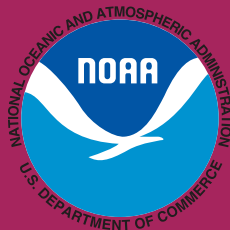


An Analysis of Issues Affecting the Management of Coral Reefs and the Associated Capacity Building Needs in the United States Virgin Islands

OCTOBER 2012





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PREPARED FOR:

The Coral Reef Management Network in the United States Virgin Islands
and NOAA's Coral Reef Conservation Program

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Table of Contents

Preface	1
Acknowledgements	3
Summary of Major Findings and Recommendations	4
1.0 Introduction	18
1.1 Purpose and Objectives	18
1.2 Assumptions	19
1.3 Audience for the Report	19
2.0 Methods for Assessing Capacity for Coral Reef Management in USVI	20
2.1 J-CAT Process	20
2.2 Aligning With Priority Goals and Priority Sites	20
2.3 Case Studies and Current Activities	21
2.4 Timeline for Coral Reef Management in the United States Virgin Islands	22
2.5 Adaptive Approach to Capacity Needs Assessment	22
2.6 Generation and Prioritization of Recommendations	23
3.0 Analysis of Issues Affecting Coral Reef Management Capacity and Near-Term Capacity Building Recommendations	24
3.1 Scale and Context for Managing Coral Reefs in USVI	24
3.1.1 Importance of Scale	24
3.1.2 Importance of Context	24
3.1.3 Context of Coral Reefs.....	25
3.2 Classification of Issue Themes and Recommendations	26
3.3 Issues Specific to Priority Goals	26
3.3.1 Goal 1: Reduce Land Based Sources of Pollution/Improve Water Quality (Ridge to Reef Management).....	26
3.3.2 Goal 2: Develop and Implement a Comprehensive Education and Outreach Program.....	31
3.3.3 Goal 3: Compliance and Enforcement.....	33
3.3.4 Goal 4: Reduce Fishing Impacts.....	36
3.3.5 Goal 5: Climate Change.....	38
3.4 Cross Cutting Issues	38
3.4.1 Linking Science to Policy.....	38
3.4.2 Integrating Across Agencies.....	40
3.4.3 Bureaucratic and Staffing Processes and Procedures	43

3.4.4 <i>Completing the Management Cycle</i>	45
3.5 Analysis of the Enabling Conditions	46
3.5.1 <i>Goals</i>	46
3.5.2 <i>Constituencies</i>	47
3.5.3 <i>Commitment</i>	49
4.0 Proposed Long-term Strategy for Building Capacity in USVI	51
4.1 Commitment to Periodic Capacity Needs Assessment	51
4.2 Build Capacity for Ridge to Reef Watershed Management	52
4.3 A Portfolio of Short-Term Training Modules	52
4.3.1 <i>Standard USVI Coral Reef Management Training Course</i>	52
4.3.2 <i>Produce Modules for Distance Learning</i>	53
4.4 Use Complex Projects as Capacity Building Case Studies	54
4.5 Strategies for Cultivating Local Leaders	55
4.6 Principles of Building Adaptive Capacity	55
Literature Cited	57
For More Information	58
Appendix A: Glossary	60
Appendix B: Interviews	62
Appendix C: Case Studies and Current Activities	64
Appendix D: Timeline	67

Preface

Building adaptive capacity to respond to ecosystem change is quite possibly the most pressing challenge of our time. The contemporary challenges of managing coral reef ecosystems require capacities for understanding complex systems and institutional function, improving collaboration and trust, resolving conflict, building social capital and actionable knowledge and how to grow leaders, to name a few. Drivers of climate change, land-based sources of pollution, impacts from development, invasive species, habitat damage from recreational use tourism and over exploitation of marine resources are increasing globally and further influenced by changes in human population, changes in economic activity, socio-political trends, cultural factors and technological change. The inter-relationships among these forces illustrate how complex the challenge is and why building adaptive capacity to address the challenge is crucial.

The purpose of this document is to summarize the assessment of capacity building needs, and therefore present a type of diagnosis of the complex set of issues that affect coral reef management. While there can be no perfect blueprint or exact course of action for building precise capacity person by person or institution by institution, a prescription on how to continue to build capacity is offered and how to sustain a capacity building strategy to implement goals and objectives as defined in the USVI Priority Setting Document. There is much capacity present in the USVI coral reef management system and some successful examples are mentioned. However, a holistic, clear and detailed strategy is needed to routinely assess capacity and continually build capacity across the wide network of implementing partner organizations.

USVI's coral reef management priorities, as defined in the 2009 priority setting process, remain the focus of this document and recommendations are linked to these goals and objectives. This document is intended to be read in conjunction, and therefore does not intend to repeat the background material presented in the USVI Coral Reef Management Priorities. However, the capacity needs assessment revealed a set of cross-cutting issues across the goal areas that require attention. The document also builds on the premise identified in the 2009 priority setting document that attention to the enabling conditions is central to a capacity building strategy. Thus, the document includes analysis of the degree to which there is formal commitment, supportive and informed constituencies, and clear and unambiguous goals.

While the primary audience of the document is for the implementing partners who are working together to manage coral reefs in USVI, it is also intended to help make the case for engaging a wider range of partners into the process of building capacity to manage coral reefs. Long term and sustained funding is essential for this purpose, and it is our hope that this document can help leverage investment from other federal agencies, private philanthropy, resources users, people who live there, visit during vacations and through cruise ships, sail through, dive, fish and swim in the emerald blue waters that surrounds the reefs. With over 2.5 million annual visitors, there is a sizable number of people who have built a connection to this beautiful place. This document is for everyone who cares about coral reefs. Unfortunately, as we identify in the document, there are few simple answers. Most of the issues facing coral reef management are dynamic, emergent, and don't follow simple cause-effect relationships, downright complex, and will likely become even more complex into the future. However, naming them and developing strategies to address them, and learning from what has worked and not worked are important steps in building networks and communities who share a common goal of protecting these systems that protect us.

We conclude the document with recommendations for a long-term integrated capacity building effort to avoid the trap of implementing piecemeal, tactical capacity building solutions and to establish the necessary internal structures to oversee a more holistic approach to a long-term and adaptive capacity building strategy in USVI.

Acknowledgements

We acknowledge the many contributions of all those who participated in the process of encouraging this capacity assessment, the many people who contributed to the review of our draft methodology in Winter 2012 and the many involved with the site visit, multiple phone calls, emails and attempted telepathy with the diverse assemblage of colleagues in the US Virgin Islands. The kindness, honesty and warmth that was displayed by all serves as the foundation for this document and hopefully creates the energy needed to implement a formal capacity building strategy. We acknowledge the involvement of Kostas Alexandridis, Alicia Barnes, Kent Bernier, Rafe Boulon, Marilyn Brandt, Jeanne Browne, Carol Burke, James Byrne, Lisamarie Carrubba, Paul Chakroff, Sharon Coldren, Carlos Farchette, John Farchette, Howard Forbes, Zandy Hillis-Starr, Anne-Marie Hoffman, Alexandra Holecek, Aaron Hutchins, Winston Le-dee, Kemit Lewis, Julian Magras, Christy McManus, Marija Micuda, Jeff Miller, Daisymae Millin, Anita Nibbs, John Ogden, David Olsen, Jean-Pierre Oriol, Jose Sanchez, Roy A. Pemberton Jr., Tricia Reed, Migdalia Roach, Caroline Rogers, Paige Rothenberger, Edward Schuster Sr., Christine Setter, David Simon, Phillip Smith, Stuart Smith, Thomas Kelley, Tyler Smith, Syed Syedali, Roberto Tapia, Joel Tutein, and Norman Williams, as well as NOAA CRCP staff Tracy Parsons, Anita Pritchett, Dana Wusinich-Mendez, Lia Ortiz and Marlon Hibbert.

The concepts and methods described in this document have evolved over many years and benefited from the ideas, experience and wisdom of many people, from scientists to spiritual leaders, from policy makers to practitioners. This document is a product of continued learning, based upon the art of convening and listening. Our goal is to improve our collective understanding and practice of the ecosystem approach by creating authentic engagement in meetings, gatherings and conversations to address the pressing issues of our time. Since the ultimate objective of this capacity needs assessment is to increase capacity for stewardship of coral reefs, we firmly believe the approach must integrate across sectors, social structures, and disciplines and take on a systems view that incorporates biophysical and social dimensions. We call this integrated approach the ecosystem approach. It is neither easy nor inexpensive to practice and requires continued investments in capacity building. The methods applied in this document draw from the work of Stephen B. Olsen, Director of the Coastal Resources Center at the University of Rhode Island, a key author of *Increasing Capacity for Stewardship of Oceans and Coasts* (National Research Council 2008) and the lead advisor of our consultant team. We have integrated methods and lessons learned from the fields of needs assessment for social interventions, innovations in interdisciplinary scholarship, developmental evaluation, capacity assessment practice and theory in the context of international development as well as complexity concepts drawn from ecosystem science. Because the methods are a composite of elements from a wide range of disciplines, they are experimental, and will be customized for each jurisdiction to match the context and capacity of the situation. This capacity assessment process has been designed in close consultation with the NOAA Coral Reef Conservation Program.

Cover Photo: Elkhorn coral, listed as 'Threatened' under the Endangered Species Act in 2006, can be found in USVI's waters. Photo Credit: NCCOS CCMA Biogeography Branch

Summary of Major Findings and Recommendations

Recently estimated at generating over \$200 million of total economic value per year, the coral reefs that surround much of the US Virgin Islands are essential to the culture and the long-term function of the local economy. Long-term projected trends of coral ecosystem health are not encouraging. The diagnosis is pretty clear. Population will continue to increase, and in all likelihood, the goods and services that coral reef ecosystems provide to society will continue to decline. The prescription, we believe, is rooted in a long term strategy aimed at building adaptive capacity to respond to this central challenge. We recommend investment in a multi-dimensional capacity building strategy that builds on the momentum of this analysis with implementation aimed at both early wins and long term system changes. First and foremost, capacity building is about orienting efforts toward change and interpreting what change is possible given limited capacity. This requires comprehending factors of organizational behavior, appreciating the complexity of change, the limitations of top-down mandates, the benefits of inclusive and meaningful engagement, the inevitability of unexpected disruptions, and the connection between individual aspirations and collective action.

Conceptual knowledge of what needs to be changed is a key first step and is offered here. Unfortunately, given the multi-dimensional, emergent and dynamic nature of coral reef management, many of the recommendations in this report may already be dated and require adjustment to reflect current reality. Nevertheless, the conceptual knowledge within this report is intended to provide a structure to develop a capacity building action agenda. It requires leadership and strong interpersonal skills in order to gain commitment for implementation of a capacity building action plan, welcoming alternative viewpoints, managing conflict and adaptively learning from implementation of the capacity building action plan. Technical skills are needed to gather, manage and disseminate stories and results of capacity building efforts. Facilitation skills are essential for keeping the capacity building process in motion. Together, these competencies work together in transformative ways to create change.

Skillfully applying these competencies is one major challenge of enabling a capacity building action plan. Another is dealing with the complexity of coral reef management and the dynamic and unpredictable nature of circumstances outside of anyone's control at any scale. Unexpected events, both positive and negative, will influence the capacity building process. Political, economic and social situations change at such a pace that basic awareness of these changes is critical. With high rates of staff turnover, reliance on outside contractors, new actors entering and old actors departing, simple situational awareness is essential. As noted below, the ebb and flow of elected leaders creates enormous uncertainty. The time horizons required to show "return" on investment for capacity building are far outmatched by short term financial priorities of job creation and economic development.

Adding these elements together, investing in capacity building is a steep climb. It is an unknown path that does not provide standard markers for success along the way. It also is the greatest challenge of our time if we as a society are to respond to the changes that we see around us. We believe investment is warranted in sound, stable and long-term capacity building programs and that there will be a cascade of positive benefits for those serious about implementing, sharing their results, and learning by doing.

Key findings and recommendations of our work in the United States Virgin Islands include:

- The period between the present and the next gubernatorial election in the USVI represents an important window of very high commitment, training, talent and capacity among key actors (particularly among the

DPNR Commissioner and the current cohort of DPNR Directors) in the coral reef management system to achieve meaningful advances in reef protection and preservation. Capacity and commitment has rarely been as high as it is now, and may be significantly reduced in the future depending on the outcome of the next election.

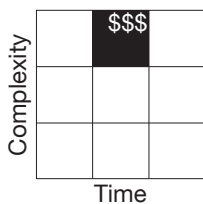
- Capacity to manage coral reefs in the USVI is generally not hampered by a lack of scientific and technical information regarding the status, extent, and threats to reefs, nor regarding the technical measures needed to improve reef health. Rather, capacity is limited to adequately promote, fund and implement well-understood measures such as improved land management practices, the upgrading of critical infrastructure such as sewage treatment and septic systems, enhanced enforcement of existing regulation, controlling unwise development, etc.
- There exist several somewhat undeveloped cross-agency groups and networks that, if capacity could be built within them, have strong potential to help promote and coordinate coral reef management actions within the territory. These include the Virgin Islands Marine Protected Area Network (VIMPAN), the Virgin Islands Network of Environmental Educators (VINE) and the Virgin Islands Coral Reef Advisory Group (VICRAG).
- Public support for conservation measures that will improve reef health is chronically undermined by a desire for economic development in the belief that development will improve job prospects and living conditions. Decision makers often acquiesce to development interests for fear of losing public support.
- For reef conservation to truly succeed, it is imperative to build an understanding among decision makers and the general public that the economic and cultural value of the territory's reefs is very high and that preserving reefs and coastal ocean health is utterly essential to the long term health and well-being of the USVI and its inhabitants.

Most of the specific recommendations are linked to the major goals of the USVI coral reef management priorities, while others are more crosscutting in nature. They are presented here in tabular form to provide an overview, with more detail provided in the text of the document. While we identify some potential collaborators, each of these recommendations will need champions to implement them as well as a long term sustained strategy to link them together and build capacity incrementally and continually to adapt and improve the management and governance of coral reefs in the US.

LEGEND

TIME SCALE	COMPLEXITY SCALE	MONETARY SCALE
Short = <1 year	Low = somewhat context independent recommendations such as “best practices” and “standard operating procedures” that have fairly high certainty of building capacity.	\$ - Less than \$5,000
Medium = 1 to 2 years	Medium = context is more important and the recommendation may require either coordination of technical expertise that may or may not be present in the system, or may require a degree of social engagement and relationship building that creates a common ground; i.e. either socially or technically complicated.	\$\$ - Between \$5,000 and \$20,000
Long = >2 years	High = Context is highly dependent and the recommendation may require strategies that are adaptively implemented and address dynamic, emergent, non-linear and complex conditions.	\$\$\$ - Between \$20,000 and \$100,000 \$\$\$\$ - Greater than \$100,000

EXAMPLE



This graphic shows project time scale of 1 to 2 years (**Medium**) with complexity scale equal to **High** and monetary scale between \$20,000 and \$100,000 (**\$\$\$**).

PRIORITIZATION

Recommendations are prioritized as **H** (High, orange shading), **M** (Medium, yellow shading) or **L** (Low, tan shading) and are presented in priority order from highest to lowest priority within their respective Goal categories. The prioritization was developed in consultation with the USVI J-CAT members who were asked to rate each recommendation. The highest 18 rated recommendations are ranked as **H**, the next 13 as **M**, and the lowest 16 as **L**.

Reduce Land-based Sources of Pollution / Improve Water Quality

GOAL 1: Reduce impacts to coral reef ecosystems by reducing terrestrial sediment and pollutant inputs and improving water quality

1.1 Priority watersheds, management plans, storm water plans, and restoration projects <i>Fish Bay, St. John; St. Croix East End Marine Park</i>	1.2 Best management practices and adaptive management plans <i>Fish Bay, St. John; Coral Bay, St. John; St. Thomas East End Reserve (STEER)</i>
1.3 New and stricter development permit conditions <i>Fish Bay, St. John; Coral Bay, St. John; St. Thomas East End Reserve (STEER); St. Croix East End Marine Park</i>	1.4 Necessary and consistent regulatory and programmatic framework exists and is enforced <i>Fish Bay, St. John; St. Thomas East End Reserve (STEER); St. Croix East End Marine Park</i>

PROJECTS ACROSS PRIORITY AREAS (18 TOTAL)

- 13 Non Initiated
- 4 Underway
- 0 Completed
- 1 Unknown

Reduce Land-based Sources of Pollution / Improve Water Quality

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost
30 H	R 1.6 Support Master Planning Process: An integrated master plan for development in the USVI is an essential component for addressing many systemic issues impacting coastal ocean and coral reef health. There is currently a growing amount of effort that could ultimately culminate in a Master Plan to guide development and build-out across the territory. These efforts should be supported, perhaps by the creation, with the expressed support of the Governor’s Office, of a high-level task force of key legislators to investigate the creation of a formal Master Plan. This could include learning journeys to, or presentations from, other insular territories that have successfully adopted master plans. Potential Partners: DPNR CZZP and CZM, TNC, Office of the Governor, Office of the Lt. Governor, Professional Services contracts, other universities	
30 H	R 1.5 Update USVI Zoning Code and Implement Subdivision Law: Updating the USVI zoning code is a prerequisite to creating any strong, enforceable master plan and vision for the future of development in the USVI. In 2009, DPNR commissioned the Rutgers University Center for Government Services and Duncan Associates, Chicago, Illinois to conduct an assessment of the zoning and subdivision code of the USVI. The assessment concluded that updating the Code and Subdivision Law is essential. These activities should be promoted and supported by the Coral Reef management community for the benefits that they will ultimately provide to coastal ocean and reef health. Potential Partners: DPNR - CZZP and CZM, TNC	
31 H	R 1.7 Share lessons learned from effective watershed scale programs: Using lessons learned, highlight success stories from what worked well, and also did not work well at watershed scale programs (e.g. Coral Bay, Fish Bay, STEER, APCs), and engaging with effective local leaders, use lessons learned to inform efforts at other local-scale coral reef conservation programs (e.g. “Collaborative Learning Guide for Ecosystem Management”, C. B. Fuert 2008, http://swim.wellsreserve.org/ctp/Collaborative%20Learning%20Guide.pdf). Potential Partners: USEPA, DPNR-CZM and DEP, USDA-NRCS, Coral Bay Community Council	

Reduce Land-based Sources of Pollution / Improve Water Quality

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost																				
29 H	<p>R 1.4f Increase vessel pump-out capacity: Increase pump-out capacity at anchorages and moorings, including pump-out boats and shore-based facilities, and create a public information campaign to improve compliance with pump-out regulations</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Complexity</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Time</td><td></td><td></td><td></td></tr> </table>	Complexity																Time			
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Time																						
27 H	<p>R 1.1 Revise DPNR Environmental Handbook: The DPNR Environmental Handbook should be updated to be a more user-friendly and useful document, and less of a “laundry list” of BMPs that lack sufficient context. The updated Handbook should include useful information about what BMPs work best in specific settings and should include success stories describing what worked where and why. A new Handbook can serve as an up-to-date and agreed upon set of standards for best practices in the territory.</p> <p>Potential Partners: USEPA, DPNR-CZM and DEP, USDA-NRCS</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Complexity</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Time</td><td></td><td></td><td></td></tr> </table>	Complexity																Time			
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27 M	<p>R 1.2 BMP Training: Building on the creation of a common set of up to date and agreed-upon standards, create an Erosion and Sediment Control Training and Promotion Program for Engineers, Contractors, Heavy Equipment Operators, Developers, Architects, and DPNR permit inspectors and reviewers. The training would include proper techniques for site planning and the application of best management practices to reduce erosion and improve sediment control.</p> <p>Potential Partners: USEPA, DPNR-CZM, DEP and BP, USDA-NRCS, USVI Department of Agriculture, EPA, NOAA, Horsely-Witten Group, Center for Watershed Protection, International Erosion Control Association (IECA)</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Complexity</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Time</td><td></td><td></td><td></td></tr> </table>	Complexity																Time			
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29 M	<p>R 1.4b BMP Training Program: Create a best practices training program for designers, plumbers and installers of wastewater treatment systems that is linked to licensing/license renewal</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Complexity</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Time</td><td></td><td></td><td></td></tr> </table>	Complexity																Time			
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27 L	<p>R 1.3 BMP Mini-Grant Program: BMPs could be more widely used if mini-grants were available to homeowners to offset the cost of installation. Ideally, the grants would be publicized and promoted through DPNR and administered with a partner organization such as TNC or NRCS.</p> <p>Potential Partners: USEPA, DPNR-CZM and DEP, USDA-NRCS, TNC, VIWMA</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Complexity</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td style="writing-mode: vertical-rl; transform: rotate(180deg);">Time</td><td></td><td></td><td></td></tr> </table>	Complexity																Time			
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28-29 L	<p>R 1.4 Adopt suite of wastewater recommendations as provided in Draft Assessment Report:</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr style="background-color: #808080; color: white;"> <th style="width: 33%;">T</th> <th style="width: 33%;">C</th> <th style="width: 33%;">\$</th> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>	T	C	\$																	
T	C	\$																				
	<p>a. Improve land registry and sewer/septic connection data infrastructure</p> <p>Potential Partners: VIWMA</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>L</td><td>H</td><td>\$\$\$</td></tr> </table>	L	H	\$\$\$																	
L	H	\$\$\$																				
	<p>c. Provide professional wastewater operator certification for WMA employees</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>M</td><td>L</td><td>\$\$</td></tr> </table>	M	L	\$\$																	
M	L	\$\$																				
	<p>d. Stakeholder Education Campaigns</p> <p>Potential Partners: all of DPNR, USDA-NRCS, EAST, SEA, VICS, and other NGOs</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>M</td><td>L</td><td>\$\$</td></tr> </table>	M	L	\$\$																	
M	L	\$\$																				
	<p>e. Commission a stand-alone study of status of wastewater treatment infrastructure and possible solution strategies</p>	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>S</td><td>L</td><td>\$\$\$</td></tr> </table>	S	L	\$\$\$																	
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Education and Outreach

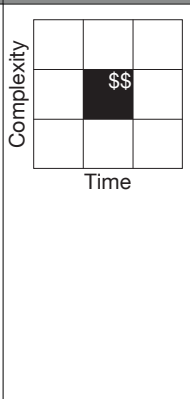
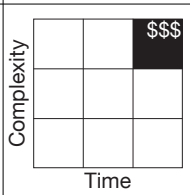
GOAL 2: Develop and implement a comprehensive education and outreach program to create buy-in and build public support for an effective coral program that targets resource users, general public and decision-makers.

