (1979), "recreational fisherman" is loosely defined as a person who has either demonstrated fishing activity or has the capability for fishing activity (i.e., boat owners). The definition also includes non-extractive marine resource users such as snorkelers and underwater photographers. This convention influences some present-day work; however recent studies by the Division Fish and Wildlife limit the category solely to fishing *per se*, and provide extensive documentation on fish landings, methods, etc.

Table 5-2 Recreational Fishing

	St. Croix	St. Thomas/St. John	Total
USVI residents	54,882	61,888	116,770
Residents' Recreational Fishing	3,294	7,705	10,999
Percentage of USVI Residents	6.0%	12.4%	9.4%

Source: Developed from information from Division of Fish and Wildlife, 1999

Frequency/ seasonality

A closed season exists annually for Red Hind from December through February in an area off the south coast of St. Thomas and at the head of Lang Bank on St. Croix. There is a closed season for Mutton Snapper off the southwest coast of St. Croix from March through June each year (Division of Fish and Wildlife brochure, undated)

According to Mateo, "saltwater recreational fishing" is a popular outdoor activity enjoyed by approximately 11% of residents (12,800 individuals). Mateo, 1999, and Mateo, et al., 2000. Further, "shore-fishing" is a form of recreation practiced by thousands of USVI residents annually despite low catches and lack of facilities (Mateo, 1999).

The seasonality of recreational fishing on St. Croix is reported to be February, April, July, and October. For St. Thomas/St. John, it is from May to November (Mateo, 2001). (The designated areas, and closed season, for reef fish was described in Section 5.1.3)

Scale of the Dependency

Recognized as one of the premier locations in the world for Blue Marlin fishing by sports fishing publications, the USVI is marketed in part as a true sport fisher paradise (*per. comm.* Department of Tourism). The USVI annually attracts 40 recreational and charter vessels from the U.S. and the Caribbean. Recreational fishing annually provides revenues of more than \$5.5 million into the V.I. economy (Mateo, et al., 2001).

As many as fifteen organized recreational fishing tournaments are held annually for inshore and offshore gamefish species. From 1995-2000, Division of Fish and Wildlife personnel acted as weighmasters and/or collected data for 48 such tournaments (Mateo, et al., 2000).

Locations of stakeholder-identified recreational fishing

A 1999 Recreational Fisheries Telephone Survey (Mateo, 1999) identifies the most popular fishing sites for St. Croix (north and east coasts) and St. Thomas-St. John (waterfront). The top three sites for anglers, by District, are:

St. Croix	St. Thomas–St. John
Frederiksted Pier	Waterfront
Altona Lagoon	Northside
Offshore East of Buck Island	Crown Bay

A VI Marine Resource Cooperative Report surveyed licensed and unlicensed fishers on St. John and describes fishing activity in detail. That data is not currently collected and reported. The report indicated that subsistence or recreational fishermen set traps both within and outside the Biosphere reserve. Fishers frequented Fish and Reef Bays on the south side and Johnson's Reef on the north side for lobster. Subsistence fishing also occurred from Rams' Head around to East End and south to Cruz Bay (Koester, 1986).

5.4 Diving

The U.S. Virgin Islands is often described as a major diving destination in the Caribbean. About 25-30 dive businesses current operate in the USVI, up from 20 in the 1980s. The Department of Consumer Affairs and Licensing reports thirty Diving/Diving School licenses were issued for the St. Thomas/St. John District, and six for St. Croix in the year 2001.

Frequency/seasonality

According to one global reef research organization, 45,000 snorkelers use the Buck Island Reef National Monument underwater trails annually (Reefbase, 2001). Many of St. Croix's dive and snorkel sites experience 100-200 visitors per site on days when cruise ships are in port (*Per. Comm.* Cane Bay Dive Shop instructors).

Scale of Dependency

In 2001, there were thirty diving shop businesses/schools licensed on St. Thomas and St. John, and six on St. Croix (*Per Comm.* Fahie, Department of Consumer Affairs and Licensing, St. Thomas). There are six on St. Croix (*Per. Comm.* Pinney, Department of Consumer Affairs and Licensing, St Croix).

Locations of stakeholder- identified diving activity

St. Croix	St. John	St. Thomas
Along the west shore from Sprat Hall to Sandy Point; The North Shore between Cane Bay and Davis Bay; Protestant Cay, Green Cay, Frederiksted Beaches	Coral Bay, Newfound Bay, Whistling Cay, Johnson Reef	Mingo Cay, Great St. James Island, Little St. James Island Long Point and south of Long Point, Saba Island Bolongo Bay, Fist Cay, Frenchmen's Bay, northwest and northeast sides of Hans Lollick

5.5 Watersports

The category of data called "recreation" collected by the Bureau of Economic Research does not differentiate between types of watersports such as parasailing, mini subs, jet skis, etc. The Department of Consumer Affairs and Licensing also does not issue licenses that are specific to the above-named watersports. It would be helpful if an agency of government were charged with collection of water sports data in a format that could be used for economic and descriptive analysis of marine resource and other purposes.

Scale of Dependency

There are 22 watersport rental businesses licensed on St Thomas/St. John (*Per. Comm.*, Ms. Fahie, Dept. of Consumer Affairs and Licensing, St.Thomas); and six watersport businesses on St. Croix (*Per. Comm.* Ms. Pinney, Dept. of Consumer Affairs and Licensing, St. Croix).

Locations of stakeholder- identified watersports use

St. Croix	St. John	St. Thomas
Frederiksted Between Annaly and Cane Bay, Chenay Bay, Turner Hole, Green Cay, Great Pond Bay, Salt River	[No sites were identified on maps in the community briefing]	West Cay, eastern peninsula of Magens Bay, Cowpet Bay, Great St. James Island

5.6 Swimming/Camping/Hiking/Snorkeling

Data does not appear to have been collected in these categories. A decision should be reached to designate a specific agency and charge it with the responsibility to collect data, and to do so in a format that will be useful in completing marine resources economic and descriptive assessments.

Frequency/seasonality

No information was located.

Scale of Dependency

No information was located.

Locations of stakeholder-identified uses

St. Croix	St. John	St. Thomas
Use: Snorkeling Long Point to Sandy Point, Ha'penny Beach, Great Pond Bay, Turner Hole, Point Udall to Great Pond Bay, Cottongarden Bay, Teague Bay, Chenay Bay to Teague Bay, Sprat Hall, Frederiksted, Sandy Point, Annaly Bay to Cane Bay, Butler Bay to Annaly Bay.	Use: Snorkeling Mennebeck Bay, Brown Bay, Leinster Bay, Francis Bay, Hawknest, Rata Cay, and Hersey Cay Trunk Bay and Newfound Bay.	Use: Snorkeling Magens, Hans Lollick, Coki Point, Smith Bay, Bolongo Bay, Flamingo Point, Sprat Bay, Saba Island, NW Jersey Bay.

5.7 Education / Research / Ecotourism

The MPA stakeholders identified sites that they use, or know to be used, for educational, research, and/or ecotourism activities. They also included sites that they think should be “eco-sites”.

On St. Croix, there are educational/ecotourism hikes and tours conducted by the St. Croix Environmental Association (SEA), University of the Virgin Islands Cooperative Extension Service, and individuals and groups, e.g., Bamboula Haven, Inc., Lumumba Coriette, and others, as part of education programs. As an outgrowth of a tourism entrepreneurship training sponsored by the Virgin Islands Tourism Awareness and Advancement Link, Inc. (VITAAL), in 1998, and a taxi and tour training sponsored by the Frederiksted Economic Development Association in 2002, safari bus and taxi van operators have begun to incorporate environmental information into their tours and site descriptions.

On St. John, the VI Environmental Research Station (VIERS) and the National Park Service provide numerous opportunities for education and ecotourism activities. St. John has the additional benefit of Cinnamon Bay Campgrounds, Maho Bay, Harmony, and Concordia Eco-tents I and II, that specifically promote "living" the educational, environmental, ecotourism experience by visitors.

On St. Thomas, according to stakeholders and local media, Mandahl Bay and Magens Bay now offer or support eco-tours. Coral World Marine Park and Underwater Observatory is generally marketed in the eco-tour category (*Per. Comm.* Department of Tourism).

Frequency/seasonality

Information was not found.

Scale of Dependency

Information was not found.

Locations of stakeholder -identified educational / research / ecotourism uses

St. Croix	St. John	St. Thomas
Sandy Point Butler Bay Rust-op Twist Cane Bay to Salt River, Chenay Bay to Teague Bay Pelican Rock (NP) Point Udall to Great Pond Bay Turner Hole Long Point to Sandy Point	[None identified on the Community Marine Maps]	Fist Cay Providence Point Flamingo Bay Buck Island (NP); Magen’s peninsula (outer side) (NP)

* *NP* indicates “Needs Protection” as recommended by stakeholders.

6.0 Economic Valuation Assessment

Values associated with marine resources have been measured in many different ways – depending upon the expected use, analysis to be undertaken, and the extent to which data is available. "Valuation" is described as a means of justifying the existence of marine protected areas (Salm and Clark, 2000). For this Report, we have taken an all-inclusive approach; that is, we identified all marine-related goods and services, support systems, and functional diversity; then we attempted to gather the necessary information to quantify the total economic value. This "total economic value" (TEV) provides a baseline of available information and analysis, allows for the greatest flexibility in current and future use of the information, and has the benefit of helping to identify gaps in data and future research needs.

Unless otherwise indicated, the definitions, procedures, and figures in this Chapter were developed by the authors of this Report based on extensive research materials and on dialogue among professionals involved and/or familiar with economic and social science research. The economic multipliers and some assumptions used in this Report have been developed, refined, and tested since 1988 in applications used by decision-support models developed for a local governmental and a quasi-governmental agency, respectively.⁴

6.1 Methodology

Variations of the "Total Economic Value" approach (TEV) have been used in numerous marine valuation studies (see Cesar, 2000). Consistent with these, our TEV approach incorporates a combination of use and non-use values related to the marine environment. We assume the use and non-use values generate, or have, economic values that can be measured through other means. As Figure 6-1 shows, there are five distinct categories.

Figure 6 - 1 Categories of Economic Value

Use Values	Non-Use Values
1. Direct Use Extractive Non-Extractive	1. Option 2. Bequest 3. Existence
2. Indirect Use	

"Use values" include both direct and indirect uses. "Direct uses" are those are consumable directly, including extractive and non-extractive uses. "Direct extractive uses" include fishing and aquarium trade; "non-extractive uses" include tourism, recreation, and research. "Indirect uses" provide more indirect gain or enjoyment, including biological support for birds, fish, and turtles as well as physical protection for ecosystems, coastal areas, and navigation routes.

⁴ The Virgin Islands Energy and Economics Management Information System (EEMIS) used by the V.I. Energy Office successfully linked energy efficiency to economic impacts, i.e., jobs, income, etc. In 1999, EEMIS adapted to implement a recycling economics management information system (MIS) for the Anti-Litter and Beautification Commission on St. Croix. John Laitner of Economic Research Associates and Marshall Goldberg of MRG Associates collaborated on the former project. MRG worked with Hinds, Unltd., on the development of REMIS, and was a member of the Hinds, Unltd., team that prepared this Report.

"Non-use values" recognize the concept that preserving existing resources has value in the future – both to the marine ecosystems and humans. So much can be gained from avoiding irreversible losses. Some benefits include option value for species, habitat, and biodiversity. For example, biological substances from the marine environment may be used in pharmaceuticals to develop cures for disease. "Bequest value" recognizes there is a value in knowing the marine environment (and all it encompasses) exists and posterity will be able to use and enjoy it. "Existence value" acknowledges that something has intrinsic value, whether or not it is used.

Figure 6-2 adapts Dixon's "Introduction to Environmental Economics" (Dixon, 2002) and "Economic Analysis and Environmental Assessment" (Dixon, 1998) to the TEV concept used in this Report. (*Appendix VI* provides additional information on TEV).

Figure 6–2 Marine Valuation Use Values

<p>1. Direct Use : Structural values usually measure output Extractive (consumptive) – e.g., fishing, coral collection Non-Extractive (non-consumptive) – e.g., diving, snorkeling, swimming <i>Techniques:</i> Changes in output of marketable goods; Cost-based approaches; Hedonic prices; Contingent Valuation, Travel Costs</p> <p>2. Indirect Use: Functional values usually measures benefits and services Pelagic and other fish dependent on reef fish Storm surge protection for coastal areas <i>Techniques:</i> Cost-based approaches; Contingent valuation methods</p>
<p>Non-Use Values</p> <p>1. Option value – “I may want to use the reef in the future.” <i>Techniques:</i> Contingent valuation; hedonic prices</p> <p>2. Bequest value – “I want to leave it for my children.” <i>Technique:</i> Contingent valuation</p> <p>3. Existence value – “I get a benefit from knowing that it is there.” <i>Technique:</i> Contingent valuation</p>

6.1.1 Data Collection

With this basic framework established, we relied on a number of sources to gather current and historical information for analysis. These include:

- Marine related studies completed for the USVI and other areas;
- Government departments and agencies;
- USVI industry groups;
- USVI Energy and Economic Management Information System (EEMIS), and the Recycling Economics Management Information System (REMIS); and,
- Focus groups and survey findings from tri-island meetings conducted in November and December 2001.

The literature research initially revealed only a few marine-related studies specific to the USVI. However, upon preliminary review of these studies we found references to a number of marine-related studies completed during the last twenty years that focused on specific activities for the Territory as a whole. A more detailed review of available studies and the information obtained from other sources was informative for determining use values primarily related to tourism, fisheries, and recreation.

The types of data collected include:

- Value of output
- Expenditure patterns
- Activity levels
- Population
- Other economic and demographic data.

Little information was available to support economic analysis of these elements:

- Aquarium trade
- Souvenir manufacturing
- Educational and research functions
- Access for shipping/commerce
- Biological support for wildlife
- Coastal protection
- Bioprospecting.

Similarly, we found little information to quantify or support economic analysis of any of the above-noted non-use categories. This is not surprising since most of the marine-related studies and the organizations contacted focus their data-gathering and research primarily on direct uses of marine resources. Furthermore, the key methodologies employed to derive economic valuation of non-use values, such as asking residents and tourists questions regarding their willingness-to-pay (i.e., contingent valuation or other methodologies) require extensive interviews and surveys that are costly to perform.

Due to the limitations of this study (i.e., data to be derived from existing/secondary sources rather than primary data collection) our analysis focuses largely on the direct use values for which we were able to obtain information. Where applicable, this Report has included indications of use and non-use values derived from existing studies and survey responses from the focus group sessions.

6.1.2 Quantification of Uses

The working premise in this analysis is that the marine environment, its unique resources, and its health, have values that can be monetized. Further, we assume many of these values to be directly related to the Territory's economy. Numerous existing studies⁵ and the significant marketing focus on the Territory's marine attributes (fishing, diving, beaches, etc.) support these premises as applicable for tourists and residents alike. Thus, with the range of goods and services identified we then gathered all available information to quantify the direct and total economic values where applicable. This included data on numbers of fisherman, fishing and boating activities, annual catch, average costs, and expenditures, among others.

It is noted, again, that the Bureau of Economic Research states that it does not estimate economic multipliers for key sectors, such as tourism. No multipliers were available from that agency or elsewhere. Data for capital expenditures and major equipment that support marine activities, such as fishing and boating, are not collected. A survey to collect such data was beyond the scope of the project.

Quantifying the total economic values is a two-step process. For purposes of this analysis, "economic value" is the economic output or benefit derived from the respective use or activity. The first step was to determine direct value. In theory, this value is fairly straightforward - it refers to the on-site or immediate effects created by a use or activity. In practice, however, direct value is not used to determine non-use values, nor it is used where only limited information is available. Such instances are comparable to the limitations of this study where we had to rely on existing analysis that was available.

In the case of commercial fishing, the direct value is the market value of fish caught by local commercial fishermen. In the case of tourism where information on visitor spending is relatively comprehensive and current, the year 2000 values (the most recently reported) were adopted. In other cases, such as boating, information is less detailed and more limited; therefore, it was necessary to combine the limited current information with data gathered from previous studies to develop an updated expenditure pattern from which to derive a direct value.

Once the direct values are calculated, the question then posed by this analysis is, "What are the total economic benefits or monetary values associated with the respective marine uses and activities?" To capture the full economic value, we must also account for the value or benefits derived from indirect economic activity resulting from the direct transactions. There are changes in economic activity that occur as "support industries" (inter-industry linkages) respond to the demands of the directly-affected industry. For example, as payment for goods or services is received, proprietors of support businesses (e.g., the fisherman or hotel owner) purchase necessary goods and services from other vendors, and so on. Clearly, spending patterns for marine related uses and activities have an additional effect on total economic activity and the associated value.

⁵ Among others, see Posner, et al., 1981; Olsen, 1979; Rogers, et al., 1988; and Downs, et al., 1997.

Other examples of support industries are: Bankers who finance purchases of equipment, accountants who balance the books, insurance companies that provide various types of insurance coverage and protection, building owners who rent office space, and fuel suppliers who provide motor fuel for business cars, trucks, and boats. Clearly, spending patterns for marine related uses and activities have an additional effect on total economic activity and associated value.

Economic output multipliers are used (where applicable) to the direct and indirect effects of change in economic activity⁶. These multipliers, accounting for local spending patterns and import ratios, capture the economic activity generated from a given level of spending in each sector to derive the total economic value. Economic output has a monetary value and contributes directly to GTP; in other words, expenditures that result in net output contribute to economic growth.

Despite extensive attempts to gather detailed and reliable data, there are a number of uncertain elements in this analysis. For example, where incomplete data is available on boating expenditures and numbers and types of boats, we made assumptions based on previous studies and anecdotal information. Similarly, due to a lack of detailed information on local industry/activity purchase patterns, we made conservative assumptions in an effort not to overstate any benefits that accrue.

Please note that, due to the nature and extent of the information provided on tourism expenditures, the total value reported for tourism should not be summed with the total values for recreational uses and activities, although the tourism value undoubtedly captures a portion of the recreational and fishery values noted in subsequent sections addressed in this Report.

⁶ No economic multipliers were available from the USVI Government, nor was data available on import content of goods or local spending patterns. Thus, to derive a local economic multiplier for fishing and boating-related expenditures and revenues, the authors relied primarily on economic analysis we completed in the USVI using anecdotal evidence compiled over the last ten years. The multiplier was calculated using the formula $1/(1-AB)$, where A represents the marginal propensity to purchase local goods and services, and B represents the share of local expenditures that accrue as income to the local economy. For this analysis, we assume A equals 80 percent and B equals 50 percent. This methodology is similar to that employed in Olsen (1979).

With this in mind, the summary results contained in Table 6-1 should not be viewed as definitive values, but rather indicative of the magnitude of monetary values for the respective marine resource uses and related activities. All monetary values are reported in year 2000 constant dollars for consistency in reporting and to facilitate comparisons.

Table 6 – 1 Marine Valuation

Summary of Marine Related Valuation Assessment (in Year 2000 Dollars)		
Use Category/ Use Values	Direct Monetary Value (Million Dollars)	Total Monetary Value (Million Dollars)
Fisheries		
Commercial Fishing	\$4.8	\$8.0
Recreational Fishing	\$0.5 - \$0.7	N/A
Boating		
Recreational Boats	\$12.8	\$21.4
Term Charter Boats/Yachts	\$29	\$49
Tourism	N/A	\$1,157*
Diving, Water Sports, Other Recreation , Other Uses	N/A	N/A
Total of all uses		

This table summarizes information found in the respective tables and text in this Chapter and in Appendix II . * Bureau of Economic Research *Annual Tourism Indicator and Annual Economic Indicators 2001*. "N/A" indicates information not available.

Sections 6.2 through 6.5 provide detail on the direct and total values associated with the marine-related uses and activities analyzed. (Additional background data for the analysis is provided in *Appendix II*)

6.2 Fisheries - Commercial and Recreational Fishing

Fisheries, whether related to commercial fishing, recreational fishing, or subsistence fishing for household consumption, are a fundamental component of life for many of the Territory's residents and tourists. Thus, its contribution to the economy and local employment must be considered in the valuation of marine resources and their use. For a detailed discussion on fishing in the USVI, see Downs, et al., 1997, among others; and for an historical perspective, see Boulon and Clavijo, 1986, and Koester, 1986, among others.

6.2.1 Commercial Fishing

In 2000, the Division of Fish and Wildlife reported that there were 349 commercial fishermen registered in the USVI. In 1999, the latest year for which reliable data is available (Tobias, et al., 2000), as Table 6-3 shows, commercial fish landings were estimated at just less than 1.2 million pounds with a gross direct monetary value of almost \$4.8 million. Accounting for the indirect impacts from this economic activity, we estimate total economic value from commercial fishing to be just under \$8 million during this one-year period. This value ⁷ may understate the total value since it does not account for local purchases/spending or financing associated with boats or other major assets (such as large equipment, buildings, etc.,) that could not be documented.

Table 6 - 2 USVI Commercial Fisheries Data 1999

Category	St. Croix	St. Thomas/St. John	Total
Registered Commercial Fishers	206	143	349
Total Trips (Reported)	7,670	5,099	12,769
Reported Landing			
Pounds	607,665	583,788	1,191,453
Direct Monetary Value (Millions)	\$2.49	\$2.29	\$4.78
Output Multiplier			1.67
Total Monetary Value (Millions)			\$7.97

Notes: All data is for the one-year period 1998-1999 and was derived from Tobias, et al., "Three Year Summary Report, 1 April 1997 - 31 March 2000," Cooperative Fishery Statistics Program, the Division of Fish and Wildlife, August 2000. Total monetary value is calculated by MRG & Associates using an output multiplier derived by MRG & Associates. See text for more detail on this methodology. Monetary value is reported in year 2000 dollars.

⁷ Total monetary value is derived by multiplying the direct monetary value times the output multiplier. MRG & Associates calculated the output multiplier. (See Section 6.1.2 for more detail.)

6.2.2 Recreational Fishing

"Fishing for pleasure" in the USVI, defined as fishing with no intent to derive monetary gain, has long been recognized as one of the most popular outdoor activities or hobbies pursued by residents of all ages, regardless of economic status. In fact, a 1999 survey by the Division of Fish and Wildlife found that almost 11,000 residents (9.4 percent of all residents) participated in fishing activities during the year (Mateo, 1999). This includes big game fishing (offshore), boat fishing (inshore), and shoreline fishing (pier, dock, beach, etc.). Similarly, for non-residents interested in fishing and/or planning to visit the Virgin Islands, recreational fishing is touted as "world-class" and is advertised as a key attraction and reason to visit.

Consistent with the thousands of residents who enjoy the numerous types of fishing and the promotional efforts to attract tourists, there were at least 46 fishing tournaments held in the USVI between 1995 and 1999 (Mateo, et al., 2000). These marine activities extract a significant amount of fish from area waters and, if sold, would represent a direct value estimated to be between \$455,000 and \$693,000.⁸

As Table 6-3 indicates, based on a telephone survey completed by the Division of Fish and Wildlife from December 1998 through July 2000, an estimated total of 172,637 pounds of fish were caught by resident recreational fisherman (including fishing on boats and shoreline fishing). Although no monetary value is typically placed on recreational catch (or that used for subsistence) because of the non-market nature of the activity, if we assume the average price per pound received by commercial fishermen, this recreational/tournament catch would have a direct monetary value of over \$693,000 annually.

Table 6-3 USVI Recreational Fisheries Data 1999

Category	St. Croix	St. Thomas/St. John	Total
USVI residents	54,882	61,888	116,770
Residents' Recreational Fishing	3,294	7,705	10,999
Percentage of USVI Residents	6.0%	12.4%	9.4%
Total Catch (pounds)	35,225	137,412	172,637
<i>Estimated Direct Monetary Value</i>			\$693,092

Notes: Fishing data from Mateo, I., Annual Report, and Recreational Fishery Assessment Project F-8-9 Job 7: Angler Telephone Household Survey, Division of Fish and Wildlife 1999. Demographic data from Annual Economic Indicators, Bureau of Economic Research. Direct monetary value estimate by MRG & Associates based on sales of catch at commercial sales price of \$4.01 per pound. Monetary value is reported in year 2000 dollars.

⁸ See *Appendix II, "Commercial Fishing Data"* for more detail on how this price is derived and the source of the data.