<p>2.1 Convey economic value of the reef to key constituencies and measure their understanding of the effect of human impacts on this value <i>Fish Bay, St. John; Coral Bay, St. John; St. Thomas East End Reserve (STEER); St. Croix East End Marine Park</i></p>	<p>2.2 Host conferences and workshops, make school presentations a. Develop communication strategies and tools and identify priority target audiences b. Support programs that connect classroom experience with field experience c. Create opportunities to keep coral reef stewards from youth programs engaged in coral reef conservation, policy and advocacy <i>Fish Bay, St. John; Coral Bay, St. John; St. Croix East End Marine Park</i></p>	<p>2.3 Transfer of information and research findings to the general public, developers and decision-makers <i>Fish Bay, St. John; Coral Bay, St. John; St. Thomas East End Reserve (STEER); St. Croix East End Marine Park</i></p>
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Projects Across Priority Areas (15 total)

- 7 Non Initiated
- 7 Underway
- 0 Completed
- 1 Unknown

Education and Outreach

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost
33 H	<p>R 2.7 Promote S&E Control Training and Possible Certification: The technical training of Sediment and Erosion Control techniques can build capacity for stewardship within a range of audiences such as developers, contractors, permit inspectors etc. Build this program using a consistent set of criteria for competencies that could lead to certification. Identify high priority sites that can be used as examples and models of how sediment and erosion control is best practiced. The reward and incentive for certification (e.g. a campaign to promote the hiring of green certified contractors) needs to be identified and promoted. Certification is a controversial topic and if this was to be pursued it would need to be linked with a requirement for continuing education within the development industry. The Green Construction Program includes good modules targeted to architects, engineers and field staff such as equipment operators. Potential Partners: USEPA, USDA-NRCS, DPNR DEP, BP and CZM, USVI Dept of Agriculture, UVI Cooperative Extension Service</p>	
31 H	<p>R 2.2 Support and develop programs to increase the connection between young people, oceans and reefs: build capacity to support school and youth programs that expose young people to the water and reef, including specifically snorkel programs, has the potential for strong long-term dividends in the territory for a rather modest investment. Potential Partners: All VINE partner organizations, DPNR, UVI-VIMAS</p>	

Education and Outreach

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost
31 H	<p>R 2.1 Inventory Existing Education Programs: Identify, inventory and describe all current environmental education programs such as Reef Jams, Green Construction Guides, Sediment and Erosion Control Training, Traveling Trunk, dramas that feature reef stewardship, exchange programs, demonstration farms, curricular programs etc. As part of inventory, define relative cost, complexity and effectiveness of programs, as well as existing "ownership" and general educational expertise capacity in USVI. Convene summit to discuss integration, consolidation and overall increasing effectiveness of current activities. This effort should build upon and update earlier similar work done at UVI in the 1990s and more recently by the Coral Management Fellow.</p> <p>Potential Partners: All VINE partner organizations</p>	
33 M	<p>R 2.6 Communicate BMPs: Building on the Recommendations 1.1, 1.2 and 1.3, DPNR and its partners should create a communications campaign to broadly encourage the use of BMPs, including arguments regarding the importance of reducing the flow of land based sources of pollution to the coastal ocean and coral reefs. Examples of successful stormwater management practices such as rain gardens, vegetated swales, semi-permeable pavement, etc. need to be effectively promoted and on display around the territory. Time-limited "one-off" campaigns are less successful and valuable than sustained, consistent messages that are promoted in an ongoing manner.</p> <p>Potential Partners: USEPA, USDA-NRCS, DPNR - DEP and CZM, NGOs</p>	
32 M	<p>R 2.5 Conduct Professional Market Analysis: Engage partners who are experts in communications and social media to build capacity to conduct market surveys, test messages, prepare issue briefs, and conduct evaluation of communication and social marketing messaging. Potential examples include Media Impact (mediainpact.org), a leading expert in message marketing, Sea Web (seaweb.org), or pursuing a partnership with a major aquarium.</p> <p>Potential Partners: All VINE partner organizations, Coral World (coralworldvi.com)</p>	
32 L	<p>R 2.3 Assess VINE Capacity and Willingness to Further Develop: The Virgin Island Network for Environmental Educators (VINE) can be an ideal partner in implementing a holistic capacity building strategy. However, VINE currently lacks the capacity to fulfill this role. It is an all-volunteer organization, has no full-time paid coordinator and currently lacks a suitable fiduciary agent to handle its financial transactions. Filling these gaps – obtaining funding for a full-time paid coordinator and finding a new fiduciary agent – are necessary prerequisites for VINE to become an active partner in advancing the education and outreach objectives of the coral reef initiative. If VINE could take these important steps, it would require a strategic plan that targets increasing capacity for board and staff development, technological and other essential resources, and expert consultation to help it become a model for territorial wide environmental education support structure.</p> <p>Potential Partners: All VINE partner organizations</p>	
32 L	<p>R 2.4 Inventory Off-Island Models of Environmental Educations: Develop an inventory of programs that have not yet been tested but are being implemented on other similar island contexts that relate to coral reef education, outdoor education strategies, conservation and stewardship. Identify through case studies the basic program requirements, cost and expertise needed as well as the resulting knowledge skills, attitudes, tools and values that are developed as a result of implementing such programs. A graduate or undergraduate student (or students) could be engaged through VI Sea Grant or VIMAS, potentially with funding support from VI-EPSCoR.</p> <p>Potential Partners: All VINE partner organizations</p>	

Compliance and Enforcement

GOAL 3: Increase the ability to effectively enforce existing rules, regulations and laws.

3.1 Maintain sufficient law enforcement staff and enforce priority regulations

Fish Bay, St. John; Coral Bay, St. John; St. Thomas East End Reserve (STEER); St. Croix East End Marine Park

3.2 Incentive mechanisms for enforcement programs and enforcement officers to keep existing staff and attract new staff

3.3 Increase enforcement capacity and enable cross-enforcement of existing regulations by providing cross training between science and management departments

Fish Bay, St. John; Coral Bay, St. John; St. Thomas East End Reserve (STEER); St. Croix East End Marine Park

Projects Across Priority Areas (11 total)

- 7 Non Initiated
- 4 Underway
- 0 Completed
- 0 Unknown

Compliance and Enforcement

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost
34 H	<p>R 3.1 Increase understanding of key decision makers about coral reef and natural resource issues: DPNR staff, with the explicit support of the Commissioner, should encourage key legislators, judges and other decision makers to accompany DPNR resource staff on trips to see coral reefs and management challenges firsthand. Judges and judicial staff should go out on the water with DEE officers to see the difficulties they face and what specific violations mean in practice. Programs and products should be created to inform key decision makers (e.g. legislators, Governor and staff, judiciary) on the value of coral reefs to the USVI economy and culture and disseminate the findings of the recent study “The Economic Value of the Coral Reef Ecosystems of the United States Virgin Islands.”</p> <p>Potential Partners: DPNR DEE, DEP, DFW, and CZM; VINE partner organizations; TNC, USVI DOJ</p>	
35 H	<p>R 3.6 Expert Monitoring, Surveillance and Enforcement (MSE) Consultation: Engage with experts in monitoring, surveillance and enforcement (such as NOAA Office of Law Enforcement) to review the range of regulations and the current level of preparedness, resources, equipment, staffing etc. to determine if there is sufficient capacity in place to effectively enforce regulations and increase compliance.</p> <p>Potential Partners: NOAA OLE, DOJ, DPNR DEE, Florida Keys National Marine Sanctuary, Wild Aid</p>	
35 H	<p>R 3.7 Increase Staff/Resources for Enforcement: Based on recommendations from MSE consultation, create plan to add additional enforcement officers and associated resources (i.e. vehicles, vessels, equipment, fuel, ongoing maintenance funds, etc.) to ensure adequate temporal and geographic enforcement presence. Thirty total enforcement officers is a preliminary target to provide adequate coverage across the USVI.</p> <p>Potential Partners: DPNR, USCG</p>	

Compliance and Enforcement

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost
35 H	<p>R 3.4 Harmonize MPA Boundaries and Rules: Given the many forms of MPAs in USVI, and the constant need for installing and maintaining demarcation buoys, providing enforcement and ensuring collaborative relations across partners, define specifically what MPA rules and oversight issues (e.g. "the wedge", Buck Island and STXEEMP) can be simplified and harmonized among management units and made more clear to the users. The VI MPA Network (VIMPAN) is a positive development and could be an ideal facilitator of this process as well as recipient of additional grants to support this work.</p> <p>Potential Partners: DPNR DEE, DFW, and CZM; NPS</p>	
35 M	<p>R 3.8 Cross Training of Rangers / Enforcement Staff: Pursuing strategies to cross train enforcement officers, interpretive rangers and peace officers is a tractable way to increase enforcement capacity across the territory. Integrating environmental regulation enforcement training (i.e. fisheries, boating, land use, sediment and erosion, etc.) into the general training provided at the Police Academy can improve enforcement capacity as well the morale of enforcement staff. Additionally, provide specific training to DEE enforcement officers in how to present their cases in court. Officers are trained in field operations only and are often not prepared to present violation cases adequately in court.</p> <p>Potential Partners: NPS, FWS, USCG, DPNR DEE, VI Police</p>	
34 M	<p>R 3.3 Define Cost vs. Benefit of Illegal Fishing: Compliance is eroded when the potential benefits of illegal activity greatly exceed the potential fines and other punishments of being caught. The benefits of illegal fishing activities (and other environmental rule breaking relevant to reef health) and the associated fines and punishments should be carefully quantified to better understand this issue. Additionally, the costs of damage to the reef ecosystem, in terms of lost ecosystem services and lost opportunities (fishing, diving, etc.) to the rule-abiding public should also be quantified to the extent possible. These findings should be integrated into briefings for the judiciary, legislature and other decision makers to increase their understanding of the state of environmental regulation, rule breaking and punishment. The NOAA Fisheries Liaison could be a partner in this effort.</p>	
34 M	<p>R 3.2 Build Awareness of Rules and Regulations: A first step would be to inventory all environmental regulations that the general public should be aware of and comply with, as well as the government office and officials responsible for enforcing them. A second step could be commissioning a professional study examining how much the general public knows about environmental regulations and what are the most trusted sources for communicating this information. Identify where rules and regulations have been well communicated to the public in the USVI and situations where there has been active participation and the involvement of stakeholders in the establishment of rules, and describe the benefits and costs of such involvement to determine where strategies have been effective for increased compliance. Expand and model these success stories to further promote the broad knowledge and acceptance of environmental rules and regulations.</p> <p>Potential Partners: DPNR - DEE, DEP, DFW, CZM; VINE partner organizations; TNC, local media</p>	
36 L	<p>R 3.9 Explore Co-management: If there is a desire to test co-management structures, whereby communities are involved in enhancing compliance with MPA rules and regulations, then identify a site where such a strategy may be successful and pilot test a participation process to define costs and benefits. Potential locations may be Coral Bay or Fish Bay on St. John or the STEER, which seem to be growing capacity and are sufficiently remote to warrant such a capacity building investment.</p> <p>Potential Partners: DPNR; TNC; NOAA - ONMS, CRCP, exchange with other MPAs in Caribbean region</p>	

Compliance and Enforcement

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost									
35 L	<p>R 3.5 Pilot Inter-Agency Agreements: Demonstrate that the necessary capacity and willingness is in place to create interagency agreements with various enforcement entities. Start in one place, such as St. Croix, to develop the necessary authorities among all officers (e.g. NPS, FWS, USCG, DPNR, DEE, VI Police) to be able to conduct enforcement across all parks. If this model is developed, use as a pilot test and allow sufficient time such as 3-5 years to explore what works well and what does not. If it works well, transfer and scale up across the territory.</p> <p>Potential Partners: NPS, USFWS, USCG, DPNR-DEE, VI Police</p>	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small; margin-right: 5px;">Complexity</div> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px; background-color: black; color: white;">\$</td> <td style="width: 20px; height: 20px;"></td> </tr> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> <div style="margin-left: 5px; font-size: small;">Time</div> </div>		\$							
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Reduce Fishing Impacts

GOAL 4: Reduce fishing impacts on critical stocks that most directly affect the health and resilience of the reef ecosystem.

COMMERCIAL FISHERIES:

<p>4.1 Reduce fishing effort on prioritized key coral reef associated species or functional groups <i>St. Croix: East End Marine Park</i></p>	<p>4.2 Reduce the use of inappropriate gear and fishing in MPAs by strengthening local enforcement and educational efforts <i>Coral Bay, St. John; Croix: East End Marine Park</i></p>	<p>4.3 Improve commercial fisheries record-keeping and fisher compliance by improving the current data-gathering process <i>St. Croix: East End Marine Park</i></p>
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RECREATIONAL FISHERIES:

<p>4.8 Obtain the necessary information to understand the impacts of recreational fisheries in the USVI <i>Coral Bay, St. John</i></p>	<p>4.12 Effective implementation of MPAs <i>St. Thomas East End Reserve (STEER); St. Croix: East End Marine Park</i></p>	<p>4.13 Assess effectiveness of MPAs in meeting their stated management goals</p>
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PROJECTS ACROSS PRIORITY AREAS (11 TOTAL)

- 6 Non Initiated
- 3 Underway
- 3 Completed
- 2 Unknown

Reduce Fishing Impacts

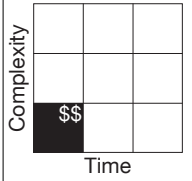
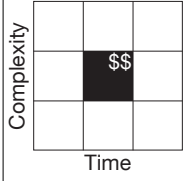
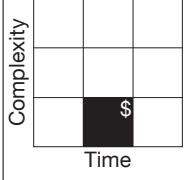
Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost
37 H	<p>R 4.5 Fisheries Record Keeping: Poor fisheries data and lax compliance with self-reporting of commercial catch and landings data continues to challenge fisheries management in the USVI. Currently, DFW and the CRCP Fisheries Liaison are working with fishers to promote accurate record keeping when they communicate with fishers during their annual registration period. Additionally, DFW has identified local liaisons to work with fishers in the communities to provide support and encourage accurate data reporting during the course of the year. DFW is also investigating the use of smart phone applications for real-time reporting of catch data to further improve accuracy and compliance with self-reporting regulations. Finally, promoting measures that improve commercial fisher “buy-in” such as paying fishers to collect research data will improve compliance and data quality. These and similar measures that help build a culture among commercial fishers that supports timely and accurate self-reporting should be promoted and grown.</p> <p>Potential Partners: DPNR-DFW, NOAA Fisheries, USVI-FACs, CFMC, NOAA, USFWS</p>	<p>Complexity</p> <p>Time</p>
37 M	<p>R 4.4 Improve MPA Marker Programs: There is a lack of clarity about who is responsible for installing, maintaining and replacing marker buoys and signs at various MPAs. Improving coordination across agencies to clearly delineate responsibilities, as well as pursuing adequate funding and capacity to install and maintain a proper marker system is essential to promote compliance and enforcement.</p> <p>Potential Partners: VIMPAN partner organizations, DPNR, NPS, NOAA, USFWS</p>	<p>Complexity</p> <p>Time</p>
37 M	<p>R 4.3 Support and Re-Invigorate VIMPAN: Complex, multi-faceted and difficult to communicate regulations continue to challenge enforcement and compliance within MPAs. VIMPAN could be an excellent forum within which to explore and discuss this issue, potentially leading toward more harmonized, consistent and readily enforced regulations at MPAs across the territory. VIMPAN could also be the forum at which lessons learned and successes from other jurisdictions could be investigated, discussed and disseminated across the USVI.</p> <p>Potential Partners: DPNR, TNC, NPS, USFWS, NOAA (CRCP and MPA Center)</p>	<p>Complexity</p> <p>Time</p>
37 L	<p>R 4.2 Promote Measures to Shift Effort: Depending upon the results of the feasibility analysis, create specific programs to install FADs, develop commercial fishery options for pelagics, train commercial fishers as sport guides and promote destination sport fishing tourism. This would likely require partnerships with organizations such as the relevant Fisherman’s Associations, the USVI Game Fishing Club, NMFS, the USVI Commission on Tourism and the Caribbean Fishery Management Council.</p> <p>Potential Partners: Fishers Associations, DPNR DFW, Sea Grant, NOAA Fisheries, Caribbean Fisheries Management Council</p>	<p>Complexity</p> <p>Time</p>
37 L	<p>R 4.1 Examine Feasibility of Shifting Fishing Effort: Define the requirements to, and potential benefits of, promoting a shift in fishing pressure from reef species to pelagics (e.g. dolphin, wahoo) and inshore sport species (e.g. tarpon, permit, bonefish, snook). Measures could include the expanded use of FADs to attract pelagics and the training of commercial fishermen as guides for both pelagic and in-shore sport fishing, including fly-fishing. Potential partners include the U. S. Virgin Islands Game Fishing Club located on St. Thomas. This (and the next) recommendation should be viewed as a means to modestly broaden the range of fisheries resources available to Virgin Islanders, but not as a stand-alone solution to overfishing.</p> <p>Potential Partners: Fishers Associations, DPNR DFW and DEE, Sea Grant, NOAA Fisheries, Caribbean Fisheries Management Council, NPS, USCG</p>	<p>Complexity</p> <p>Time</p>

Climate Variability

GOAL 5: Manage for resilience to climate change and related effects, including impact of elevated sea temperature; sea level rise; acidification and calcium carbonate dissolution; hurricane intensity/frequency and sedimentation to promote recovery of reefs from previous events.

<p>5.1 Research issues that are priorities for USVI given this management goal (coral diseases, bleaching, resilience, climate change, etc.)</p>	<p>5.2 Identify areas of high resilience and sources of juveniles/recruits of coral species for additional protection</p>	<p>5.3 Coordinated response and restoration strategy for physical disturbances to increase recovery of affected coral reef ecosystems. Identify means of communication with managers in neighboring islands to alert of disturbance events, leverage resources, etc.</p>
<p>5.4 Coral reef ecosystem water quality standards in management/regulatory strategies.</p>	<p>5.5 Training opportunities to coral reef managers to increase their understanding of impacts of climate change, range and uncertainty of changes, and management strategies and tools.</p>	

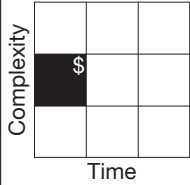
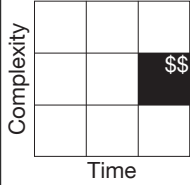
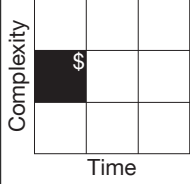
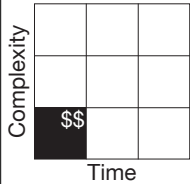
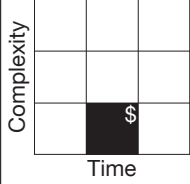
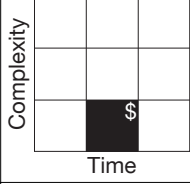
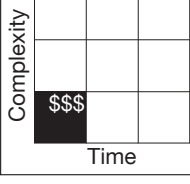
Climate Variability

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners		Complexity / Time / Cost
38 M	R 5.2	<p>Develop Compelling Climate Change Visual Aids as Part of Public Information Campaign: Visual imagery, such as GIS-based inundation maps and other graphical tools, is an important part of communicating climate change messages and should be developed for USVI and disseminated. TNC is a potential partner for such an effort. In an island state like the USVI, simply marking potential future sea level in a publicly visible way can be a compelling part of a public information campaign to raise awareness about climate change (e.g. http://www.climatedots.org/toolkit/sea-level-rise-action-guide/, http://takvera.blogspot.com/2009/11/walkers-mark-dangers-of-rising-sea.html).</p> <p>Potential Partners: VINE partner organizations, Puerto Rico CZMP</p>	
38 M	R 5.1	<p>Improve Internal and External Climate Change Communications: DPNR should improve its efforts to inform managers and staff about climate change issues and potential impacts and to improve communication of these messages externally. Internal and external climate change messaging can be linked to the Governor's pledge and campaign to reduce USVI fossil fuel consumption by 60% by 2025.</p> <p>Potential Partners: VINE partner organizations, Puerto Rico CZMP</p>	
38 L	R 5.3	<p>Investigate Lessons Learned on Climate Change Adaptation from other Insular States: It is likely that other similar insular states have climate change mitigation, adaptation and communication programs and plans that would be applicable to the USVI. Research into other such programs could provide important lessons learned that could be applied in the USVI.</p> <p>Potential Partners: TNC, NOAA CRCP, Puerto Rico CZMP, Caribbean Community Climate Change Centre (www.caribbeanclimate.bz), DPNR-CZM, USFWS, NPS</p>	

Recommendations that Cut Across Multiple Goals

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost
50 H	<p>R 6.11 Explore Alternate Funding Strategies and Track Progress to Protected Area Goals: With over 2.5 million tourists visiting the USVI each year, the territory has the opportunity to build capacity to take advantage of innovative potential funding sources, including tourism user fees, tourism and entry/exit fees, mooring user fees, as well as mechanisms for generating funding to encourage conservation activities, including cost and benefit sharing, investment and enterprise funds, and fiscal instruments and arrangements for private or community management of marine protected areas and facilities. These potential sources of income should be carefully studied and presented to both the current and future Governor with the goal of gaining formal commitment for raising funds dedicated directly to reef conservation and management programs. A Protected Area Trust should be investigated as a potential mechanism to gather and disburse funds raised through the novel strategies recommended here. The Nature Conservancy was recently funded to create sustainable finance plans for STEER and STXEEMP. These documents appear to still be in draft form and should be finalized under the terms of the award that supported them.</p>	
44 H	<p>R 6.9 Depoliticizing/Improving Selection Process for DPNR Directors and Assistant Directors: Currently DPNR Directors and Assistant Directors serve at the discretion of the governor, resulting in the potential for rapid turnover and the loss of program continuity as well as the potential for the placement of Directors that lack the appropriate educational and professional training. This situation could be improved by critically evaluating the process by which Directors are appointed, potentially including 1) creating classified Director (or Assistant Director) positions that do not change with the governor's election cycle and 2) creating specific Terms of Reference and professional qualifications for these positions, ensuring the selection of highly qualified individuals in these technically demanding positions.</p> <p>Potential Partners: VI Governor, DPNR</p>	
39 H	<p>R 6.1 Strengthen Linkages Between Science and Management: In general, good coral reef management in USVI is not being limited by a lack of publishable scientific information about the status of reefs, causes of declines, responses to stressors, etc., and more priority should be given to investigating and filling capacity gaps related to good governance (e.g. improving compliance and enforcement, improving bureaucratic function, depoliticizing the selection of natural resource managers, encouraging peer-to-peer learning, improving outreach, education and communications measures to grow a stewardship ethic among decision makers and the general public, updating codes, regulations, job descriptions, handbooks, and other similar recommendations presented in this assessment) over the continued funding of peer-reviewed "pure science."</p> <p>Potential Partners: SEA Grant, NOAA Fisheries, NOAA CRCP (through semi-annual meetings to be coordinated by liaisons)</p>	
44 H	<p>R 6.8 Improve Administrative Function and Hiring/Staffing Procedures at DPNR: Commissioner Barnes and DPNR CFO Millin should be briefed on the impacts of bureaucratic inefficiencies and be actively involved in developing solution strategies. Bureaucratic inefficiencies and staffing issues should be explored and discussed in a facilitated, cross-level forum to help improve transparency, gain a shared understanding of how this issue affects program managers, and develop a shared commitment to update and amend processes and procedures, including the development of unambiguous standard operating procedures (SOPs). To the extent that problems are perceived to exist outside of DPNR (e.g. problems within the Division of Personnel exacerbating hiring delays), appropriate representatives from outside agencies should be brought into the facilitated forum.</p> <p>Potential Partners: USVI Governor, DPNR leadership, leadership in other territorial governmental agencies affected by this issue</p>	

Recommendations that Cut Across Multiple Goals

Page # / Priority	Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost
47 H	<p>R 6.10 Realistic Goal Setting With Reference to Reef Health, Human Well Being: The focus, going forward, should be on the creation of near-term, achievable goals and proposed projects linked to those goals that are better matched to the currently existing capacity within the system in question. While direct cause and effect relationships of specific actions should not be measured against reef health and human wellbeing, we believe the specific conditions of the coral reefs, and the goods and services that people derive from these reefs, could be made more explicit at each of the priority sites.</p>	
42 M	<p>R 6.7 Support and Encourage Regional Partnerships: Many issues affecting coral reef management in the USVI have been addressed in similar island settings in the Caribbean and lessons can be learned by pursuing and participating in regional partnerships such as NOAA in the Caribbean. Becoming active in the Caribbean Challenge, a multi-national initiative to put an end to “paper parks” in the region, could make new sources of sustainable funding available for MPAs in the USVI.</p>	
40 M	<p>R 6.2 Pursue Management-focused Science: There is often a disconnect between the projects that coral scientists pursue and seek funding for and the questions that managers feel they most need answered to better manage coral resources. Measures and processes to improve communication between scientists and managers should be pursued and strengthened with the goal of scientists pursuing funding for projects that provide information that is expressly needed by managers. Potential Partners: UVI, SEA Grant, NOAA CRCP and NOAA Fisheries (SERO and SE Fisheries Science Center)</p>	
41 L	<p>R 6.3 Examine Costs and Benefits of Coral “Initiative” versus “Formal Program”: There are costs and benefits of transforming coral reef management in the USVI from the current “initiative” of widely dispersed activities operating through a variety of government departments and programs to a formally mandated “Coral Program” coordinated from a single division or department. Benefits could include the creation of a strong mandate that could survive changes of administrations in the USVI or even the loss of NOAA coral funding, while the costs might include the large bureaucratic challenges inherent in such a reorganization. A thoughtful examination of the costs, benefits and potential bureaucratic structure of a formal coral program should be evaluated. The VICRAG could serve as a forum for such an analysis. Potential Partners: NOAA CRCP, Florida CRCP, USVI DPNR</p>	
41 L	<p>R 6.4 Dive Reciprocity: A lack of reciprocity between DPNR and the NPS creates inefficiencies when these two entities desire to dive together on a project (e.g. divers from both entities cannot work side-by-side from the same support vessel). Both entities, perhaps within the context of the VIMPAN, need to constructively evaluate and discuss this issue to arrive at a definitive answer as to whether or not to pursue formal dive program reciprocity. If the decision is to not pursue reciprocity in the near term, then set a date (e.g. in 5 years) to revisit this topic.</p>	
42 L	<p>R 6.6 Support and Encourage Local Leaders: Smaller and less accomplished programs at the scale of homeowner associations, particularly on St Croix, would benefit from having leaders from established and successful programs such as Sharon Coldren from Coral Bay or Anne-Marie Hoffman from STEER attend their meetings and share lessons learned and success stories. Potential Partners: DPNR, TNC, UVI, SEA Grant</p>	
42 L	<p>R 6.5 Re-energize VIMPAM and VI CRAG: Reinvigorating both these inter-agency bodies could help improve integration across the coral management system in the USVI Potential Partners: NOAA CRCP, DPNR - CZM and DFW, TNC, NOAA MPA Center, NPS</p>	

1.0 Introduction

1.1 Purpose and Objectives

Over the past three years, the NOAA Coral Reef Conservation Program (CRCP) has completed a series of steps to define what needs to be done at the national and jurisdictional levels to conserve coral reefs in the United States flagged jurisdictions (hereafter jurisdictions). The results of these processes are described in the NOAA CRCP National Goals and Objectives document and the Coral Reef Management Priority documents (hereafter priority setting documents or PSD) for each of the seven jurisdictions with coral reefs (American Samoa, the Commonwealth of the Northern Mariana Islands, Florida, Guam, Hawai`i, Puerto Rico, and the US Virgin Islands).

The USVI coral management community, under the direction of NOAA CRCP, engaged in a detailed round of strategic planning and priority setting in 2009, culminating in the release of the “United States Virgins Islands’ Coral Reef Management Priorities” document in July 2010. The findings in this report are based on the assessment of capacity needs to implement the United States Virgin Islands (USVI) PSD. Since this document directly follows the USVI PSD, much of the material that was presented in that document, such as context and situation analysis, is not repeated in this document.

The capacity assessment work began with a detailed document review and discussions with key NOAA personnel, and continued with in-depth telephone interviews, email correspondence, and extensive in-person interviews and focus groups conducted during a site visit in March 2012. After the site visit, the data gathering continued with follow-up interviews, further document review, analysis and synthesis through July 2012 with a wide range of stakeholders throughout the USVI reef management system. A “Coral Reef Management Capacity Assessment Methodology,” was prepared and distributed in February 2012 and the methods used are summarized briefly in Section 2, below.



*SustainaMetrix team meets with representatives from St. Croix Environmental Association (SEA) at the Nature Conservancy offices on St. Croix).
Photo Credit: SustainaMetrix*

While the principle reference points for this capacity assessment process are the USVI priority goals and objectives and priority sites, the context for coral reef management is dynamic. It was clear from the outset of this assessment that adaptations to the priorities have been made in response to shifts in conditions, the perceptions of key individuals, agencies or partners, and other factors. In other words, the territory is practicing adaptive management. Nevertheless, the NOAA priority setting document process remains the primary lens through which the capacity assessment is directed since NOAA uses this document to prioritize financial and technical support provided by its cooperative agreements with the jurisdiction.

1.2 Assumptions

Key assumptions underlying this capacity assessment include the following:

- The assessment focus is on the capacity to implement the priority goals and objectives as articulated in the most recent jurisdictional Priority Setting Document (PSD) prepared for the USVI in 2009 and priority locations identified in the PSD;
- Words and phrases matter and their meaning can be different across the jurisdictions. Our assessment is based on the use of terms that we are using across the seven jurisdictions and a glossary of terms as defined in Appendix A; and,
- Our primary focus for the capacity needs assessment is at the scale of the USVI territorial government programs within DPNR who have been given the mandate for coral reef management in the jurisdictions. Furthermore, DPNR is the recipient of the NOAA CRCP Cooperative Agreement that supports implementation of activities toward the USVI coral reef management priorities. While there are other implementing partners, an operational consensus was developed with NOAA CRCP and the jurisdictional capacity assessment team that the capacity needs assessment would focus largely on the activities within DPNR that are related to coral reef management. Since implementation is interconnected across many organizations, the capacity needs assessment did include interviews with staff from National Park Service, The Nature Conservancy, SEA, etc. A full list of organizations interviewed is in Appendix B.

1.3 Audience for the Report

As stated in the “National Goals and Objectives”, the CRCP has pledged to shift away from a “sectoral” approach to managing individual coral reef resources through a more integrated ecosystem approach. The ecosystem approach recognizes that environmental issues cannot be separated from the social, economic, political, and governance issues of the associated human population. It calls on practitioners to identify and promote changes in human behavior that are required to restore and sustain the desired qualities of ecosystems (UNEP/GPA 2006). Therefore, the primary audience for this report is the people in USVI who are managing coral reefs and organizations who are in a position to support capacity building efforts in USVI. This includes agencies within DPNR and other territorial government partners, federal agencies present in USVI as well as academic partners such as the University of Virgin Islands (UVI), members of civil society, market forces, philanthropy etc. The report is intended for staff at all levels including those involved in administration, field operations, management, and policy/decision making regarding issues of coral reef management in USVI. A secondary audience includes people working on coral reef management issues in other jurisdictions or at other administrative levels who are interested in capacity needs assessment.

2.0 Methods for Assessing Capacity for Coral Reef Management in USVI

2.1 J-CAT Process

As part of the process of inquiry into capacity needs, we convened a small standing committee of “key informants” with in-depth knowledge and deep personal involvement in coral reef management in USVI that we dubbed the Jurisdictional Capacity Assessment Team, or “J-CAT.” We held six meetings with this group, either by conference call or in person, between January and June 2012 including one during our March 2012 site visit. We collaborated with J-CAT members during scheduled meetings, as well as on an ad hoc basis, to:

- Share available information at key points in the capacity assessment process;
- Create a shared communications strategy about the capacity assessment process;
- Customize the methods based on local context;
- Coordinate an efficient process of data collection;
- Provide input to assist in prioritizing capacity building needs;
- Analyze and summarize results and recommendations; and,
- Make the overall process as useful as possible.

J-CAT members summarized the experience with largely positive comments. Our goal was a collaborative process among the consultant team and the J-CAT to create a participatory process (with a clear beginning, middle and end) that provided extensive opportunity for input along the way. This document was developed, carefully reviewed and edited in consultation with the USVI J-CAT.

2.2 Aligning With Priority Goals and Priority Sites

The USVI PSD lays out a set of eight management targets, five of which were deemed “priorities”, organized into goal statements, with specific objectives listed under each goal. It also identifies four “high priority geographic areas” to apply these goals and objectives. The PSD guided our initial approach to the capacity assessment, essentially framing the assessment in terms of the capacity present in the system to accomplish the goals and objectives detailed in it. From this starting point, we adaptively deployed a set of methodological tools aimed at building our understanding of the system and illuminating current capacity gaps, as well as persistent barriers to building capacity (hereafter referred to as “gaps and barriers”), as they related to realizing the goals and objectives in the PSD. The priority goals as stated in the PSD remain the primary organizing principal of the capacity assessment and this report.



USVI J-CAT members meet at the DPNR offices at St. Croix East End Reserve. Photo Credit: SustainaMetricx

2.3 Case Studies and Current Activities

An early step in the capacity assessment was to review the Local Action Strategies (LAS) and site based management plans, as appropriate, for the four priority sites. From these plans we developed a detailed matrix, cross-referencing the extensive lists of projects proposed in the plans with the appropriate goal and objective in the PSD, with the goal of investigating the capacity present in the system to execute these projects and achieve the goals and objectives stated in the PSD. It became apparent that the number of proposed projects was vast, many were not yet implemented, and that we needed to cull the list to a more manageable number of projects that could serve as examples of the capacity present in the system to manage coral reefs. We worked with the J-CAT to rank the list of projects, based primarily on the criterion of the utility of each project to illuminate gaps and barriers in the system (rather than the success or failure of the project, its importance, state of completeness, etc.). Based on this ranking we selected three programs to investigate as detailed case studies and 15 projects to investigate as less in-depth current activities.

After arriving at the culled list of case studies and current activities (see Appendix C), we developed a list of key contacts associated with each project and developed a plan to interview each contact to build our understanding of how the project fits into the larger coral reef management system in the territory and how its “performance story” could illuminate capacity gaps and persistent barriers as well as successes in building capacity and managing coral resources. The case studies became a primary, but not the only (or in some cases even the dominant) line of inquiry in our interviews. We prepared detailed qualitative summaries of each interview, coded and collated in several ways, including gap and barrier “issue themes” as well as groups of related potential capacity building approaches and existing examples of successes in capacity for coral reef management.

2.4 Timeline for Coral Reef Management in the United States Virgin Islands

We developed a detailed timeline of key events affecting coral reefs in USVI, and their management, from 1917 to the present. The timeline includes natural events such as large hurricanes and bleaching events, as well as key governance milestones, from political events like the establishment of the Virgin Islands as a US territory, to laws and rulings that directly affect coral management. The timeline was based upon our documentation of interviews and anecdotes as well as historical information published about the system from perspectives in social science, humanities and natural science.

We printed out, on a long sheet of paper (~12 feet), a physical timeline and brought it with us to meetings during the site visit for review and input. The timeline proved to be extremely popular with interviewees, who often expressed interest in the level of detailed information about reef management over time pulled together in one place. All were encouraged to “grab a Sharpie” and add new events. With strong input, the timeline became far more detailed and complete during the course of our visit and afterwards via email (see Appendix D for a tabular representation of the timeline, including these additions). The timeline not only presents highly useful, contextually relevant information, but it serves as a visual reminder of the wide range of antecedents, actions, and plans that have built the platform for contemporary coral reef management and that current and future managers need to consider these historical antecedents. The timeline also became an “icebreaker” that created an engaging environment within which to conduct our interviews.

The timeline and case studies reveal that there has been significant capacity built to manage the coastal zone, and more recently coral reefs. However, the timeline and case studies also reveal a range of management plans (such as Areas of Particular Concerns and comprehensive fisheries management planning efforts) that have been formulated and may have received formal commitment, but are not fully implemented. As a result, the timeline and case studies reveal that there is a positive trend for building capacity for integrated coral reef management in the USVI, but also provide evidence of implementation gaps, forces of fragmentation, periods of high and low management capacity and political will, challenges posed by dynamic natural and social systems, and conflicting priorities. These forces constrain institutional capacity building and adaptive implementation of coral reef management and are the focus of this assessment.

In our experience, looking back into the timeline can help illuminate previous “generations” of coral reef management, which in turn can illuminate the analysis of issues affecting the capacity to manage them. A generation of management can be defined as a discrete time frame, usually measured in years, where issues have been identified that lead to the preparation of a management plan of action that is funded and adopted, implemented and evaluated. These steps are what we refer to as a cycle of management (Olsen, Page and Ochoa 2009). After the evaluation step, ideally, a new generation starts with a reexamination of the issues based on previous evaluation, a new plan prepared, and the efforts can proceed through a new generation of implementation and assessed through evaluation. When linked together over time, management can be seen as going through several generations that builds capacity to respond to the current suite of issues.

2.5 Adaptive Approach to Capacity Needs Assessment

Over the course of conducting the assessment and applying the tools discussed above, we adapted our approach due to exigencies on the ground. In some places, and among some actors, neither the PSD, nor the relevant LAS or

management plan, appeared to be the key expressed driver of their coral reef management priorities or activities. Furthermore, in some instances, when we investigated a given “current activity,” and to a lesser extent, case study, with staff who were thought to be involved in the activity, they were not familiar with it, or dismissed it as something in a document in which they had little investment. Nonetheless, our semi-structured interview approach worked well as we often began inquiring about a specific activity and expanded the scope to include more open ended dialogue that illuminated gaps and barriers, successes, and more broadly, the current status and context of the coral reef management system in the USVI. Using an adaptive approach to the capacity needs assessment, it became clear that the overarching themes of the PSD were still valid as general categories for the issues analysis and recommendations for a capacity building strategy, although cross cutting issues were also identified and are discussed separately in Section 3, below. Finally, we also conducted an analysis of the enabling conditions, behavioral changes and social norms required to effectively build capacity to improve coral reef management in the USVI.

Our investigation of current activities and case studies did yield specific and often detailed information about gaps and barriers to successful implementation of the projects. These findings are not presented here in a project-by-project review, as that would be beyond the scope of this effort. The findings on capacity building needs, as presented here, are therefore informed by:

- A review of dozens of documents relevant to the system;
- Over 50 in-depth interviews with key actors in the system;
- Development of the timeline, case studies and current activities as defined above,
- Our discussions with, and feedback from, the J-CAT;
- Our immersion in and contributions to the professional literature of coastal governance, capacity assessment, organizational behavior and other related disciplines; and,
- Our professional judgment, informed by similar assessments in locations around the world.

2.6 Generation and Prioritization of Recommendations

The recommendations presented in this report were generated after careful consideration of the information gathered as described above in Section 2.5, and in close coordination with the USVI J-CAT. SustainaMetrix ultimately presented to the members of the J-CAT 47 discrete recommendations, grouped into categories linked to the priority goals detailed in the USVI PSD (along with one category containing recommendations that cut across multiple PSD goals. Using an Microsoft Excel-based survey instrument, each J-CAT members was then asked to rate these recommendations as either of High, Medium or Low priority. Each was also given the opportunity to further highlight up to six of their chosen High priority recommendations as deserving of additional prominence. SustainaMetrix used the results of this process to present the recommendations in their final, prioritized order as presented in the summary tables in the Summary of Major Findings and Recommendations section of this report.

3.0 Analysis of Issues Affecting Coral Reef Management Capacity and Near-Term Capacity Building Recommendations

3.1 Scale and Context for Managing Coral Reefs in USVI

3.1.1 Importance of Scale

Building adaptive capacity is scale dependent. At one extreme, there is a limited capacity to address global scale process of climate change, including more frequent and severe bleaching events due to higher water temperatures, negative impacts on coral health due to diseases and ocean acidification and an increased likelihood of severe storm events. Given that global climate change and associated impacts are expected to be the biggest direct drivers of coral reef health in the coming decades, a clear-headed recognition of the scale of these issues, and the capacities that are needed to reduce risk and adapt, pose an enormous management challenge that must be addressed at multiple scales (Millennium Ecosystem Assessment 2005). At the other extreme, capacity to manage the Cruise Ship terminals in Fredricksted (St. Croix), beachfront restaurants and bars in Red Hook (St. Thomas) and pump-out stations in St. John all can be managed at the scale of the jurisdiction. The challenge of building capacity to address issues at a regional scale (e.g. invasive marine species, in-migration patterns) and how to deal with cross scale dynamics and multi-level interactions becomes even more challenging. Increasingly, capacity is needed to “see together” the inter-play across multiple scales, identify how to navigate up and down scales to better see the implications of network and power dynamics, socio-economic factors and the multiple drivers that so often originate from afar. Experiences from around the world suggest it is increasingly important to understand how adaptive capacity at the community scale intersects with external events, resources and governance institutions nested at higher scales (Armitage and Plummer, 2010).

3.1.2 Importance of Context

Building capacity is also context dependent. Understanding the specific context of the USVI is essential when diagnosing the causes of capacity gaps and developing relevant, practical solution strategies. The USVI is a small English speaking US territory, a short flight and easily accessible cruise distance from the mainland US and a destination for people from around the world, attracting on average 2.5 million of tourists per years (USVIBER.org). The territory covers 133 square miles consisting of three main islands, each with an abundance of steep slopes, and fifty islets and cays.

Throughout the history of the USVI (and other islands in the Lesser Antilles) people have been in constant flux. The history is filled with periods of boom and bust as economic opportunities drew people in, and the lure of something better drew them away. Not surprisingly, racial identity and ethnic affiliation are very important and influence political and social dynamics. Of the roughly 106,000 residents of the Virgin Islands, the population is a mosaic of people of African descent, Eastern Caribbean islanders, Puerto Ricans, Dominicanos (i.e. from the Dominican Republic), French Islanders, Americans (Continental), Arabs and Asians.