As Table 6-4 indicates, a recent 5-year recreational fisheries study, also completed by the Division of Fish and Wildlife, reports similar results. Including catch from tournaments noted earlier, we estimate the direct monetary value (if the catch were sold at commercial rates) to exceed \$455,000. This lower value, compared with the 1999 study (\$693,092), is due to the smaller estimate for average annual catch over the 5-year period.

Table 6-4 USVI Recreational Fisheries Data 1995 -1999

Category	St. Croix	St. Thomas	Total
Total Catch (pounds)	115,197	452,284	567,480
Average Annual Catch (pounds)	23,039	90,457	113,496
Estimated Annual Direct Monetary Value			\$455,657
<i>Notes: All fisheries-related data was derived from Mateo, et al., "Activity and Harvest Patterns in the U.S. Virgin Islands Recreational Fisheries, October 1, 1995 – September 30,2000". The Division of Fish and Wildlife December 2000 "Total Catch" and "Average Annual Catch" reports shoreline and offshore catch for 1995-1999 and tournament data for 1996-2000. The estimated Monetary Value is based on analysis by MRG & Associates that assumes the catch is marketed at an average price of approximately \$4.00 per pound (consistent with the average price received by commercial fisherman). Monetary values are reported in year 2000 dollars.</i>			

Several past studies found similar values. A 1979 socio-economic survey of recreational fishing and boating in the USVI attempted to address the direct value associated with recreational fishing. According to the study, its purpose was to "indicate the presence of an unquantifiable 'recreational product'". The study found that recreational fishing "generates a product (catch) worth \$578,000 annually" compared with a commercial fishing catch valued at \$2.4 million, both in 1978 dollars. (Olsen, 1979).

In addition to the enjoyment value (for which no direct monetary value is assigned here due to lack of information) there are a number of activities directly associated with fishing that contribute to the economy. These include: sale of bait, purchase of boats, fishing gear and equipment, purchase of motor fuels for boats, slip rents, boat charter/rentals, and boat repair, among others. Some of these values are captured in subsequent sections dealing with boats.

Another indication of the broad spectrum of local businesses that benefit from marine/fishing related activities are those involved in the Virgin Islands Marine Industries Association, an industry trade group representing local businesses associated with marine activities. It represents almost twenty different types of businesses, including boat builders, repair shops, marinas, yacht sales, communication equipment sales, and supply houses.

A 1994 recreational fishing study appears to incorporate its full economic benefits. The study estimates fishing activities contribute \$25 million annually to the USVI economy (see Hinckey, et al., cited in Mateo, et al., 2000). The Hinckey source document was not available for more detailed review and analysis of the results. Despite the significant role recreational fishing plays in the Virgin Islands, and the results from the Hinckey study and others, unfortunately, there is relatively little information available to further document or update the full economic values associated with these activities in the USVI.

Similarly, no studies have been done in the USVI to measure the value residents and tourists place on the opportunity to fish or to pursue recreational enjoyment. To the extent that recreational fishing is associated with boating (private, term, and day charter boats) and/or tourism expenditures, added benefits/values from resident and tourist spending are reflected in subsequent sections in this Chapter.

6.4 Boating - Recreational

Based on information provided by the Virgin Islands Charter Yacht League there are currently estimated to be 150 "term charter yachts" (vessels that take passengers out for one week or longer) and a similar number of "day sail" and "day fishing charter" boats (vessels that depend primarily on cruise ships to book day tours) operating in the USVI (Chandler, 2001).

Utilizing boating information from the recreational fishing survey cited in Section 6.3 and expenditure data from earlier studies and from the V.I. Charter Yacht League, we estimate the direct monetary value (i.e., expenditures) from all private recreational boats and term charter boats was \$42.2 million in 2000 (Table 6-5). For private recreational boats, this includes expenditures for fuel, refreshments, bait, ice, slip rent and/or dingy fees, and fishing gear only. It does not include expenditures for repairs, purchase of boats, or other miscellaneous expenses. Expenses for term charter yachts include food and beverages, insurance, maintenance, slip fees, wages, fuel, and commissions paid to local booking agents. We also estimate that the term charter yachts employ (including owner-operators) an estimated 450 persons annually.

Accounting for indirect impacts from our analysis of expenditures, the total monetary value of private recreational boats and term charter boats/yachts is estimated to be \$70.4 million. As noted earlier, this value may understate the total value since it does not account for local spending or financing associated with capital purchases (e.g., boats or other major equipment) or capture all expenditures for all boats or crew members due to the unavailability of information. Similarly, the analysis does not account for expenditures from boats traveling to the USVI from other areas. Inasmuch as one recent study reported 48 recreational boats from the U.S. Mainland in the USVI in 2000 (Mateo, et al., 2000), this is another area and market niche that warrants further research and analysis.

A 1981 study for the Virgin Islands National Park also attempted to provide a monetary value for recreational boats. The study, using a similar expenditure-based analysis as was used here, estimated a combined, gross income (direct monetary value) from all charter boats (totaling 372), of \$17.5 million in 1979 (see Posner, et al., 1981).

The study estimated an annual gross income of \$13 million from crewed term charter boats. Bareboat charter companies were reported to have grossed income of \$4.5 million. The lower values noted in this earlier study, relative to our current estimate, are due in part to a slightly different expenditure pattern, but primarily due to rising costs for all goods and services and higher wages for employees that have more than doubled in most areas over the 20-year period.

Table 6-5 USVI Registered Boat Data 2000

Category	Quantity	Value
All Registered Boats	2,462	
<i>Private Recreational Boats</i>	1,813	
Direct Monetary Value (Millions)		\$12.8
Total Monetary Value (Millions)		\$21.4
<i>Term Charter Boats/Yachts</i>	150	
Total Employees*	450	
Direct Monetary Value (Millions)		\$29.4
Total Monetary Value (Millions)		\$49.0
<i>Other Commercial Recreational and Fishing Boats</i>	499	
Total Employees	N/A	
Direct Monetary Value (Millions)	N/A	
Total Monetary Value (Millions)	N/A	
Total Private Recreational and Term Charter Boats/Yachts	1,963	
Direct Monetary Value (Millions)		\$42.2
Total Monetary Value (Millions)		\$70.4
<i>Notes: Monetary values are based on an analysis of expenditures for the respective categories of boats. Data on numbers of boats and expenditures are estimates derived from a number of sources noted in the text and contained in Appendix II. Data and analysis do not include commercial fishing boats or commercial recreational day sailboats or day charter boats due to lack of detailed information.</i>		
<i>* Place of residence of employees, i.e., USVI or mainland US was not determined.</i>		

As Table 6-5 indicates, the direct monetary value for private recreational boats alone is \$12.8 million annually. Total monetary value is estimated to be \$21.4 million. Direct monetary value for term charter yachts and boats alone is \$29.4 million annually. Total monetary value is estimated to be \$49.0 million.

No current information was available on day sail and day fishing charter boats. To the extent these “recreation” related expenses are tourism-based, the values may also be captured in the recreation portion of the section titled “*Tourism Activity*” discussed in this Chapter.

6. 5 Diving and Water Sports

Similar to boating and fishing activities noted earlier, diving, snorkeling, and other water sports, particularly those associated with the coral reefs, are a main attraction for residents and tourists in the USVI.

Unfortunately, no data or studies were available to further document these activities and industries or the associated monetary values. To the extent the uses and monetary value are related to tourism, they are captured in the recreation category of the Section 6.7, “*Tourism Activity*”, discussed in this Chapter. (For an older, but informative, description of recreational uses in the Virgin Islands National Park, including water sports, see Rogers, et al., 1988.)

6. 6 Other Recreational Uses

The USVI marine environment encompasses just under 210 miles of coastline recreational areas and aquatic life support with 65 miles of beaches ("2000 Water Quality Assessment", 2001). It provides and supports a many recreational uses in addition to those discussed thus far, including swimming or wading in the water; sitting, walking, or picnicking on beaches/coastlines; souvenir hunting; photographing and/or viewing scenic vistas and wildlife (birds, fish, turtles, etc.).

Almost 2.5 million people visited the USVI in 2000, the majority of whom came to enjoy the Territory's unique environment. Although neither definitive, nor directly quantifiable in monetary terms (without additional information and analysis noted earlier), one indication of the value residents and tourists place on marine attributes and related activities is the significant number who choose to visit specific areas, such as the Virgin Islands National Park on St. John, and Buck Island Reef National Monument on St. Croix. Both sites boast of their unique marine environments.

According to the VI National Park, visitation to the park has increased dramatically – by ten times – in the last thirty years. Recreational visits to the national park in St. John have risen from below 100,000 in 1967, to almost 1,000,000 in 2000 (Rogers, et al., 1988, and V.I. National Park, 2001). Another indication of the attractiveness and value placed on the USVI as a destination by residents and off-islanders is found in a recent discussion on future challenges to the VI National Park. The NPS notes that:

"With visitation to Virgin Islands National Park already at one million each year, that number is expected to increase dramatically as the "mega class" cruise ships bring as many as 3,000 passengers to the Park at one time. It is expected that within two years the smaller cruise ships will be supplanted with the newer "eagle class" of ship that can carry up to 4,000 passengers - doubling the regular population of St. John during a single cruise ship visit. In three years, it is further expected that the Havensight dock on St. Thomas will have the capacity to dock enough cruise ships to offload 20,000 visitors onto St. Thomas, again increasing possible visitation to the Park" (National Park Service 2001).

Although clearly not as striking in numbers as visitation to the VI National Park, visitors to Buck Island Reef National Monument total approximately 50,000 annually (Reefbase, 2001). Unfortunately, no studies or information are available to further document these activities or the associated monetary values other than that assimilated here in Section 6.7, "*Tourism Activity*".

6.6.1. Stakeholder Recreational Marine Resource Values

Indications of the value residents' place on marine resources and their relationship to recreational activities are found in the following responses to survey questions asked at community briefings on the USVI on marine protected areas:

In response to: "*Access to USVI marine resources (clean beaches, fishing and fish habitat, coral reefs, diving, boating and/or other marine related activities) is important to me?*"

More than 97 percent of respondents “Strongly Agree”.

In response to: “*If marine resources were degraded (decline in water quality, reduced numbers of fish, damage to coral reef, etc.) I would limit my marine related activities?*”

More than 70 percent of respondents “Strongly Agree”.

The summary data is presented in *Appendix V*.

6.7 Tourism Activity

The reliance of USVI tourism on marine resources is anything but vague. One need only view a few of the numerous informational brochures, expanding numbers of USVI internet/web sites, and descriptions of the USVI, to fully appreciate the tourism economic values associated with the marine environment. Promotions designed to attract tourists (and future residents) focus almost exclusively on clean and clear waters, quiet coves of white sandy beaches, offshore islands, blue seas, coral reefs, sea grasses, the underwater world, fishing, boating and the like. With this obvious and important link in mind, we report all tourism expenditures as economic value directly related to the marine environment.

As Table 6-6 indicates, just fewer than 2.5 million people visited the USVI in 2000 (the most recent year for which complete information is available). Total visitor expenditures exceeded \$1.1 billion and were responsible for over 8,000 jobs (VI Bureau of Economic Research, 2001). These figures are compiled by the VI Bureau of Economic Research and represent both direct and indirect impacts to the economy. The Bureau's analysis is based on tourism surveys completed by the Bureau and includes spending by tourists (i.e., those who stay overnight), air excursionists, and cruise passengers. Expenditures include spending for lodging, transportation, food and beverages, retail/shopping, recreation, and other (business conferences, funerals, etc.).

Table 6-6 USVI Visitor Expenditures – 2000

Sector	Expenditures (Millions of Dollars)
Hotels/Lodging	\$240
Food & Beverages	\$158
Retail (gift shops, etc.)	\$495
Transportation	\$89
Recreation	\$101
Other	\$74
Total Monetary Value	\$1,157
Percent of Gross Territorial Product	57%
Tourism-Related Employment (thousands)	8,660
Percent of Private Sector Employment	30%
Total Visitors (thousands)	2,477.9
<i>Notes: All data are derived from Bureau of Economic Research, Annual Tourism Indicators and Annual Economic Indicators, USVI Government Development Bank, 2001, and Personal Communications with Bureau of Economic Research representatives. Expenditures represent direct and indirect economic activity. All dollar values are reported in year 2000 dollars.</i>	

The value of this impact is even more obvious considering that these expenditures represent 57 percent of the USVI's GTP in 2000. The employment supported by this economic activity accounts for 30 percent of all private employment in the Territory – almost one out of every three working people, excluding government workers.

Since the Bureau of Economic Research aggregates all recreational activities in one category the current analysis delineates more detailed expenditures that may be attributable to fishing, boating, diving, and other water sports addressed earlier. For this reason, all or a portion of

the monetary values associated with these uses/activities may also be captured in tourism expenditures.

6.7.1. Tourism – Related Marine Resource Values

Indications of the value of marine resources as they are associated with tourism are found in these responses to survey questions asked of hotel industry participants at the community briefings:

In response to: *“How would you rate the importance of marine resources/uses (such as clean waters, access to beaches, boating, fishing, and diving, and marine views/aesthetics to tourism in the USVI?)”*

100 percent of respondents selected “Very significant”.

In response to: *“On a 1 – 5 scale, with 1 being highest priority, how would you rate, in level of importance, the following amenities to hotel guests/tourists' access to: beaches, shopping, boating/fishing/diving, restaurants?”*

"Access to beaches" was rated the highest, followed by "access to boating/fishing/diving".

In response to: *“What impact does the proximity to beaches/coast have on the decision by tourists of where to stay while in the USVI?”*

100 percent of respondents selected either “Very significant” (60 percent) or “Significant” (40 percent).

In response to: *“If the coast/beaches and waters were degraded (oil spill, etc.) or fisheries and/or coral reefs declined, what impact would this have on tourist visits to the USVI?”*

100 percent of respondents selected “Very significant”.

The following responses are from all focus group participants (not restricted to hotel participants):

In response to: *“Protecting marine resources is essential to the continued and future well being of the USVI economy?”*

100 percent of respondents assigned "3" or higher on a scale of 1-5 where "1" is "Strongly agree", with 88.6 percent of respondents actually selecting “Strongly agree”.

6. 8 Other Values

The USVI marine environment provides a number of other use and non-use values not addressed earlier. These include: potential pharmaceutical bioprospecting; aquaculture; access for shipping/commerce; small-scale souvenir manufacturing; educational and social values; research value; ecosystem and habitat value; contribution to biological diversity and preservation of genetic resources; protection of coastline; added value to properties on the

coast or located nearby. Option value, bequest value, and existence value are other non-use values introduced in Section 6-1.

Unfortunately, no USVI specific studies or information are available to document the associated monetary values, other than that captured in the Section 6.7, *“Tourism Activity”*. Although a number of valuation studies related to these types of uses and activities have been undertaken elsewhere (see Gustavson, 2000), further analysis is beyond the scope of this study.

Additional indications of the value of USVI marine resources are found in the following responses to survey questions asked of all participants at community briefings:

In response to: *“I am concerned about maintaining the USVI’s unique marine resources for my children and/or future generations to use and enjoy?”*

100 percent of respondents either "Strongly agreed" (94.3 percent) or "Agreed" (5.7 percent).

In response to: *“Management of USVI marine areas should balance economic, environmental, and preservation interests?”*

More than 80 percent of respondents assigned "3" or better on a scale of 1-5, where "1" “Strongly agree”; 60 percent selected “Strongly agree”.

The following responses are from real estate industry participants:

In response to: *“How would you rate the importance of marine resources/uses (such as clean waters, access to beaches, boating, fishing, and diving access, and/or views/aesthetics, among others) to home sales in the USVI?”* 100 percent responded “Very significant”.

In response to: *“How would you rate, in level of importance, the following amenities to homebuyers (1 being the highest priority)? Access to: beach, beachfront views, shopping, schools, or transportation?”* Access to beaches and beachfront views rated the highest.

In response to: *“What impact does the proximity to beaches/coast have on the price of real estate (compared with similar properties not on or very close to the beach/water)?”* 100 percent responded 60%, which was the highest impact listed.

In response to: *“If the coast/beaches and waters were degraded (oil spill, etc.) Or fisheries and/or coral reefs declined, what impact would this have on beach front property values?”* 100 percent responded “Very significant”.

A Table summarizing stakeholder response appears in *Appendix V*.

7.0 Resource Use Conflicts

The goals of the USVI Coastal Zone Management Program outline a program that would, with adequate resources, be uniquely qualified to facilitate and resolve resource use conflicts. Of the eleven goals set forth in the VI Coastal Zone Management Act (CZM Act), Section 903(b), some are specific and state, in part:

- Assure the orderly, balanced utilization and conservation of the resources of the coastal zone, taking into account the social and economic needs
- Preserve what has been tradition and protect what has become a right of the public....
- Promote and provide affordable and diverse public recreational opportunities...public access to and along the shorelines consistent with the protected rights of property owners.

The Division of Coastal Zone Management has been charged with "Managing Our Coastal Resources for the Future". In the preparatory phase of a comprehensive socio-economic assessment, the CZM Division's resource needs for achieving one or all of the stated goals could be addressed by selecting a parameter (such as 'Organizations and Governance') and subparameters ('Administrative structure, Management efforts'). (See Bunce, et al., 2000, for description of phases, steps, and options in the assessment process.)

7.1 Description of Historic and Current User Group and Use Conflicts

In all of the reviewed reports there were references made to user and use conflicts. Conflicts cited in the literature either continue to exist or are perceived by stakeholders to be continuing conflicts. No instances were found in which user or use conflicts were reported to have been resolved. Some of the conflicts identified in the literature and by participants in the MPA meetings include:

- Private property rights versus traditional access by the public;
- Compelling environmental needs versus questionable economic opportunity;
- Public policy, and rules and regulations versus uses desired by stakeholders;
- Desire for a balance between a pristine environment versus the built environment;
- Competing needs of divers, boaters, and fishers;
- Recreational versus commercial needs.

There are actual, perceived, and potential jurisdictional conflicts between the local and federal governments, e.g., President Clinton's designation in 2000 of new U.S. Virgin Islands national monuments. There are authority and control conflicts between local government agencies, and gaps in enforcement and management efforts of a number of agencies.

The literature and the comments by stakeholders throughout the process suggest that the USVI has not suffered so much for want of studies or workable recommendations to resolve these conflicts, but only, perhaps, from the absence of the political will to follow through with them. The major difference in the recommendations made over the years has been the decade in which they were offered.

The conflicts identified in the literature and by the stakeholders are presented in five (5) categories. Where information on a conflict is available from previous studies, it is included. Stakeholder characterizations of the conflicts are consistent with those cited in other areas with coastal tourism, e.g., UNEP (1997), Cesar (2001), and Salm (2000). Given the sensitive nature of some of the conflicts and the confrontational nature of initial meetings at which the Department of Planning and Natural Resources announced the MPA project, it is encouraging to note that stakeholders in the recent process were both calm and articulate in addressing the conflicts and making suggestions. The recommendations listed in the matrix that appears at the end of this section are indicative of the stakeholders' understanding of the issues that impact successful MPA management.

CONFLICT 1: Public Policy, Rules and Regulations versus User Groups

Under this category, it continues to be the case, or the perception, that a) policies, rules, and regulations developed without input of stakeholders are harmful, and b) that some policies and rules are enforced selectively. There was agreement that there are some good laws and policies, many of which are not enforced because of inadequate resources in Government. Participants also mentioned that non-point source pollution and pressures from human use and upland development have become more serious and need to be mitigated through stronger policy and enforcement. This is addressed in some detail in Section 8.2.

One long-standing area of conflict between public policy and user groups is that of traditional ways and activities. In the literature and in the recent stakeholder process, it is evident that this particular conflict has diminished little over time.

Closed Areas

From the onset of closed or restricted areas (commonly referred to as “closures”, or “closure” in the USVI), various user groups have felt shut out from the decision-making process, and are frustrated and upset by denial of access to traditional uses and places. More than 20 years ago, a socio-economic assessment of recreational boating and fishing (Olsen, 1979) identified public attitudes that conflicted with public policy.

The 1996 Caribbean Fisheries Management Council (CFMC) Regulatory Impact Review concerning the Red Hind spawning aggregation closures noted the following three of six problems:

- The closure area for red hind established in 1993 is too large and puts an unnecessary burden on commercial fishers;
- There are conflicts among the users of the resource, especially between commercial and recreational fishers;
- The size of the recreational fishery is unknown.

In the current MPA process, residents shared their perception that Government initially takes action, then lacks the resources to properly follow through on policy, rules, and regulations. They point to the following as evidence that the “Government acts, but lacks”:

- Enforcement of good laws and policies is lacking;
- Government pollution control efforts are inadequate;

- Federal and local government collaborative efforts are lacking or ineffective;
- Government efforts to solve marine resource conflicts are inadequate.

Pressure on Traditional Uses, Dislocation, and Relocation

A VI Resource Cooperative report on the socio-cultural role of fishing in the St. John biosphere reserve written by Koester in 1986 presented fishers' viewpoints on "Infringement on traditional ways":

- Do residents have the right to continue to use their environment in their traditional ways - a right that has been breached by Government restrictions?
- Why ban our traditional methods, e.g. large seine nets and gill nets, and allow "tourism techniques", e.g., flippers, spear guns? We get fined if we tie up near our homes because now leaving a boat unattended for more than 24 hours is okay for visiting yachts, but what about those who live there and anchor near home?
- Disallowing livestock to graze in the Park is traditionally part of the rural Caribbean lifestyle;
- "I feel the same way the Indians felt", was how one fisherman expressed the cumulative effect of regulations and the other changes that have disrupted St. John's fishing tradition. Several fishermen explained that regulations are "...fooling around with the native culture of fishing and will probably wipe the whole thing out." Koester notes that at the time of that statement there were an estimated 30 fishermen on St. John. For these men, fishing is more than a contribution to their economic strategies or a pleasure to be enjoyed: it is an essential element of their culture, their history, and their own identity. They suggested that the NPS should be responsive and work with/explain things to residents-not just enforce the "don'ts" but explain the "do's". (Koester, 1986).

In addressing the relocation/dislocation issue, the CFMC reported that:

"The possible relocation (temporary or permanent) to reduce fishing has potential consequences that are not related to the total fish catch. A "second-best" fishing strategy may simply relocate effort to other spawning aggregations...a portion of the potential benefits from the closures will be lost due to "damage" to these other concentrations of redhind spawners. In general, marine conservation districts (MCD) may lead to crowding less catch per unit effort and degradation of the habitat areas outside the MCD... Relocation and dislocation may affect charter boat and recreational activities as well as commercial. Further, the opportunity costs associated with MCD - related displacement of fishermen from preferred fishing grounds is thought to be relatively small. (CFMC, 1999).

In the MPA stakeholder process the participants touched on many of the same conflicts between public policy and user group issues that have re-appeared in study after study. Stakeholders often noted that there were major conflicts related to user and/or use relocation or dislocation, including interruption of traditional activity. Perceptions and concerns on "relocation or dislocation" conflict were stated:

- The same Government (federal) that bans turtles, whelks, and fish goes and bombs those same turtles and fish when they get to Vieques;

- Enforcement has never been fair and equitable: "Who will decide *who* gets to tie up *where*?"
- There's no consensus on traditional uses: "What timeframe defines 'traditional'?" and, "Are traditional uses sustainable with today's population load?"
- "Why doesn't Government work on restoring the deteriorated areas instead of taking away our good areas?"
- "Where national monuments end and MPA begin - what's left for us to enjoy?"
- Government needs to think about: "If you close one area, aren't you creating an overuse problem for another area - like over-fishing, too much snorkeling, crowded beaches?"
- "Are you planning to include substitute sites for what gets taken away?"

CONFLICT 2: Inter/ Intra Governmental Conflicts

Stakeholders perceived a number of conflicts between the local and federal Governments, and between agencies of local government. Among the "Ownership/Authority" conflicts mentioned by stakeholders are:

- The U.S. Department of Commerce, and the USVI government have jurisdiction over submerged lands and coral reefs within the USVI - some boundaries and submerged lands are points of contention;
- Local government agencies do not archive information on any level and are unlikely to share documents, planning, or decision-making which creates conflicting information for the public;
- Federal agencies and some universities have conducted studies but have not returned information or benefit from those studies to the Territory;
- No one communicates clearly with the stakeholders on issues and concerns of federal and local jurisdiction, restrictions, conflicting rules and regulations.