The USVI is currently experiencing an economic downturn across the territory, perceived to be most significant on St. Croix, exacerbated by the global recession and magnified by multiple local events. This situation on St. Croix is due to many global and local factors, including the recent closure of the HOVENSA oil refinery. While reports vary on the

actual impact of the economic downturn in St. Croix, the island is currently bracing for increasing unemployment, reduced demand for housing, price inflation (particularly for gasoline which had been subsidized as part of the HOVENSA operation) and a possible decline in tourism – although several interviewed felt that the tourism sector may remain stable over the next few years.

According to the resource managers and senior level officials we spoke with, the economic downturn can have both positive and negative impacts on coral reef management. Less development pressure could present an opportunity to improve integrated coastal zone management practices and develop a territory-wide stewardship ethic before development pressure picks up again. On the other hand, unemployment was expected to result in a short-term increase in fishing pressure on the near shore reefs for basic food security. Other localized social factors include a territorial-wide hiring freeze within the government, the persistent challenge of balance between the perceived short-term imperative for development versus the long term value and costs associated with protection of coral reef resources. Either way, the indirect drivers of population change, changes in economic activity, socio-political factors, cultural factors and technological change all interrelate in the context of coral reef management. Indeed, the complex interrelationship among current and future drivers clearly illustrates the need for increased capacity to manage coral reefs and respond to ecosystem change.

3.1.3 Context of Coral Reefs

Coral reefs surround much of the landscape of USVI with fringing and patch reefs as well as spur and groove formations frequently found around St. John and St. Thomas. St Croix has several large barrier reefs and lagoons. According to NOAA's Coral Reef Information System (CoRIS) website, coral reefs lie in deeper water along the shelf edge in depths from approximately 100 to 200 feet (31-67 meters) with plating corals deeper and more columnar forms and gorgonians dominating the shallow reefs. Maps of USVI benthic habitats to 100 feet (30 meters) show that “61 percent of the 485 km² area is coral reefs and corals on hard bottom; 33 percent is predominantly seagrass beds, and 4 percent is sediment or rocky bottom.” In such a setting, individual and community actions on land and on the water have the potential to have a great impact on the condition of near shore shallow coral reef resources.

In general, as one may expect, the shallower fringing reefs are in poorer condition and are more subject to land-based nutrient pollution, sedimentation, boat groundings, anchor damage and stress due to physical damage by divers and snorkelers. There was dramatic loss of the living coral, estimated at over 50% from a massive bleaching event in 2005 and subsequent coral disease (Rogers et al. 2009). While managers cannot prevent bleaching and subsequent disease, there is an overall acceptance that improved management to build resilience and health of these reefs is needed for the reefs to better respond to bleaching and disease. By contrast, deeper reefs, including lesser-studied mesophotic reefs, are considered to be in better health than shallow reefs and potentially more resilient to the effects of recent bleaching and disease events. Despite being less (and more difficult) to study, knowledge about deeper reefs is building in the USVI. The CRCP Territorial Coral Reef Monitoring Program has nine permanent monitoring sites at depths between 95-220 feet as part of a broader program to study these reefs. Such research will be key to understanding their relative susceptibility or resilience to future changes in water temperature or acidity.

Fisheries have also been documented as in decline. Beets and Rogers (2000) sum up the situation to justify a network of no-take reserves:

In the USVI, there is clear evidence that overfishing has resulted in fishery declines and changes to reef fish assemblages. Degradation of benthic habitats has undoubtedly contributed to these changes, but the signs of overfishing appeared before the extensive loss of habitat from coastal development, coral diseases, hurricanes, and other stresses. Loss of spawning aggregations, decreases in average size of fishes, and dramatic declines in fish abundance point to fishing as the causative agent.

3.2 Classification of Issue Themes and Recommendations

Capacity issues and associated recommendations are grouped together, below, into three major categories. The first category, discussed below in Section 3.3 (Issues Specific to Priority Goals), is organized by the five priority goals presented in the PSD. The second category (Section 3.4, Cross Cutting Issues), gathers together issues and recommendations that are more general and crosscutting in nature. The final category (Section 3.5, Analysis of the Enabling Conditions), discusses issues that can be considered as part of the broader “enabling environment” for coral reef management, and includes the need for:

- Well informed constituencies composed of the general public and stakeholders in both the private sector and government agencies that are supportive of coral reef stewardship;
- Governmental commitment to enhanced reef management that includes formal mandates, publicly expressed support and the commitment of financial resources required for long-term program implementation; and
- Clearly expressed, unambiguous goals against which coral reef management efforts can be measured (after Olsen, Page and Ochoa 2009).

3.3 Issues Specific to Priority Goals

3.3.1 Goal 1: Reduce Land Based Sources of Pollution/Improve Water Quality (Ridge to Reef Management)

Reducing impacts to coral reef ecosystems by reducing terrestrial sediment and pollutant inputs and improving water quality is the first priority management goal in the USVI PSD. This is a broad goal and will require building capacity across the coral reef management and governance systems in the territory, integrating needs as diverse as master planning, enhanced compliance and enforcement, regulatory and zoning reform, increased public stewardship values, improved bureaucratic function and the upgrading of infrastructure, among others.

BMPs

Effective, practical measures that should be employed to reduce sediments and nutrients in stormwater runoff coming off the landscape attributable to land use changes such as building and road construction, land clearing and agriculture are frequently referred to as “best management practices” or BMPs. In general, the widespread use of BMPs in the USVI is not constrained by a lack of technical know-how about the best techniques. Rather, capacity needs to be built in the system by which BMPs are described, communicated, promoted and funded. Strategies to help build these capacities include:

Recommendation 1.1 Revise DPNR Environmental Handbook

A primary mechanism for describing and communicating BMPs is the DPNR Environmental Handbook. The handbook has not been updated since 2002 and as currently configured is more of a “laundry list” of BMPs and lacks critical information about what techniques should be applied where, and why. The DPNR Environmental Handbook should be updated to be a more user-friendly and useful document, and less of a simple list of BMPs that lack sufficient context. The updated Handbook should include useful information about what BMPs work best in specific settings, guidance on BMP implementation and success stories describing what worked where and why. A new Handbook can serve as an up-to-date and agreed upon set of standards for best practices in the territory.

Recommendation 1.2 BMP Training

The creation of an updated Handbook can serve as the foundation to expand and promote professional BMP trainings. Building on the creation of a common set of up to date and agreed-upon standards, an Erosion and Sediment Control Training and Promotion Program for Engineers, Contractors, Heavy Equipment Operators, Developers, Architects, and DPNR permit inspectors and reviewers should be developed. The training would include proper techniques for site planning and choosing and applying best management practices to reduce erosion and improve sediment control. Including measures that create incentives for professionals to engage in these sorts of trainings, such as creating incentives for homeowners and project managers to preferentially choose trained contractors, will improve program success.



Watershed Association sign in Southgate, St. Croix. Photo Credit: SustainaMetricx

Recommendation 1.3 BMP Mini-Grant Program

BMPs could be more widely used if mini-grants were available to homeowners to offset the cost of installation. Such a program would also create an incentive for professionals to engage in the training recommended above, as the grants program could be tied to using only trained and approved contractors. Ideally, the grants would be publicized and promoted through DPNR and administered with a partner organization such as TNC or NRCS.

WASTEWATER

Wastewater management is clearly an enormous challenge in the territory. Building capacity to improve it will require an understanding of, and tactics and strategies to address, a wide range of challenges affecting the resource management agencies and their partners. It serves as an excellent example of how the issues interrelate and how capacity building must proceed in an integrated and cross cutting manner. While responsibility for handling wastewater resides predominantly within the VI Waste Management Authority (WMA), reducing the harmful impacts of wastewater in the territory, and by connection, improving reef health, will require reforms and improvements across many entities, including multiple divisions within DPNR.

The scope of the challenge is summed up by the WMA on its website (www.viwma.org/Divisions/Wastewater.aspx):

“The task becomes even more difficult when you have inherited a sewer system that contained unmapped sewer lines, undocumented records of users and illegal connections, and years of neglect. It creates a unique challenge to overcome”,

and by DPNR Commissioner Barnes who stated “WMA inherited a mess... We are extremely, extremely challenged when it comes to wastewater management.”

Specific challenges affecting wastewater management include:

- An aging treatment infrastructure and a lack of funds to modernize it;
- A lack of basic data on sewer connections, septic systems and package treatment plants, exacerbated by poor and uneven land records;
- Insufficient inspection and enforcement capacity;
- A lack of trained and certified installers that understand and promote best practices;
- A low level of professional certification among WMA plant operators;
- The absence of a conservation ethic and little willingness among homeowners to embrace best practices and properly maintain their systems;
- Poor understanding of the issues when violations are settled in court; and
- Poor understanding among the general public and developers about the connection between poor wastewater management practices and reef health.

Achieving the goal of improving water quality and reef health through addressing challenges in the wastewater management system will clearly entail a diverse set of strategies to address issues that cut across multiple sectors and capacity building will need to proceed in multiple venues.

Recommendation 1.4a: Improve land registry and sewer/septic connection data infrastructure

We heard repeatedly how poor land use records are hampering management in a wide range of settings. Holistically addressing this complex issue will pay dividends in the realm of wastewater management, but also in other arenas. There is no accurate and up-to-date, spatially explicit, readily accessible electronic database that includes basic information identifying real estate parcels, their size, location, address and ownership, along with relevant sewer connection or septic/package sewage treatment status. Exacerbating this problem, new development projects are often submitted with hand-drawn maps presented in inconsistent geographic projections that cannot be readily added to existing maps or databases.

A further complication is that there is no consistent and accepted street naming convention in USVI, although we believe that this issue is currently being addressed.

Together, these problems with the land use and registry data infrastructure make it extremely difficult for planners to obtain rather basic information about the territory, complicating zoning, watershed planning and other basic project planning and prioritization activities. We recommend that this large and complex issue be the subject of a study, most likely in partnership with a university geography program, to suggest the most effective path forward. The American Samoa Department of Commerce Land Use Planning Web Portal (<http://portal.gis.doc.as/LandUse/>) could serve as a model of a partial solution to this issue.

Recommendation 1.4b: Create a best practices training program for designers, plumbers and installers of wastewater treatment systems that is linked to licensing/license renewal

Training wastewater professionals in best practices for wastewater management in the territory, and linking the certification to licensing/license renewal, will enhance the skills, knowledge and abilities of the professional community, improving the quality of installed systems and improving compliance with existing regulations.

Recommendation 1.4c: Provide professional wastewater operator certification for WMA employees

Few WMA wastewater operators have professional certifications (perhaps 20 out of 50, David Simon, DPNR, pers. comm.). Operators without certifications should be identified and a course should be offered to those operators interested in obtaining professional certification, with a goal of certifying a discrete percentage of all operators by a given time (e.g. 80% of all operators by 2015).

Recommendation 1.4d: Stakeholder Education Campaigns

- Create public information campaigns that disseminate information on best practices for wastewater management as well as information on the connection between wastewater and reef health; and
- Create targeted campaigns to inform and educate the judiciary and other key decision makers about wastewater issues to build awareness for the need to enforce existing regulations and promulgate new ones.

Recommendation 1.4e: Commission a stand-alone study of status of wastewater treatment infrastructure and possible solution strategies

The current state of the wastewater treatment infrastructure is so problematic, and the gap between existing and needed capacity to address deficiencies is so great (as is the deleterious impact of nutrient pollution on reef status), we recommend that a stand-alone study be commissioned to evaluate the entire system. This appears to be an area where the territorial government is simply overwhelmed and is currently forced to “muddle along” at a low level of functionality.

Additional Recommendations: 1.4f

- Raising and leveraging funds to upgrade failing infrastructure;
- Increasing enforcement and inspection capacity within DPNR;
- Increasing pump-out capacity at anchorages and moorings, including pump-out boats and shore-based facilities, and creating a public information campaign to improve compliance with pump-out regulations

As this example demonstrates, deconstructing a highly complex problem such as wastewater management into a set of cogent issues, and then building concrete strategies to address the individual issues can help clarify the problem, reduce its complexity and create an actionable set of recommendations.

MASTER PLANNING

There is no formally adopted comprehensive land and water use plan in the USVI. However, our interviewees frequently reported that many plans had been initiated and are in varying degrees of completion, but none had been formally adopted. Some interviewees feel the phrase “Comprehensive Land and Water Use plan” is so loaded with nega-

tive connotations that it should not be used. Additionally, DPNR Division of Coastal Zone Management employees remarked that it seemed unlikely that a comprehensive plan could be formulated and adopted when they are currently struggling to simply obtain accurate information on land records in a timely manner. Nonetheless, DPNR Commissioner Barnes stated unequivocally that she is “committed” to creating a comprehensive plan and seeing it through to formal adoption during her tenure at the Department, seeing this as an important part of her potential legacy.

Updating the USVI zoning code is a prerequisite to creating any strong, enforceable master plan and vision for the future of development in the USVI. In 2009, DPNR commissioned the Rutgers University Center for Government Services and Duncan Associates, Chicago, Illinois to conduct an assessment of the zoning and subdivision code of the USVI. The assessment stated that

There is general agreement among DPNR staff, community leaders, developers, environmental groups, and others that the current land development regulations are deficient, and that a plan is needed to establish policies to guide the Legislature’s and the DPNR’s decision making on development decisions. But the effort expended by stakeholders of all types to update the 2003 plan left people discouraged and unsure as to whether the planning process could ever succeed in this environment. There is, however, agreement that the zoning and subdivision laws need to be revised as soon as possible, which is how this assessment came to be.

We agree that without strong, codified and enforceable zoning regulation, achieving a vision for sustainable build-out in the USVI will not be possible. Indeed, the Rutgers/Duncan Associates study notes that DPNR itself, on its website, recognizes this fact:

The lack of land and water use planning and/or insufficient planning can result in inappropriate development, land use conflicts, contamination of surface and ground water, erosion, increased flooding, gut and drainage fillings, uncontrolled and excessive exploitation of natural resources, destruction of plant and animal habitats, declines in productivity of the marine environment, pollution, etc.

A second prerequisite to achieving an integrated Land and Water Use Plan is solving the difficult problem of poor land registration record keeping. As discussed earlier, under the Wastewater recommendations, it is imperative that the territory creates a modern, comprehensive, updatable, computer-based land registry database coupled with a new street address naming convention.



*USVI coral reef Point of Contact (POC) Paige Rothernberger.
Photo Credit: SustainaMetricx*

Recommendation 1.5: Update USVI Zoning Code and Implement Subdivision Law

Updating the USVI zoning code is a prerequisite to creating any strong, enforceable master plan and vision for the future of development in the USVI. These activities should be promoted and supported by the coral reef management community for the benefits that they will ultimately provide to coastal ocean and reef health.

Recommendation 1.6: Support Master Planning Process

An integrated master plan for development in the USVI is an essential component for addressing many systemic issues impacting coastal ocean and coral reef health. There is currently a growing amount of effort that could ultimately

culminate in a Master Plan to guide development and build-out across the territory. These efforts should be supported, perhaps by the creation, with the expressed support of the Governor's Office, of a high-level task force of key legislators to investigate the creation of a formal Master Plan. This could include learning journeys to, or presentations from, other insular territories that have successfully adopted master plans.

Recommendation 1.7: Share lessons learned from effective watershed scale programs

Using lessons learned, highlight success stories from what worked well, and also did not work well, at watershed scale programs (e.g. Coral Bay, Fish Bay, STEER, APCs), and engaging with effective local leaders, use lessons learned to inform efforts at other local-scale coral reef conservation programs (e.g. "Collaborative Learning Guide for Ecosystem Management", C. B. Fuert 2008, <http://swim.wellsreserve.org/ctp/Collaborative%20Learning%20Guide.pdf>).

3.3.2 Goal 2: Develop and Implement a Comprehensive Education and Outreach Program

The USVI Priority Setting Document rightly sets developing and implementing education and outreach activities to promote coral conservation objectives as its second priority goal. For many of the specific projects and programs recommended in this report, such as improved BMPs, a coordinated effort to educate the public about them and their links to reef health will enhance their likelihood of success. Additionally, promoting more general measures to improve the public's and decision makers' understanding of reef health issues and the factors that contribute to reef health and decline is integral to creating a social environment conducive to long term conservation of the USVI's coastal zone and coral reefs. Recommendations for building such an understanding are presented below; with more general measures presented first followed by measures intended to support specific programs.

GENERAL

Recommendation 2.1: Inventory Existing Education Programs

Identify, inventory and describe all current environmental education programs such as Reef Jams, Green Construction Guides, Sediment and Erosion Control Trainings, the Traveling Trunk, dramas that feature reef stewardship, exchange programs, demonstration farms, curricular programs etc. As part of this inventory, define relative cost, complexity and effectiveness as well as existing "ownership" and capacity in USVI. Convene a summit to discuss integrating, consolidating and increasing the overall effectiveness of current activities. This effort should build upon and update earlier similar work done at UVI in the 1990s and more recently by the Coral Management Fellow.

Recommendation 2.2: Support and develop programs to increase the connection between young people, oceans and reefs

Many of our interviewees were adamant that "you need to start with the kids." While lamenting the degree of disconnect between modern youth and the natural environment, many saw the issue as especially troubling in an island territory where the entire population lives within just a few miles of reefs yet so few have any firsthand experience or appreciation of this asset. Many young Virgin Islanders do enjoy the beach, and like to wade in sandy shallows, but few are confident swimmers and very few have ever snorkeled or dived. Continuing to build capacity to support school and youth programs that expose young people to the water and reef, including specifically snorkel programs, has the potential for strong long-term dividends in the territory for a rather modest investment. Without investments in this area, the territory risks a rising generation with limited connection to, and appreciation of, coral reefs and environ-

mental stewardship. Gather lessons learned from the fun, innovative and successful “Reef Jam” program (<http://reefjam.com/>) as model that could be celebrated, supported and potentially expanded.

Recommendation 2.3: Assess VINE Capacity and Willingness to Further Develop

The Virgin Island Network for Environmental Educators (VINE) can be an ideal partner in implementing a holistic capacity building strategy. However, VINE currently lacks the capacity to fulfill this role. It is an all-volunteer organization, has no full-time paid coordinator and currently lacks a suitable fiduciary agent to handle its financial transactions. Filling these gaps – obtaining funding for a full-time paid coordinator and finding a new fiduciary agent – are necessary prerequisites for VINE to become an active partner in advancing the education and outreach objectives of the coral reef initiative. If VINE could take these important steps, it would require a strategic plan that targets increasing capacity for board and staff development, technological and other essential resources, and expert consultation to help build off of previous campaigns such as “Leave Paradise in its Place” and “Coral Reefs are 1000s of Years Old: Respect Your Elders” and become a model for territorial wide environmental education.



Student art about coral reefs displayed at the DPNR offices on St. Thomas. Photo Credit: SustainaMetricx

Recommendation 2.4: Inventory Off-Island Models of Environmental Educations

Develop an inventory of programs that have not yet been tested but are being implemented in other similar island contexts that relate to coral reef education, outdoor education strategies, conservation and stewardship. Identify through case studies the basic program requirements, cost and expertise needed as well as the resulting knowledge skills, attitudes, tools and values that are developed as a result of implementing such programs. A graduate or undergraduate student (or students) could be engaged through VI Sea Grant or VIMAS, potentially with funding support from EP-SCoR.

Recommendation 2.5: Conduct Professional Market Analysis

Engage partners who are experts in communications and social media to conduct market surveys, test messages, prepare issue briefs, and conduct evaluation of communication and social marketing messaging. Potential examples include PCI Media Impact (mediainpact.org), a leading expert in message marketing, Sea Web (seaweb.org), or pursuing a partnership with a major aquarium. To reach a wider audience that would include coral reef user groups, elected officials, etc., community-based social marketing campaigns have worked well in other places but usually require initial external expertise, an implementing partner and a budget to support a long-term campaign. The territory has the opportunity to build on the existing capacity surrounding the use and application of social media campaigns to make a compelling case that long-term stewardship of the coastal ocean and coral reefs is intimately tied to the long term economic vitality of the entire Territory. Given the diverse audiences that need to be reached through such a campaign, it is essential that the specific behaviors that the campaign desires to engender or change are clear. The work done by PCI Media Impact and their Caribbean communications program called Callaloo, which is aimed at building capacity to adapt to climate change, should be explored. According to Media Impact, “Callaloo is a steamy new radio drama making a big splash in fifteen Caribbean Countries and is part of a larger communications program, My Island- My Com-

munity, using media and communications to address a suite of pressing environmental, social, health and economic issues, encouraging community resilience to climate change and sustainable development” (Personal Communication, Sean Southy Executive Director of Media Impact).

SPECIFIC

Recommendation 2.6: Communicate BMPs

Building on the Recommendations 1.1, 1.2 and 1.3, DPNR and its partners should create a communications campaign to broadly encourage the use of BMPs, including arguments regarding the importance of reducing the flow of land based sources of pollution to the coastal ocean and coral reefs. Examples of successful stormwater management practices such as rain gardens, vegetated swales, semi-permeable pavement, etc. need to be effectively promoted and on display around the territory. Time-limited “one-off” campaigns are less successful and valuable than sustained, consistent messages that are promoted in an ongoing manner.

Recommendation 2.7: Promote S&E Control Training and Possible Certification

The technical training of Sediment and Erosion Control techniques can build capacity for stewardship within a range of audiences such as developers, contractors, permit inspectors etc. Build this program using a consistent set of criteria for competencies that could lead to certification. Identify high priority sites that can be used as examples and models of how sediment and erosion control is best practiced. The reward and incentive for certification (e.g. a campaign to promote the hiring of green certified contractors) needs to be identified and promoted. Certification is a controversial topic and if this was to be pursued it would need to be linked with a requirement for continuing education within the development industry. The Green Construction Program includes good modules targeted to architects, engineers and field staff such as equipment operators.