CONFLICT 3: Commercial Fishers versus Other User groups

As early as 1979, it was reported that there is inherent and actual competition for resource yield potentials between recreational and commercial fisherman (Olsen, 1979).

The VI Marine Resource Cooperative Report No. 12 (Koester, 1986) reported that:

- Boat propellers cut and drag float lines and cause loss of fish pots;
- Tourists swimming into pools of fish while wearing suntan oil is another reason baitfish have become scarce;
- Conflict noted between fishers and tourism/new fishing technologies - especially flippers, spear guns, and diving tanks. Fishers held perception that some kind of pollution caused the disappearance of sea urchins in the first 4 months of 1984;
- Commercial fishers' practices lead to over-fishing.

CONFLICT 4: Non-extractive User Groups and Coral Reef Health

The health of the marine resource is important to groups such as swimmers, fishers, tourism businesses, yet related uses could prove to be detrimental to that resource:

- Diving, snorkeling, other watersports, may begin to stress the health of the reef;
- Near coast to ridgetop activities by developers are stressing marine health;
- Impact of existing and planned marinas, docks, etc., may conflict with requirements for life cycle protection of marine species.

CONFLICT 5: Jet skis versus Fishers and Swimmers

There is little question that jet skis are strongly disliked. Jet skis were not spoken of in a positive light in any of the meetings or on the surveys. Stakeholders' comments on jetskis included the following:

- Jet skis kill turtles, chase [disturb] fish, and spoil the atmosphere of the seaside;
- Swimmers are put at risk by jet skis; jet-skiers should have their own (one) beach designated for jet skis;
- Jet ski noise, pollution, and safety risks are unacceptable activity anywhere in our waters.

Table 7-1, a three-page matrix, portrays stakeholder characterization of conflicts and recommendations as recorded in the community briefings and focus groups. The characterizations and recommendations are stated in the words of the stakeholders with minor edits for clarity.

Table 7-1 Matrix of User Group Conflicts and Recommendations

CONFLICT	STAKEHOLDER CHARACTERIZATION OF THE CONFLICT	STAKEHOLDER RECOMMENDATIONS FOR CONFLICT RESOLUTION
1. Public Policy, Rules and Regulations versus User Groups	<p>A. User groups are locked out from policy development and decision making processes.</p> <p>B. Policies infringe on, or don't reflect an understanding of or respect for traditional ways or activities.</p> <p>C. Policies don't consider long-term well-being of users.</p>	<p>1) Use “plain English” and standard success factors to determine if goals are being met and are effective.</p> <p>2) Use MPA management to control fishing techniques and “our predatory” ways.</p> <p>3) Improve decisions and policies by collecting recreational fishing numbers and expand the fish count data.</p> <p>1) Conduct research on fishing methods, impact of suntan oils/repellants.</p> <p>2) Involve the user groups in monitoring and enforcement tasks and jobs.</p> <p>3) Determine if fish farming could complement traditional commercial fishing.</p> <p>1) Systematically gather baseline information re: commercial fishing, e.g., actual expenses, <i>who</i> buys <i>what</i> from fishers, where/why they buy; who doesn't and why they don't; complete a market study and develop better marketing; work with stores and restaurants to increase sales.</p> <p>2) In public policy planning, explicitly link [consider] job creation, set asides, preferential treatment to any temporary or permanent closures.</p> <p>3) Use mariculture only if designed to be sustainable, i.e., locally co-owned, using local species.</p> <p>4) As a matter of policy, link jobs creation, “set asides”, preferential treatment for fishers for new jobs created by MPA management (enforcement, monitoring, guides, etc).</p>
2. Inter/Intra Governmental Conflicts	<p>A. Federal and local governments do not communicate their roles clearly to the public.</p> <p>B. BVI-USVI license issue persists.</p> <p>C. Agencies' rules conflict.</p>	<p>1) The National Park Service and enforcement staff should answer questions, use visuals, and good communication with residents and visitors alike.</p> <p>2) At all levels, Government should make every effort to win user groups' trust.</p> <p>3) Go out to the people “where they are” and publicize the goals of MPA management and report regularly on the progress being made.</p> <p>1) Get proper body (Legislature, Governor's Office or Federal Government) to resolve the fishing license reciprocity issue between the BVI and USVI.</p> <p>1) Structure the MPA system framework to harmonize the multiple managers, agencies, rules, and regulations that govern marine resources.</p>

Table 7 –1 cont'd		
CONFLICT	STAKEHOLDER CHARACTERIZATION OF THE CONFLICTS	STAKEHOLDER RECOMMENDATIONS FOR CONFLICT RESOLUTION
3. Commercial Fishers versus Other User Groups	<p>A. Fishers have no voice in issues that concern them.</p> <p>B. Restrictions are not enforced fairly.</p> <p>C. Practices that hurt stock must not be allowed.</p>	<p>1) Create fishers' Liaison Office with expertise and authority to broker fishers' needs.</p> <p>2) Compile existing scientific data, prioritize current research needs, and establish long-term research/monitoring scientific projects, and correlate all data with survey data from stakeholders with special focus on fishermen's input.</p> <p>1) No Take, No Mooring, No Anchor zones must be equitable and consistent.</p> <p>2) No Take zone must be accompanied by No mooring, No anchors zones, with consistent enforcement.</p> <p>1) Gill nets take too many fish and should be banned.</p> <p>2) Establish areas where commercial fishing has priority.</p>
4. Non-extractive User-groups and Coral Reef Health	<p>A. Divers, snorklers, other watersports may begin to stress the reef's health.</p> <p>B. Near coast to ridgetop activities are stressing the health of the reef.</p> <p>C. The impact of existing and planned marinas, docks, etc., may conflict with requirements for life cycle protection of marine species.</p> <p>D. People don't know how their actions negatively impact the coral reef.</p>	<p>1) Invite and encourage scientific research to increase the understanding of reef health.</p> <p>1) Community and in-school education to specifically include real estate, construction, and tourism interests.</p> <p>2) Develop and enact a sound Comprehensive Land and Water Use Plan.</p> <p>1) Invite and encourage scientific research to increase the understanding of species' requirements at each phase of the life cycle and use that information to support environmental remediation where necessary.</p> <p>2) Plan to meet the need for technical and financial assistance to retrofit marinas and docks.</p> <p>1) Develop "Good examples-bad examples" of what to do in the MPA, and promote with reader-friendly, culturally competent materials.</p> <p>2) Target the Youth: Increase learn-to-swim programs and marine education that is culturally competent and widely accessible.</p>

Table 7 –1 cont'd		
CONFLICT	STAKEHOLDER CHARACTERIZATION OF THE CONFLICTS	STAKEHOLDER RECOMMENDATIONS FOR CONFLICT RESOLUTION
5. Jet skis versus Fishers/Swimmers	A. No good words for Jet skis or jet skiers.	1) Ban Jet Skis altogether or restrict area where there is no conflicting activity.
6. General: Other Comments	<p>A. Facilitate conflict resolution between user groups.</p> <p>B. Build awareness and capability at the community level.</p> <p>C. Gather new data to create useful information that broadens understanding of MPA impact.</p>	<p>1) Build skills for/facilitate opportunities for conflict resolution in small group settings.</p> <p>2) Formally acknowledge long-standing and current conflicts between user groups.</p> <p>3) Facilitate user groups' skill-building in conflict resolution.</p> <p>4) Hold facilitated sessions to work out the issues and try to create a shared agenda.</p> <p>1) Commit to leadership training for community-based groups.</p> <p>2) Takes steps to ensure the sustainability of the process.</p> <p>3) Develop and implement an "Awareness Hour" presentation to take to different user groups.</p> <p>4) Re-visit the terminology used in the MPA process, e.g., add "food security", "valuable resource", and "resource abuse".</p> <p>1) Develop the capability to objectively analyze and publicize the economic benefits of marine resource excellence for fishers, property values, tourism, jobs creation, sites for film-video-ads location, etc.</p>

7.2 Use Conflicts

7.2.1 Boating versus the Natural Environment

In the earliest reports reviewed for the MPA Project, there are cautions concerning the extent of boating activity and the health of the natural environment. Damages caused by boating, e.g., oil slicks, anchor damage, turbidity, or disturbance of roosting and nesting site, are described. It is the beauty and serenity of the natural environment that draw the recreational boater, and the potential for good fishing that draws both the commercial and recreational fishers. Since one of the ways to enjoy the natural marine beauty is from a boat, the level of boat traffic can pose a direct conflict to maintaining the very beauty and abundance that attract the users.

In the VI Marine Resource Cooperative Report on the socio-economic and cultural role of fishing, conflicts between boats and the natural environment were observed to begin around 1946 when “engines began to replace sails and tourist boat traffic increased”. Koester (1986). The report further characterizes the conflict by citing:

- Observations by National Park staff and others indicated that Windswept Reef and Hawk Nest (Hawksnest) patch reefs suffered severe damage from boats striking or running aground on the reefs. An increase in the number of snorkelers is also resulting in more damage to coral colonies;
- Chronic turbidity from excessive boat traffic;
- Anchor damage survey January-March 1987 showed damage ranged from "negligible" to "severe";
- Fishers cited the steady increase in shipping, ferry traffic, and pleasure boats as the explanation for the sharp decrease in baitfish (frys and sprats), red tail, and stoplight parrotfish. Baitfish started to move away in 1946 when engines began to replace sails and tourist boat traffic increased.

An assessment of, and policy on, the carrying capacity of marine areas would be useful in making the determination of actual vis-à-vis perceived use conflicts, and in arriving at solutions for the actual conflicts.

7.2.2 Built Environment versus the Natural Environment

An IRF report described the use of the coast, until the mid 1900s, as limited to use by residents to launch boats for passage to other places, to market their product and wares, or to catch fish. There were marine businesses but no agricultural activity near-shore, and mangroves and salt ponds were rarely disturbed except to extract salt. (IRF (3), 1993).

The Mangrove Lagoon and Benner Bay (MLBB) Analytic Study (IRF (3), 1993) reported that escape from urban blight and the discovery of “America’s Paradise” for second homes, vacation rentals, and, ultimately, for primary residences became the norm and changed the traditional coastal use pattern significantly during the mid-1900s. Examples of conflicts

between the built environment and the natural environment cited in the analytic study for MLBB, St. Thomas, include:

- The 1968 filling-in of a mangrove-vegetated delta to build the racetrack – the effect was to re-route all the drainage entering from Turpentine Run into a single channel and reduce the cleansing action of the tributaries, leading to a greater influx of sediment and pollutants into the lagoon;
- The siting of the landfill on or near major aquifers with no consideration of watersheds;
- The leaching into the ground of waste oil, hospital wastes, lubricants, batteries, tires, household chemicals at the Bovoni landfill;
- The conflict between commercial development of the bay and lagoon.

Regardless of the source, pollution from activity and construction within the watershed directly affects the health and productivity of a reef.

Commercial marine-related industries generally argue that the numerous other commercial, public sector, and residential ventures in the watershed are the primary reason for environmental degradation, while many residents and politicians blame declining water quality on the marine industry (IRF (3), 1993).

The draft Management Plans for three APCs (Areas of Particular Concern) completed in 2001 identify in great detail the conflicts between the built and natural environments:

- A two-tier coastal zone system offers inadequate guidance for construction and development on islands of decidedly limited land mass;
- The lack of a comprehensive land and water use plan contributes to uncontrolled, high-density residential development, commercial construction that does not follow appropriate erosion control measures, irrational siting of structures (e.g. Cancryn School constructed in a floodplain on the St. Thomas waterfront);
- Deficiencies in public policy, e.g., incentives for conservation easements, appropriate setbacks, extraction fees, enforcement, and penalties for building code violations;
- Issues of visual and physical access, and noise pollution;
- Improper design and construction of roads and driveways – creating serious water quality problems;
- Disregard of 30 years of national experience of public policies related to carrying capacity, development extraction fees, maximum limits of growth, noise ordinances, etc.

7.2.3 Private Property Rights, Public Access, and Natural Resource Protection

The USVI was one of two jurisdictions to apply the doctrine of “customary rights” and to have it upheld on appeal by the Courts (*USVI vs. St. Thomas Beach Resorts Inc.*, District Court of the VI 1974). According to participants in the stakeholder process, conflict between “traditional access” and rights of property owners has not been resolved, and the existence of “gated communities” or hotels and condominiums that bar access in practice, if not in theory, remains a sore spot for many locals and others who take offense at having to make their way through narrow, unkempt paths where they once walked freely to the shore. There are also issues of visual access.

The VI Marine Advisory Service under the federally-funded Sea Grant Program conducted the 1987 workshop “Public Access to the Virgin Islands Shoreline”. According to the Workshop Proceedings (Peters, 1986), the workshop was organized in response to changes in shoreline access. Population growth coupled with the development of hotels, resorts, and private homes on the coast led to a decrease in areas for public recreation along the coast. Among the issues addressed were the following:

- Shoreline property owners' increasing reluctance to permit access to “their beaches” by a public that has traditionally used those sites;
- The trend of “declining access”, the then emerging trend in regions dependent on tourist dollars to sell their shorelines in the quest for economic progress;
- Denial of public access to legally, or illegally, filled submerged lands said to have been “given” by the government to private developers, e.g., pond at Cabrita Point on St. Thomas, and for property in Estate Judith’s Fancy on St. Croix.

In a presentation on the issue of public access to the shoreline, then Sen. Viridin Brown made reference to the testimony of residents in public hearings, stating,

“Several individuals testified that they were made to feel, or had the feeling, and in some instances were made to feel, that they were not really welcome. This is a psychological factor that comes into play as to whether or not we feel free, and whether or not beach access is fully exercised in the freest and truest sense of the word. To break that psychological barrier is to know that we have free beaches.” (Peters, 1987).

The Sea Grant Workshop proceedings presented a definitive set of recommendations, but it was beyond the scope of this Report to ascertain whether or not those recommendations have been enacted, to what extent, and with what impact. Experiences shared by participants in the stakeholder meetings suggest that this type of conflict continues to exist.

Racial undercurrents of a present-day access conflict

Undercurrents of perceived or actual racism and discrimination are not far below the surface in the USVI according to Erace-isms⁹, a community-based NGO that offers information, training, and services to address racism and other forms of discrimination. In an effort to diffuse conflict surrounding a racially-charged incident, Erace-ism members explain the dynamics that can distort the event, e.g., it is not unusual for an incident to be filtered through the lens of suspicion as it is discussed within the group that perceives itself to have been harmed by that incident. The St. Croix community briefing brought one such undercurrent to the surface.

At the St. Croix community briefing, a number of participants registered their concern that the unannounced placement of large boulders blocking four customary access roads to the shore on East End created resentment, raising issues about denial of livelihood and culture. A number of fishers and other participants in the briefing spoke of their perception that they were being denied access for traditional use of East End beach access by those who have only recently come to live in the USVI, or those who resent the presence of “locals” in that area of the Island. In short, the perception was voiced that East End residents (read that “rich Continentals/Whites”) are systematically blocking locals’ access. It would be a mistake to dismiss this issue as a tempest in a teacup. The agency of government or individuals responsible for blockage of these access roads would do well to answer reasonable questions about why this occurred, who did it, and whether it is temporary or permanent.

⁹ ERACE-isms is a St. Croix-based NGO whose services include diversity training and conflict resolution, funded by the World Council of Churches since 1998. The author of this Report has developed and conducted anti-racism training since 1981, is a founding member of Erace –isms, and finds this view to be consistent with general practice and the literature on this subject. Readers may refer to EMBRACE (February 1998); Valerie Batts, Ph.D., "Modern Racism: New Melody For the Same Old Tunes" (1989); or McIntosh, P., "White Privilege and Male Privilege: A Personal Account", (Wellesley College Center for Research on Women, No 189, (1988)

7.2.4 Tourism versus the Natural Environment

There is an extensive body of literature and conference proceedings on the negative impact of tourism on Caribbean environments. Regional conferences such as the Sustainable Alternatives for Tropical Islands States, sponsored, in part by the Commonwealth Science Council, and the annual Miami Conference on Latin America and the Caribbean, have examined the tourism-related stresses, threats, and successful responses. The works of Salm and Clark, Dixon, Bunce and the UNEP report referenced for this Report address a broad range of issues and responses to tourism use and the natural environment.

In the USVI, reports on visitor-related damages within the VI National Park (St. John) and Buck Island National Monument (St. Croix) support the contention that, in many instances, human intrusion is in conflict with the natural environment.

In 1973 and 1976, Robinson drew attention to the environmental damage associated with recreation in the VI National Park in the 1970s - prior to the dramatic increase in visitation. In 1986, a VI Marine Resource Cooperative report stated that throughout the Caribbean, tourism and coastal development were exerting severe pressure on the natural resources of many islands and countries, and that:

- Fishers expressed the perception that tourism pushed commercial fishing; refrigeration encouraged folks to catch more than they could use in a short time;
- Fishers expressed the perception that tourists swimming into pools of fish while wearing suntan oil is another reason baitfish have become scarce;
- There is a trend of “declining access”, as well as an emerging trend in regions dependent on tourist dollars to sell shoreline in the quest for economic progress.

7.3 Examples of Use and User Group Conflicts in the APCs

Three examples of Use Conflict, one per island, are taken from the comprehensive analytic studies for the APCs completed by IRF in 1993. The use conflicts in the APCs mirror the conflicts cited throughout this Chapter, but are, perhaps, more visible because multiple conflicts are represented within a small, defined area.

Christiansted Waterfront Boardwalk Extension, St. Croix

Three of the four User Group Conflicts, and all Use Conflicts noted in Chapter 7 occur in a previous APC, including pressure on traditional use by fishers; federal vs. local government conflict; built environment versus natural environment; boating versus natural environment. An excerpt from the "Christiansted Waterfront APC Analytic Study", IRF (1) (1993), reads:

"The boardwalk extension to Gallows Bay is envisioned as a means to facilitate pedestrian movement into Christiansted town and is, in the minds of many, central to economic revitalization plans. This part of the harbor is the site of traditional fishing activities, including fish marketing, boat repair, and boat mooring. Without proper planning and meaningful community input, the new boardwalk could conflict with the fishing community.

"Additionally, if the boardwalk is to include the northern boundary of the Christiansted Historic Site, then it will need to have National Park Service approval since, in the 1972 Agreement, Article IV, paragraph 2, the Government of the Virgin Islands agreed to 'control incompatible uses of the surrounding wharf and to prevent construction of a roadway or other intrusive devices on the harbor side of the historic site'.

"The mini-cruise ship and large cargo vessels, which use the VI Port Authority dock, stir up large amounts of silt when they run their engines while at dock. Over a period of 3-4 years this caused a build up of silt under the travel lift at St. Croix Marina and decreased the draft size of vessels that the marina was able to accommodate." IRF (1) (1993).

Coral Bay APC, St. John

Of the four User Group Conflicts, and two of the three Use Conflicts noted in Chapter 7 are seen in the abovementioned, earlier APC, including user conflict with policy, rules, and regulations, built environment versus natural environment, and boating versus natural environment. An excerpt from the "Coral Bay APC Analytic Study" reads:

"Some residents believe that, especially within the inner Harbor area, degraded water quality presently precludes swimming or other water contact sports...water pollutants include several land-based sources of sediments, nutrients, and sewage from on-site

septic system failures and marine-based vessel waste discharge. Related to the water quality, is the perception among some local residents that there are too many boats - either transient or permanently moored in Coral Bay. A growing polarization seems to be taking place between those involved in or in support of the boating community and others who feel that perhaps the boating community is largely responsible for the observable degraded water quality.” (IRF (2), 1993)

Mangrove Lagoon and Benner Bay APC, St. Thomas

One of the four User Group Conflicts, and one of the three Use Conflicts noted in this Chapter are also evident in the earlier APC, including pressure on traditional uses, public access, built environment versus natural environment. An excerpt from the "Mangrove Lagoon and Benner Bay APC Analytic Study" states:

"Public access to the shoreline is guaranteed under the [V.I.] Open Shoreline Act, e.g., curtailment of public access at Mangrove Lagoon and Benner Bay by commercial and private development structures, walls, fencing, and guard dogs blocking traditional footpaths. " (IRF (3), 1993)

7.4 Initiatives to Reduce Conflict

There are current MPAs and conservation management capacities that can reduce some of the negative impacts from over-fishing, anchor damage, and other causes. The Rogers 2001 report describes local MPAs and monitoring/conservation management capacity represented by:

- Hind Bank Conservation District (St. Thomas)
- Buck Island Reef National Monument (St. Croix)
- VI National Park (St. John)
- Salt River Bay National Historical Park and Ecological Preserve (St. Croix)
- VI government-designated Marine Reserves and Wildlife Sanctuaries at Salt River, Cas Cay, Mangrove Lagoon, and St. James Island.

The designation of National Monuments, the International Coral Reef Initiatives, and the creation of Marine Conservation Districts have brought attention and both financial and technical resources to improve understanding and management of coral communities. Monitoring and reporting activities, and greater visibility of reef protection activities, should benefit the efforts to identify and resolve conflicts.

There is a non point source pollution management plan prepared by the Department of Planning and Natural Resources, which could, if adequately funded, devote consistent attention to resolving conflicts over time.

There were few initiatives cited in the literature, such as the community briefings or focus groups, that are resolving the conflicts noted in Sections 7.1 – 7.2.4. Stakeholders felt that with adequate resources, the Department of Planning and Natural Resources and environmental groups could work in partnership to resolve existing and future conflicts. They also offered recommendations that they felt would help to alleviate some of these conflicts, some of which appear in *Appendix V*.

8.0 Stresses and Threats: Current and Emerging

Damage to marine habitats occurs from natural processes such as hurricanes and disease outbreaks. In addition to the nature-based stresses and threats, there are negative impacts of human activities, including development and construction, ships and boats running aground, trash, and sewage discharges. These human activities can produce source and nonpoint source pollution. Man-made and natural causes can lead to degradation of reef habitats. The loss of coral reef habitats directly affects a wide range of organisms including fisheries of considerable commercial and recreational significance (Caribbean Fisheries Management Council, 1999).

8.1 Natural Stresses

The recent report, *Status of Coral Reefs in the US Virgin Islands* (Rogers, et al., 2000), offers detailed information on the full range of coral health and threats and is cited extensively as the source of information and authorities used throughout this Chapter.

8.1.1 Storms/Hurricanes

Reefs are fragile but can show resilience to the ravages of storms and hurricanes. Eight hurricanes have affected the USVI in the last twenty years – with the last five producing extensive, major destruction on all four inhabited islands. The extent of damages from hurricanes is described in Rogers ,et al., (2000):

"The impact of Hurricane David...left ramparts of dead Elkhorn, some rising above sea level, replaced flourishing reef crests in Fish Bay and Reef Bay, St. John (Beets, 1986), living coral cover declined on reefs off St. Thomas (Rogers, et al., 1983). Reefs at BUIS [Buck Islands National Monument] and off the south shore of St Croix suffered damage from David [1979] and Hugo [1989]; hard corals shattered, soft corals/gorgonians were uprooted, and coastal sand deposits were redistributed with Hurricane Hugo. Reef crests off the south of the island was (*sic*) moved 30 meters landward (Hubbard, et al., 1991). In some shallow zones at Buck Island, *Acropora palmata* cover already reduced from 85% to 5% by White Band disease fell to .08% (Gladfelder, 1991).

"Over 40 hermatypic coral species are found on the reefs in the USVI – although some species are less abundant than in the past primarily because of mortality from storms and diseases. According to Bythell, et al. (1993), *M. annularis*, the dominant species of three common coral, suffered greater mortality from chronic factors such as predation and tissue necrosis than from hurricanes. Brain coral, *D. strigosa*, suffered more tissue loss from the storm than from chronic factors, while *Porites astreoides* had substantial mortality from all factors (Bythell, et al., 1993)."

As a matter of course, ecosystems experience, and recover, from most natural impacts of windstorms and hurricanes. USVI disaster preparedness has improved significantly in the decade since Hurricane Hugo, but the improvements were not enough to mitigate many

anthropogenic impacts, e.g., the flow of raw sewage, septic tank run-off, contaminants from industrial areas, and sediment carried to the sea after hurricanes Marilyn [1995], Bertha [1996], and Lenny [1999]. The reefs were challenged to fend off the negative impact of that sewage and runoff, the debris from sunken and broken boats and marinas, oil spills, and garbage that was dumped or blown into the sea.