3.3.3 Goal 3: Compliance and Enforcement

DPNR DEE is chronically understaffed. Many interviewees reported stories of witnessing ongoing violations, such as people fishing in closed areas or using personal watercraft in areas forbidden to them, and finding that no enforcement officer was available or close enough to issue a violation. The issue of enforcement capacity across the territory is one of the most clear-cut examples of a lack of simple capacity – the number of enforcement officers – negatively impacting the ability of DPNR to adequately manage the coral reef resources of the USVI. Furthermore, a lack of understanding of enforcement issues within the judiciary and a lack of training among enforcement officers to present cases forcefully in court results in many cases being thrown out of court and in a general lack of fear of any strong repercussions coming from rule breaking.

Compliance and enforcement can be viewed as two sides of the same coin. On one side, a well-informed and supportive constituency will tend to comply with regulations, making strict, expensive and widespread enforcement effort unnecessary. On the other side, a well-funded enforcement infrastructure, with good coverage and strong judicial follow-up, will reduce the likelihood of persistent environmental rule breaking. Certainly, a highly informed, supportive and compliant constituency, including commercial and recreational fishers, scuba divers, boaters, etc. that is not inclined to break environmental regulations is preferable to a system marked by frequent violations and strict enforcement. A key goal of improving overall regulatory compliance is to simultaneously build voluntary compliance while ensuring adequate enforcement to discourage rule breaking.

Specific recommendations to improve compliance with, and enforcement of, environmental rules in regulations that will help support coral reef health in the territory include:

Recommendation 3.1: Increase understanding of key decision makers about coral reef and natural resource issues

DPNR staff, with the explicit support of the Commissioner, should encourage key legislators, judges and other decision makers to accompany DPNR resource staff on trips to see coral reefs and management challenges firsthand. Judges and judicial staff should go out on the water with DEE officers to see the difficulties they face and what specific violations mean in practice. The overall lack of familiarity of some judges with the applicable rules and regulations is resulting in valid violation cases being improperly adjudicated or even thrown out of court.

Key decision makers are more likely to support and enforce regulations designed to protect and enhance reef health if they are aware of the economic value that reefs contribute to the USVI economy. Programs and products should be created to inform key decision makers (e.g. legislators, Governor and staff, judiciary) on the value of coral reefs to the USVI economy and culture and disseminate the findings of the recent study “The Economic Value of the Coral Reef Ecosystems of the United States Virgin Islands.”

Finally, Commissioner Barnes’ attending the Coral Reef Task Force meeting in Washington, DC is an example of success that helps build support for reef conservation among high level officials, and should be supported and replicated. While it can be difficult for decision makers to take time away from their job duties and to obtain travel funding, this sort of experience can pay strong dividends in the system.

Recommendation 3.2: Build Awareness of Rules and Regulations

A first step would be to inventory all environmental regulations that the general public should be aware of and comply with, as well as the government office and officials responsible for enforcing them. A second step could be commissioning a professional study examining how much the general public knows about environmental regulations and what are the most trusted sources for communicating this information. Identify where rules and regulations have been well communicated to the public in the USVI and situations where there has been active participation and the involvement of stakeholders in the establishment of rules, and describe the benefits and costs of such involvement to determine where strategies have been effective for increased compliance. Expand and model these success stories to further promote the broad knowledge and acceptance of environmental rules and regulations.



*Personal watercraft near Charlotte Amalie, St. Thomas.
Photo Credit: SustainaMetric*

Recommendation 3.3: Define Cost vs. Benefit of Illegal Fishing

Compliance is eroded when the potential benefits of illegal activity greatly exceeds the potential fines and other punishments of being caught. The benefits of illegal fishing activities (and other environmental rule breaking relevant to reef health) and the associated fines and punishments should be carefully quantified to better understand this issue. Additionally, the costs of damage to the reef ecosystem, in terms of lost ecosystem services and lost opportunities (fishing, diving, etc.) to the rule-abiding public should also be quantified to the extent possible. These findings should be integrated into briefings for the judiciary, legislature and other decision makers to increase their understanding of

the state of environmental regulation, rule breaking and punishment. The NOAA Fisheries Liaison could be a partner in this effort.

Recommendation 3.4 Harmonize MPA Boundaries and Rules

Improving enforcement and compliance in MPAs is a complex and multidimensional task. Given the many forms of MPAs in USVI, and the constant need for installing and maintaining demarcation buoys, providing enforcement, and ensuring collaborative relations across partners, defining specifically what MPA rules and oversight issues (e.g. "the wedge", Buck Island and STXEEMP) can be simplified and harmonized among management units and made more clear to the users will be of great value. Many of our interviewees stated that the patchwork of regulations is too complex to adequately communicate to stakeholders and should be simplified. We also frequently heard that spatial regulations need to be much better communicated and more thoroughly marked on the water with buoys. Novel communication strategies such as creating GPS and nautical chart products that include MPA regulatory information could help. The optimal solution likely lies in careful coordination among MPAs to streamline, simplify and communicate marine spatial regulations in a consistent manner across the territory. The VI MPA Network (VIMPAN) is a positive development and could be an ideal facilitator of this process as well as recipient of additional grants to support this work.

Recommendation 3.5: Pilot Inter-Agency Agreements

Demonstrate that the necessary capacity and willingness is in place to create interagency agreements with various enforcement entities. Start in one place, such as St. Croix, to develop the necessary authorities among all officers (e.g. NPS, FWS, USCG, DPNR, DEE, VI Police) to be able to conduct enforcement across all parks. If this model is developed, use as a pilot test and allow sufficient time such as 3-5 years to explore what works well and what does not. If it works well, transfer and scale up across the territory.

Recommendation 3.6: Expert Monitoring, Surveillance and Enforcement (MSE) Consultation

Engage with experts in monitoring, surveillance and enforcement (such as NOAA Office of Law Enforcement) to review the range of regulations and the current level of preparedness, resources, equipment, staffing etc. to determine if there is sufficient capacity in place to effectively enforce regulations and increase compliance.

Recommendation 3.7: Increase Staff/Resources for Enforcement

Based on recommendations from the MSE consultation, create a plan to add additional enforcement officers and associated resources (i.e. vehicles, vessels, equipment, fuel, ongoing maintenance funds, etc.) to ensure adequate temporal and geographic enforcement presence. Thirty total enforcement officers is a preliminary target to provide adequate coverage across the USVI.

Recommendation 3.8: Cross Training of Rangers / Enforcement Staff

Pursuing strategies to cross train enforcement officers, interpretive rangers and peace officers is a tractable way to increase enforcement capacity across the territory. Integrating environmental regulation enforcement training (i.e. fisheries, boating, land use, sediment and erosion, etc.) into the general training provided at the Police Academy can improve enforcement capacity as well the morale of enforcement staff. Additionally, provide specific training to DEE enforcement officers in how to present their cases in court. Officers are trained in field operations only and are often not prepared to present violation cases adequately in court.

Recommendation 3.9: Explore Co-management

If there is a desire to test co-management structures, whereby communities are involved in enhancing compliance with MPA rules and regulations, then identify a site where such a strategy may be successful and pilot test a participation process to define costs and benefits. Potential locations may be Coral Bay or Fish Bay on St. John or the STEER, which seem to be growing capacity and are sufficiently remote to warrant such a capacity building investment.

3.3.4 Goal 4: Reduce Fishing Impacts

This is a complex topic that seems to be well understood as a capacity gap. A cornerstone of addressing this issue is building the awareness of the fishing rules and increasing willingness of the fishing community to comply with rules



*Commercial fisherman and Caribbean Fishery Management Council chairman Carlos Farchette being interviewed by SustainaMetrix on St. Croix.
Photo Credit: SustainaMetrix*

and document actual catch. Around the world, experience has shown that coercive enforcement alone will not produce the effective implementation of fisheries regulations. Fishing in the USVI has been integral to island survival, culture and livelihoods for thousands of years. Fishers from the three main fishing communities in USVI are engaged in defining how and where to reduce effort and are beginning to collaborate more effectively across the communities. Building upon this present capacity to further engage fishers in decision-making is strongly recommended. Key partners in this process would include Dr. David Olsen, who is currently involved in the St. Thomas Fishermen's Association, and the work of interdisciplinary teams at UVI working to better understand how “knowledge of the past and the present can be best used to inform future sustainable and resilient decisions in regards to

USVI fisheries and its management.” Capacity is present at UVI to better “understand the conditions and thresholds that are likely to produce a sort of ‘domino effect’ and negative feedback mechanisms, ensuing fishery decline resulting in species extinction, coral decay, loss of jobs and food, and increased fish prices in a recession weakened tourism-based economy” (Alexandridis et al. 2011). This level of cross disciplinary, applied social science research is needed to build toward a shared understanding.

The enabling conditions for the implementation of fisheries reform, which include a shared set of clear and unambiguous goals, supportive and informed fishers who choose to comply with the rules, rules that have been developed with significant input by the fishers, and adequate capacity to track landing data are all being developed in USVI. Investments to further build capacity to reduce inappropriate gear, ban SCUBA spear fishing, improve record keeping, and reduce effort on target species are needed, beyond the NOAA CRCP cooperative agreement. We conclude that sufficient capacity is present within the fishery management realm of the USVI to achieve many of the core objectives of the PSD as long as fishers are engaged in the process, a wider range of funding is secured (beyond CRCP) to continue progress in each of these areas, and research teams are engaged that integrate social science and natural science for improved understanding and commitment to compliance of rules.

Specific recommendations to help reduce fishing impacts on coral reef health include:

Recommendation 4.1: Examine Feasibility of Shifting Fishing Effort

Define the requirements to, and potential benefits of, promoting a shift in fishing pressure from reef species to pelagics (e.g. dolphin, wahoo) and inshore sport species (e.g. tarpon, permit, bonefish, snook). Measures could include the expanded use of FADs to attract pelagics and the training of commercial fishermen as guides for both pelagic and inshore sport fishing, including fly-fishing. Potential partners include the U. S. Virgin Islands Game Fishing Club located on St. Thomas. This (and the next) recommendation should be viewed as a means to modestly broaden the range of fisheries resources available to Virgin Islanders, but not as a stand-alone solution to overfishing.

Recommendation 4.2: Promote Measures to Shift Effort

Depending upon the results of the feasibility analysis, create specific programs to install FADs, develop commercial fishery options for pelagics, train commercial fishers as sport guides and promote destination sport fishing tourism. This would likely require partnerships with organizations such as the relevant Fisherman's Associations, the USVI Game Fishing Club, NMFS, the USVI Commission on Tourism and the Caribbean Fishery Management Council. While fishing traditions and cultural norms will likely prevent a rapid and large-scale shift from reef species to pelagics, improving opportunities to do so will help broaden fishing options and build resilience in the system.

Recommendation 4.3: Support and Re-Invigorate VIMPAN

Complex, multi-faceted and difficult to communicate regulations continue to challenge enforcement and compliance within MPAs. VIMPAN could be an excellent forum within which to explore and discuss this issue, potentially leading toward more harmonized, consistent and readily enforced regulations at MPAs across the territory. VIMPAN could also be the forum at which lessons learned and successes from other jurisdictions could be investigated, discussed and disseminated across the USVI.

Recommendation 4.4: Improve MPA Marker Programs

There is a lack of clarity about who is responsible for installing, maintaining and replacing marker buoys and signs at various MPAs. Improving coordination across agencies to clearly delineate responsibilities, as well as pursuing adequate funding and capacity to install and maintain a proper marker system, is essential to promote compliance and enforcement.

Recommendation 4.5: Fisheries Record Keeping

Poor fisheries data and lax compliance with self-reporting of commercial catch and landings data continues to challenge fisheries management in the USVI. Currently, DFW and the CRCP Fisheries Liaison are working with fishers to promote accurate record-keeping when they communicate with fishers during their annual registration period. Additionally, DFW has identified local liaisons to work with fishers in the communities to provide support and encourage accurate data reporting during the course of the year. DFW is also investigating the use of smart phone applications for real-time reporting of catch data to further improve accuracy and compliance with self-reporting regulations. Finally, promoting measures that improve commercial fisher "buy-in" such as paying fishers to collect research data will improve compliance and data quality. These and similar measures that help build a culture among commercial fishers that supports timely and accurate self-reporting should be promoted and grown.

3.3.5 Goal 5: Climate Change

While measures to truly address the issue of climate change clearly will need to operate at a global scale, there are some measures that the territory can take to improve public understanding of the issues that could lead to behavior changes that are relevant to preserving and protecting coral reefs at the scale of the USVI. These recommendations include:

Recommendation 5.1: Improve Internal and External Climate Change Communications

DPNR should improve its efforts to inform managers and staff about climate change issues and potential impacts and to improve communication of these messages externally. Internal and external climate change messaging can be linked to the Governor's pledge and campaign to reduce USVI fossil fuel consumption by 60% by 2025.

Recommendation 5.2: Develop Compelling Climate Change Visual Aids as Part of a Public Information Campaign

Visual imagery, such as GIS-based inundation maps and other graphical tools, are an important part of communicating climate change messages and should be developed for USVI and disseminated. TNC is a potential partner for such an effort. In an island state like the USVI, simply marking potential future sea level in a publicly visible way can be a compelling part of a public information campaign to raise awareness about climate change (e.g.

<http://www.climatedots.org/toolkit/sea-level-rise-action-guide/>,

<http://takvera.blogspot.com/2009/11/walkers-mark-dangers-of-rising-sea.html>).

Recommendation 5.3: Investigate Lessons Learned on Climate Change Adaptation from other Insular States

It is likely that other similar insular states have climate change mitigation, adaptation and communication programs and plans that would be applicable to the USVI. Research into other such programs could provide important lessons learned that could be applied in the USVI.

3.4 Cross Cutting Issues

3.4.1 Linking Science to Policy

A key to good ecosystem based management and governance, which is highly relevant to coral reef management in the USVI, is having a robust scientific infrastructure that generates reliable, relevant information about the system under management, and transmits that information in a timely and useful manner to decision-makers. However, tensions can arise, especially in times of tight financial resources, over the quantity and type of scientific data that are needed to adequately inform management and the need to balance investments in science against investments in the implementation of approved site management plans, building enforcement capacity, etc.

It is difficult to define which is the most relevant and useful data to be collected, what long term-monitoring might best be abandoned, and how best data that is collected is analyzed and disseminated in a way that enhances decision-making. The coral reefs of the USVI have been the subject of considerable research and a wealth of good data exists regarding the spatial extent and general health of reefs in the Territory. Those interviewed do not find that a lack of biophysical data about the shallow, nearshore coral ecosystem is an impediment to enhanced reef management. However problems with access to and use of data did arise repeatedly. These include:

- A lack of clarity in the system of the degree to which monitoring data is proving useful to the management process.

- High quality monitoring data is being collected, by both DPNR and UVI, but there is limited capacity to analyze, publish and disseminate it.
- High quality, accurate fisheries landings data is severely lacking. Most fisheries data is self-reported and there is little incentive to provide accurate data if it might indicate overfishing or violations of rules.
- Wastewater management is hampered by a lack of:
 - spatially explicit information on sewage connections and septic systems;
 - information on the age and status of existing septic systems; and
 - easily accessible, synoptic, electronic land records.
- Water quality (WQ) standards are based on continental US criteria that lack local relevance, and the lack of good QA/QC procedures has reduced the quality and usability of large quantities of WQ data.

Perceived examples of capacity that exists in the system include the following:



*DPNR employee Anita Nibbs during interview with SustainaMetrix.
Photo Credit: SustainaMetrix*

The relationship between UVI and DPNR is quite strong and the capacities to deliver timely monitoring data are improving on an annual basis. The NSF funded VI-EPSCOR program at UVI recently implemented a Masters Degree program in Marine and Environmental Sciences and has already woven specific applied research projects into the curriculum. Strong social scientists have been brought in who bring much needed expertise in the human dimensions of coupled social ecological systems. The program receives adequate funding to do positive research at sites across the territory that helps to identify management targets. Lab facilities have been enhanced and the timeliness of quality assured and quality controlled data delivery has improved, but gaps remain.

Recommendation 6.1: Strengthen Linkages Between Science and Management

In general, good coral reef management in the USVI is not being limited by a lack of publishable scientific information about the status of reefs, causes of declines, responses to stressors, etc., and more priority should be given to investigating and filling capacity gaps related to good governance (e.g. improving compliance and enforcement,

improving bureaucratic function, depoliticizing the selection of natural resource managers, encouraging peer-to-peer learning, improving outreach, education and communications measures to grow a stewardship ethic among decision makers and the general public, updating codes, regulations, job descriptions, handbooks, and other similar recommendations presented in this assessment) over the continued funding of peer-reviewed “pure science.”

If the VI-EPSCOR program intends to engage in more management relevant science, it has the potential to contribute to the translation of science into effective stories that captivate attention and change behavior, particularly for decision makers.

Recommendation 6.2: Pursue Management-focused Science

There is often a disconnect between the projects that coral scientists pursue and seek funding for and the questions that managers feel they most need answered to better manage coral resources. Measures and processes to improve communication between scientists and managers should be pursued and strengthened with the goal of scientists pursuing funding for projects that provide information that is expressly needed by managers.

3.4.2 Integrating Across Agencies

At the present time there is no distinct “Coral Reef Program” at the level of the USVI Territorial Government. Rather, activities and responsibilities specifically aimed at enhancing reef management (and those that otherwise materially impact reef health) are dispersed widely across many territorial government agencies and within various NGOs active in the environmental sector. Accordingly, any coral activity that involves multiple agencies and organizations requires coordination across these entities. In many such instances, communication and clarity regarding roles and responsibilities is a challenge and there were several examples of where outcomes suffered. When asked about this situation and a potential remedy to it, Commissioner Barnes noted:

We need to assess roles first. There are a lot of actors – Feds, territorial agencies, DPNR, NGOs, UVI. We need to assess ... all the initiatives we have made in legislation, grant applications, MOUs, etc., before we can move forward.

Specific examples of where challenges of integration are negatively affecting the capacity to manage reefs include:

- There are many opportunities to improve collaboration between NPS and the territorial government.
 - NPS, the Coral Bay Community Council and the territorial government have identified the need to improve collaboration on management in the Coral Bay watershed.
 - UVI and NPS have noted experiences where data gathering, the location of monitoring transects and the sharing of monitoring data was not well coordinated, resulting in overlapping, poorly integrated and/or duplicative effort.
 - NPS and DPNR employees acknowledge the need for integration as there is a long history, some positive and negative, yet no clear code of conduct.
- Joint management of the Salt River Bay National Historical Park and Ecological Preserve by the National Park Service (NPS) and DPNR’s State Historic Preservation Office is not an ideal model of integration and could benefit from facilitation and adaptation.
- DPNR SCUBA divers and divers from many partners do not share the same certification standards, hampering coordination on projects that require scientific diving; and
- Our interviewees were not clear on how enforcement responsibilities are shared between DEE and other DPNR divisions (e.g. CZM, CCZP). This leads to confusion about the degree to which enforcement officers need to be versed in, and physically patrol and enforce, land-based (e.g. sediment and erosion control) and water-based (e.g. fisheries and boating) regulations.

Perceived examples of capacity that exists in the system include the following:

The emergence of environmentally focused non-governmental organizations (NGO) in the USVI has added much needed capacity and largely enhanced integration across territorial and federal agencies. The presence and active con-

tributions of The Nature Conservancy (TNC), a widely respected international NGO, is a good example of the range of contributions. From innovative hiring/staffing arrangements, to SCUBA reciprocity with NPS, to building GIS capacity at DPNR, TNC has been an important collaborator. It is important to note that the use of MOAs and MOUs are important vehicles to explicitly state expectations and define collaboration and integration arrangements. Also, work at priority sites such as STEER and STXEEMP are good examples of successful integrations and building needed capacity.

Another recent and positive example of integration across agencies has been the Virgin Islands Marine Protected Area Network (VIMPAN) that has been facilitated by TNC and has established a good platform for dialogue, decision-making, action and reflection on the development of a more integrated and coordinated network of marine protected areas. The network is exploring joint opportunities, coordinating funding cycles, using a strategic planning process with federal partners, and contributing a collective voice to management decisions.



DPNR officials look over additions to the USVI Timeline. Photo Credit: SustainaMetricx

There have also been positive examples of partnerships with market forces and NGOs. For example, Elizabeth Armstrong from the Buccaneer Hotel has worked with SEA to develop a Coral Conservation Corps as a high school program with the purpose to create a group of youth advocates for coral. According to SEA leaders, this has been successful in building pride in the reefs and local natural resources at some high schools on St. Croix.

DPNR has limited resources and very dedicated people who have worked to creatively establish integration and partnerships. With a small staff dedicated to the priority areas of STEER and STXEEMP, DPNR has been successful in their collaboration with TNC and NOAA CRCP

liaisons. At the staff and manager level, DPNR has a largely positive history of trust and transparency in their relationship with NGOs and has developed creative ways to leverage the resources they bring to the table.

Specific recommendations to improve integration across agencies to improve coral reef management include:

Recommendation 6.3: Examine Costs and Benefits of Coral “Initiative” versus “Formal Program”

There are costs and benefits of transforming coral reef management in the USVI from the current “initiative” of widely dispersed activities operating through a variety of government departments and programs to a formally mandated “Coral Program” coordinated from a single division or department. Benefits could include the creation of a strong mandate that could survive changes of administrations in the USVI or even the loss of NOAA coral funding, while the costs might include the large bureaucratic challenges inherent in such a reorganization. A thoughtful examination of the costs, benefits, type of mandate, and potential bureaucratic structure of a formal coral program should be evaluated. The VICRAG could serve as a forum for such an analysis.