In the USVI, hurricanes also impact the number of individuals involved in fishing. The Division of Fish and Wildlife "3-Year Summary Report (2000)" looked at the number of individuals involved in fishing post-hurricane and reported that the number of registered fishermen – which includes part-time fishermen - fluctuates with the availability of work in the private sector, and the occurrence of major storms. In the former instance, job availability in construction, tourism, and industrial sector often lures the part-time fisher. All fishers suffer gear loss as the result of severe storms, and the part-time fishers are more likely to move from this secondary income source into post-hurricane construction jobs (Tobias, and Gomez, 2000).

8.1.2 Conditions of Natural Balance / Imbalance

Decreased herbivory by sea urchins and fishes is the suspected culprit in the failure of the Lameshur Bay, St John, reef to show significant recovery ten years after Hugo decimated 40 percent of the living coral in 1989. It appears that the level of herbivory is too low to keep the macroalgae in check, and that the algae are inhibiting settlement by coral recruits and growth by existing colonies. The decreased herbivory may be the result of both the loss of the long spined sea urchins, and the decrease in the number and size of herbivorous fish as a result of over-fishing (Rogers, et al., 1997).

If it is the case that there is a relationship between sea turtle populations and seagrass health, then MPA managers may need to resolve issues of overabundance of species as well as that of declining species.

On a positive note, there is better understanding of how to support reef health and biodiversity as evidenced by work completed on nearshore communities. A year 2001 study suggests that habitat complexity, hydrodynamic effects on larval supply, and stable substrate may also contribute to the increased abundance and species diversity of nearshore fish communities (Mateo, et al., 2001).

8.1.3 Ciguatera

Consumption of fish containing the toxin *Ciguatera* causes what is commonly called “fish poisoning”. Fishermen have long indicated that the threat of *Ciguatera* affects both the marketing of locally caught fish and the fishermen’s own consumption habits.

The problem of *Ciguatera* inhibits full utilization of viable and otherwise acceptable resources because of its sporadic and unpredictable nature (Sylvester, et al., 1977). In their attempt to avoid tainted fish, fishers may stress or overfish those species that are not suspect.

8.1.4 White Band Disease and Other Coral Diseases

White Band Disease (WBD) and other diseases of coral reefs destroy or seriously compromise the health of a reef system. According to the report on the status of USVI reefs by Rogers, coral diseases caused extensive coral mortality on reefs off St. John in 1997. The branching *Acropora* species, which are most vulnerable to storm damage, are also the most susceptible to WBD. Shallow reefs on St. John and St. Croix, including Buck Island, suffered the ravages of WBD when it swept through the Elkhorn stands on many Caribbean reefs in the late 1970s and '80s. It appears that WBD killed large stands of Elkhorn coral in the USVI between 1976 and sometime after 1984. In July 1999, only six living *A. Palmata* colonies were found on the Haulover Bay reef off St. John's north shore (Rogers, et al., 2000)

Plague Type II

Rogers also reports that, currently, the most severe disease observed on St. John reefs is caused by a species of bacteria, *Sphgamonas sp.* No recovery of diseased portions has been noted on the colonies in several bays around St. John. However, monthly surveys beginning in December 1997 documented new incidents of disease (bare white patches of skeleton) every month associated with the loss of living coral (US Geological Service). A dozen species are exhibiting signs of disease on reefs in Newfound, Mennebeck, Haulover, Lameshur, and several other bays (Rogers, et al., 2000).

8.1.5 Other diseases

Other diseases are discussed in "The Status of Coral Reefs in the USVI" (Rogers, et al., 2000):

- The incidence of Black Band Disease (BBD) appears to be low; at Buck Island, BBD is seen typically on fewer than ten colonies of *Diploria* each year;
- Small patches of reef *Porites porites* are now completely dead in many bays around St. John, St. Thomas, and St. Croix, possibly from an [as yet] undetected disease (Rogers 1999, Miller *per. comm.*, B.Kojis *per comm.*);

Sea fan disease caused by the fungus *Aspergillus sydowii* occurs in sea fans on St. John reefs (Rogers, et al. 2000, Garriet Smith *per comm.*) The pathogenic strain of the fungus has been isolated from air samples taken from Sahara dust events, and links air quality directly to coral reef health.

8.1.6 Bleaching

Bleaching of coral colonies is often associated with warmer water temperatures and has the potential to cause the death of an entire coral colony, although it is rare for living corals to be completely eliminated from a section of a reef (Salm, 2001). The most recent experiences in USVI waters have been either partial mortality or complete recovery (Rogers, et. al., 2000).

Coral reef conservation strategies often identify areas that have good prospects for resisting bleaching or recovering rapidly from it. Salm (2001) reports that:

“ Patterns of bleaching-related mortality provide insights into the factors influencing the differential responses of coral communities to bleaching which in turn provide opportunities for us to select and design MPAs to give adequate protection to coral communities shielded by these factors...we now recognize that climate-related bleaching events pose a serious global threat to coral reefs and need to be addressed by management and planning guidelines.”

8.1.7. Earthquakes and Tsunamis

As a result of the convergence between the Caribbean and North American tectonic plates, the USVI is located in one of the most earthquake-prone regions of the world. During the past 450 years, damage has occurred from earthquakes and associated tsunamis. Strong seismic shocks were recorded for the USVI in 1777, 1843, 1867, and 1918. Scientists at the US Geological Service report high seismic potential for a major rupture in the Puerto Rico trench north of Puerto Rico and the USVI (USGS, 1984). The Territory is classified as “Zone 4” for earthquake vulnerability, the highest damage zone (the same classification given to many parts of California). (IRF (2), 1993).

St. Croix

St. Croix is situated on a different shelf platform than St Thomas and St. John and may not be subject to the same seismic probabilities as her brother islands. However, tsunami impact on St. Croix was experienced following earthquakes on St. Thomas and St. John in the past. The waterfront in Christiansted is especially vulnerable to impacts from earthquakes due to substantial construction on reclaimed land (IRF (2), 1993).

St. Thomas/St. John

Studies prepared in 1984 estimated that an earthquake of MMMVIII intensity (Modified Mercalli Scale) has a recurrence period of between 110 and 200 years for the St Thomas-St. John area. There is a 50-70 percent probability of such an earthquake occurring in the next twenty years, and a 60–80 percent probability of such an occurrence within the next 50 years (IRF (2), 1993).

8.2 Anthropogenic Sources of Stress

"Anthropogenic", or man-related, stresses on coral reefs not only directly compromise the condition of the organisms that depend on them, but also undermine their ability to recover from natural stresses. According to the Caribbean Fisheries Management Council, lack of management of commercial and recreational fisheries can also impact the reef ecosystem by disturbing the natural biological balance of interacting and co-dependent organisms. (CFMC, 1999).

In the report on the status of coral reefs, Rogers states that human-related damages may be masked by natural causes such as sea swells, fire worms, fish damages, weakening of the coral skeletons through action of boring bivalves, abrasion from vehicular water-traffic, deposition of sediment particles, and the smashing and overturning of coral during heavy seas. Chronic coral damage occurs in areas of high recreational use by snorkelers and divers (Rogers, et al., 2001).

The number two objective of the "1999 Fishery Management Plan for Coral and Reef-Associated Plants and Invertebrates of Puerto Rico and the USVI" was:

"To minimize adverse human impacts on coral, live rock, seagrasses, reef-associated plants and invertebrate resources by reducing fishing pressure, wasteful harvest practices, and the anthropogenic stresses directly affecting them, and allowing for the restoration of naturally-balanced reef systems." (CFMC, 1999).

Fishing practices (over-fishing, traps, anchors) are one of the many anthropogenic stresses, and include extraction of groundwater, irrigation, solid waste disposal, contamination by hazardous chemicals and waste oil, opening lagoon mouths, introduction of non-indigenous species (fish or plants), sediments/nutrients, agricultural and industrial activities.

8.2.1 Degraded Water Quality

Water quality is degraded by inadequate treatment of sewage, stormwater runoff, leaching from septic systems, runoff from livestock, and boats that discharge sewage. In addition to degrading water quality from the standpoint of health and aesthetics, these pollutants are a major culprit in mortality of coral reefs.

A major cause of mortality of corals and associated seagrass, and invertebrates is sedimentation and pollution caused predominantly by land-based or near shore activities such as deforestation and discharge of untreated sewage (Caribbean Fisheries Management Council, 1999).

Tobias (1998) reports that unregulated development of upland and coastal areas has resulted in increased sedimentation rates and the introduction of pollutants has degraded the water quality of coastal environs. Pollutants ranged from sewage to dissolved oxygen deficit linked to landfill run-off at marinas, and residential sources (Tobias, 1998).

The listings of impaired waterbodies included in the Department of Planning and Natural Resource water quality assessment reports show an increase in the number of impaired priority areas between 1996 and 1998. The "2000 Water Quality Assessment" for the US Virgin Islands (USVI DPNR, 2001) includes the "1996 Impaired Waterbodies List", which reports:

- St. Thomas: two high priority, and one medium priority, segments
- St. Croix: three medium priority areas
- St. John: one medium priority area

The DPNR report continues that, by 1998, the impaired waterbodies list reflected:

- St. Thomas: three high priority and two medium priority segments
- St. Croix: three medium priority areas
- St. John: one medium priority area

Lastly, the report reflects that the "2000 Impaired Waterbodies List" remains unchanged from the 1998 listings. (USVI DPNR 2000)

Table 8–1 Rating of USVI Impaired Waterbodies

	1996		1998		2000	
	high	medium	high	medium	high	medium
St. Croix	0	3	0	1	0	1
St. John	0	1	0	1	0	1
St. Thomas	2	1	3	1	3	1

Source: Prepared from Division of Environmental Protection *Year 2000 Water Quality Assessment Report 303(d) Lists* from 1996–2000.

In the 2000 *303(d) Report* the summary of "Fully, Partially and Non-Supporting Coastal Waters" shows that 82.44 percent of coastal shoreline fully supports its designated use; 9.85 percent partially supports the use; 4.21 percent does not support the designated use. For 3.5 percent of the area there is too little data for assessment (Division of Environmental Protection, 2001).

The study shows no change in the Water Class of Use by island between the 1998 and 2000 reports:

- St. Thomas: 0.0 miles of Class "A", 45.5 mi. Class "B", 7.3 mi. Class "C"
- St. Croix: 2.5 miles of Class "A", 55.3 mi. Class "B", 12.5 mi. Class "C"
- St. John: 1.0 mile of Class "A", 48.7 mi. Class "B", 0.0 mi. Class "C" waters (Division of Environmental Protection, 2001).

8.2.2 Fishing and Reef Fish Stock Imbalance

It has been reported that the effects of over-fishing on reef community structure are not well understood. That conclusion is distressing in view of the substantial evidence that over-fishing,

independent of harvesting levels, can also directly impact the overall integrity of the coral reef structure. In the 75th Caribbean Fisheries Management Council (CFMC) meeting, the Scientific and Statistical Committee recommended a minimum level of commercial stocks of fishes, not to drop below the level at which interaction between reef fishes and substrate are altered in some way (CFMC 1999).

The above-mentioned lack of understanding of effects of over-fishing on reef community structure extends to effects on the condition of the reefs themselves (CFMC, 1999). Changes in species composition from continuous, unregulated fishing have been documented, e.g., Nassau Grouper spawning aggregations no longer occur in the southern part of the USVI. Various studies have reported a marked decline in the fisheries resources in the USVI. Certain species were over-harvested while others approached the limits of their resource potential. Unregulated harvest resulted in the extinction of Nassau Grouper. According to CFMC, a 1992 assessment of inshore fisheries resources showed increasingly declining trends, and concluded that the steady decline cannot be attributed to over-fishing alone. CFMC (1999).

The "Final Supplemental Environmental Impact Statement" by CFMC includes a "Problem Statement" that states:

“ Biomass of fishes increases with greater structural diversity of the substrate. Increased fishing pressure on reef herbivores, such as parrotfish, may account for observed increases in algal biomass, which, in turn, reduces living invertebrate cover. Reef herbivores may reduce the abundance of certain competitively superior algae, thus allowing coral and cementing corraline algae to survive. Community imbalances in reef-associated organisms may result from large-scale reduction on (coral) cover or structural heterogeneity of live coral or other substrate, or from over-fishing of certain components of the commercial fishery.” (CFMC, 1999).

Garrison, cited in CFMC (1999), reports some trends suggesting relatively large changes in species composition and, indirectly, evidence of decreasing biodiversity in his 1997 study of the St. John trap fishery. Six species accounted for more than 50 percent of the total catch, representing a number far less than was reported in similar studies.

Stakeholder concern about introduction of non-native species is supported by a CFMC-cited study of Blue Tangs, which concluded that, “ The dominance of blue tangs in this study may be an example of a small, fast-growing species from the lower trophic level dominating catch as a result of intense fishing pressure.” (CFMC, 1999).

The literature review completed for this MPA project component identified only a few studies and references on the problem of over-fishing. In the "Survey of Commercial Fishers' Opinions" (Uwate, Tobias, et al., 2001), the most common issues/problems identified by all respondents included over-fishing and pollution. Document review and stakeholder comments suggest that the extent and impact of over-fishing throughout the USVI has not been fully documented; that over-fishing and extraction of juvenile fish occurs, and has had a detrimental effect on fish stocks. There is support for these opinions. Rogers states that for commercially

important species, decimation of spawning aggregations, decreases in average size of fishes, and dramatic declines in their abundance all point to over-fishing as either the causative agent or as a major contributing factor. Rogers, et al. (2001).

The Ocean Conservancy identifies overfishing as a significant threat to USVI marine ecosystem and cautions that overfishing depletes important species that eat algae growing on the coral that will otherwise overgrow and kill the coral. (Ocean Conservancy, 2003).

Lack of enforcement

Although there are size restrictions and seasonal closures on certain species in the USVI, Rogers reports that closures are not enforced, and that several studies document the failure of existing territorial regulations to protect reef fishes or to reverse declines in abundance of preferred species. (Rogers, et al., 2002)

Fishing Methods / Impact on Species Life Cycles

Reef fish harvesting equipment, such as boats, motors, and gear, have become more sophisticated and allow fishers to access more areas, set and retrieve more traps in a day, use longer-lasting, less degradable traps and, consequently, leave a severe impact on many species of reef fish (Rogers, 2001).

Commercial fishing methods indiscriminately catch juvenile species. Concentrated fishing pressure at Altona Lagoon on St. Croix has resulted in extremely high fishing mortality of juveniles and sub-adults (Tobias, undated).

8.2.3. Recreation–related Stresses and Threats

There is a growing recognition of the damage associated with increased recreational uses of marine resources in the Caribbean, and a realization that the goals of, and benefits to be derived from, tourism and resource protection are inherently interdependent.

There are numerous examples of severe localized damage to marine ecosystems attributable to recreation: anchor damage from cruise ships and dive boats, boat groundings, people walking on reef flats, removal of coral for souvenirs (Rogers, 1985).

A VI Marine Resource Cooperative report on recreational uses in the national park observed that one consequence of the popularity of the VI National Park and Biosphere reserves on St. John has been “degradation of the park’s marine resource, particularly some of the coral reefs and seagrass beds along the north shore of the island...anchor damage and damage from boats striking or grounding on reefs is evident...seagrass beds in popular bays have deteriorated.” (Rogers, et al., 1988).

Boating Activity

The stresses from boating can be mitigated, in part, by establishing and enforcing zones and speed limits, and by diverting activity away from fish nesting areas. Problems experienced from boating include:

- Destruction from boat anchors and from boats running aground have ranged from a 283 meter³ section of reef destroyed by a cruise ship on St. John in 1988 (with no significant recovery 10 years later) to an average of four boats a week running aground and destroying coral, particularly Elkhorn (prior to the installation of moorings); (Rogers, Mclain, Zullo, 1988);
- Occasional ship groundings of large commercial vessels and smaller recreational boats, anchoring, and the deployment of fish traps on coral reef areas; (Rogers, Mclain, Zullo, 1988);
- Damage from boat propellers which also often disturb and suspend silt;
- Generation of wave energy by use of personal motor craft at high speeds in the embayment that can accelerate shoreline erosion and adversely affect the behavior of juvenile fishes (Tobias, 1998);
- Entry of pathogens into the waters from discharge of sewage from boats, which can cause disease and scarring in many species (Rogers, Mclain, Zullo, 1988).

Diving/Snorkeling

The Peters report suggests that injuries to coral from snorkelers and divers and from adverse environmental conditions, such as turbidity and sediment, could increase the frequency of occurrence of diseases such as WBD (Peters, 1984).

A U.S. EPA "Fact Sheet" describes the way in which snorkelers and divers kick up sediment that lands on the coral, blocks needed sunlight, thereby destroying living coral. Suntan oil used by from swimmers and snorkelers can harm or even kill sensitive coral (U.S. Environmental Protection Agency "Fact Sheet", undated).

Dixon suggests that even with good management practices, the presence of large numbers of divers or snorkelers in the water is often damaging to coral reef systems (Dixon, Hamilton, et al., 2001).

Camping/Picnicking

Public Service campaigns of conservation groups, Earth Day celebrations, and the Anti-Litter and Beautification Commissions have long focused attention on the garbage problems that plague many of the Territory's beaches. In the community briefings and focus groups, stakeholders also complained that negative impacts from camping and picnicking during residents' and visitors' treks "back to nature" include improper disposal of trash, damage to nearby trees and plant life, noise pollution, smoke, and waste oil pollution from generators.

Tourism

A United Nations Environmental Program report on coastal tourism impacts addresses the links between a pristine environment and tourism, stating:

"The issues of overuse of resources, damage to natural resources and ecosystems, increased conversion of coastal zone space to more stressful uses, and increased social tensions, all create major imbalances . . ." (UNEP, 1997)

It is estimated that tourists generate as twice as much solid waste per capita as local residents, a substantial amount of liquid waste, place a high demand on potable water energy, and spend their time in tourism facilities that are, for the most part, built within 800 meters of the high water mark in environmentally-sensitive areas. (Dixon, Hamilton, et al., 2001).

In the USVI, energy and potable water are produced from fossil fuels. A higher usage of water and energy by tourists, coupled with traffic congestion, and the related emissions, constitute environmental stresses. These stresses need to be understood and, therefore, warrant research and analysis.

Landscaping for tourism facilities may obstruct views, and at times results in the introduction of plant species that are not compatible with local conditions.

8. 2. 4 Habitat Degradation

Degradation of habitats – salt ponds, mangroves, coral, and seagrass – whether by natural forces or anthropogenic influences, negatively impacts the marine resource. The concept of an “ecosystem” makes it clear that loss or degradation of habitats is critical for the shelter and nutritional needs of many birds and animals. These areas also serve as nurseries or home to many - including endangered - species. Studies of mangroves have determined that these areas are of principal importance to the marine resource health (IRF (2) 1993).

On St. Croix, immediate and long-term threats to the existing nursery habitats in Salt River and Altona Lagoon include point source, and non-point source, pollution, coastal development, permitted water-dependent and land-based recreational activities (Tobias, 1998).

In theory and in practice, “spot zoning” often permits a use and/or construction that does not give adequate consideration to nearby environmentally sensitive areas. Coupled with the absence of a comprehensive land and water use plan, spot zoning can be a contributor to habitat degradation.

According to Rogers, little is known about the interactions among reefs, mangroves, and seagrass beds, and how deterioration of mangroves and seagrass beds contributes to the degradation of coral reefs. Degradation of benthic habitats has undoubtedly contributed to the

significant changes in reef fish assemblages as gleaned from qualitative observations and quantitative research. (Rogers, et al., 2001)

Habitat degradation can result from a variety of activities, including:

- Upland development without proper sediment control measures resulting in unintentional filling in or even loss of a pond;
- Cutting or anchoring to mangroves damages or destroys mangroves which can eliminate nature's filtering mechanism;
- Extended camping and cookout activities have resulted in gradual destruction of mangrove habitat. Particularly at Salt River on St. Croix, mangroves have been cleared for campground areas and burned for firewood. (Tobias, 1998);
- Dredging, sand extraction, groin construction, and sewage effluent have affected reefs on St. Thomas and St. Croix (Goenaga and Boulon, 1992). A dredging project on St. Croix in the early 1990s removed 122,000 cubic yards of bottom material and destroyed approximately 5 acres of seagrass meadows (IRF (1), 1993).

Metals and the Marine Resource

The 1993 Christiansted APC Analytic Study addresses the impact of metals on the reefs:

"Metals such as mercury, lead, and copper, toxic organic chemicals (dioxin, PCBs) pesticide, herbicides found in industrial and agricultural runoff and runoff from landfills are extremely damaging to reefs. These toxic substances can cause scarring, death or reproductive failure in fish, shellfish and other marine organisms- they can accumulate in fish tissue leading to fish consumption advisories. In 1986, a study completed for the Division of Environmental Protection reported elevated levels of copper, lead and mercury in the marine sediments adjacent to the marina in Gallows Bay. That same study reported that the amount of copper in Christiansted harbor was 343 times that of copper found in Hawknest Bay (St. John) and the copper concentration exceeded US Environmental Protection Agency allowable 24 hour average for protection of salt water aquatic life ...Sediment taken from Gallows Bay in 1991 showed levels of cadmium, copper, and lead greater than ER-L and mercury at the ER-L ("Effects Range Level" is the concentration above which adverse effects may be observed or predicted among sensitive life stages and/or species." (IRF (1), 1993)

Global Warming and Bleaching of Coral

Approximately 50 countries have reported coral bleaching since 1997 (CNN.com., 2002). While many coral normally recover from short bleaching events, long-term or frequent bleaching may severely weaken the coral, leaving them more vulnerable to disease. During the first half of 1998, more ocean area in the tropics experienced exceptionally high sea surface temperatures than had been observed in any full year since 1982. An increase in just one or two degrees above usual maximum temperature can be deadly to these life forms (NOAA, 1998). The massive expansion of coral bleaching is a concern to scientists who were shocked

when coral that had survived for hundreds of years suddenly died in 1998. Divers in the tropics found that up to 90 percent of some species were dead (CNN.com, 2002).

8.3 Nonpoint Source Pollution

Unlike pollution from industrial and sewage treatment plants, nonpoint source pollution comes from diffuse sources as rainwater moves over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, depositing them into wetlands, coastal waters, and in aquifers.

"When rain falls, water strikes the surface of the land washes off into coastal ponds, bays, and estuaries. On the way, it picks up soils and contaminants from the ground surface. If the storm water runoff discharges through a pipe or gut, it is called a "point source" discharge. If it reaches the shore by flowing over the land, it is considered a "nonpoint source" (Division of Environmental Protection "Fact Sheet", 2000).

The pollutants include excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas, oil, grease and toxic chemicals from urban runoff and energy production. Sediment from improperly-managed construction sites also constitutes nonpoint source pollution, as well as bacteria and nutrients from pet wastes and livestock, and faulty septic tanks can be carried by runoff and constitute nonpoint source pollutants.

Scientists and environmental activists consider nonpoint source pollution to be a leading cause of water quality problems because it can impair the quality of drinking water, water supply, marine recreation, fisheries, and wildlife.

8.3.1 Household Chemicals and Wastes / Septic Wastes

Pollutants such as waste oil, septic discharge, and household chemicals can be carried in storm water runoff. If it reaches the saltponds, it can result in the death of animals, plants, and in disruption of the ecology of the pond.

Chemicals in household cleaning products flushed down the toilets may find their way into the aquifer, into the salt ponds, and eventually the sea.

8.3.2 Oil / Waste Oil

Oil spills may occur as marine or industrial accidents, or as a result of oil tank leakage. According to a Division of Fish and Wildlife brochure (undated), there may be small spills (of oil) from leaky boats or accidental fuel tank discharge that may result in oil-contaminated wildlife. These spills affect seabirds, sea turtles, waterfowl, ospreys, fish-eating bats, and shorebirds.

In the 1998-1999 reporting period for the "2000 Water Quality Assessment", the Division of Environmental Protection, 41 "spills" or, releases of oil into to the waters of the VI, were reported to the St. Thomas office; 14 spills were reported to the St. Croix office. The VI Water and Power Authority had seven spills; the Department of Public Works, one; and HOVENSA had six incidents of oil sheen seen in the harbor The Division of Environmental Protection reportedly tracked leaks in underground storage tanks in various stages of remediation at twelve gasoline stations. (USVI DPNR, 2001).

Waste oil can originate in connection with automotive or boat maintenance, or from industrial processes. Improperly handled waste oil can lead to long-term ecological problems as described in public education fact sheets and brochures developed and distributed by the V.I. Energy Office beginning in 1990. The Office also developed and funded a waste oil collection program in the 1980s and 1990s in an effort to protect ground water.¹⁰

8.3.3 Automobile Pollution

Automobiles that are not properly maintained contribute to air pollution that may cause airborne particulate matter to settle on and damage the reefs.

Abandoned cars are a potential threat to ground water and the aquifer as the batteries, waste oil, gas tank, and paint chips move with storm water runoff or leach into the aquifer.

Waste motor oil that is improperly disposed of pollutes the aquifer and may leach into the sea.

8.3.4 Boat-related Pollution

There are several sources of boat-related pollution.

- Recent surveys make it clear that anchoring gear has damaged critical benthic resources. Garrison (1993), and Link (1997) report that breakage occurs from occasional ship groundings of large commercial vessels and smaller recreational boats, anchoring, and deployment of fish traps on coral reefs;
- While boats are on railways during repair and maintenance, oil, grease, paint chips, and other scrapings and materials fall directly into the water;
- Although the use of tributyltin (TBT) is prohibited in the U.S., it is not prohibited in many countries. Foreign ships entering [USVI] harbors may utilize bottom paint containing TBT (IRF, Christiansted, 1993).

¹⁰ The fact sheets are out of print and no longer distributed by the Virgin Islands Energy office; however the author of this report was the Director of that Office and is aware of the content of the facts sheets.

8.3.5 Watershed Degradation

A stakeholder comment, “What’s done on the hills, ends up in the bay,” raises the issue of “ridge to reef” continuity. In an island microstate like the USVI, it is puzzling that this continuity does not appear to be well understood, and has not been translated into public policy. The APC Analytic studies and other literature address the degradation of substantial watershed areas in the USVI as the result of unplanned and largely unregulated construction over the past 30–40 years. With the knowledge of the stresses on watersheds – and ultimately on the marine resource – much more work urgently needs to be done to halt and reverse the degradation. The Territory’s total watershed area is substantial: St. Croix has 54,072 acres of watersheds, St. Thomas has 18,952 acres, and St. John has 12,049 acres. (USVI DPNR Division of Environmental Protection, 2001).

The draft management plans for the Christiansted (St. Croix), Mangrove Lagoon/Benner Bay (St. Thomas), and Coral Bay (St. John) APCs, for which final approval is pending, describe the impact of watershed degradation. For example, Christiansted Harbor receives drainage from a watershed composed of eight sub-watersheds having a total area of 10.44 km². Major areas in that combined watershed are densely populated, with numerous paved and unpaved roads and driveways, both abandoned and active gas stations, automotive and other businesses, etc. Frequent stormwater runoff and sewage discharge combine with litter and sedimentation creating visual and environmental degradation.

The draft APC management plan for Mangrove Lagoon and Benner Bay states that without comprehensive planning, the combined watershed above Mangrove Lagoon/Benner Bay now supports more than one-third of the population of St. Thomas in high and moderate density housing, multiple businesses, and poorly-designed and poorly-maintained roads and driveways. The issues of litter, sedimentation, flooding, and general degradation are yet to be addressed through adequate planning and action.

To a lesser extent, the Coral Bay watershed is experiencing similar stresses and negative impacts of hillside development, but stakeholders expressed serious concerns about future degradation.

8.3.6 Built Environment/Inappropriate Development

The APC Analytic studies completed by IRF in 1993, and the corresponding draft APC Management Plans completed in 2001, identified numerous stresses and conflicts between the built environment and the natural environment in the USVI:

- Construction in known floodplains;
- Inadequate or absent setbacks, unpaved roads, bad road and driveway design;
- Coastal development increases the cumulative threat potential with respect to 3 types of coastal storm impacts: threats to public health safety and welfare, costs

to taxpayers for disaster relief and protection, losses of irreplaceable natural resources;

- Illegal setbacks from "guts";
- Groundwater contamination: attributed to bacteriological contamination from failing septic tanks, leaking municipal sewer lines, migration of contamination from previous injections and disposal practices, frequent sewage bypasses (DPNR, 1998);
- Excessive amount of nutrients from improperly treated sewage.

Sediment-laden runoff after a heavy rainfall can be a by-product of poor land management practices, an increase in the density or intensity of development, excessive land clearing, or loss or degradation of mangroves and salt ponds. Turbidity is an outgrowth on sediment runoff.

8.3.7 Sedimentation and Runoff

Some of the leading causes of nearshore coral decline are related to land development and nearshore construction that are not environmentally sensitive. Sediment, silt, and other suspended solids wash off of plowed fields, construction sites, and urban areas. Coastal sediment is also caused by land clearing, and construction of seawalls, docks, and marinas (U.S. EPA, 1998).

In the "Status of Coral Reefs in the USVI 2000" (2001), the impact of sedimentation and runoff is described:

"Together with over-fishing and destructive fishing practices, the effects of sedimentation and pollution have been identified as the primary human-induced agents of stress that are contributing to the decline in tropical coastal marine habitats and their associated reef fishes (Rogers, 1990, Roberts, 1993). Sedimentation can affect coral health growth and recruitment, thereby reducing a reef's capacity to develop and regenerate." (Rogers, 1990).

The September 2001 MPA NEWS references the New Atlas of World's Coral Reefs in which coral reefs "at risk" are defined as those experiencing a medium to high level of threat from fishing, pollution, or sedimentation. It further reports that there is a need for attention to be given to more than simply the direct impact of humans on reefs. Fishing and tourist activities may be controlled, but the more remote source of threats to reefs, notably pollution and sedimentation from adjacent land, continues unabated. Without a more concerted effort to control all of the impacts of humans on coral reefs, even the best-managed marine protected areas may be managed in vain. (Emphasis added).

On St John, with slopes exceeding 30 percent on more than three-quarters of the island, the accelerated development, absent prudent land management practices, presents a major threat to the water quality and the marine resources. Rogers, et al. (2001) reports unpublished USGS water quality data from thirty sites around St. John that show bays with developed watersheds

have higher turbidity and light extinction coefficients, and lower light transmission than bays inside the park associated with underdeveloped or less disturbed watersheds.

The potential for sedimentation and runoff to negatively impact benthic health is illustrated by the Potts and Lebow description of the 1993 floods in the Continental United States. Those floods brought tons of sediment to the Gulf of Mexico, much of which was deposited on Florida reefs with severe consequences at marine parks, sanctuaries, and reserves in lower Florida.

“The establishment of parks and reserves was an important step in managing reefs but it did little more than establish “coral islands”. What is needed is an integrated approach to gain control over pollutants from distant sources...while the success of these reserves may be debated, the plans of incorporating source pollution control is key to the success of any coral reef management.” (Emphasis added) Lebow and Potts, 1996.

The report, "Status of Coral Reefs in the USVI 2000" includes an appendix of monitoring reports on water quality throughout the Territory that should raise the level of concern for water quality and reef health.

8.3.8 Agricultural and Animal Wastes, and Chemicals

Environmentally responsible practices must be taught and promoted in concert with current efforts to expand the agricultural sector. Agricultural practices and animal wastes can either be the culprit in habitat degradation, or they can further goals for sustainability as in demonstrated in integrated farm system models. A Division of Environmental Protection "Fact Sheet" (undated #1) on pesticides describes the following:

- Fertilizers, pesticides, and use of inappropriate species for landscaping (especially non-native varieties) coupled with high maintenance (water) requirement increases the sediment in the runoff;
- Atmospheric deposition, agricultural and urban runoff, and cleaning products high in phosphates can harm coral reef habitats;
- Salt from irrigation practices, agriculture, and landscaping;
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems;
- Groundwater is a threatened resource; and recharge areas often lie close to surface and may be affected by agricultural operations. Once contaminated, groundwater is difficult or impossible to clean.

8.3.9 Trash

Trash and marine debris are unsightly and threaten marine resource health. Whether floating on the ocean or resting on the floor, debris may rub against or smother coral. Boaters, divers, ships and other vessels, and improper disposal of trash contribute to the problem.

In recent years, the Anti-Litter and Beautification Commissions in both the St. Croix and St. Thomas–St. John districts have initiated community-based clean-up campaigns, adopt-a-spot programs, and youth summer programs to clean and beautify beaches, mangroves, salt ponds, and other areas. These and other efforts achieve temporary trash and litter reduction.

Integrated solid waste management solutions are prevalent in communities throughout the US, due, in part, to the work of the waste management coalitions that grew out of regional federal-state compacts, i.e., the Southern States Energy Board (SSEB). Despite a decade of membership in the SSEB paid for by the V.I. Energy Office, and opportunities for technical assistance from SSEB's Solid Waste Management Coalition, the USVI continues to be plagued by waste mismanagement. It is likely that marine resources will continue to be stressed by the trash that is improperly disposed, and by the government's inability to effectively manage trash that is properly disposed.

Plastics cause a wide range of deadly threats as described in a government agency brochure on plastics pollution (Division of Environmental Protection, undated #2). Discarded fishing lines, nets, traps, six-pack holders, styrofoam cups and food trays, marine debris, trash floating on the ocean or resting on the ocean floor comes from many sources, including boaters, divers, improper disposal of trash on land and beaches, storm water runoff of rivers and streams, ships

and other vessels. This debris harms fish species and aquatic organisms on the reef, and can kill coral by continually rubbing against it or smothering it.

"Plastic Pollution: Local Solution" (Division of Environmental Protection, undated brochure) describes the sources of and damage to marine life by plastic pollution:

- Plastics and plastic pollutants can wrap around and suffocate coral;
- Birds and fish ingest plastics and plastic pollutants;
- Thousands of marine animals are killed annually by entanglement in and ingestion of plastics and plastic pollutants;
- Plastic debris in our environment is a proven killer of marine and land mammals, seabirds, sea turtles, fish, crabs, and conch.
- Divers' lives are threatened by entanglement; and boats may become fouled in plastic debris.
- The majority of plastics found in our waters and on shore come from commercial fishing boats, military ships, passenger liners, merchant ships, research vessels, and pleasure boats dumping their garbage overboard. Other sources include docks and marinas, picnickers and beachgoers.

8.4 Point Sources of Pollution

Marine management strategies are extending beyond the reef proper to all waters and activities that have influence on the system, including both point source and non point source pollution (see Chapter 1.1).

8.4.1 Sewage

Sewage that is improperly treated or discharged can harm or destroy marine habitats. Sewage may act like fertilizer in the water causing excessive algae growth that, over time, deprives some fish and marine animals of oxygen and space to grow.

According to the "Year 2000 Water Quality Assessment" (DPNR, 2001) the use of salt-water flushing systems and the high wastewater strength have contributed to advanced deterioration of the entire municipal collection and treatment system.

Sewage problems on St. Croix are frequently in the headlines and are noted in the Division of Environmental Protection reports. St. Croix logged 83 sewage bypass, spills, or leaks from the municipal system in the 1998-99 reporting period. Breakdowns of the municipal sewage system and the subsequent illegal bypasses have created numerous instances of nutrient-loading in St. Croix Waters (Division of Environmental Protection, 2001).

On St. Croix, the Department of Public Works has five manholes located seaward of the Mean Low Water line. The Division of Environmental Protection studies show that in 1992 waters surrounding these manholes had extremely elevated bacterial levels, especially after heavy rains. Bacterial levels were recorded at greater than 1000 colonies per 100 milliliters, exceeding both territorial water quality standards and the US Environmental Protection Agency's "swimmable" criteria.

An illegal outfall discharge point that is utilized when the Lyndon Baines Johnson (LBJ) lift station is not operational is of major concern because it is located in the same segment of the water body as drinking water intake for the major desalination units on St. Croix.

The Department of Public Works is currently facing legal charges related to, but not specifically for, permit violations (Division of Environmental Protection, 2001); to-wit:

- Discharge of waste overboard directly into the sea by boat owners and the difficulty of regulating such activity (Division of Environmental Protection, 1998);
- Sewage pump-out facilities are woefully lacking or inadequate throughout the Territory in marinas and harbor, especially where "liveaboards" are moored (IRF (1), 1993).

8.4.2 Industrial / Commercial

Regulated industrial discharges are monitored and documented by the Division of Environmental Protection, including brine discharges from reverse osmosis plants, other technology, and from freshwater production plants, industrial facility process water discharges, and industrial facility drainage discharge. According to reports by the Division of Environmental Protection, many of the regulated facilities are not in full compliance with the provisions described in their respective permits. Site inspections of these facilities, and reports of unpermitted discharges, indicate that the water bodies near such facilities are constantly impacted (Division of Environmental Protection, 2001).

On St. Croix, the following adverse impacts have been reported:

- Several buildings in Christiansted Town discharge their air conditioning condensate and basement sump pumps into drainage guts. This flow is considerable and carries dirt and litter into the sea (IRF(1), 1993);
- Sewage from Hotel on the Cay in Christiansted Harbor is carried in a pipe that is vulnerable to anchor and storm damage (IRF(1), 1993);
- Untreated rum-effluent is persistently discharged along St. Croix's south shore resulting in a five-mile long benthic "dead zone" caused by the high toxin level, high Biological Oxygen Demand, and the high temperature of the effluent (Rogers, et al., 2001);
- There are industrial effluents from VI Water and Power Authority outfall;
- HOVENSA is permitted discharge of sulfide (S), total chromium (K_r), and phenols into the water. (Division of Environmental Protection, 2001).

The APC Analytic studies completed in 1993 by IRF addressed the impacts of industrial activities on marine resources. The Christiansted study stated that sediment collected at the Water and Power Authority outfall at Christiansted Harbor had levels of DDE (a degradation product of DDT) of 45.8 parts per billion – higher than both the ER-L and ER-M guidelines (2ppb and 15ppb, respectively). The concentration of phosphorus (P) in the water at this site was also shown to exceed local water quality standards (IRF (1) 1993).

A 1986 Environmental Assessment Report on the construction of the Water and Power Authority's pier on St. Croix clearly attributes the rotting plant matter in the area to the Authority's thermal discharge (USVI Government, 1986). The outfall mixing zone was not in compliance with territorial law as indicated by several factors: 1) the existing poor condition of the benthic community within the mixing zone and the presence of nonproductive adjacent seagrass beds; 2) the outfall's proximity to important habitat on Long Reef, and 3) the proximity of the water intake pipe for the desalination plant.

Major outfalls such as those of the Department of Public Works and the Water and Power Authority are of concern since they are located in the same segment of the water body where water intake occurs for the major desalination units at HOVENSA and the Richmond plant of the Water and Power Authority, respectively (Division of Environmental Protection, 2001).

8.5 Stakeholder-identified Stresses, Threats, and Solutions

Stresses and threats described by the stakeholders mirror those found in the literature, and some appear in the conflicts described in Chapter 7. Stakeholder input was not prioritized, however, among the stresses and threats identified were:

- Threat of federal and local government elimination of fishing as a livelihood;
- More people competing for a finite marine resource;
- Rapidly-increasing size of our human footprint on the environment;
- Increase in tourism, requiring a balancing of economic benefit with environmental cost.

Species Survivability

Species survivability depends on the protection and health of the species throughout phases of the life cycle. In much of marine management, there has not been an holistic approach to understanding and protecting species throughout their life cycles. Such an approach is likely to fail in the long run (*Per. comm.*, Drayton, The Ocean Conservancy, 2002).

8.6 Conflicts, Stresses and Threats Specific to the APCs

There has been an attempt by local government to give special focus to APCs. The 1993 APC Analytic Studies completed by Island Resources Foundation developed comprehensive baseline information on the stresses and conflicts in all APCs. Management plans have been drafted for three of those APCs, and a summary of APC water quality issues was included as an attachment in the year "2000 Water Quality Assessment Report". (USVI DPNR DEP, 2001)

The designation as an APC denotes the need for attention and action, and there is a fair amount of overlap between the designated APCs and marine areas already identified, or with the potential to be identified, as MPAs. Stakeholders agreed that it makes sense to establish a link between the MPA and APC planning processes. All information in Table 8–2 is excerpted from the VI "2000 Water Quality Assessment Report". The number(s) following the name of the site refers to the number assigned to the APC that corresponds to that site.

Table 8–2 APC Stresses and Threats

APC AREA(S)	STRESSES AND THREATS
ST. CROIX Southshore Industrial Area (APC # 1, 4)	<ul style="list-style-type: none"> • Expansion of commercial, residential, industrial boundary conflicts with important wildlife areas and sea turtle nesting beaches; • Local fishers vie with boat traffic to access fishing grounds in the Channel; • HOVENSA oil seepage has been noted for decades and other hydrocarbon storage sites have contaminated groundwater supply.
Christiansted Waterfront (APC# 1,2,4,5)	Results from numerous water quality and biological surveys indicate a worsening problem, particularly as growth and development plans for these areas are underway. Problems include: <ul style="list-style-type: none"> • Toxic conventional and unconventional pollutants; • Water quality degradation and thermal pollution from the LBJ pump station; • Excessive amounts of heavy metals, phosphorus, and DDE, TBT, and oil discharge from boats.
Southgate Pond - Cheney Bay (APC # 1,3,4,5)	Includes one of St. Croix’s remaining wetlands, and is situated in a large floodplain which has many federally and locally listed endangered species. <ul style="list-style-type: none"> • With a marina and two resorts in the APC, CZM has issued four permits for major commercial development. The marina has been cited for previous water pollution; • Current Conflict: conservation efforts are at odds with development pressures – despite its classification as an APC, as an Area for Preservation and Restoration, and its inclusion in the VI Coastal Barrier Resources System, additional commercial development and CZM major permits have been allowed.
St. Croix Reef System (APC # 1,3)	<ul style="list-style-type: none"> • Terrestrial runoff is the primary factor in reduced water quality, mainly in nearshore waters; • Sedimentation and nutrient-loading, and bacteria levels from poorly-functioning septic systems and vessel waste are of concern as well; • Oil and grease can also affect the health of coral reefs.

Source: *Year 2000 Water Quality Assessment Report*, USVI Department of Planning and Natural Resources, Division of Environmental Protection.

Note: The APC number (#) refers to the DPNR designation of APC identified as # 1-# 18

Table 8-2 (cont'd)	
ST. JOHN Enighed Pond – Cruz Bay (APCs # 2,4,5)	<ul style="list-style-type: none"> • Unplanned, intensive development has resulted in violation of building codes and incompatible land uses; • Boat fuel stored in the creek area with little regard for safety measures; • Creek has been in violation of its Class B Standards due to storm sewer discharges and heavy commercial boat use; • Cruz Bay’s water quality classification as “fishable/swimmable” is questionable.
Chocolate Hole – Great Cruz Bay (APC # 5)	<ul style="list-style-type: none"> • Most use conflicts arise due to increasing boat anchoring and mooring which has reduced maneuverability in the area; • Other conflicts include small craft use and snorkeling/diving activities; • Dredging in the 1960s and 1980s significantly increased turbidity; • Vessel waste discharge has become more of a concern as boaters use the bay for anchorage; • A closed solid waste dump at Estate Susannaberg may be contributing pollutants to the watershed; • Further development within the Chocolate Hole/Great Cruz Bay area needs to be strictly managed.
ST. THOMAS St. Thomas Harbor and Waterfront (APC # 2,3,4,5)	<ul style="list-style-type: none"> • There is very little green space left; • Water pollution in the harbor comes from 5 main sources: 1) sedimentation, runoff, and propeller wash; 2) leaking sewer pipes and storm water flow; 3) vessel waste discharges; 4) solid waste from both land and vessels; and 5) oil contamination from both land and sea dumping and leaks; • There is no consistent water quality monitoring system. Therefore, specific regulation implementation will have little scientific merit.
Magens Bay (APC # 3,6)	<ul style="list-style-type: none"> • Post-Hugo: Experienced an unquantified amount of hydrocarbon pollution due to the increased use of gasoline-powered generators; • Continuing development and excessive beach use need to be managed.
Mandahl Bay (APC # 1,3,6)	<ul style="list-style-type: none"> • Construction of stone jetties resulted in loss of beach sand; therefore, public usage of the beach has significantly declined; • Storm water runoff has negatively impacted the pond periodically; • Elevated levels of fecal coliforms have been reported, probably due to septic tank effluent.
Vessup Bay - Red Hook (APC # 3,4,5)	<ul style="list-style-type: none"> • Both are used for anchorage and experience heavy boat traffic; • Oil disposal has been a problem.

Source: Year 2000 Water Quality Assessment Report, USVI Department of Planning and Natural Resources, Division of Environmental Protection.

9.0 Projected Demand for Marine Resources

The USVI is an insular area, albeit one whose population increases tenfold by annual visitor arrivals (BER, 2001). It may be important to look at the demographic base needed to support each unit of marine-related business, and assess whether and how much growth in this area can be supported by the demographics. Commonly, in community economic planning assessment of the of the population is needed to determine existence of support for a particular economic activity, e.g., the mix of families and single adults of “x” income level necessary to provide enough business to support, for example, a hardware store or pharmacy. Such information enables planners to make fairly sound assumptions about the potential for success or failure of additional hardware stores or pharmacies in the particular community.

Notwithstanding more than thirty years of marine interest and activity in the USVI, the VI Bureau of Economic Research still does not collect or organize data that is specific to the marine resource. Absent baseline data or previous trend analysis, this Report offers what is, admittedly, speculation concerning projected demand vis-à-vis economic opportunities. There is no indication from our research that existing traditional conflicts are being resolved; therefore, speculation on the direction if not the magnitude, of such conflicts, is perhaps a bit more grounded.

Absent baseline data, it was necessary for the MPA survey be long enough to capture respondents' demographics, general questions, and specific user groups' questions, yet short enough to be considered reasonable by stakeholders. We extracted information on trends and projections from the supplemental surveys and comments made at community briefings and focus groups, although it is important to note that none were of sufficient detail to generate statistically reliable figures or conclusions. A separate survey to obtain input on projections and trends should be undertaken for future, comprehensive MPA analysis.

To accurately project demand on resource use and identify opportunities for growth in marine supportive businesses, USVI marine management planning will have to identify and measure relevant parameters, and define and address issues related to the carrying capacity of the islands. The issue of overfishing should be understood through data not anecdotes, and the determination of environmental costs and economic benefits of increased diving activity must be measured not surmised. (See *Appendix VI* for parameters and subparameters measured in socio-economic assessments.

9.1 Economic Opportunities and Associated Natural Resource Dependencies

We estimate the total value of marine resources in the USVI is well in excess of \$1 billion annually – the equivalent of more than half of the Territory's GTP (see Table 6–1). Recognizing the direct link between the marine environment and the Territory's economy, it is not surprising that the largest monetary value by far was attributable to the tourism industry and related activities. Term charter boats and yachts, private recreational boats, commercial fishing,

and recreational fishing followed tourism in monetary value. The extent to which other marine-related uses and non-use categories have values that may be equal to, or possibly exceed those noted, is unclear and warrants further research.

In order to obtain a truly accurate economic picture, the economic opportunities presented by effective MPA management include “plugging” some of the economic leakage, potential increase in fish production, and creation of a sustainable ecotourism product. These opportunities augment the obvious benefits of job creation and income gains from increased activity in boating, fishing, and diving.

9.1.1 Reduction of Economic Leakage

Generally, goods and products consumed in the USVI are imported from the Mainland United States. In recent years there has been a growing understanding of the concept of "economic leakage" - that the rate at which money spent in the Territory leaves the economy with little or no re-spending benefit thereby "leaks" out of the local economy. The high rate of leakage for the USVI was reported in "The USVI Energy Profile", which included an analysis that compared the USVI's 0.45 self-sufficiency index with the 0.75 self-sufficiency index for the U.S. as a whole (Economic Research Associates, 1994). In the context of economic operations, self-sufficiency is not linked to political status, but to the extent to which there is re-spending of dollars (the multiplier effect) within that economy. Without a computation of the self-sufficiency index for areas similar to the USVI, e.g., Guam or Puerto Rico, the U.S. figure is offered as a relative – not a comparative – reference.