Recommendation 6.4: Dive Reciprocity Program

Currently, DPNR does not have an American Academy of Underwater Sciences (AAUS) certified SCUBA program (or similar certification), while many of its partners, including NPS, NOAA, EPA, USGS, USFWS, TNC and UVI do. This creates significant logistical challenges for DPNR divers and those of its partners to work together on the water.

This also has significant financial implications as fully qualified staff within DPNR can't dive alongside coral reef management partners, which results in additional funds allocated for fuel, boat time, staff time and results in the need to coordinate schedules to head out to sea at the same time on different vessels and “meet on the bottom”.

Due to a lack of internal dive capacity, DPNR often engages members of the commercial fishing community in dive operations. These dives are an important component of trust building and sharing between DPNR and the fishing community, and should DPNR seek formal certification of its dive program, these activities could be threatened. DPNR and the larger reef management community have been aware of the need for a reciprocal dive program for many years and should not let this impediment stand in the way of reaching a solution. DPNR, NPS and other potential dive partners, perhaps within the context of the VIMPAN, need to constructively evaluate and discuss this issue to arrive at a definitive answer as to whether or not to pursue formal dive program reciprocity. If the decision is to not pursue reciprocity in the near term, then a date (e.g. in 5 years) should be set to revisit this topic.

Recommendation 6.5: Strengthen and Reinvigorate VICRAG and VIMPAN

The Virgin Islands Coral Reef Advisory Group (VICRAG) consists of the Directors of CZM, DFW and DEE, and representatives from the Center for Marine and Environmental Studies (CMES) at UVI, the VI Experimental Program to Stimulate Competitive Research (VI-EPSCoR) and TNC. VICRAG serves the roles of advising the directors and the Commissioner of DPNR on strategic priorities and funding strategies, among other matters. While VICRAG has not been meeting lately the members routinely interact with each other at various meetings. There is an opportunity to reinvigorate VICRAG and clearly define its role and governance structure and how it would ideally advise the Directors and the Commissioner. Ideally there would be clear channels of communication from VICRAG to the sitting Governor and possibly to the legislature. Additional strategies are noted in section 4.0 as part of a long term recommendation.

Similarly, the development of VIMPAN, particularly as a potential model for collaboration and integration across agencies, should be supported. Define a code of conduct for collaboration that could be a model that network members use to build consensus that could then be applied to marine park units such as STEER, STEEMP, Coral Bay, Fish Bay, and Buck Island/Salt River NPS Units. This recommendation is further detailed in Section 4.0. Ideally, such a code of good conduct would serve as an accepted norm for collaborating on issues from improving messaging across units to collaborating on research and law enforcement.

Recommendation 6.6: Support and Encourage Local Leaders

Experience in the territory has shown that the success of watershed scale reef programs, such as Coral Bay and St. Thomas East End Reserve are highly dependent on having skilled, motivated people in leadership positions. Smaller and less accomplished programs at the scale of homeowner associations, particularly on St Croix, would benefit from having leaders from established and successful programs such as Sharon Coldren from Coral Bay or Anne-Marie Hoffman from STEER attend their meetings and share lessons learned and success stories.

Recommendation 6.7: Support and Encourage Regional Partnerships

Further support the continuation of fisheries advisory committees (e.g. trap and effort reduction committees) that bring together different voices and perspectives and provide input to the DPNR Commissioner and the Caribbean Fisheries Management Council. Once again, capacity to improve meeting effectiveness was identified as a gap that can

be closed with a more effective process for creating dialogue, improving decision-making, and ensuring that meeting results are translated into meaningful and tractable action items and outputs.

Continued involvement in “NOAA in the Caribbean” would build upon a recent conference held in USVI and identify specific areas where this regional meeting can assist with building capacity. These efforts should align with NOAA’s Caribbean Strategy and vision from the Ocean Council to make clear the commitment across NOAA line offices to the Caribbean Region. Such an effort is a model for other federal agencies to sum up the aggregate activities in a particular jurisdiction and better link and engage with local jurisdictional partners and clearly share plans for what they are currently doing, what kinds of things they can assist with, and listening to jurisdictional partners who are saying to the federal partners “we need your help with this”.

According to the TNC website,

In May of 2008, the Bahamas’ government, alongside leaders from Jamaica, Grenada, the Dominican Republic, and St. Vincent and the Grenadines launched the Caribbean Challenge, a region-wide campaign to protect the health of the Caribbean’s lands and waters. To date, participating governments in the Caribbean Challenge include: Antigua and Barbuda, The Bahamas, Cayman Islands, the Dominican Republic, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines.
(<http://www.nature.org/ourinitiatives/regions/caribbean/caribbean-challenge.xml>)

Becoming active in the Caribbean Challenge could make new sources of sustainable funding available for MPAs in the USVI.

3.4.3 Bureaucratic and Staffing Processes and Procedures

Interviewees were all but unanimous in stating that the process whereby the DPNR accepts, manages and disburses federal funds from NOAA targeted for reef conservation projects (generally to specific Divisions within DPNR itself) is not working satisfactorily. This is a common state of affairs in large, complex and diverse organizations such as DPNR (Conklin 2005) and should not be construed as a criticism of DPNR staff. Nonetheless, it is a serious problem within the Department and has the negative effect of reducing morale and job satisfaction. Capacity needs to be built within DPNR to critically examine its bureaucratic processes and procedures and develop actionable solutions to address this issue.

Many interviewees also expressed that the process by which staff at DPNR are hired and retained is problematic and that it is compromising the capacity of the agency. This is manifested in several ways, including very long times to hire staff after a funded job opening is announced (often longer than one year), poor retention of qualified, and especially technical, staff, and a lack of qualified applicants with strong local ties to the USVI. We heard several anecdotes of DPNR programs obtaining funding to hire staff but ultimately having to return the funding to NOAA owing to the extremely long delay in hiring, resulting in the time to administer the grant expiring before the bureaucratic hiring process could be completed. This problem may be exacerbated by procedures that exist outside of DPNR, including within the Division of Personnel, which adheres to inflexible guidelines that compromise efficiency and expediency in the hiring process for DPNR employees.

Together, the issues of problematic bureaucratic function and staffing procedures were among the most consistently mentioned themes in our interviews. Some of these problems are essentially internal to DPNR and can be address by targeted reforms within the Department. Others are external to the Department, and relate to more systemic issues at

the scale of the territory, including a lack of high-quality local applicants for natural resource management and technical positions and a persistent “brain drain” in which many of the most qualified potential employees are eager to leave the USVI for what they perceive are better opportunities off-island, and either do not consider local employment or leave after a short period of service.

Finally, several interviewees also commented that decision-making regarding the costs and benefits of maintenance spending is not optimal. We learned of several instances where vessels, motors, and other equipment was rendered inoperable, or even “a total loss”, for want of relatively inexpensive and presumably cost effective maintenance spending. There is a perception that many DPNR staffers are overly cautious in the wake of earlier financial scandals at DPNR and demand excessive justification and may perceive risk in approving basic expense requests.

There is capacity in the system for administrative effectiveness and there are numerous examples. What we believe is most important is the expressed willingness of Commissioner Barnes and her Chief Financial Officer (CFO) to address the overall flow of the administrative system and establish clear standard operating procedures.

Recommendation 6.8: Improve Administrative Function and Hiring/Staffing Procedures at DPNR

- Near-term: Commissioner Barnes and DPNR CFO Millin should be briefed on the impacts of bureaucratic inefficiencies and be actively involved in developing solution strategies. Due to the widespread and ingrained nature of this problem, a trained facilitator from outside of DPNR would increase the likelihood of success and adaptation in the system.
- Medium-term: Bureaucratic inefficiencies and staffing issues should be explored and discussed in a facilitated, cross-level forum to help improve transparency, gain a shared understanding of how this issue affects program managers, and develop a shared commitment to update and amend processes and procedures, including the development of unambiguous standard operating procedures (SOPs). To the extent that problems are perceived to exist outside of DPNR (e.g. problems within the Division of Personnel exacerbating hiring delays), appropriate representatives from outside agencies should be brought into the facilitated forum.

Such a facilitated, targeted and limited training to streamline bureaucratic function and hiring practices, bringing together program managers, financial staff and high level leaders, could yield very real and tangible benefits that will improve coral program success and lead to improved morale and performance across the Department.

Recommendation 6.9: Depoliticizing/Improving Selection Process for DPNR Directors and Assistant Directors:

Currently DPNR Directors and Assistant Directors serve at the discretion of the governor, resulting in the potential for rapid turnover and the loss of program continuity as well as the potential for the placement of Directors that lack the appropriate educational and professional training. This situation could be improved by critically evaluating the process by which Directors are appointed, potentially including 1) creating classified Director (or Assistant Director) positions that do not change with the governor’s election cycle and 2) creating specific Terms of Reference and professional qualifications (e.g. educational training and attainment, years of service in natural resource management, etc.) for these positions, ensuring the selection of highly qualified individuals in these technically demanding positions.



The USVI J-CAT meets at the University of the Virgin Islands on St. Thomas. Photo Credit: SustainaMetric

3.4.4 Completing the Management Cycle

For many USVI coral activities, issues have been identified and excellent program plans prepared. However, formal adoption and funding often falls short of program needs, and implementation proceeds at a lower level than envisioned, or, occasionally, not at all. We refer to this as the “implementation gap” and find it to be a common problem in the USVI. Many of our interviewees had been involved with project and program plans that “sit on the shelf,” never implemented. This situation often leads to “planning fatigue” among stakeholders, with attendant losses in morale and commitment.

Specific examples include:

- The Areas of Particular Concern (APC) program traces its roots back to the late 1970s, and management plans were written for each APC in the 1990s. While a small number of these plans have been partially implemented or incorporated into other planning efforts that have been partially implemented, overall, many aspects of the APC program have gone through repeated cycles of planning and reevaluation with only limited results on the ground.
- So many abortive attempts have been made to create and adopt a “Comprehensive Land and Water Use Plan” that the phrase itself is considered “tainted” by some and “needs to be dropped” in favor of another name (quotes from DPNR staff and managers).

- Rutgers University was commissioned to conduct a thorough review of zoning regulations. These recommendations have not been acted upon and the review is in danger of becoming “another study on the wall that cost \$100s of thousands.” (NGO staff).
- “Too many plans provide a false sense that things are getting done” (UVI faculty members).

Perceived examples of capacity that exists in the system include the following:

As the timeline shows, there are also many positive examples of where projects have been designed based on local issues, a formal plan developed and adopted, implemented and features a reflection/evaluation exercise to learn from what happened. Indeed, it was the conclusion of the J-CAT that there is strong competency and capacity within the network of partners to first test projects at the pilot scale and learn from them. Unfortunately, many remain there without further resources, formal commitment or financial support to scale up.

These examples should be recognized and replicated as possible in the future. Additionally, creating realistic plans with achievable goals, as recommended in Section 3.5.1 Goals, below, should reduce the implementation gap and improve planning and the achievement of goals going forward.

3.5 Analysis of the Enabling Conditions

3.5.1 Goals

A set of clearly expressed and unambiguous goals must be present for successful coral management. Certainly, the PSD and the process that led to it, under CRCP’s guidance, is an excellent example of the system recognizing this need and working pro-actively to fill it. The document is well organized and logically presented, and lays out clear and unambiguous goals for the system. Importantly, it recognizes the key link to NOAA’s National Goals and Objectives, while specifically encouraging the partners to address local jurisdictional priorities. This linkage across both local and national scales is a key feature intended to “increase efficiency and leveraging of resources available for coral reef conservation” (USVI Priority Setting Document p. 18) and seems to be accomplished through the coordination of the NOAA Coral Liaisons. Recommendations are forthcoming (anticipated summer 2013) by this consultant team on potential capacity building strategies to further enhance this function of linkage to and coordination with National goals and objectives.

Building off of the priority setting process in USVI, the territory, in conjunction with external consultants, also produced detailed management plans and LASs for the four priority sites chosen in the PSD. These documents also lay out clear and detailed goals (often a reiteration of the PSD goals), supported by a range of proposed projects intended to build toward accomplishing the goals. As intended, these projects become the basis for the NOAA Cooperative Grant (as well as the basis for grants that seek other sources of funding) to support coral reef management and are often negotiated with NOAA Liaisons to ensure that adequate capacity is in place. Part of the purpose of this capacity assessment is to help identify where capacity gaps exist and to identify where capacity-building strategies may better align with implementation.

Simply identifying and agreeing to priority sites and following up with the LAS and the site management process is a positive step that recognizes capacity is limited and focuses limited resources. Explicit directions are often included in the documents to produce “a written plan that has ... a realistic assessment of required resources (funding, staff, capacity needs)” as described in the 2010 Coral Bay LAS 2010. In general, the process of developing these

management plans, particularly at STXEEMP and STEER has been an inclusive and positive process that identifies key short-term goals and objectives and defines an implementation plan that intends to be consistent with capacity. Implementation of the LAS plans reveals a range of other capacity gaps of essential key partners, such as the lack of sufficient capacity within DPNR to meaningfully engage in priority site projects such as Coral Bay or Fish Bay on St. John.

Recommendation 6.10: Realistic Goal Setting With Reference to Reef Health, Human Well Being

Overall, the coral reef management system in USVI has not lacked for the formation of clear and unambiguous goals. Rather, the focus, going forward, should be on the creation of near-term, achievable goals and proposed projects linked to those goals that are better matched to the currently existing capacity within the system in question. While direct cause and effect relationship of specific actions should not be measured against reef health and human wellbeing, we believe the specific conditions of the coral reefs, and the goods and services that people derive from them, could be made more explicit at each of the priority sites. This is not intended to be the exclusive measure for management effectiveness. Clearly, there are many stressors, impacts, and drivers at multiple scales and across multiple dimensions that affect both reef health and societal wellbeing. Nevertheless, the opportunity exists for partners involved in coral reef management at USVI to include a summary of the condition of the adjacent reef, and goals for management, as well as the benefits to local community, to make explicit the linkages between management actions, reef health and societal wellbeing. For example, a key partner in this endeavor would be staff at UVI who could describe both the reef health at each of the priority sites and specific societal benefits for improved coral reef management.

3.5.2 Constituencies

It is broadly accepted throughout DPNR and among other actors in the reef management system, including essentially all of our interviewees, that building broad-based support for reef conservation, and natural resource conservation generally, among a wide range of constituencies is a critical prerequisite for any successful reef conservation initiative. This is well known to CRCP and is addressed under Goal 2: Education and Outreach (and associated Objectives) of the PSD, as well in a more theoretical fashion in Appendix Two of that document.

Perceived difficulties in building constituency support include:

- USVI residents are characterized by highly heterogeneous communities with strongly varying knowledge of, and opinions about, coral reefs and measures to manage them. Only 48% of Virgin Islanders are native born and residents hail from multiple locations throughout the Caribbean and beyond (coris.noaa.gov/activities/coral_demographics/09_USVI.pdf). Demographic and socio-economic conditions vary widely across the territory's three islands. Similarly, tourists arrive on the islands with different itineraries and attitudes. Reaching these diverse stakeholders is a complex challenge.
- It was often stated that young Virgin Islanders are increasingly disconnected from natural resources and many do not appreciate nature. A separation from nature is viewed in some circles as a status symbol.
- MPAs, including STXEEMP, Buck Island and the Virgin Islands National Park, have struggled to demonstrate benefits, such as increased fish populations or improved coral health (which realistically will take many years), as the result of management measures that have required public sacrifice. This undermines public support for regulations that restrict access and limit allowed activities in reef areas.

- With unemployment in the USVI at 9% (usviber.org/UN12.pdf) and likely to rise, and the recent closing of HOVENSA, residents are desperate for economic development and jobs and see environmental conservation as an impediment to both. DPNR is viewed by some as anti-development, which leads to resentment of regulations and a lack of public support for restrictions in reef use.
- Many key decision makers, including senators and judicial employees, are poorly informed about natural resource issues and do not understand or appreciate the negative impact of activities such as illegal fishing and why the impacts matter.
- DPNR is primarily a technical agency and its capacity to communicate natural resource issues effectively is limited. The Department's capacity to create public information campaigns does not meet current needs and existing capacity is dispersed, including within DFW's Bureau of Environmental Education, the public information officer in the Commissioner's Office and elsewhere.

Examples of capacity that exists in the system include the following:

A range of education programs exist at University of Virgin Islands (i.e. NSF RISE project) that provides local students exposure to fisheries and natural resource management and opportunities to participate in related research even if they came in with a different focus of study. For example, Lia Ortiz became part of the RISE program in 2004 and began with an interest in biomedical science and ended up doing population genetics research in fisheries. Today she is a well-regarded NOAA Fisheries Liaison who interacts easily with fishers from both communities of St. Thomas and St. Croix and provides fisheries content and cultural expertise.

The NOAA Coral Management fellowship program that started in 2003 with a goal to provide opportunities for local residents to experience coral reef management, but the reality was over 90% came from off-island because it is so hard to find qualified local applicants. However, this opportunity brought people such as Susan Curtis to USVI who then helped to develop a series of projects and networks such as VINE (VI Network of Environmental Educators) which is functioning today across multiple agencies and connecting reef education with thousands of youth.

Migdalia Roach, who is from USVI, started her service as an administrative assistant for DPNR CZM at the STXEEMP and was trained by NOAA Fellow Karlyn Langhar to take over in the role of community outreach coordinator there. With each new opportunity she's been given, she has risen to the challenge and has become a stellar example of someone who was born and raised in the USVI and is now an active member of the coral conservation community. During a peer-to-peer exchange, she learned about a "traveling trunk" used in Florida, and she created one for the St. Croix East End Marine Park. She's planning to travel to Florida to see some of the programs they have implemented using the traveling trunk, shadow some of the education and outreach colleagues at schools and parks and learn about the signage they have associated with it.

There are several programs such as Reef Jam/Reef Fest (<http://reefjam.com/>) that are designed to reach the broader community and encourage stewardship. The programs target specific schools and provide follow-up with the students so they can see the same person on an on-going basis. VINE and SEA teamed up to work with a local high school to develop a presentation/drama that reflects economic opportunities from coastal resources and involves the creation of murals, formal presentations, poster sessions etc. One leader of SEA noted that "We need to show that reef conservation has economic value – otherwise forget it." There is a small but growing trend on St. Croix to do "Reef Raps" at parties that follows on a program at Reef Jam where teens competed on rap songs about coral reefs.

Commissioner Barnes recently assigned all her directors and senior staff who attended schools in the USVI to give presentations about their careers. Roy A. Pemberton Jr. presented at his school and described it as an “outstanding experience to be back in the same classroom talking to them about my life. I was one of them not too long ago. It was surreal.”

As a young student in the USVI, Makeda Okolo was invited by SEA to be involved in a mangrove restoration project. She had an outstanding experience and according to SEA staff, it was a key factor motivating her to pursue a legislative career that contributes to protecting the natural resources of the USVI. She is currently working in DC as the primary point person for USVI Delegate Donna Christensen on energy and conservation issues.

These successes should be celebrated as best practices and emulated throughout the system in the future, as possible. Many such strategies are included in this report, including under Recommendation 1 Reduce Land-based Sources of Pollution / Improve Water Quality, Recommendation 2 Education and Outreach, Recommendation 3 Compliance and Enforcement and Recommendation 4 Reduce Fishing Impacts.

3.5.3 Commitment

Building formal commitment for improved coral reef conservation within the USVI government, both within the highest levels of DPNR, as well as within the broader territorial government, is a crucial prerequisite and persistent challenge for truly successful implementation of a coral reef management initiative. There is a strong feeling throughout the territory that there is an important window of opportunity at this time to build political will and capitalize on strengths currently present in the system. Most importantly, there is strong agreement in the system that many current decision makers in DPNR are highly trained and motivated, generally get along well, and have relevant skills and training, creating a unique opportunity to make progress now toward a common set of goals. It is noteworthy that Commissioner Barnes attended the Coral Reef Task Force meeting in DC in 2012, marking strong support from the USVI in the process of coral reef management and opening up new networks and opportunities for collaboration. For a variety of reasons, these opportunities are not always easy to coordinate, but they are crucial to building formal commitment.

Adding to a sense of collaboration is the fact that the global economic slowdown has caused a relative lull in development and development requests, creating some space during which the current cohort of decision makers can potentially advance policies supportive of enhanced reef conservation, and further make the case for sustainable development and enhanced coral reef management.

These positives notwithstanding, almost all of our interviewees raised the concern that with the upcoming election, the potential exists for a reduction of political will within the highest reaches of the USVI government which could have a range of different effects on reef management. Unemployment is high, the public is eager for jobs, and elected officials rightly see that a pro-development agenda will improve their electability. The essential challenge lies in creating the case that enhanced reef conservation will, in the long term, translate into real and meaningful improvements in the welfare of the territory.

Specific examples and indicators of where political will effects reef conservation include:

- DPNR Commissioner and Directors are political appointees. This can result in instances when the technically strongest candidates for important positions relevant to reef management are not chosen for the

job and a current cohort of strong directors is replaced by a new cohort that requires time and effort to regain positive momentum.