Consumer purchases of imported items (food, clothing, boats, raw materials for manufacturing, fuel, and goods for resale) contribute to economic leakage. In urban and community planning, community economic development strategies are often designed to "grow an economy" from within, thereby offsetting leakage. New or expanded business activities linked to the marine resource – e.g., development of the game fishing, or sustainable mariculture designed to meet domestic, hotel, and restaurants needs – could be part of a community economic development strategy to grow the economy from within and reduce economic leakage.

Any venture into mariculture should, however, be designed for sustainability based on the successes and failures of other mariculture efforts, and should go forward after comprehensive environmental assessment is completed and a system for monitoring is in place.

9.1.2 Positive Impact on Fish Production

Stakeholders in all meetings expressed interest in sustainable mariculture as constituting a potential benefit to fishers, food production, and the economy. Although no specific studies were found to document annual fish catch and local demand, the literature review provided some indication that the demand for fish has consistently exceeded supply in the USVI since the 1930s (see Section 5.1.3). If this is true, and if the reported impacts of the Soufriere Marine Management Area mentioned earlier are accurate (i.e., positive impacts on the mass, diversity, and abundance of stock in the managed areas), then a combination of a marine protected area

approach and sustainable mariculture could serve to increase stock not only for local consumption but possibly for export as well. The latter is another example of the way an economy may show growth from within.

9.1.3 Sustainable Ecotourism

The nature trails and hiking normally associated with ecotourism are not without problems. The economic success of ecotourism in the Central American country of Belize or St. John in the USVI has been widely publicized. The potential downside of that success is overuse and deterioration of the very resources that bring the significant new dollars to the economy. For example, trails and routes may need to be rotated to avoid changes in drainage patterns and to avoid damage to sessile life along the paths. For marine resources to be sustained for use by locals or tourists, the use may have to be limited at some stage. GIS models can support the assessment of carrying capacity at the early stage of development and can help to refine the assessment over time. The dynamics of sustainable economic and environmental balance will require GIS modeling.

9.1.4 Boating

According to a report in a local on-line newspaper, signs for the boat-chartering season are good. The St. Croix Source wrote, “As local and regional marine stalwarts agreed that the VI chartering industry is alive and showing signs of good health despite tourism downturns...charter yacht bookings have increased...” (Gates 2001).

Reporting on a meeting between the VI Marine Industries Association and the Coast Guard Marine Office, The St. Croix Source wrote that a local senator re-stated her objective to “encourage ongoing plans to systematically return the local marine industry to its former importance to the economy”. MPA stakeholders expressed cautious optimism that with the Executive and Legislative Branches' recent attention to the USVI's decline as a “premier location for yachting, and regattas”, the decade-long decline may be reversed. The VI Marine Industries Association described that decline:

" In 1988, the USVI was the charter yacht capital of the world, putting a hundred million dollars into the local economy—with a goal of two hundred million by the year 2000.... It did not happen, and 1992 had reduced the industry to \$20 million." (Gates, 2001).

Reflecting an expanding recreational boat sector, the Division of Fish and Wildlife registered more than 1,813 recreational vessels in 1998; existing marinas were upgraded, and new marinas were constructed (Mateo, 1999).

The VI Charter Yacht League reported that the annual Charterboat Show, which showcases crewed charter vessels 45 to 105 feet in length to charter brokers, filled up early in 2001. (Gates 2001).

Stakeholders recommended that there should be comprehensive economic analysis of commercial and recreational boating activity. With an understanding of the economic benefit and the environmental/social costs of boating, sound decisions could be made regarding promotion and marketing of these activities. The Department of Tourism's and/or boating groups' plans to increase the number of events such as races/regattas, fishing tournaments, and the like, are not, apparently, known at this time.

9.1.5 Fishing

Both commercial and recreational fishers in the stakeholder process agree that marine resource management that is well-planned and well-implemented will benefit fish stocks. However, the uncertainty about possible boundaries and restrictions arising from federal or local government action has put a damper on some fishers' thoughts about the future.

All fishers agreed that there is a need for improved commercial and recreational record-keeping in order to identify "who is fulltime/part time", "who is commercial/recreational" fisher, "how much of what kind fish" are being caught, and "what methods" and "what equipment" are being used. Until that is done, it will not be possible to make accurate projections because there is no baseline data.

Fishers who participated in the stakeholder process also recommend that British Virgin Islands (BVI) fishers who fish in USVI waters should also be accounted for as they may deplete stocks.

Both groups (commercial and recreational fishers) agreed that it is important to ensure a healthy and plentiful stock of game fish in order to expand the already lucrative gamefishing area.

9.1.6 Diving/Diving Schools

The Virgin Islands placed second for "*Best snorkeling*", and St. Croix was rated fourth overall for "*Best overall destination, best visibility and value in the Caribbean, and the world's most popular destination*" in a poll taken by Rodale's Scuba Diving Magazine. (CYBER SCUBA DIVER, 2002).

The USVI has a vigorous diving industry that reaches both the local and the tourist market. From the standpoint of environmental protection and the number of consumers needed to support diving activities, study and analysis is required to determine the benefit, cost, and feasibility of an expanded diving sector. There are many recent studies and reports on the impact of divers on the marine resource, and it would not be difficult to assess the potential environmental benefits and costs. As for the question of whether market demographics support an expanded diving industry, data is not available. The Bureau of Economic Research aggregates diving and water sports data with the tourism/recreation category, thereby clouding the possibility of making diving-specific trend analyses and projections. It also appears that no government agency has been tasked with developing industry-related demographic analysis for

the USVI. There is a need for research to rationally define the carrying capacity or a specified area, and research to ascertain economic parameters, e.g., divers' willingness to pay.

9.1.7 Water Sports Rentals (Snorkeling, Jet Skiing, and Other Related Businesses)

One outcome of establishing an MPA could be a relocation of watersport activity or a restriction on the numbers of users in a defined area within a specific time period. In the absence of MPA-related restricted areas, a steady growth in tourism and in the resident population should stimulate an increase in water sport businesses. An increase in these businesses could bring economic, if not environmental, benefit. Since watersport equipment is not manufactured in the Territory, money will “leak” out of the economy as these small businesses purchase equipment from off-island. It is, however, reasonable to expect that these small businesses will play the role normally played by small businesses in any economy, i.e., they will be locally-owned, pay taxes to government, pay wages to residents, and make other expenditures locally for such goods and services as advertising, utilities, groceries, etc., that circulate dollars within the local economy. These are the direct and indirect economic benefits that may counter economic leakage, rendering expansion of this sector an economic benefit.

9.2 Potential Conflicts

It may be unavoidable that greater demand for a finite resource will produce a range of conflicts. In the absence of a structured process which has been publicized, is accessible, and culturally competent, and to which stakeholders have been seriously engaged, it is likely that the conflicts will escalate. The conflicts will continue in the areas in which they have always persisted, i.e., the public's "customary access" to the shoreline; commercial versus recreational uses; extractive versus non-extractive uses; etc. It is also possible that new conflicts will emerge as marine managed areas designate who can do what, where, and when.

The following conflicts were identified and discussed during the stakeholder process:

1. Public resentment to the policies and practices of the NPS on St. John has been voiced for more than twenty years. While MPAs are an initiative of the local government, their emergence in the same period of time as the controversial designation in 2000 of "National Monument" in status by President Clinton in the waters of St. Croix and St. Thomas/St. John could stimulate resentment and resistance equal to or greater than that noted on St. John.
2. The Department of Housing Parks and Recreation, and the Department of Planning and Natural Resources, as the local government agencies with responsibility for MPAs, have the opportunity to craft meaningful public participation in the planning and conflict-resolution processes. They can demonstrate collaboration and cooperation as they engage community organizations and the private sector in the MPA planning process. If they share too much or too little of the MPA management with NGOs or CBOs, or select NGO or CBO partners on the basis of something other than their qualifications, it can be anticipated that the overall MPA effort will suffer.
3. The Federal Coastal Barriers Improvement Act of 1990 established parts of the USVI as a Coastal Barrier Reef System. Its purpose was to protect valuable natural resources from being destroyed by unwise economic development. The Federal Government recognized that the seduction of "dollars and jobs" often rings louder than the need to adhere to natural resource protection. In the USVI, as areas suitable or desirable for development diminish, absence of a comprehensive land and water use plan, or attempts to project and prioritize the future landscape and seascape needs, designations CBRS, APC, significant natural area (SNA), or MPA, could be entirely negated.
4. Developers of marinas, hotels, and condominiums continue to propose construction in prime areas, which are, more often than not, environmentally-sensitive areas, e.g. Botany Bay, Chocolate Hole, Robin Bay. Far too often, as has been documented in media and scientific reports, adherence to conditions in coastal zone permits is lacking. The environmental degradation evident in Charlotte Amalie Harbor, and the southwest coast of St. Croix, will become increasingly common unless or until there is sound environmental impact review, improved enforcement of special conditions for permits, and a comprehensive land and water use plan to guide decisions on zoning requests. In U.S. communities, a Land Use Board of Appeals reflecting balanced representation from academicians, practitioners, and community

residents is able to serve the community effectively. In general, when decision-making is supported by geographic information systems, communities are able to more effectively balance development and environmental protection.

5. There is insufficient effort to address the difficult, but necessary, issue of marine species survivability at each and every phase of their life cycles. Attention paid thus far to juvenile and adult stages is an important start, but does not yet address the earlier phases that make the latter phases possible.

6. An understanding of the stresses, threats, life requirements, and a supportive response, e.g., providing technical and financial support to retrofit marinas or docks that are contributing to early life cycle threats, should be considered during the MPA development process. Admittedly, the science and study of species' life cycles is emerging, however, under construction are the marinas and buildings whose silt, sedimentation, and turbidity could issue the death sentence at the very sensitive early phases in the life cycles of these creatures.

7. Relocation of traditional activity - whether temporary or permanent - may create resentment because of the loss of income or enjoyment by residents.

8. The USVI is home to endangered species that are protected under federal laws. Plans for marine protected areas must be in compliance with federal guidelines for species that inhabit the specified area. To the extent that there are federal guidelines for sensitive habitats, the local government will have to comply with those in developing marine parks and protected areas.

10.0 Summary of Stakeholder Responses

Stakeholder response was obtained through surveys and the focus group process, both of which were preceded by the community briefings. (See Chapter 2). In the briefings, stakeholders viewed the Soufriere Marine Management Area video (with stakeholder comments), heard the MPA project overview, and participated in general discussion about the MPA, concerns, conflicts, and some framed their comments relative to the Soufriere experience.(see footnote 1).

Surveys

Stakeholder responses were entered into a spreadsheet model in this Report that makes it possible to track responses demographically. Survey responses are summarized in Chapter 4 Section 3, in Chapter 7, Sections 7.6 and 7.7, and in *Appendix V*. *Note:* The project design did not support significant manipulation of data, e.g. factor analysis, more detailed charts, etc.

Focus Groups

Participants responded to formatted questions on benefits, concerns, and impacts. The Comments are provided in Section 10.1 - 10.3, and in *Appendix V*.

10.1 Stakeholder Understanding of MPA

The responses described in this section are a summary of the responses obtained in the focus groups. The responses from the questionnaires are summarized in Chapter 4, Section 4.3, and appear in *Appendix V*.

The economic and environmental opportunities that could result from effective MPA management appear to be well-understood; however, stakeholders are at least a little skeptical as to whether MPAs can be done well in the USVI.

"First Thoughts"

When asked to express their “first thoughts” upon hearing the words “marine protected area”, stakeholders’ responses revealed a good understanding of the purpose and activities of MPAs. The responses also made it clear that, for many in the focus groups, the first thought when asked to think about an MPA is the word “NO”: No take, No livelihood, No access.

As a “first thought”, stakeholders in all groups mentioned "protection", "conservation", and "restriction". Other “first thoughts” included:

- “Managed areas with multiple uses and restrictions” ;
- “Use restriction/Barriers” ;
- “Increased fish population”;
- “Conflicts”;

- “Eco-tourism”;
- “Closure”;
- “Pristine-ness”.

Purpose of an MPA

When asked to state the purpose of an MPA, stakeholders appeared to have grasped the range of activities, e.g., targeted use, closures, and spillover benefits e.g., economic, ecotourism, environmental education, and scientific goals. They were also keyed into the potential problems including increased resentments against government, loss of livelihood, and traditional access, increased competition, and conflict between user groups for use of the non-MPA areas. Other “Purposes” mentioned include:

- To define and support a healthy ecosystem that supports maximum takes of existing fish;
- To increase the average size of fish, stimulate “appropriate” tourism, re-establish a body of scientific work.

Benefits of an MPA

The benefits of marine management to the health of the reef and improvement of fish stock was unquestioned by the participants in the focus groups and in the community briefings. Some fishers did question the accuracy of scientists’ assessment of declining fish stocks. They said that numbers being used to develop marine managed areas might be inaccurate because, as one fisher offered, “If I take them where I really get good fishing, they (the government) might take that spot away too.”

Many stakeholders stated that MPAs would increase the value of whatever area was protected, and that it would protect intangibles like “quality of life”, and sentimental and cultural treasures. There was also a statement that MPAs would be good for attracting “the right kind of tourist”, i.e., - those who are considered to be good for the economy and for the environment.

In one focus group the comment was made that a definite benefit of an MPA would be 'to ensure better fishing down the road...but for whom?'

Many stakeholders from the public and private sectors expressed hope that the attention to marine resources might finally push the CLWUP (comprehensive land and water use plan), strong land development policies, and move us in a sustainable “right” direction.

10.2 Perceived Socio-cultural and Economic Impacts

There are strong economic benefits from game fishing activity, and stakeholders expressed a concern that the fish are being “saved” for recreational – not commercial – fishers. Participants expressed a desire that the MPA system protects the future of the commercial fishermen as well as the future fish populations.

Other MPA impacts perceived by the stakeholders included:

- A backlash to the MPA effort by developers, real estate interests, who think that anything “pro” environment is “anti” development;
- MPAs may be seen as a “threat” to tourism-related development;
- MPA work could create some unity among the users if it’s done right;
- Well-managed ecotourism could benefit the USVI economy as it did for Belize.
- *If the existence of the NPS has made real estate costs skyrocket on St. John, will new MPA areas have a similar impact?*
- With an anticipated increase in federal and private land trust funds available to support a solid MPA plan, there may be an opportunity for new jobs and services, at least some of which will require training that is not currently available.

10.3 Concerns About MPA status

Much of the concern about MPA status centered on the potential limitation of use. At the community briefings on St. Croix and St. Thomas, statements were made reflecting the concern that, *“There are more and more restrictions and closures. When does it stop?”*

Concern about the matter of the new National Monuments forming even more limits on top of existing restrictions was voiced at both the St. Croix and the St. John meetings. In all meetings – focus groups and community briefings – came the question, *“Will the No take zone be forever?”*

Others concerns were:

- MPAs could mean complete elimination of a livelihood, and of cultural activities;
- Can the jurisdictional issues and oversight of marine issues by multiple parties ever be rationalized in some way?;
- There are already too many managers, agencies, rules, and regulations. MPAs will come into an existing melée of Federal Government, Local Government and private property owners' actions;
- Will MPA status be reversible by Big Developers or by lobbied Senators? Is status permanent, or subject to review and revision?;
- Can MPA efforts restore and sustain traditional species balance?

10.4 Stakeholder Recommendations

Too often, the words of the stakeholders are relegated to the appendix in reports. Stakeholder buy-in will be critical to the success of MPA management. Their support may be facilitated by the Department of Planning and Natural Resource staff's explicit acknowledgement that community input is central to the process. Some stakeholder recommendations are presented in the body of this Report to familiarize the marine planners with the scope and quality of recommendations made in the MPA socio-economic assessment process. These recommendations demonstrate that stakeholders have given serious thought to MPA matters. Stakeholder recommendations are presented as offered with minor edits.

General

- Strong watershed protection - a "ridge to reef" approach and better land management;
- Create and use environmental sensitivity maps;
- Use the GIS to model economic and environmental impacts to aid the decision-making;
- Establish a Marine Biology "Chair" at the University of the Virgin Islands;
- Get the scientists back to work;
- Organize data from the Bureau of Internal Revenue, Bureau of Labor Statistics, Division of Fish and Wildlife, Department of Tourism, and the Real Estate Associations into a management information system (MIS) that can "sell" the economic importance and fragility of our marine resource;
- Assign some value to being the only English-speaking tropical environment under the US flag.
- Try to create a healthy ecosystem that supports maximum takes of existing fish while controlling allowable fishing techniques

Education/Training and Outreach

- Involve the developers and real estate associations in the MPA process and begin to determine carrying capacity, and maximum limits of growth supported by GIS models;
- Develop some consensus of marine resource values;
- Bring the private sector (architects, real estate interests, boating associations, etc. into government and / or the University of the Virgin Islands discussions and planning for the marine resources;
- Use elders to bring perspective and teaching about the recent environmental degradation;
- Establish an on-going dialogue and campaign to create voluntary compliance and to "stigmatize" the abuse of natural resources.

Management

- Let an NGO have co-manager responsibility;
- Recognition and cooperation with NGO that has time other resources that Government doesn't have - let government delegate prudently;

- Choose an informed manager, various disciplines, checks and balances, political and non-political appointments; active monitoring by government agencies, e.g., Magens Bay Authority or the Urban Forestry Council;
- Create a new type of entity for management (a new model);
- Cultural competence and pro-activism in MPA management;
- Management: local government, CBOs and NGOs in partnership for management;

Public Policy

- Create tax incentives, transfer of development rights, conservation easements, and court new development that is consistent with our Territorial environmental and sustainable economic goals and objectives;
- Review and revise the disincentives to private sector initiatives, i.e., exorbitant annual fees for docks, cost of seawalls, retaining walls;
- Put a lid on “spot zoning”;
- Fix the dismal watershed situation and use a “ridge to reef” approach to protection;
- Develop the Territorial Park System;
- Change the 2-tier system to a single tier system for CZM purposes.

Additional recommendations are provided in *Appendix V*.

11. Additional Data Types Needed to Support MPA Development

MPA management is challenged to address competing environmental, economic, and social demands. The data required to do so must be purposefully organized so that the information is useful to decision-makers. The scope of an MPA plan determines the data types that will support decision - making by planners and policy makers. There may be a need for data that helps to explain the benefit of coral reefs to sand production and shoreline protection, or the value of funding for marine research. There may be a need for data that is more difficult to obtain, e.g., quantifying the cultural importance of access to a beach or dive spot , or calculating the diminishing returns when carrying capacity is exceeded. For the USVI, there are gaps in basic data, and there is a need for valuation studies that can support MPA policy and decision making.

To derive more precise monetary values and enhance the level of analysis already undertaken, will require a significantly larger research effort. That effort will require more time, more money, and more cooperation in identification of useful reports and data. A comprehensive assessment could complete a more extensive literature search for USVI marine resource studies and data (much of which was not available or quite old), and prepare information related to coral reef functions, recreational use statistics, coastal real estate values, and other areas for which data is lacking. There must also be a focus on initiating new primary research.

Gaps in data types have been noted throughout this Report, and also include:

1. Economic data to support modeling and analysis of direct and indirect impacts of MPA:
 - a) It will be necessary to coordinate data from the Bureau of Economic Research, the Division of Fish and Wildlife, the Division of Environmental Protection, Office of the Tax Assessor, the Department of Tourism, and the Department of Consumer Affairs and Licensing,
 - b) Little information was available to support economic analysis of aquarium trade, aquaculture, souvenir manufacturing, educational and research functions, access for shipping/commerce, biological support for wildlife, coastal protection, bioprospecting, among others. It would appear that the agencies in (a), above are either not mandated to do so, or lack the resources to do so;
 - c) The absence of complete data on boating expenditures, and numbers and types of boats, left us to make assumptions based on previous studies and anecdotal information. Similarly, due to a lack of detailed information on local industry/activity purchase patterns, we made conservative assumptions in an effort to not overstate any benefits that accrue. Due to the nature and extent of the information provided on tourism expenditures, the total value reported for tourism should not be summed with the total values for recreational uses and activities. The tourism value undoubtedly captures a portion of the recreational and fishery values noted in subsequent sections addressed in this Report.
2. Data needed to improve marketing and market studies re: local fishing industry, e.g., who buys what fish, where, and why, and who doesn't and why;

3. Data from improved record keeping for recreational and commercial fishing related to landings, economics of fishing, vessels, technology, methods;
4. Data from an MIS that is specific to fish catches and captures National Park Service and the Division and Wildlife, and any other relevant fish catch data;
5. There is a need for information that characterizes User groups, including, but not limited to: age, sex, income group, ethnicity/place of origin, community demographics, etc. (see *Appendix VI*);
6. Information that more fully characterizes User group activity, e.g., the nature and type of activities, methods, techniques, vessels, technology used in fishing, personal watercrafts, and locations of uses, including overlap of user group activities;
7. Documentation of public policy and institutional roles, including, but not limited to a) who has the authority and responsibility- and to what extent – for various issues, policies, etc., b) where are there institutional conflicts and/or overlaps: c) what policies may be in conflict with other policies of the same or different institutions;
8. At least one extensive survey of public attitudes re: marine resources including values, desires, awareness, concerns, and ideas and perception of marine management;
9. Data generated by an inventory of traditional access sites, wetlands, ponds (existing and filled) to determine restorative strategies;
10. Data from primary research to monetize the value of the intangibles (Section 6.1.2. and *Appendix VI* for parameters and subparameters and methods used in marine valuation
11. An analysis of stakeholder and community livelihoods that combines an understanding of how stakeholders combine their use of marine resources with other activities and factors that affect livelihood strategies, e.g., tourism's seasonality, fish life cycles. Household case studies are an effective way of presenting these data (Bunce, et al., 2000).

An example of A Rapid Assessment Methodology that describes categories of information necessary to support creation of a sound socio-economic framework appears as Table 11– 1.

An example of the Essential Elements of a base interview guide using a predominantly Rapid Rural Appraisal methodologies from a Montego Bay Marine Park case study (Bunce, Gustavson, et al., 1999) appears below with minor modifications.

TABLE 11-1 Element for Rapid Appraisal Methodologies

Characteristics of the Activity	Current activity (range of operations; equipment, size and frequency of activity; individuals and time involved); history of activity (changes in numbers and types; types of clients, locations and frequency); expectations for the future; current locations within (<i>proposed</i>) park waters.
Characteristics of Users	Structure of the industry or activity; characteristics of the manager, employee and/or user (including age, gender, ethnicity, place of origin, education, and economic status); seasonality and duration of involvement; area of residence; basis of participation; dependency on income over time; willingness and/or tendency to shift to other employment; types/acceptability of alternate jobs; individuals or businesses linked to activity; type/nature of ties to other activities.
Users' Perception of MPA Management	Perceptions of: reef conditions; most significant impacts; impacts from water sports, hotels, fishing, farming, cruise ships, littering, manufacturing, sewage; environmental awareness and concern; groups involved in marine environmental management; group resources to benefit management; top concerns for the MPA needs for better MPA management.
Cultural Value of activity	Attitude/outlook toward the activity of management, staff, and/or users; importance to the user group's community; perceptions of larger community's attitude and outlook toward the activity; importance of activity to the larger community/particular groups.
Community and Institutional Structures	Formal and informal organizations (social and professional) and structures; decision-making and conflict resolution processes (including addressing common problems); nature of social relations within groups; relations/interactions with other groups (including fishing, diving, jet skis, parasailing, and other water sports, hotels, farming, cruise ships, and manufacturing); other groups' effects on use; nature of relations with government officials; trust in political institutions; relations/involvement with the MPA; perceptions of the MPA.
Economics	General industry/activity economic state; profitability of industry or activity; typical costs of structures (capital outlays, labor, repairs, depreciation, goods and services, taxes); changes over time; perceived reasons for change.

Table adapted from "The Human Side of Reef Management: A Case Study Analysis of the Socioeconomic Framework of Montego Bay Marine Park", Bunce, Gustavson, et al., 1999.

12.0 Conclusions

The following conclusions may be drawn from the research, stakeholder process, findings, and analyses contained in this Report:

1. As demonstrated in the stakeholder process, the general public is interested, knowledgeable, and supportive of the need for marine resource management. They have considered the trade-offs between various uses, as well as the social and political conflicts. They have offered recommendations and expressed a willingness to develop solutions. With attention to effective outreach, timely notification, accessible venues and meeting times, the local government will find in the general public willing partners for MPA management
2. MPA management would benefit from initiatives to improve the management of marine resources. An important avenue for such initiatives is improved communication, cooperation, and coordination between the federal and local governments.
3. With increases in population over the last thirty years and more intensive building construction – especially on steep slopes – existing land management practices are a significant threat to marine health. On the other hand, there are local examples of excellence in environmentally sensitive approaches to design and construction. These practices, and MPA management that may include temporary or permanent restrictions, will ultimately enhance the experience for divers, fishers, swimmers, and boaters.
4. There are major gaps in the data that is necessary for understanding marine resource use and for marine resource valuation. The gaps exist, in part, because certain questions are only now being posed. The decision-support tools that are now available make it possible to complete more sophisticated modeling and analysis using basic data, e.g., numbers of divers, divers' willingness to pay, cost of boats and equipment used for commercial and recreational fishing.

Agencies of government can and should play an important role in gathering and organizing data for economic, social, and environmental impact analyses. With the articulation of marine management goals and coordination with GIS capability, planners can develop decision-support tools for economic impact analysis, policy analysis, and for understanding other impacts of MPA strategies.

5. Coral reefs are central to the issue of marine resource management in the USVI because reefs:
 - a. Provide protection from storm surges, heavy wave action, and beach erosion;
 - b. Provide a non-consumptive, non-renewable resource that has recreational, aesthetic, and economic value;
 - c. Are the backbone of the food chain that includes a number of fish species and marine species used for food and for economic purposes;

- d. Contribute to the beauty of the waters that attract tourists and give pleasure to residents and tourists alike.

12.1 The Role of a Shared Agenda

The USVI should be able to construct a successful MPA initiative if there is a commitment to promoting a shared agenda from which policy makers, planners, and NGOs develop and implement a strategic process. A shared agenda can help to secure the commitments to participation in the planning process, and can facilitate the resolution of very real and very serious conflicts in marine resource management.

The MPA socioeconomic assessment process identified early indicators of consensus across user groups that can help to define that shared agenda. The areas of consensus include those contained in the "*Key Findings*" (*Executive Summary*), and the MPA Benefits on Table 4 –3.

12.2 The Role of Science

One recommendation of the stakeholders was “bring back the scientists”. They expressed a desire to see good science – not quick junkets – which would provide information that is important to local user groups. They stated that attention of the scientific community was “mostly good” for the Territory. This local recognition and acceptance is important to the cooperation that scientists will receive.

Scientists and managers from more than twenty countries gathered in a workshop held prior to the Coastal Zone 2001 Conference in July 2001 to share information on the role of science in MPA management. The findings of the MPA socioeconomic assessment in this Report concur with the advice of the natural and social scientists from eight countries on four continents as reported in MPA News (Sept., 2001):

- A need for partnerships and linkages, including technical advisory boards for MPAs that include both scientists and managers;
- A need for the creation of international research and management networks for MPAs as well as electronic discussion groups;
- Scientists and managers should treat communities as peers--listening to them, getting instructions, directions, and priorities from them, and involving them in data collection.

12.3 The Role of Economic Valuation Research

It will be possible to assign economic value to many aspects of marine resource benefits, e.g., the direct and indirect economic value of gamefishing. The value of “the pleasure of enjoyment” must be addressed in the determination of carrying capacity, but may never be

accurately monetized. New primary research for the purpose of economic valuation can be conducted based on well-established econometric modeling, with the inclusion of the expertise of social scientists who can structure instruments and processes that meets accepted standards of statistical rigor.

This new research, largely in the form of interviews, focus groups, and surveys will render it possible to gather more up-to-date and detailed data on industry activity and expenditure patterns, e.g., commercial fishing, term and day charter boats, resident boating and fishing, diving and water sports, and the tourism industry as a whole. It can also be designed to assess how residents and tourists value the tangible and intangible aspects of the existing marine environment, and the extent to which they value enhancement of the quality of the marine resource for future generations.

Finally, we reiterate that this Report offers a preliminary understanding of information that must be covered more extensively and intensively if successful MPA management is to be realized in the U. S. Virgin Islands.

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APPENDIX I

Terms of Reference

TERMS OF REFERENCE

SOCIO-ECONOMIC ASSESSMENT FOR USVI MARINE PARK MANAGEMENT PLAN

Background

As part of the United States Coral Reef Initiative, the Government of the United States Virgin Islands (USVI) has embarked on a project to develop a Marine Park System Plan for the Territory. This project, which is being coordinated by the University of the Virgin Islands (UVI), has four main components:

1. Preparation of a Marine Park System Plan for the USVI;
2. Preparation of a Resource Description Report for the marine environment in the USVI;
3. A Socio-economic Assessment of the resource use patterns of the marine environment in the USVI; and
4. Preparation of a Management Plan for the proposed marine park for the east end of St. Croix.

The University of the Virgin Islands is now seeking to acquire professional services to carry out the Socio-Economic Assessment.

Activity Description

Review and assemble information on how the marine environments of the Virgin Islands are utilized, and determine the importance of the various uses to the Virgin Islands economy. Meet with user groups to obtain their input. Pinpoint areas where data is lacking, and propose ways to obtain this information.

Proposed Tasks

The Consultant is required to undertake the following tasks:

1. Identify and classify groups of users of marine resources. Where possible, characterise the groups (age, sex, area of residence, etc.), and determine their level of dependence on the resources.
2. Describe resource use patterns (types of activities, frequency of activities, scale of operations, location of activities, etc.).

3. Describe historic and current conflicts between uses and user groups, and where possible, past and current dispute resolution initiatives.
4. Identify current threats to the resource, including point and non-point sources of pollution. Where possible, such threats should be quantified, and their relative importance stated.
5. Estimate future demand for recreational and other uses.
6. Identify existing and potential conflicts between resource uses and existing and proposed marine protected areas.
7. Determine user perceptions concerning the status of the resources, including any changes noted over time.
8. Determine direct and indirect use values of the marine environment to the economy of the U.S. Virgin Islands, broken down by uses and user groups where possible.
9. Identify data gaps, and propose ways to obtain missing/relevant data.
10. Participate in meetings with Department of Planning and Natural Resources, VI Parks Advisory Committee, and project collaborators as required.

Deliverables

- Report Outline.
- Socio-Economic Assessment Report (which should contain the information generated in Tasks 1 through 9 above).
- Assembled reports/documents.
- Bibliography of assembled reports.

Product Delivery Schedule

UVI expects to receive the draft report from the Consultant by November 30, 2001. However, a more detailed delivery schedule will be developed during the contracting process.

Budget

This assignment has an upper budgetary limit of Thirty Thousand Dollars (US\$30,000.00).

Additional Considerations

In addition to the tasks set out above, The Consultant should be aware of the following considerations/expectations:

- a. Data will be generated using standard research methods. Though it is expected that, for this assignment, the principal method will be document and database analysis, other means of data capture (interviews, telephone surveys, stakeholder focus groups, etc.) should be used to validate the findings and close information gaps..
- b. The Consultant is expected to interact with other project personnel in order to ensure that areas of overlap, and data relevant to all project components, are fully integrated.

Submission of Proposal

The proposal should include, at a minimum, the following:

- The general approach and/or methodology to be used in conducting the assessment;
- The principal consultant(s); and
- A detailed cost estimate.

The proposal to carry out the Socio-Economic Assessment should be received at UVI **by 4:00 p.m. Friday August 10, 2001**. The proposal should be submitted to:

Dr. Henry Smith
Vice Provost
University of the Virgin Islands
2 John Brewer's Bay
St. Thomas, VI 00802
Fax: (340) 693-1065

The proposal may be submitted by facsimile.

For additional information or clarification, please contact Lloyd Gardner, Project Coordinator, by telephone at: (340) 693-1209, or by email: lgardne@uvi.edu.

APPENDIX II

Data Sets Used for Analysis

APPENDIX II

Data on Marine-related Economic Activities

Commercial Fishing Data -1999			
	St. Croix	St. Thomas/St. John	Total
Registered Commercial Fisherman	206	143	349
Reporting Commercial Fisherman	200	136	336
Total Trips (Reported)	7,670	5,099	12,769
Reported Landing			
Pounds	607,665	583,788	1,191,453
Direct Monetary Value	\$2,488,843	\$2,294,526	\$4,783,369
Average Price per Pound	\$4.10	\$3.93	\$4.01
Output Multiplier			1.67
Total Economic Value			\$7,972,282
Average Landing per Fisherman			
Pounds	3,038	4,293	3,546
Monetary Value	\$12,444	\$16,872	\$14,236
Notes: All data, except the output multiplier and total economic value are derived from "Three year Summary Report, 1 April 1997 - 31 March 2000," Cooperative Fishery Statistics Program, Bureau of Fisheries, Division of Fish and Wildlife, August 2000. MRG & Associates calculated the output multiplier as is noted in this Report. Multiplying the direct monetary value times the output multiplier derives total economic value. Monetary values are reported in year 2000 dollars.			

Recreational Fishing Data - 1999			
	St. Croix	St. Thomas/St. John	Total
Residents Recreational Fishing	3,294	7,705	10,999
Total Catch (pounds)	35,225	137,412	172,637
Average Price per Pound			\$4.01
Estimated Direct Monetary Value			\$693,092
Average Landing per Fisherman			
Pounds	10.6	17.8	15.6
Average Monetary Value			\$63
Notes: Fishing and catch data from Mateo, I., <i>Annual Performance Report: USVI Angler Telephone Household Survey</i> , USVI Department of Planning and Natural Resources, Division of Fish and Wildlife, U.S. Virgin Islands, 1999. Average price per pound is based on commercial fishing data from "Three year Summary Report, 1 April 1997 - 31 March 2000," Cooperative Fishery Statistics Program, Bureau of Fisheries, Division of Fish and Wildlife, Department of Planning and Natural Resources, USVI, August 2000. The monetary value is calculated by multiplying the total catch by the average price per pound. Monetary values are reported in year 2000 dollars.			

Appendix II (cont'd)

Recreational Fishing Data - 1995-1999			
	St. Croix	St. Thomas/St. John	Total
Primary Activity	Shoreline	offshore	
Shoreline Catch -1995-1999 (pounds)*	65,192	31,505	96,697
Offshore Catch - 1995-1999 (pounds)**	41,486	274,133	315,619
Tournaments (1995-1999)	10	36	46
Tournament Catch	8,519	146,646	155,164
Total Catch (1995-2000)	115,197	452,284	567,480
Annual Average Catch (pounds)	23,039	90,457	113,496
Average Price per Pound			\$4.01
Estimated Direct Monetary Value			\$455,657
<p>Notes: All fisheries related data was derived from Mateo, et al., "Activity and harvest patterns in the U.S. Virgin Islands Recreational Fisheries, October 1, 1995 – September 30,2000, Division of Fish and Wildlife December 2000. “*” Refers to estimated total based on surveys. “**” Refers to data for charter and private boats derived from log sheets, surveys and personal interviews, does not include tournament data. “Total Catch” and “Average Annual Catch” includes shoreline and offshore catch for 1995-1999 and tournament data for 1996-2000. Average price per pound is based on commercial fishing data from “Three year Summary Report, 1 April 1997 - 31 March 2000," Cooperative Fishery Statistics Program, Bureau of Fisheries, Division of Fish and Wildlife, Department of Planning and Natural Resources, USVI, August 2000. The monetary value is calculated by multiplying the total catch by the average price per pound. Monetary values are reported in year 2000 dollars.</p>			

Appendix II (cont'd)

Recreational Boating Data – Year 2000		
Assumptions		
All Registered Boats - 2000	2,462	
Average days per month used	7	
Months per year used	12	
Term Charter Boats	150	
Day Charter and Day Sail Boats	150	
Commercial Fishing Boats	349	
Total Registered Boats 2000 - non-commercial or charter	1,813	
Expenditure (Expd) Data - Year 2000		
Boats Analyzed	1,813	
	Daily Expenditures	Total Expenditures
Fuel	\$41.24	\$3,704,612
Refreshments	\$30.04	\$3,295,381
Fishing Gear	\$28.41	\$2,421,878
Travel to Boat	\$17.79	\$1,897,776
Ice	\$11.93	\$981,196
Bait	\$5.23	\$533,675
Total	\$134.64	\$12,834,517
	Monthly Expenditures	Total Expenditures
Slip Rent (29%)	69.47	\$11,592
Dingy Fee (15%)	29.69	\$1,786
		\$13,378
Total Direct Expenditures		\$12,847,895
Output Multiplier		1.67
Total Economic Value		\$21,413,159
Notes: Data on numbers of registered boats and commercial boats is based on personal communications with Dr. Roger Uwate, Chief of Fisheries, Division of Fish and Wildlife, VI Department of Planning and Natural Resources, and data from Mateo, et al., 2000. Data on the number of Term and Charter boats and boat use is based on personal communications with Susan Chandler, Director of the Virgin Islands Charter League. Daily and monthly expenditure data is based on expenditures reported in Olsen (1979) that have been updated to account for inflation. To calculate the total expenditures, each average daily or monthly expense is multiplied by the number of applicable boats and the number of days per month and months per year used – as noted in the assumptions. The resulting total expenditure is then multiplied by the output multiplier to derive the total monetary value. The output multiplier was derived by MRG & Associates (see section 6.1.2 for more detail on how this value was derived).		

Term Charter Boat/Yacht Data - 2000	
Assumptions	Values
Number of Boats	150
Total Employees	450
Employees (average)	3
Mate (per week)	\$450
Chef (per day)	\$125
Captain and Chef team (per year)	\$60,000
Weeks of Charter (per year)	25
Food & Beverage (per week)	\$1,500
Insurance (per year)	\$6,000
Slip Fees	
Days in Slip (average days/charter week)	3
Fee per day (under 55')	\$50
Fee per day (up to 130')	\$280
Fuel Costs (per week per boat)	\$160
Maintenance Costs (per year per boat)	\$60,000
Expenditure Data	
Number of Boats	150
Food & Beverage	\$5,625,000
Insurance	\$900,000
Slip Fees	\$562,500
Maintenance	\$9,000,000
Employee wages	\$10,687,500
Fuel	\$599,071
Commissions to Booking Agents	\$4,697,315
Total Boat Expenditures	\$32,071,386
Average retail cost (per person per week)	\$1,800
Number of boats	150
Number of passengers per boat	5
Number of weeks	25
Total Trip Cost - Revenues	\$33,750,000
Commissions not retained in USVI (92%)	\$4,321,530
Notes: All data on numbers of boats and other assumptions (except fuel costs) represent approximations of industry averages based on personal communications with Susan Chandler, Director of the Virgin Islands Charter League. Fuel costs are estimates made by the author based on data contained in Posner, et al., "Economic Impact Analysis for the Virgin Islands National Park," 1991. To calculate the total expenditures per year, each expense category is multiplied by the number of boats and the number of weeks per year – as noted in the assumptions. For example: food and beverage = \$1,500 (per week) x 150 (boats) x 25 (weeks) = \$5,625,000. For slip fees, we assume the more conservative lower rate (\$50) due to lack of data on boat sizes. For employee wages we assume an average of one mate and one captain and chef team – a total of 3 persons. The total trip cost (revenues) was calculated using a similar methodology. The number of passengers (an average estimate made by the author based on information provided by Ms. Chandler) is multiplied by the number of weeks multiplied by the average retail cost multiplied by the number of boats.	

Appendix II (cont'd)

Tourism Related Data - 2000				
Category		Value		
Total Employment		44,050		
Total Private Sector Employment		29,020		
Total Visitors (thousands)		2,478		
Total Cruise Ships (thousands)		1,014		
Total Cruise Ship Passengers (thousands)		1,768		
Total Rooms and Units		4,997		
Occupancy Rate		59%		
Total Hotel/Lodging Guests		652,953		
Percent USVI residents		7%		
Percent Non-Residents		93%		
Total Gross Territorial Product (millions of dollars)		\$2,038.7		
Visitor Expenditures				
Sector	Visitor Expenditures (millions of dollars)	Percent of GTP	Tourism Related Employment	Percent of Private Sector Employment
Hotels/Lodging	\$240	12%	3,980	14%
Food & Beverages	\$158	8%	2,100	7%
Retail (gift shops, etc.)	\$495	24%	2,010	7%
Transportation	\$89	4%	570	2%
Recreation	\$101	5%	N/A	N/A
Other	\$74	4%	N/A	N/A
Total	\$1,157	57%	8,660	30%
Notes: All data from Bureau of Economic Research, <i>Annual Tourism Indicators</i> and <i>Annual Economic Indicators</i> , USVI Government Development Bank, 2001 and personal communications with Bureau of Economic Research.				

APPENDIX III

Survey Instruments

Survey instruments (cont'd)**BOATERS - Recreational**

1. The presence of an MPA(s) will enhance this activity ___yes ___no ___don't know
2. The greatest benefit of MPAs could be ___ economic ___ environmental ___Other (specify)_____
3. My biggest concern is a) size of the area ___ b) length of time for restriction c) effective mpa management ___other (specify)_____
4. Number of days per year you went out boating: ___less than 60 ___ 60-119 ___ 120+
5. Do you own your own boat? ___Yes ___No
 - a) If yes, did you purchase it in the US Virgin Islands? ___Yes ___ No
 - b) If no, do you go out on charter boats primarily? ___Yes ___ No
6. Yearly expenditures for fuel, maintenance, equipment, wages, charter/rental, etc.): approx. _____
7. Breakdown of expenditures (total 100 percent): ___fuel ___ maintenance ___equipment ___wages ___charter/rental ___other (list)
8. Number of paid employees (if any): ___full-time (30+ hrs per week) ___ part-time (less than 30 hrs per week)

note: Demographic information and Part A questions appeared on all surveys (see Boaters survey, above)

B. User-specific questions DIVING - Divers

1. The presence of an MPA will enhance this industry ___yes ___no ___don't know
2. The greatest benefit of an MPA could be ___economic ___environmental ___ quality of life ___other (specify)_____
3. My biggest concern is a) size of the area ___ b) length of time for restrictions c) effective mpa management ___other(specify)_____
4. Please check one (or both): ___recreational diver ___ commercial diver (income is from diving)
5. Number of days per year spent diving: ___less than 60 ___ 60-119 ___ 120+
6. Percentage of yearly income from diving (if commercial diver): ___less than 25% ___25%-49% ___50%-74% ___75%-100%
7. Yearly income from diving (if commercial diver) activities: \$_____ or (choose one) ___less than \$1,000 ___\$1,000-\$9,999 ___\$10,000-24,999 ___\$25,000+
8. Yearly expenditures on diving(fuel, maintenance, equipment, wages, rental,): \$_____
9. Share of spending/expenditures (total 100 percent): ___fuel ___maintenance ___equipment ___wages ___rental ___other (list)
10. Number of paid employees (if commercial diver, include yourself): ___full-time (30+ hrs per week) ___part-time (less than 30 hrs per week)

DIVE SHOPS

1. The presence of an MPA will enhance this industry ___yes ___no ___don't know
2. The greatest benefit of an MPA could be ___economic ___environmental ___ quality of life ___other (specify)_____

Survey instrument (cont'd)

3. My biggest concern is a) size of the area ___ b) length of time for restrictions c) effective mpa management ___ other(specify)_____
4. Yearly Sales: \$_____ or (choose one) ___less than \$10,000 ___\$10,000-\$24,999 ___\$25,000+
5. Percentage of yearly sales (total 100 percent): ___to local residents ___ to tourists
6. Yearly expenditures (goods sold, equipment, wages, etc.): \$_____
7. Share of expenditures (total 100 percent): ___goods ___equipment ___wages ___other (list)
8. Number of paid employees (including yourself): ___full-time (30+ hrs per week) ___ part-time (less than 30 hrs per week)

FISHERS : Part A (as above)**B. User-specific questions FISHING - Commercial**

1. The presence of an MPA will enhance this industry ___yes ___no ___don't know
2. The greatest benefit of an MPA could be __economic __environmental __ quality of life ___Other (specify)_____
3. My biggest concern is a) size of the area ___ b) length of time for restriction c) effective mpa management ___ other (specify)_____
4. Number of days per year spent fishing: ___less than 60 ___60-119 ___120+
5. Do you own your own boat? ___yes ___no
6. If yes, did you purchase it in the US Virgin Islands? ___yes ___no
7. Percentage of yearly income from fishing: ___less than 25% ___25%-49% ___50%-74% ___75%-100%
8. Yearly sales/income from fishing: \$_____ or (choose one) ___less than \$1,000 ___\$1,000-\$9,999 ___\$10,000-24,999 ___\$25,000+
9. Yearly expenditures for fishing (fuel, maintenance, equipment, wages, and charter/rental): \$_____
10. Expenditure breakdown (total 100%): ___fuel ___maintenance ___equipment ___wages ___Charter/rental ___other (list)
11. Number of employees (include self) __full-time (30+ hrs per wk)__part-time (less than 30hrs per wk)

FISHING – Recreational/Competitive

1. The presence of an MPA will enhance this industry _____yes ___no ___don't know
2. The greatest benefit of an MPA could be __economic __environmental __ quality of life ___Other (specify)_____
3. My biggest concern is a) size of the area ___ b) length of time for restriction c) effective mpa management ___ other (specify)_____
4. Number of days per year spent fishing: ___less than 60 ___60-119 ___120+
5. Do you own your own boat? ___yes ___no
 - a) If yes, did you purchase it in the US Virgin Islands? ___yes ___no
6. Yearly spending/expenditures for fishing activities (fuel, maintenance, equipment, wages, Charter/rental, etc.): \$_____
7. Expenditure breakdown (total 100%): ___fuel ___maintenance ___equipment ___wages ___Charter/rental ___other (list)

Survey instrument (cont'd)**B. User –specific questions - HOTEL/TOURISM**

1. The presence of an MPA will enhance this industry ___yes ___no ___don't know
2. The greatest benefit of an MPA could be __economic __environmental _ quality of life
___Other (specify)_____
3. My biggest concern is a) size of the area __ b) length of time for restrictions c) effective
MPA management ___other (specify)_____
4. How would you rate the importance of marine resources/uses (such as clean waters,
access to beaches, boating, fishing, and diving, and marine views/aesthetics to tourism in
the USVI? ___little if any ___moderate ___significant ___very significant
5. On a 1 – 5 scale, with 1 being highest priority, how would you rate, in level of
importance, the following amenities to hotel guests/tourists ___access to beaches ___access
to shopping ___access to boating/fishing/diving ___access to restaurants
6. What impact does the proximity to beaches/coast have on the decision by tourists of
where to stay while in the USVI? ___little if any ___moderate ___significant ___very
significant
7. If the coast/beaches and waters were degraded (oil spill, etc.) or fisheries and/or coral
reefs declined, what impact would this have on tourist visits to the USVI? ___Little if any
___moderate ___Significant ___very significant

REAL ESTATE

1. The presence of an MPA will enhance this industry ___yes ___no ___don't know
2. The greatest benefit of an MPA could be __economic __environmental _ quality of life
___Other (specify)_____
3. My biggest concern is a) size of the area __ b) length of time for restriction c) effective
mpa management ___other (specify)_____
4. How would you rate the importance of marine resources/uses (such as clean waters,
access to beaches, boating, fishing, and diving access, and/or views/aesthetics, among
others) to home sales in the USVI? ___little if any ___moderate ___significant ___very
significant
5. How would you rate, in level of importance, the following amenities to homebuyers (with
1 being the highest priority)? ___access to beach ___beachfront views ___access to
shopping ___access to schools ___access to transportation
6. What impact does the proximity to beaches/coast have on the price of real estate
(compared with similar properties not on or very close to the beach/water)? ___little if any
___less than 10% ___10%-29% ___30%-59% ___60%+
7. If the coast/beaches and waters were degraded (oil spill, etc.) or fisheries and/or coral
reefs declined, what impact would this have on beach front property values? ___little if
any ___moderate ___significant ___very significant

Part A, as above**B. User-specific questions SUPPORTIVE BUSINESS (type)**_____

1. The presence of an MPA will enhance this industry _____yes _____no _____don't know
2. The greatest benefit of an MPA could be ___economic ___environmental ___ quality of life
___other (specify)_____
3. My biggest concern is a) size of the area ___ b) length of time for restrictions c)
effective mpa management ___other(specify)_____
4. How would you rate the importance of marine resources/uses (such as clean waters,
access to beaches, boating and fishing, and/or marine views/aesthetics, among others) to
tourism in the USVI? ___little if any ___moderate ___significant ___very significant
5. How would you rate, in level of importance, the following amenities as they relate to your
business and sales (with 1 being the highest priority) ___beaches___boating/fishing/diving
___shopping ___restaurants ___hotels
6. If the USVI coast/beaches and waters were degraded (oil spill, etc.) or fisheries and/or
coral reefs declined, what impact would this have on your business/sales in the USVI?
___little if any ___moderate ___significant ___very significant