- The vast majority of reef conservation funds spent by the territorial government are largely “pass-throughs” from federal agencies (predominantly NOAA), creating a dependency on federal funds with minimal requirements to allocate scarce locally sourced funds for reef management.
- The judiciary is best described as uneven as it relates to strict enforcement of natural resource violations.
- Many plans and programs are initiated and developed on paper, but never achieve a formal mandate from the legislature and/or are not codified by the appropriate authority. Examples include the Areas of Particular Concern (APC) program and the Comprehensive Land and Water Use Plan, among others.
- DPNR is charged with considering both the economic development and natural resource conservation implications of its actions, and must balance these often-contradictory imperatives.

Recommendation 6.11: Explore Alternate Funding Strategies and Track Progress to Protected Area Goals

USVI has been a global model in formal commitment to marine protected areas for coral reef conservation. This trend has been expressed through various ways since 1960 and has included proclamations by the President of the United States, the USVI Governor, multiple federal agencies and territorial agencies. This has resulted in a rather impressive range of protected areas, currently being planned as an integrated network (discussed in more detail later in this document), that may one day be guided with formal commitment toward a common goal. If such a network is to be supported through formal commitment and common goals then it must have a linked sustainable financing strategy. Developing sustainable funding strategies has proved problematic for MPAs around the world.

For some of the more innovative approaches, such as blue carbon trading and payment for ecosystem goods and services, capacity would be needed to attract and administer such relationships, including leveraging additional government and donor funds, NGO grants and private and voluntary donations, from both international and domestic sources. With over 2.5 million tourists visiting the USVI each year, the territory has the opportunity to build capacity to take advantage of innovative potential funding sources, including tourism user fees, tourism and entry/exit fees, mooring user fees, as well as mechanisms for generating funding to encourage conservation activities, including cost and benefit sharing, investment and enterprise funds, and fiscal instruments and arrangements for private or community management of marine protected areas and facilities. There are a range of lessons to be learned from the NPS Buck Island and Salt River experience of outsourcing concessions. These potential sources of income should be carefully studied and presented to both the current and future Governor with the goal of gaining formal commitment for raising funds dedicated directly to reef conservation and management programs. A Protected Area Trust should be investigated as a potential mechanism to gather and disburse funds raised through the novel strategies recommended here. The Nature Conservancy was recently funded to create sustainable finance plans for STEER and STXEEMP. These documents appear to still be in draft form and should be finalized under the terms of the award that supported them.

4.0 Proposed Long-term Strategy for Building Capacity in USVI

The previous section features a set of short and near-term tactical capacity building recommendations that are possible within the current governance, institutional and organizational contexts. The focus is on implementing a set of actions that, if implemented, would likely add building blocks of adaptive capacity that addresses the current challenges of coral reef management. While there are no panaceas or “silver bullets” for building capacity for coral reef management, the recommendations are mainly aimed at DPNR and current partners in coral reef management in USVI to provide a 1-3 year road map of what could be accomplished to increase capacity in the near term. This section presents a more integrated and strategic approach for how to implement and track the sets of recommendations and develop longer-term capacity building strategies (3-10 years). This section places greater emphasis on the appropriate scale, ideal home, social networks, institutional structures, range of programs, and funding implications for over-seeing capacity building efforts.

4.1 Commitment to Periodic Capacity Needs Assessment

Central to the future of coral reefs is the question: does USVI have the adaptive capacity to cope with and adapt to the long-term pace of ecosystem change that’s likely ahead and still have functional reefs to support a tourism economy, fishing communities and a way of life? The answer to this question lies in both adaptive capacity to embrace change and the resilience of the governance structures within which such capacity is built. Great progress has been made in developing a range of management responses to coral reef condition but the proper fit, interplay and scale of governance will likely be an issue into the future. We recommend using a range of effective diagnostic methods¹ to periodically assess the capacity to manage coral reefs and the governance structures within which they fit as a central feature of a long-term strategy. This would include a periodic review of the issues, such as every three to four years, and the degree to which the issues are important to key stakeholders. Such an assessment should include a review of the power relationships, effectiveness of enforcement and compliance, best management practices and the degree to which there is formal commitment and supportive and informed constituencies for sustained coral reef management. We recommend the Virgin Islands Coral Reef Advisory Group (VICRAG) facilitate the dialogue and invite other key stakeholders from across civil society, market forces such as tourism and other forms of government.

Reengaging VICRAG to specifically oversee a periodic review of coral reef management capacity would serve to clarify purpose for the group beyond their advisory role and link with review and advice for grants, cooperative agreements etc. Terms of reference for serving on the group and active chair (such as the coral reef coordinator position within CZM of DPNR) are good starting points. Such an effort would build on the success of VICRAG since its inception in 2008 such as reorganization of coral initiative, defining of priorities goals and objectives, and the local action strategy plan.

¹ The methods used for this capacity building assessment could serve as a baseline from which to measure future changes, particularly if analysis of governance structures is featured as a unit of analysis.

4.2 Build Capacity for Ridge to Reef Watershed Management

Ridge to Reef management is complex and multi-dimensional, requiring and a wide range of skills and a high degree of coordination. Capacity to do this work is building in USVI. We recommend a regular summit on the topic every two years, or so, to further learn from experiences at priority sites (Coral Bay, Fish Bay, STEER, STXEEMP). The physical location for the event would change across the three main islands and feature field trips, peer to peer mentoring and lessons learned. We recommend the focus on ridge to reef because we believe highly integrated and coordinated site-specific management actions at the scale of a watershed will make the most difference in USVI. Audience should include field operations staff, managers and policy/decision makers.

This recommendation underscores the importance and continued emphasis on priority sites as a more manageable landscape unit that illustrates the diversity of settings in which coral management is occurring and the effectiveness of management and governance strategies. It is in these reference sites that over the long term, monitoring and analysis should be focused to track efforts to adaptively and effectively steer management in response to the societal and environmental change that is likely to accelerate over the coming decades. It is also in these selected places where baselines of response to ecosystem change should be put in place to establish an objective, well-documented and long-term sources of learning, knowledge and adaptation. These would be focal points for both social and natural science research that are built around asking questions regarding effectiveness of management. Ideally, the reference sites provide a range of case studies that are going to be crucial for any kind of training program described below. Ideally, summarizing progress in Ridge to Reef management is shared and compared to what is happening in Puerto Rico, and possibly elsewhere in the Lesser Antilles.

Innovation in ridge to reef management strategies mark a transition away from conventional command-and-control approaches to more cross-sector and collaborative strategies that build upon strong social networks, feature shared goals, high quality collaborative processes, and effective community engagement. This is neither easy nor inexpensive but from all indications it is necessary to build a shared knowledge base of what seems to be working on the ground to steer communities away from harm and towards adaptation.

4.3 A Portfolio of Short-Term Training Modules

A key feature of a long-term capacity building strategy is an explicit focus on systematic learning that features a standard in-person training course, distance learning modules and events held as necessary to deal with current and emergent topics.

4.3.1 Standard USVI Coral Reef Management Training Course

On-site trainings are recommended to be conducted every two years, to respond to the staff turnover rate, and designed as a set of modules for USVI that address such topics as: drivers of coral reef decline, how to implement marine spatial planning, and improving fisheries landings data. Routine trainings are a well-established practice for building knowledge and skills for effective coral reef management and could feature a formal process for new staff (at all levels) to build a basic understanding of coral reef management issues and convey current knowledge and lessons learned.

There are many sources available for building a custom curriculum and lessons learned for structuring training modules. For example, the Coastal Resources Center at the University of Rhode Island is developing a set of modules for

the certification of professionals involved with MPAs. Custom modules for three levels of participants (field operations, management staff and policy and decision makers) have been prepared, applied and tested in East Africa. The CRC/WIOMSA certification program is only one source of training materials, there are many others that may be more appropriate for the USVI.

Rules for participation should enhance peer-to peer learning in the home office by applying the following conditions:

- Commit to staying on in the jurisdiction for two years (cannot be strictly enforced but presented as a general condition)
- Commit to sharing what has been learned with others involved in coral reef management
- Commit to completing, in a timely fashion, surveys that probe the benefits of such training

4.3.2 Produce Modules for Distance Learning

Create a set of pre-produced modules, such as courses that are filmed at the annual training institutes that are edited to optimize distance learning, and make them available on-line to staff from all levels (field operations, managers/directors, policy makers). These could include:

- Module on “the what”: causes and drivers of land based sources of pollution, fisheries impacts and effects of climate change;
- Module on the “the how”: policy cycle, marine spatial planning, marking marine zones, building political will, developing social media campaigns, improve quality of fisheries landings data;
- Module on sustainable financing and coordination of funding across agencies. Currently agencies do routinely connect on project specific examples, but a module on coordination of funding strategies will be needed as no single grant, federal program or even market-based strategy or innovative partnership (i.e. public-private, private-social, cooperative) will suffice. A portfolio of strategies is needed to address long-term financial support for sustained efforts to manage coral reefs. Recent effort on the sustainable financing strategy for the St. Croix East End Marine Park is one expression of such an effort dedicated to creatively support the territorial initiative;
- Module on fostering collaboration and trust that includes essential elements of effective meetings, fostering effective dialogue, conflict resolution, and decision-making;
- Module on codification of good practices for coastal zone management, marine protected areas etc. are made available to staff and the subject of mini-courses and trainings, an example is Code of Conduct for Responsible Fisheries (FAO 2007); and,
- Modules on dealing with persistent administrative barriers such as staff turnover, improved collaboration, better meetings, integration across agencies, and writing SOPs (standard operating procedures).

Materials for these types of modules may require custom production or may be available from a wide variety of sources such as Sea Grant, NOAA’s Coastal Services Center, Center for Watershed Protection, Caribbean Sea Large Marine Ecosystem, International Waters Learning Exchange and Resource Network (IWLEARN), and UN Train Sea-

Coast. There are a growing number of publications that would be useful in developing these modules to build capacity and therefore do not bear repeating here².

4.4 Use Complex Projects as Capacity Building Case Studies

There are examples of reef management initiatives that illustrate the challenges of design and implementation that serve as case studies for examining what works and why. In the USVI there are several potential initiatives that could be the subject of broader analysis to examine in more detail specific challenges that have prevented implementation. These could be joint exercises with UVI and DPNR staff as a learning tool for students, managers and decision-makers to specifically focus on what capacities are needed to move an initiative through the five-step management cycle of issue analysis, program planning, formal approval, implementation and evaluation.

We recommend the Areas of Particular Concern as an ideal case study topic as it has a long and rich history, it is currently in use today, but since it was never formally approved it serves as an outstanding example of a well-intentioned program stuck in the implementation gap. A second case study that is potentially challenging but could benefit from a case history is the Salt River Bay NPS site that features both land and sea and is jointly managed by both NPS and DPNR. Such a case study, approached in a learning orientation, could allow all parties to contribute to a sober view of what the potential for collaborative and integrated management could be.



Sunrise over St. Thomas, USVI. Photo Credit: SustainaMetric

² Reef Resilience Tool Kit, How's My MPA Doing, Healthy Reefs Healthy Communities, International Waters Experience Notes, World Fish Centers Lessons Learned 1804, Great Barrier Reef 2009 Baseline, GEF's International program

4.5 Strategies for Cultivating Local Leaders

The USVI has produced a range of local leaders in coral reef management serving a wide range of roles in government, civil society and market forces (see Appendix B for a representative, but by no means complete list). Leaders are experienced communicators, effective collaborators and play a central role in navigating support for a plan of action. While examples abound in the current USVI coral reef network, developing, mentoring and rewarding emerging leaders is essential. While creating feeder networks is a persistent barrier, there are a growing number of young people who are emerging leaders from USVI. Such young leaders are models for working effectively within the community, serve as potential mentors, and are role models that can motivate future leaders. Traditional approaches of peer-to-peer exchanges, participating in learning journeys, and further investment in professional development are sound. However, we recommend specific criteria to guide, encourage and reward young leaders. While a wide range of literature exists, the following set of leadership characteristics from the NRC (2008) resonates particularly well for USVI:

- Critical and reflective thinking and a willingness to challenge the status quo and invite inquiry into potential new ways of doing and seeing;
- Ability to see the big picture, as well as the parts and their interrelationships – also known as system orientation;
- Skillful and honest communication, including listening skills and the ability to speak and write with clarity, vision and purpose;
- Openness to the diversity of world views and perspectives and ability to make choices, especially when a decision goes against popular thought or opinion; and,
- Ethical foundation of word and action to navigate the political arena without susceptibility to corruption.

4.6 Principles of Building Adaptive Capacity

A summary set of principles to undergird a long-term capacity building strategy is as follows:

Principle #1: ISSUES MATTER! Building adaptive capacity needs to be directed at a set of issues, as described in detail in section 3.0 of this report. There should be direct links between the issues and this strategy. Issues should matter most to the people of the place and represent both challenges and opportunities. Issues change and may become more or less important over time and new ones will form in the coming years, some through crisis and others gradually over time. Therefore an adaptive strategy is needed to respond to the range of issues associated with management of coral reefs.

Principle #2: WHO'S THE AUDIENCE? Once the issues are identified, an assessment of capacity needs should follow that is directed at the appropriate “levels” in the management system (field operations, managers, decision makers). Capacity building can be directed at an individual, groups, teams, organizations, and across networks. What matters most is defining who currently needs the capacity and who may need such capacity in the future.

Principle #3: CAPACITY TO DO WHAT? Once the audience has been identified, the questions center around defining what capacity is needed and what it will accomplish. Identifying the competencies that are desired in precise terms is essential and best accomplished with clear and unambiguous goals.

Principle #4: CONTEXT IS KEY. There is no “one” strategy to build capacity, and if one strategy works well in one location, it may or may not work well elsewhere. Given the complexities in coral reef management, bundles of capacity building strategies are needed that fit in the local context, are timely, appropriate and balanced across audiences. While basic capacity building needs in USVI are mostly similar across the territory, issues play out differently across the mosaic of contexts on St. Thomas, St. John or St Croix.

Principle #5: LONG-TERM AND SUSTAINED, BUILT ON SUCCESS. A long-term and sustained commitment to building capacity must address frequent staff turnover, shifts in the social and environmental issues, ongoing learning and the need for adaptation. Fortunately, such a long-term perspective seems to be evidenced across current federal, territorial and NGO partners. Such a long-term strategy must be built on successes within the USVI to keep momentum strong.

Adaptive capacity is about building resilience and becoming less vulnerable to disturbance or change. While capacity is largely determined by the resources that are available to the system (e.g. technical, financial, social, institutional, political and environmental), it is made functional by the social processes and governance structures through which the resources are employed and mediated. Therefore, this document attempts to link the analysis of issues that influence both the resources within the system and the organizational structures through which they are mediated.

Literature Cited

- Alexandridis, K., Duggy, J., Taverier, B., McCrae, K. and Ortiz, L. 2011. Studying the Historical Ethnoecology of the USVI - St. Thomas Fishing Community. Poster Abstracts, GCFI: 63
- Conklin, J. (2005) Dialogue Mapping: Building Shared Understanding of Wicked Problems, Wiley. Available from the CogNexus Institute at: <http://cognexus.org/wpf/wickedproblems.pdf>
- Coral Bay LAS 2010
- Food and Agriculture Organization of the United Nation, 2007. Implementation of the 1995 FAO Online available at <http://www.fao.org/docrep/005/v9878e/v9878e00.HTM>
- Great Barrier Reef Outlook Report 2009 / Great Barrier Reef Marine Park Authority.
- Hernández- Delgado, E. A., Ramos-Scharrón, C. E., Guerrero-Pérez, C. R., Lucking, M. A., Laureano, R., Méndez-Lázaro P. A., and Meléndez-Díaz, J. O. (2012). Long-Term Impacts of Non-Sustainable Tourism and Urban Development in Small Tropical Islands Coastal Habitats in a Changing Climate: Lessons Learned from Puerto Rico, Visions for Global Tourism Industry - Creating and Sustaining Competitive Strategies, Dr. Murat Kasimoglu (Ed.), ISBN: 978-953-51-0520-6, InTech, Available from: <http://www.intechopen.com/books/howtoreference/visions-for-global-tourism-industry-creating-and-sustaining-competitive-strategies/long-term-impacts-of-non-sustainable-tourism-and-urban-development-in-tropical-coastal-habitats-in-a>
- Fourth Assessment Report (AR4) of IPCC 2007 Adaptive Capacity & Environmental Governance, Armitage, D. and Plummer, R. (Eds). Springer Heidelberg, Dordrecht, New York. 307 p.
- Lemos M.C., Boyd E., Thomkins E.L., Osbahr H., Liverman D. (2007). Developing Adaptation and Adapting Development. *Ecol Science* 12(1):1.
- Linden, Larry, Steve McCormick, Ivan Barkhorn, Roger Ullman, Guillermo Castilleja, Dan Winterson, Lee Green. 2012. A Big Deal for Conservation. *Stanford Social Innovation Review* Vol. 10, Number 3.
- Matthews and Syndesmith (2010). Chapter 11 in Adaptive Capacity & Environmental Governance, Armitage, D. and Plummer, R. (Eds). Springer Heidelberg, Dordrecht, New York. 307 p.
- National Research Council (2008) Increasing Capacity for Stewardship of Oceans and Coasts: A Priority for the 21st Century, National Academy Press.
- Olsen, S.B.; Page, G.G. & Ochoa, E. (2009): The Analysis of Governance Responses to Ecosystem Change: A Handbook for Assembling a Baseline. LOICZ Reports & Studies No. 34. GKSS Research Center, Geesthacht, 87 pages.
- Smith et al. (2001) in Adaptive Capacity & Environmental Governance, Armitage, D. and Plummer, R. (Eds). Springer Heidelberg, Dordrecht, New York. 307 p.
- Swanson et al. (2007) in Adaptive Capacity & Environmental Governance, Armitage, D. and Plummer, R. (Eds). Springer Heidelberg, Dordrecht, New York. 307 p.
- Rogers, Caroline S., Erinn Muller, Tony Spitzack, and Jeff Miller. 2009. Extensive coral mortality in the US Virgin Islands in 2005/2006: A review of the evidence for synergy among thermal stress, coral bleaching and disease. *Caribbean Journal of Science*, Vol. 45, No. 2-3, 204-214.
- Roopnarine, Lomarsh. 2010. Social Identity in the Modern United States Virgin Islands. *Social Identities*. Vol. 16 no. 6. P. 791-807.
- Stoffle, Brent, James R. Waters, Susan Abbott-Jamieson, Shawn Kelley, David Grasso, Joy Freibaum, Susanne Koestner, Nate O'Meara, Sita Davis, Marissa Stekedee, and Juan Agar. 2009. Can an Island be a Fishing Community: An Examination of St. Croix and its Fisheries. NOAA Technical Memorandum NMFS-SEFSC-593, 57p.
- Towle, Edward J. 2003. History of Protected Areas Initiatives in the U.S. Virgin Islands. Island Resources Foundation Occasional Paper Series #58.
- Whitmore, M, and De Lacy, T. (2004). Sustainable development and management of tourism in Moreton Bay: Executive Summary. Sustainable Tourism CRC, Brisbane, Australia, pp. 1-23
- World Fish Center (2008). Lessons Learned and Good Practices in the Management of Coral Reefs. Lessons Learned #1804. World Fish Center, Penang, Malaysia. Available at: http://www.reefbase.org/gefil/pdf/lessonslearnedbrief_English.pdf

For More Information

Pomeroy, R.S., Parks, J.E. and Watson, L.M. (2004). How is Your MPA Doing? A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Areas Management Effectiveness. IUCN, Gland Switzerland and Cambridge, UK.
<http://www.mangrovesforthefuture.org/RTC-documents-resources.htm>

International Union for Conservation of Nature (IUCN). Establishing Payments for Watershed Services. IUCN Water and Nature Toolkit Series. <http://www.iucn.org/about/work/programmes/water/resources/toolkits/?4914/Pay--establishing-payments-for-watershed-services>

IUCN World Commission on Protected Areas (IUCN-WCPA) (2008). Establishing Resilient Marine Protected Area Networks – Making it Happen. IUC-WCPA, National Oceanic and Atmospheric Administration and The Nature Conservancy. Washington, D.C.
http://cmsdata.iucn.org/downloads/mpanetworksmakingithappen_en.pdf

Reef Resilience. Building Resilience into Coral Reef Conservation. The Nature Conservancy. <http://www.reefresilience.org/>

Aaronson, D. and M. Manuel (2008). Conservation Easements and Climate Change. Sustainable Development Law and Policy, Winter 2008.
<http://www.goldbergkohn.com/assets/attachments/110.pdf>

The Nature Conservancy. Private Lands Conservation: Conservation Easements.
<http://www.nature.org/aboutus/privatelandsc Conservation/conservationeasements/>

The Nature Conservancy (2008). Marine Conservation Agreements: A Practitioner's Toolkit. <http://www.mcatoolkit.org/>

The World Bank. Best Practices in PES [Payment for Ecological Services] Design.
<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTTEEI/0,,contentMDK:20487921~isCURL:Y~menuPK:1187844~pagePK:210058~piPK:210062~theSitePK:408050,00.html>

Cambers, G. (1998). Coping with Beach Erosion. Environmental Development in Coastal Regions and in Small Islands. UNESCO.
<http://www.unesco.org/csi/pub/source/ero1.htm>

Caribbean Disaster Mitigation Project. Hazard-resistant Construction. Organization of American States.
<http://www.oas.org/cdmp/safebldg.htm>

Simpson, M.C., S. Gossling, D. Scott, C. M. Hall and E. Gladin (2008). Climate Change Adaptation and Mitigation in the Tourism Sector: Frameworks, Tools and Practices. UNEP, University of Oxford, UNWTO, WMO: Paris, France.
<http://www.unep.fr/scp/publications/details.asp?id=DTI/1047/PA>