APPENDIX IV

Stakeholder Information

- A. MPA Stakeholder Meeting Participants**
- B. Stakeholder Demographics**
- C. Level of Involvement in Marine Resource Uses**

A. Meeting Participants

Community Briefings

Focus Groups

St. Croix		
Participants		Participants
1. Julian Durand	19. Edward Schuster	1. Claudia Lombard
2. Renalda Garcia	20. Juleta DeLeon	2. Olasee Davis
3. Juan Noles	21. Albert Joachim	3. Rafael Llanos, Jr.
4. Jesus Soto	22. Aaron Hutchins	4. Edward Schuster
5. Julian Morla	23. Thomas Daley	5. Ryan Smith
6. Bill Turner	24. Chris Vivacan	6. Liz Goggins
7. Daniel James	25. Gerson Martinez	7. Bill Turner
8. Joeseeph Henry	26. Rafael Llanos, Jr.	8. Kimberly Woody
9. Mariel Mercardo	27. O. McGregor	9. Phillipe Mayor
10. Liz Goggins	28. Kimberly Woody	10. Marcia Taylor
11. Bruce Milliken	29. Olasee Davis	11. Katy Garland
12. Ditty Layton	30. Tony Felix	12. Cher Will
13. Robert Weary	31. Catherine Fahy	13. Bill Will
14. Henry Tonnemacher	32. Joseph Gilbert	
15. Katy Garland	33. Phillipe Mayor	
16. Violeta Villanueva-Mayor	34. Cynthia Young	
17. Kelly Gloger	35. Ivan Mateo	
18. Dennis Smith	36. Nick Drayton	
St. John		
1. Jane Israel	8. Tilford Meyers	1. Liberty Bryan
2. Becky Bremser	9. Don Catanzaro	2. Jane Isarel
3. Jennifer Thal	10. Barry Devine	3. Barry Devine
4. Peter Laurence(?)	11. Craig Barshinger	4. Doug White
5. James Dalmida	12. Julien Harley	5. Norm Ghedhing
6. Kendall Anthony	13. Liberty Bryan	
7. Doug White	14. Frank Montgomery	
St. Thomas		
1. Adam Quandt	9. Sandra Romano	1. Kanit Cottrell
2. Robert Hewitt	10. Harry Clinton	2. Gil Anspacher
3. Roger Uwate	11. David Berry	3. Nick Drayton
4. Sue Higgins	12. Marielle Brandon	4. Toni Thomas
5. Lyndon Keen	13. Nick Drayton	5. Adam Quandt
6. Greg J. (?)	14. Bob Rapok	6. Janice Hodge
7. Kanit Cantrell	15. Andre Webber	7. Julie Wright
8. Gil Anspacher	16. Dagmar Sigurardettir	

APPENDIX IV (cont'd)
Stakeholder demographics (from MPA Surveys)

	Total Responses	Percent of Total Responses
SURVEYS	65	
SUPPLEMENTAL SURVEYS	35	
RESPONDENT		
RESIDENCE *	64	
St. Croix	33	51.6%
St. John	13	20.3%
St. Thomas	18	28.1%
Water Island	0	0.0%
SEX/AGE GROUP	57	
Male	39	68.4%
Female	18	31.6%
20-30	13	
31-40	14	
41-50	12	
51-60	12	
60+	3	
WORK SECTOR	48	
Public	17	35.4%
Private	22	45.8%
Nonprofit Organization	6	12.5%
Retired	1	2.1%
Unemployed	2	4.2%

Source: Analysis of surveys completed by participants in community briefings and focus groups

* Note: Some respondents did not complete all demographic information

C. Level of Involvement of Selected Users

Supplemental Survey						
	Boaters- Commercial	Boaters - Recreational	Divers	Dive shops	Fisher-commercial	Fishers - recreational
# of Respondents (40)	3	8	17	none	9	3
days involved in				none		
less than 60	1	5	9			
60-119		2	4		2	2
120+	1				6	1
Own boat	1	6	-----	-----	9	4
Where purchased	VI	3 VI	-----	-----	3VI	2VI
Work on/rent boat	2	2	-----	-----		0
% of income from		N/A				N/A
less than 25%	1	2	2			
25 - 49%	1	1	1		2	
50 – 74%						
75 - 100%					7	
# of employees	0	N/A		none		N/A
fulltime		0			3	
part time			2		2	
Income from activity (annual)				none		N/A
less than \$1000	0		1			
\$1000 - \$9,999	1				1	
\$10,000 - \$24,000			1		5	
\$25,000+					3	

Source: Information compiled from supplemental surveys distributed at MPA community briefings N/A is No answer

APPENDIX V

STAKEHOLDER RESPONSES

- A. Locations of Uses Identified by Stakeholders**
- B. Supplemental Survey 2001- Summary of Marine Values**
- C. Summary Responses to Survey Questions**
- D. All other Comments/Recommendations**

A. Locations of Uses Identified by Stakeholders

St. Thomas

West Cay – Kayak

Stumpy Bay – Protected Status for Coral Reef/colonized and uncolonized hard pavement

Magen’s Bay- swimming

Eastern peninsula of Magen’s – inner side Kayak, outer side “heavy Use”; need to protect

Hans Lollick-VINP Boundary- snorkeling, recreational boating

Cay Dive sites on NW and NE side

Mingo Cay – Diving south of Cay

Coki Point, Smith Bay- heavy use

Cowpet Bay- Kayak; Protect

Great St. James Island – Kayak, Diving

Little St. James- Diving

NW of Jersey Bay- snorkel

Buck Island- Dive sites on West Side need attention

Long Pont- Divvy sites south of LP

Bolongo BAY- Dive sites, recreational use

Frenchmen’s Bay- Dive sites

Flamingo pt- recreational use Sprat Bay-recreational use

Fist cays/providence pt, flamingo Bay- snorkel; diving on the East Side

Saba Island – recreational use- snorkeling, diving

St. John

Great Cruz bay-Cruz Bay – Fishing on reef between them

Great and Little Lamshur Bay- Bait catching

Ram’s Head – fishing

Newfound Bay- snorkeling, diving

Mennebeck Bay – snorkeling

Leinster Bay (West side) – diving/snorkeling

Whistling Cay - diving

Rata Cay - snorkeling

Euorpa Bay to Great Lamshur Bay-Fishing

Salt Pond Bay- fishing

Coral Bay- Diving

Hawknest- snorkeling

Brown Bay- snorkeling

Francis Bay- snorkeling

Johnson Reef – Diving

Hersey Cay- snorkeling

Locations of use(cont'd)**St. Croix**

Sandy Point - Frederiksted – Swimming, relaxing, hiking, ecotourism, personal water crafts

Frederiksted- Diving, swimming, personal water crafts

Between Frederiksted and Sprat Hall – Diving

Sprat Hall- swimming personal water crafts

Butler Bay- possible hotel

Global Crossing

Butler bay –Annaly Bay – Hiking, Ecotourism, hiking peaceful quite

Between Annaly and cane bay- camping, swimming, small boats, diving, personal water crafts

Davis bay- hotel

Cane bay to Salt River – hiking, condos

Salt river-0 kayaking; marina

Salt River to Christiansted harbor- swimming; sewage disposal

Beauregard bay – Sailing

Beauregard Bay to Half penny Bay on south shore- commercial fishing

Chenay Bay – bird watching, swimming, kayaking, camping. Snorkeling

Green Cay- recreational swimming, diving, sailing

Between Chenay and Teague Bays – fishing, swimming, hiking, ecotourism; Jacks grown

Teague Bay- yachting, hiking

Pelican Rock – needs protection; barely hanging on

Cottongarden bay- swimming personal water crafts ,camping

Point Udall- to Great Pond Bay- hiking, ecotourism

Jack and Isaac bay- snorkeling, swimming, lobstering

Turner Hole- small boat-recreational Camping, hotel

Rod Bay – possible hotels/golf course

Great Pond Bay- camping, kayaking, launch boats, Castle Nugent farm

Halfpenny beach- body surfing. /camping

Halfpenny to longpoint- Red Snapper

Long Point to Sandy point- hiking, ecotourism

B. Supplemental Survey 2001- Summary of Marine Values

USVI MPA SUPPLEMENTAL SURVEY 2001											
	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total	Total
RESPONDENT	Responses	Responses	"1"	Responses	"2"	Responses	"3"	Responses	"4"	Responses	"5"
RESIDENCE	22										
St. Croix	15										
St. John	0										
St. Thomas	7										
Please respond to questions using a scale of 1 through 5 where 1 is strongly agree and 5 is strongly disagree.											
1. <i>Access to USVI marine resources is important to me.</i>	35										
Response	34	97.1%	33	94.3%	1	2.9%	0	0.0%	0	0.0%	0
Don't know	1	2.9%									
2. <i>If marine resources were degraded I would limit my marine related activities.</i>	35										
Response	31	88.6%	20	57.1%	5	14.3%	4	11.4%	2	5.7%	0
Don't know	4	11.4%									
3. <i>If marine resources were degraded I would have to spend more time and/or money to purchase or catch fish, and/or go boating, swimming, diving elsewhere.</i>	35										
Response	33	94.3%	22	62.9%	6	17.1%	4	11.4%	1	2.9%	0
Don't know	2	5.7%									
4. <i>With expanding use, some management is necessary to ensure marine resources stay healthy and usable.</i>	35										
Response	32	91.4%	30	85.7%	2	5.7%	0	0.0%	0	0.0%	0
Don't know	3	8.6%									
5. <i>Protecting marine resources is essential to the Continued and future well being of the USVI economy.</i>	35										
Response	35	100.0%	31	88.6%	1	2.9%	3	8.6%	0	0.0%	0

Don't know	0	0.0%										
<i>6. Marine resources are the most important factor in sustaining the USVI tourist industry.</i>	35											
Response	31	88.6%	20	57.1%	4	11.4%	6	17.1%	0	0.0%	1	
Don't know	4	12.9%										
<i>7. I am concerned about maintaining the USVI's unique marine resources for my children and/or future generations to use and enjoy.</i>	35											
Response	35	100.0%	33	94.3%	2	5.7%	0	0.0%	0	0.0%	0	
Don't know	0	0.0%										
	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total
RESPONDENT	Responses	Responses	"1"	Responses	"2"	Responses	"3"	Responses	"4"	Responses	"5"	Responses
<i>8. The best use of marine resources is to help the economy and make money.</i>	35											
Response	34	97.1%	9	25.7%	4	11.4%	7	20.0%	6	17.1%	8	
Don't know	1	2.9%										
<i>9. Management of USVI marine areas should balance economic, environmental, and preservation interests.</i>	35											
Response	29	82.9%	21	60.0%	4	11.4%	4	11.4%	0	0.0%	0	
Don't know	6	17.1%										
<i>10. I am interested in volunteering my time to learn more and help preserve the marine environment.</i>	35											
Response	29	82.9%	23	65.7%	2	5.7%	3	8.6%	1	2.9%	0	
Don't know	6	17.1%										

C. Summary of response to general questions

USVI MARINE PROTECTED AREAS SURVEY 2001

Stakeholder Primary and Secondary Interest	Total	% of Total	Total	% of Total	Total	% of Total
	Responses	Responses	"1"	Responses	"2"	Responses
SURVEYS (not including Supplemental)	65					
SUPPLEMENTAL SURVEYS	35	53.8%				
RESPONDENT						
RESIDENCE	64					
St. John	33	51.6%				
St. Thomas	13	20.3%				
St. Croix	18	28.1%				
Water Island	0	0.0%				
SEX/AGE GROUP	57					
Male	39	68.4%				
Female	18	31.6%				
20-30	13					
31-40	14					
41-50	12					
51-60	12					
60+	3					
WORK SECTOR	48					
Public	17	35.4%				
Private	22	45.8%				
NonProfit Organization	6	12.5%				
Retired	1	2.1%				
Unemployed	2	4.2%				

A. General Questions: write 1 for primary interest, 2 for secondary interest-check all that apply						
1. Marine interest - Commercial	63					
Boats (Ferry)	8	12.7%	4	6.3%	4	6.3%
Boats (Charter)	9	14.3%	5	7.9%	4	6.3%
Boats (Repair, Fuel, Maint)	4	6.3%	1	1.6%	3	4.8%
Boats (Provisioning) - not included in Boaters, Divers, Fisherman	2	3.2%	1	1.6%	1	1.6%
Dive Shop	5	7.9%	2	3.2%	3	4.8%
Fishing	19	30.2%	16	25.4%	3	4.8%
Marina	4	6.3%	0	0.0%	4	6.3%
Other	12	19.0%	12	19.0%	0	0.0%
Specify						
2. Marine interest – Recreational	187					
Swim/Camp	49	26.2%	35	18.7%	14	7.5%
Fish	27	14.4%	17	9.1%	10	5.3%
Dive/Snorkel	52	27.8%	44	23.5%	8	4.3%
Boat	37	19.8%	27	14.4%	10	5.3%
Parasail/Kayak	20	10.7%	11	5.9%	9	4.8%
Other	2	1.1%	2	1.1%	0	0.0%
Specify						
	Total	% of Total	Total	% of Total	Total	% of Total
	Responses	Responses	"1"	Responses	"2"	Responses
3. Marine Interest - Other	180					
Educational	42	23.3%	31	17.2%	11	6.1%
Scientific	33	18.3%	26	14.4%	7	3.9%
Environmental	46	25.6%	41	22.8%	5	2.8%
Property Value	13	7.2%	6	3.3%	7	3.9%
Quality of life	46	25.6%	40	22.2%	6	3.3%
4. Are you familiar with marine protected areas	58					
Yes	49	84.5%				
No	9	15.5%				
If yes, specify						
5. Marine Protected Areas should be managed by:	72					
Government	19	26.4%	18	25.0%	1	1.4%

Nonprofit organization	18	25.0%	13	18.1%	5	6.9%
Public/Private partnership	35	48.6%	35	48.6%	0	0.0%
If existing, specify						
6. There should be Marine Protected Areas (MPAs) in the USVI	57					
Yes	57	100.0%				
No	0	0.0%				

D. ADDITIONAL STAKEHOLDER RECOMMENDATIONS/COMMENTS

1. Recommendations

Education and Outreach

- Publicize incentives to study conduct research in our strategic shelf location;
- Target the Youth - increase How - to - swim programs; marine education that is culturally competent;
- Training of Trainers approach to institutionalize a cadre of environmental educators k – 12;
- Ensure cultural competence in all materials: guidelines, educational etc.;
- Collaborate with NGO, CGOs for advocacy, community education;
- Approach the opening of MPAs as a celebration.

Enforcement

- Equitable and consistent across the board.

Monitoring and Research

- Coordinate and aggressively market our strategic shelf location i.e., the “Wall”
- Improve record keeping and convince fishers of the benefits of keeping and submitting good records.

MPA Manager/management

- Must embrace/include various disciplines, checks and balances, political and nonpolitical appointments;
- Refer to Magens Bay Authority, Urban Forestry Council, BVI Park Trust, Soufriere MMA as organizational models but don't be afraid to create a completely new model;
- Let a NGOs have co-responsibility for management;
- Include money for maintenance of the process;
- Publicize the goals, measure and report progress regularly;
- Create a Fisheries Liaison Office with expertise and authority.

Public Policy

- “One Stop” system for licenses / quick approval/denial;
- Avoid complicated legislation to govern MPA activities.

Relocation/Dislocation Alternatives:

- Re-train fishers for fly fishing guides, eco-tour guides;
- Ensure alternative recreational activities for those that will be restricted;
- Shift fishing from reef to offshore- to create opportunities for fly-fishing and ease the stress on reef fish.

2. Comments :

Purpose and Benefits of an MPA

Conservation. Wildlife, and a number of systems
 Makes sure that sustainable use of resources ” goes in the right direction”
 Economic Component: diving, fishing, tourism, real estate
 Environmental education
 Increase in average size of fish caught;
 Tourism increases; ecological tourism/education of tourist
 Protection
 Preserve and restore
 Long term benefits
 Unity amongst the users
 Spill-over benefits
 Ecotourism
 Education and research
 Gene pool biodiversity
 No take zones/No anchor/no mooring areas
 Enforcement /Education of community groups, and all users
 Monitoring and research
 Control of uses
 Barrier, Conservation, Protection,
 Use restriction, Increase fish population
 Protect the future of the fishermen and the fish population
 Increase the value of the protected: economic, sentimental, quality of life, cultural)
 Increase marine/environmental awareness (value, use, and tourist)
 Impetus to develop viable territorial park system
 To attract Tourists, scientific study and outside investment (ads, film, video, environmental trust organizations)
 Community empowerment
 Quality of life benefits
Could create unity among users

WHAT IS NEEDED

Control of uses
 Resources and political will to back existing enforcement, regulations and authority More regulations are needed re: size of catch and methods
 NGO advocacy, community education, seminars to convene dialogue to maintain voluntary compliance help to “stigmatize” the abuse of resources
 Good Communication
 Know the goals and see/report them being met
 Rumors need to be straightened out
 Measurement –today and in 5 years (e.g.)
 Money for maintenance of the process and the MPA management
 Explicitly link job creation; set asides, preferential treatment to any closures.
 Fishers must report exactly what they catch- but must point out the benefits of reporting
 People have to know about it; use good monitoring to report increase in takes, jobs impact over time

Comments(cont'd)

Education hikes

Establish and reach standards and goals that are site specific for each mpa

Sufficient resources: seek funds from Us dept. of Interior

Get Community support by building management plan through consensus

Educational programs for visitors and youth: including nnps

Good publicity (rec.: signage and materials)

Good monitoring: research and study stocks and replenishing

“Strategic Plan”

Conflict resolution – on-going with community representation)

Alternative activities /sites for those who are displaced

Community participation

User identification and buy-in/shared ownership

Ensure continuation of recreational activities

Advertising and Promotion

Refer to successful and failed models.

Direct info to the students; Go to the groups, use media effectively

Education of Real Estate developers

Eco models, “alternatives” user analysis of impact, do the sites work as intended?

There is a perception of too much closure..create visuals to represent various restrictions.

CONFLICTS

Public resentment to restrictions-“non-information”

Environmental protection is perceived as anti-development: get developers involved, developed the “what if” scenarios

Education and training using objective, economic analysis as the basis – not bunny hugging

Property ownership issues: trades, TDRs, conservation easements

Jurisdictional issues – can it be successful if done unilaterally. If Feds wont’ give it up- ask to demonstrate or have authority to run it, but Feds should be in this process

Jurisdictional Questions re: coastal areas

Lack of watershed protection/enforcement

Hire people who are in interested and qualify

Fishing methods are in conflict

Gas stations and ground water contamination

Re-visit the language and terms used with MPA

Need for data, specific alternative activities, training in negotiation and conflict resolution. Conflicts resolution, community participation; Alliance of NGOs and CBOs

Clear role definition; clearly delineate areas; consistent enforcement; maximize the transparency of the process in order to build trust. ; Process presented but not followed through

Build trust - must demonstrate that the process can be trusted

APPENDIX VI

METHODS FOR MARINE RESOURCE SOCIO-ECONOMIC ASSESSMENT

The information in this Appendix was adapted from the Global Coral Reef Manual .

The Scope of the Assessment

The first phase of conducting a sea is when the scope of the assessment is established. The scope involves defining the goals and objectives, identifying stakeholders, and determining the parameters to be assessed. The GCRWN Manual gives thorough treatment of all aspect of the preparatory activities that are summarized in *Tables A, B, C* in this Appendix.

The allocation of time and money is a major determinant of whether the project can undertake and complete the desired Scope of assessment and deploy a competent team.

The Team

Social scientists may include sociologists, anthropologists, economists, rural communication or extension specialists, institutional specialists, and gender specialists

The organization usually defines the goals and may include an Assessment Specialists to help determine how to set up the assessment and how complex it will be.

THE GOALS

In general, there are five types of goals: Management, Research, development, Monitoring, Policy. The Goals and their respective Objectives are shown below.

Table A

GOAL	OBJECTIVES
Management	1.To collect information to design reef (MPA) management Appropriate to local socioeconomic conditions. 2. To establish a process of participatory reef (MPA) management.
Research	1.To identify and understand socioeconomic issues relating to reef (marine) use and reef (marine) stakeholders.
Development	1. To collect information to design strategies to mitigate the socioeconomic impacts of development. 2. To establish a process of analysis and planning to identify and understand socioeconomic issues relating to coral reefs (marine uses) and to collect information to help planning or appropriate development activities
Monitoring	1. To establish baseline data for monitoring socioeconomic impacts of development activities. 2. To establish baseline data to monitor the socioeconomic impacts of management strategies.
Policy	1. To identify and understand socioeconomic issues relating to coral reef use to guide wider policy development.

STAKEHOLDER PROCESSES AND SAMPLING METHOD

The levels of stakeholder participation are categorized by GCRWN as Informed, Consulted, Partnership, Ownership. And both random and non-random sampling are acceptable.

Table B

Sampling Method	Method	Advantages	Disadvantages
Non-Random Sampling	Oral History, observation focus groups, survey, semi-structured interview	Relatively inexpensive, not time consuming, uncomplicated, does not require a well-defined stakeholder group, helps achieve an understanding of diversity of the group	Resulting data are not statistically representative of the stakeholder group
Random Sampling	Survey, semi-structured survey	Data are statistically representative of the stakeholder group	Expensive, time consuming, complicated, requires a well-defined stakeholder group, i.e., a list of all stakeholders

Adapted from IUCN Table on Approaches to Sampling

According to the Socioeconomic Manual for Coral Reef Management, non-random sampling is typically used when:

- Resources (time and money) are not sufficient to conduct a full, statistically representative sample
- There is an interest in interviewing specific people
- The stakeholders are not well enough defined/identified to select people at random, or
- The team wants an overview of stakeholders and does not expect to analyze the data statistically

In order to complete Random sampling it is necessary to:

- Accurately measure the stakeholder group size
- Apply basic research design standards to select the number that need to be sampled to obtain a 95% Confidence level/5% Confidence Interval
- Develop a process to select *who* to sample to satisfy required sample size

The GCRMN manual provides detailed description of all steps to both the Non-random and Random sampling approach.

PARAMETERS -

The decision on *what* gets measured may be driven by level of importance and difficulty of collection, or may be constrained by the project .

Parameters	Sub-parameters	Typical level of Importance	Typical Ease of Data Collection
Reef Use Patterns	a) Activities, use rights, location, seasonality, timing; b) Stakeholders/techniques used	All are HIGH	a) Moderately Difficult b) Relatively easy
Stakeholder Characteristics	a) Residency status, inhabitants and households, education, age, gender, community livelihoods b) Economic status, stakeholder livelihoods,	All are HIGH	a) Relatively easy b) Difficult
Stakeholder Perceptions	a) Reef conditions, threats, reef management; b) Culture and beliefs	All are MEDIUM	a) Relatively Easy b) Difficult
Organization and Resource Governance	a) Political context b) Use and property rights, NGOs c) Government administrative structure	LOW HIGH MEDIUM	a) Relatively Easy b) Moderately Difficult c) Relatively Easy
Traditional Knowledge	a) Local knowledge of resources b) Variations in knowledge and Folk Taxonomy	HIGH MEDIUM	a) Moderately Difficult b) Moderately Difficult
Community Services and Facilities	Markets and retail outlets, educational and religious facilities, medical services, transportation, public utilities	All MEDIUM	All Relatively Easy
Market Attributes for Extractive Uses	a) Supply, Demand, Market structure, Market infrastructure and Operation b) Market prices	HIGH MEDIUM	a) Difficult b) Moderately difficult
Market Attributes for Non-Extractive Uses	Demand for Tourism, Activities, Vulnerability of Tourism Market, Characteristics of Tourism stakeholders	HIGH	Difficult
Non-Market and Non-Use Values	a) Indirect Use, Direct Use b) Option Value, Bequest Value, Existence Value	MEDIUM LOW	a) Difficult b) Difficult