Parish, F. (2006). Coastal Greenbelt Initiative: Development of green belts to protect coastal communities and resources. Global Environment Centre. <http://www.fao.org/forestry/media/12692/1/0/>

Allison, E.H. et. al. 2005. Effects of climate change on the sustainability of capture and enhancement fisheries important to the poor: analysis of the vulnerability and adaptability of fisherfolk living in poverty. Summary Report Project No. R4778J. Fisheries Management Science Programme Department for International Development. http://www.fmsp.org.uk/Documents/r4778j/r4778j_1.pdf

Daw, T., N. Adger, K. Borwn and M. Badjeck. Paper 2: Climate Change and Capture Fisheries – impacts, adaptation, mitigation, and the way forward. University of Newcastle upon Tyne, WorldFish Centre.
http://www.fao.org/fileadmin/user_upload/foodclimate/presentations/fish/Daw.pdf

Food and Agriculture Organization (FAO) (2006). Building Adaptive Capacity to Climate Change- Policies to sustain livelihoods and fisheries. New Directions in Fisheries – A series of Policy Brief on Development Issues, No. 08. Rome. 12 pp.
www.fao.org/hivaid/publications/Policy_Brief-Final_En.pdf

The Worldfish Center: Adapting to Climate Change: <http://www.worldfishcenter.org/>

General Approaches to Addressing Mariculture as an Element of Integrated Coastal Management programs
<http://www.crc.uri.edu/index.php?themeid=1>

Bien A. (2007). A Simple User's Guide to Certification for Sustainable Tourism and Ecotourism Center or Ecotourism and Sustainable Development. 3rd Edition. <http://www.iadb.org/IDBDocs.cfm?docnum=1028822>

Deutsche Bank Research (2008). Climate Change and Tourism: Where Will the Journey Lead? <http://www.dbresearch.com/> (search title)

UNWTO, UNEP and WMO (2008). Climate Change and Tourism: Responding to Global Challenges <http://www.e-unwto.org/content/kk9027/?p=c9070dafc494bd39462e4d3431e84e4&pi=0>

Coral Reef Alliance (CORAL). Guidelines and Best Practices http://www.coral.org/resources/guides_best_practices

Bethke, L., J. Good and P. Thompson (1997). Building capacities for risk reduction. Disaster Management Training Programme. United Nations Department of Humanitarian Affairs. <http://www.pacificdisaster.net/pdnadmin/data/documents/635.html>

Rambaldi, G., M. L. Fernan and S.V. Siar (1998). Participatory Methods in Community-based Coastal Resource Management: Volume 2 Tools and Methods. International Institute of Rural Reconstruction (IIRR), Silang, Cavite, Philippines. <http://www.iapad.org/cbcrm.htm>

SERVIR Regional Visualization & Monitoring System. Regional modeling and visualization for Latin America, Caribbean, and Africa. <http://www.servir.net/index.php?lang=en>

Global Water Partnership (GWP). Toolbox for Integrated Water Resources Management. <http://www.gwptoolbox.org/>

McConney, P., R. Pomeroy and R. Mahon (2003). Guidelines for coastal resource co-management in the Caribbean: Communicating the concepts and conditions that favour success. Caribbean Coastal Co-management Guidelines Project. Caribbean Conservation Association, Barbados. <http://www.dfid.gov.uk/r4d/Output/54318/Default.aspx>

Olsen, S. ed. 2003. Crafting Coastal Governance in a Changing World. Coastal Resources Center, University of Rhode Island, Narragansett, RI. http://www.crc.uri.edu/download/Crafting_Coastal_Governance.pdf

Olsen, S., K Lowry and J. Tobey (1999). The Common Methodology for Learning: A Manual for Assessing Progress in Coastal Management. Coastal Resources Center, University of Rhode Island, Narragansett, RI. http://www.crc.uri.edu/download/SEL_003F.PDF

Encora. 2008. Coastal and Marine Wiki. Internet encyclopedia of information pages for and by coastal professionals providing up-to-date high quality Coastal and Marine information http://www.encora.eu/coastalwiki/Category:Coastal_management

UNESCO (2007). Sustainable development in Coastal Regions and in Small Islands. <http://www.unesco.org/csi/index.htm>

Knowledgebase for Lessons Learned and Good Practices in the Management of Coral Reefs. GEF Lessons Learned, the ReefBase Project. <http://gefll.reefbase.org>

Appendix A: Glossary

Adaptive Management: A central feature of the practice of any form of ecosystem-based management is that it must respond positively to changing conditions and to its own experience. In other words, the practice of coral reef management must be grounded in a process of learning and adaptation. Adaptive management is not reactive management whereby the practitioner simply responds to the unexpected. It is rather a conscious process of examining the course of events as they unfold at larger, or smaller, spatial and temporal scales, and being cognizant of future projections and developing adaptation options in consideration of these dynamics. In other words, in the face of uncertainty, this includes being able to change or redirect decision-making based on the evolving outcomes

Actions: Projects, procedures or techniques intended to implement an objective as defined in the priority setting documents.

Best Management Practices: Management measures or practices that are established and widely accepted as meeting the intent of coral reef conservation in a variety of disciplines (fisheries management, watershed management, biophysical monitoring, etc.)

Capacity: The overall ability of the individual or group to perform their responsibilities for coral reef management. It depends not only on the capabilities of the people (their knowledge, abilities, relationship and values), but also on the overall size of the task, the resources which are needed to perform them, and the framework within which they are discharged.

Capacity Building: Programs that are designed to strengthen the capacity (knowledge, abilities, relationship and values) to reach the goals as defined in the priority setting documents. This includes strengthening the institutions, processes, systems, and rules that influence collective and individual behavior.

Capacity Development: A widely recognized definition of capacity development was published by the United Nations Development Programme in 1997 as: “the process by which individuals, organizations, institutions and societies develop abilities (individually and collectively) to perform functions, solve problems and set and achieve objectives.” We expand this definition to put greater emphasis on the strategic role of a facilitator in helping this process in an uncertain and changing environment. Our suggested definition is: “Externally or internally initiated processes designed to help individuals and groups to manage coral reefs and to enhance their abilities to identify and meet coral reef management challenges in a sustainable manner.”

Capacity Strengthening: Capacity strengthening is part of the capacity development process and is set within a dynamic context and involves individuals, networks, organizations and even societies who have a stake in functioning coral reefs. It involves such processes as continuous learning, adaptation and innovation in dealing with unanticipated problems or issues. A central feature of capacity strengthening is assessing and reacting to current and future needs in order to improve the ability to learn and solve problems in the long-term.

Commitment: In the case of coral reef management and governance, commitment often refers to governmental commitment to the policies of a program and expressed by the delegation of the necessary authorities and the allocation of the financial resources required for long-term program implementation. When commitment is used in a different context it will be defined.

Conservation Action Plans (CAPs): The Nature Conservancy’s process for “helping conservation practitioners develop strategies, take action, measure success, and adapt and learn over time.” From Conservation Action Planning: Developing Strategies, Taking Action, and Measuring Success at Any Scale—Overview of Basic Practices. The Nature Conservancy 2005. Available in English and Spanish at: http://conserveonline.org/workspaces/cbdgateway/cap/resources/1/TNC_CAP_Basic_Practices.pdf/download

Constituencies: While constituencies can be broadly defined, we use the word to define active support of the coral reef management program by a core group of well-informed and supportive people composed of stakeholders in the private sector, civil society and government agencies.

Coral Reef Management Priorities: Those goals and objectives that have been defined by a core group of coral reef managers and stakeholders in each of the seven jurisdictions and identified through a voting process as those that require immediate attention over the short term of 3-5 years. For the purposes of the capacity assessment, the term goals will refer to the highest-level results the jurisdiction seeks to achieve (e.g., stable, sustainable coral reef ecosystems), as articulated in the jurisdictional priority setting documents. These goals in general refer to efforts to understand and address the three major threats to reefs; impacts from climate change, fishing, and land-based sources of pollution as well as other identified jurisdictional priorities.

Coral reef resilience: According to the Reef Resilience Toolkit (<http://www.reefresilience.org/>) website, resilience is more than being able to recover from a major disturbance, surviving bleaching, or resisting bleaching. For a coral community to be resilient, it must also be able to continue to thrive, reproduce, and compete for space and resources. For example, coral communities that have experienced bleaching but not mortality may be weakened and less able to thrive, grow, and reproduce in the competitive reef environment. Multiple factors contribute to resilient coral communities, some of them known and others to be discovered. Scientists are working to identify important factors (biological,

physical and ecological) that managers can evaluate to determine the health or resilience of a coral community. It is important that managers build the capacity to be able to identify and better understand these factors, so management strategies can be focused on maintaining or restoring communities to more optimal conditions to maximize coral survival after stressful disturbances.

Core managers group: This term refers to the agencies/organizations involved in management of coral reefs in a jurisdiction not just a geographic site within a jurisdiction. Most locations have a core group like this and will be the central focus of the capacity assessment process.

Ecosystem approach: According to the COMPASS Scientific Consensus Statement, Ecosystem-based management emphasizes the protection of ecosystem structure, function and key processes; is place-based in focusing on a specific ecosystem and the range of activities affecting it; explicitly accounts for the interconnectedness among systems, such as between air, land and sea; and integrates ecological, social, economic and institutional perspectives, recognizing their strong interdependences.

Local Action Strategy (LAS): LAS's are a U.S. Coral Reef Task Force led initiative to identify and implement priority actions needed to reduce key threats to valuable coral reef resources in each U.S. coral reef jurisdiction. In 2002, the Task Force adopted the "Puerto Rico Resolution" which calls for the development of three-year LAS by each of the seven U.S. jurisdictions containing coral reefs: Florida, Puerto Rico, the U.S. Virgin Islands, Hawai'i, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. These LAS's are locally driven roadmaps for collaborative and cooperative action among federal, state, territory, and non-governmental partners.

Marine Protected Areas (MPAs): Any area of the marine environment that has been reserved by federal, state, territorial, tribal or community law, mandate, regulation or declaration to provide lasting protection for part or all of the natural and cultural resources therein.

Nested Systems: Thinking in terms of nested systems is essential because issues of coral reef management impact upon, and are impacted by, conditions and actions at both higher and lower levels in an ecosystem and governance hierarchy. Some issues of coral reef management can be addressed more effectively at one level, and less effectively at another. The choice of the issue or set of issues to be addressed must therefore be made in full knowledge of how responsibility and decision making authority is distributed within a layered governance system. Planning and decision making at one scale, for example within a jurisdiction, should not contradict or conflict with planning and management at another – for example, at the scale of the nation. The reality is that such contradictions and conflicts are common across the world. A major challenge for the coral reef manager is to recognize these differences and work to either change them or select goals and strategies that recognize that such contradictions must be accommodated or resolved. In practical terms this means that a central feature of ecosystem approach is that all planning and decision-making must recognize and analyze conditions, issues and goals at least at the next higher level in the governance system. Thus, the ecosystem approach at the jurisdictional scale must – at a minimum – be placed within the context of governance at the smaller scale of the village or municipality while governance at the scale of a state/territory – at a minimum – be analyzed with an eye to governance at the scales of the village/municipality as well as that of the nation.

Objectives: The environmental, social, and institutional outcomes the jurisdiction must achieve to reach the end goal, generally actionable within a three to five-year time frame.

Participation: One of the defining characteristics of the practice of the ecosystem approach is its emphasis on participation and its relevance to the people affected by its practice of coral reef management. The ecosystem approach recognizes that the support of those whose collaboration is needed if a program is to be successfully implemented must be won by involving them in the processes of defining the issues that the program will address and then selecting the means by which goals and objectives will be achieved. Both individuals and members of institutions are more likely to comply with a management program when they feel that it is consistent with their values, responds to their needs and to their beliefs of how human society should function. Voluntary compliance by a supportive population lies at the heart of the successful implementation of a program. A participatory approach helps stakeholders and the public to see the efforts of a program as a whole.

Site managers: A person or persons designated with authority to manage the marine protected area at any level be it community, agency, state or federal.

Situation Analysis: A preparatory document for the priority setting process that summarized coral reef threats, condition and trends, key management issues, and goals of management agencies.

(Key) Stakeholder: A person, group, or organization that has direct or indirect stake in an organization that is involved with managing coral reefs.

Stewardship: Where equitable and sustainable forms of development are the ultimate goals of ecosystem approach, the practices of stewardship is the path to that destination. Ecosystem stewardship is an ethic practiced by individuals, organizations, communities and societies that strive to sustain the qualities of healthy and resilient ecosystems and their associated human populations. Stewardship takes the long-term view and promotes activities that provide for the wellbeing of both this and future generations.

Appendix B: Interviews

Name	Institutional Affiliation and Title	Method
PRE-SITE VISIT		
J-CAT Meeting #1 (1/31)		Telephone
J-CAT Meeting #2 (2/23)		In Person
Lia Ortiz (3/1, 3/15)	NOAA-NMFS Fisheries Liaison	Telephone
Roy A. Pemberton Jr. (3/8)	DPNR DFW, Director	Telephone
James Byrne (3/9)	TNC	Telephone
J-CAT Meeting #3 (3/13)		Telephone
Tyler Smith (3/14)	UVI, Research Assistant	Telephone
Lisamarie Carrubba (3/23)	NOAA-NMFS Caribbean Field Office	Telephone
MONDAY 3/26/2012		
Paige Rothenberger	DPNR CZM, Coral Reef Initiative Coordinator	In Person
Marlon Hibbert	NOAA-NOS, Coral Management Liaison for USVI	In Person
Lia Ortiz	NOAA-NMFS, Fisheries Liaison	In Person
Migdalia Roach	DPNR CZM STXEEMP Office, Marine Park Outreach Coordinator	In Person
John Farchette	DPNR CZM STXEEMP Office, Park Interpretive Ranger	In Person
Jose Sanchez	DPNR CZM STXEEMP Office, Park Interpretive Ranger	In Person
Marija Micuda	NOAA Coral Reef Management Fellow	In Person
Norman Williams	DPNR CZM, Assistant Director of DPNR	Telephone
Howard Forbes	DPNR DEE, Assistant/Deputy Director	In Person
Anita Nibbs	DPNR DEP, Water Quality Management Program Manager	In Person
Syed Syedali	DPNR DEP, Groundwater, UST, Terminal Facility Program Manager	In Person
Edward Schuster, Sr.	Chair of St. Croix FAC, STXEEMP Advisory Committee Participant	In Person
TUESDAY 3/27/2012		
Kemit Lewis	TNC	In Person
Jeanne Browne	TNC	In Person
Aaron Hutchins	TNC	In Person
Carol Burke	SEA	In Person
Paul Chakroff	SEA	In Person
Carlos Farchette	CFMC, Head of Council	In Person
WEDNESDAY 3/28/2012		
Winston Ledee	St. Thomas Fisheries Advisory Committee, CFMC Member	In Person
Alicia Barnes	DPNR Commissioner	In Person
Daisymae Millin	DPNR CFO	In Person

Name	Institutional Affiliation and Title	Method
Tyler Smith	UVI, Research Assistant Professor	In Person
Marilyn Brandt	UVI, Territorial Coral Reef Monitoring Program	In Person
Kostas Alexandridis	UVI, Assistant Professor of Marine and Environmental Studies	In Person
Alexandra Holecek	DPNR CZM	In Person
Stuart Smith	DPNR CCZP, Director of Comprehensive Coastal Zone Planning	In Person
Phillip Smith	DPNR Director for Building Codes and Permits	In Person
Roberto Tapia	DPNR DEE, Director	In Person

Thursday 3/29/2012

Caroline Rogers	USGS, Virgin Islands National Park	In Person
Christy McManus	NPS, Virgin Islands National Park	In Person
Thomas Kelley	NPS, Virgin Islands National Park	In Person
Anne-Marie Hoffman	STEER/TNC	In Person
Sharon Coldren	CBCC	In Person
Tricia Reed	CBCC	In Person
David Simon	DPNR DEP, Director	In Person
Kent Bernier	DPNR DEP	In Person
Dr. David Olsen	St. Thomas Fishermen's Association	In Person
Julian Magras	Chairman of St. Thomas Fishermen's Association Board	In Person

Friday 3/30/2012

Christine Setter	VI Marine Advisory Service	In Person
J-CAT #4		In Person

Sunday 4/7/2012

Roy A. Pemberton Jr.	DPNR Director of Fish and Wildlife	In Person
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Post-Site Visit

J-CAT #5		Telephone
Marlon Hibbert (5/4)	NOAA-NOS, Coral Management Liaison for USVI	Telephone
Jean-Pierre Oriol (5/7)	DPNR CZM, Director	Telephone
Zandy Hillis-Starr (5/7)	NPS, Buck Island National Monument	Telephone
Joel Tutein (5/7)	NPS, Buck Island National Monument	
Rafe Boulon (5/10)	NPS, Virgin Islands National Park	Telephone
Jeff Miller (5/10)	NPS, Virgin Islands National Park	

Appendix C: Case Studies and Current Activities

USVI Case Studies

St. Croix East End Marine Park, to include Phase I LAS, Management Plan, recent activities

Areas of Particular Concern (APC) Program, to include exploration of watershed management in the USVI

2005 USVI Comprehensive Marine Resources and Fisheries Management Plan

USVI Current Activities

Project (Source)	Description
STXEEMP Management Plan	
Enforcement Program	Activity 1 (H): Hire and Train Park Enforcement/Interpretive Officers. Given the need to have a regular presence in the Park, including regular water patrols, it will be necessary to hire at least four Enforcement/Interpretive Officers, one of whom should be made a supervisor of the Enforcement Team. This will permit at least two Enforcement/Interpretive Officers to be on duty seven days a week. Given their intimate knowledge of the Park, the Marine Park Office should seek to hire qualified local fishermen as Enforcement/Interpretive Officers. The Enforcement/Interpretive Officers should receive training as Marine Park Enforcement Officers as well as Marine Park Interpreters. Officers will be the primary contact and information source for Park users and should be well versed in the goals and activities of the EEMP. This activity will be implemented by the Marine Park Office, and completed in Year 1.
Enforce Development Regulations	When appropriate regulations are created and enforced, the regulatory system becomes an effective tool that provides structure and stability to management efforts. Both commercial and residential development, as well as road building, road improvement, and gut maintenance, should be carefully reviewed when those activities affect the associated fragile marine ecosystems. Permits granted for land movement and similar activities should receive greater scrutiny within the area bordering the Park. Minimizing the impacts of land development will decrease the devastating effects of erosion (i.e., increased sediment and nutrient loads) on seagrass and coral reef communities. Additionally, careful review and appropriate enforcement of land development activities that affect nearby wetlands (i.e., mangrove communities and salt ponds), should prevent further loss of essential habitat for juvenile fish and wading birds.
Communications	Activity 1 (H): Printed Materials. Develop printed materials to inform the public about the impact of their activities, both land and water-related, on the Park's resources and environmental quality. Materials may include brochures, posters, newsletters, and contributions to periodicals. Distribute materials in bulk to high interception locations, such as marinas, dive shops, hotels, airports, tourism offices, and schools. This activity will be implemented by the Marine Park Office, or subcontracted, and completed in Year 1, and then be ongoing. Activity 2 (H): Audio-Visual Materials. Develop audio-visual materials to educate the public about the impact of their activities, both land and water-related, on the Park's resources and environmental quality. Distribute materials to schools and other public forums. This activity will be implemented by the Marine Park Office, or subcontracted, and completed in Year 1. Activity 3 (H): Public Service Announcements. Establish a program to promote the Park goals and activities through public service announcements in St. Croix that present an overview of the Park, its resources, and their ecological significance, for routine distribution to radio, television and newspapers. This activity will be implemented by the Marine Park Office, or subcontracted, and completed in Year 1, and then be ongoing.
Domestic Wastewater	Activity 1 (H): Water Quality Standards. Upon reviewing current standards, this activity will identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem. Examples are C:N:P ratios (Carbon: Nitrogen: Phosphorus), alkaline phosphatase activity, and shifts in community structure by habitat. These measures could be incorporated into the current water quality monitoring program, and could provide the basis for resource-oriented water quality standards (biocriteria) for the Park. This activity will be implemented by the Division of Environmental Protection and completed after Year 1.

USVI Current Activities

Project (Source)	Description
Wetlands	Activity 1 (H) Activity 1: Development of a Comprehensive Coastal Wetland and Watershed Protection Plan. Using a science and community based methodology, this activity will identify those upland watersheds and coastal wetlands that are critical to protecting the integrity of the waters of the Park. This should be undertaken as a coordinated effort between Federal, Territorial and local non-governmental organizations. Critical upland watersheds and coastal wetlands could then be protected via the use of conservation easements and/or fee simple purchase. The Federal government makes available to states and territories funds for upland watershed and coastal wetland protection, via the Land and Water Conservation Fund (L&WCF), the Forest Legacy Act (FLA), and the North America Wetlands Conservation Act (NAWCA). These funds may be used for the purchase of conservation easements and/or fee simple purchase. As these funds often require a local and/or private match, a coordinated effort with local conservation oriented non-governmental organizations to raise matching funds is essential. This activity will be implemented by the Marine Park Office, or subcontracted, and completed over five years.
Stormwater	Activity 1 (H) Stormwater permitting - Based on a review of existing stormwater permitting, require that no development in watersheds that drain into the East End Marine Park be exempted from the stormwater permitting process. This strategy would require that the Virgin Islands ordinances cover all developments, with no exemptions from the stormwater permitting process within the Park watersheds. This activity will be implemented by DPNR and completed in Year 1. Activity 2 (H) Stormwater management (Guts, Roads, Etc.) - Upon reviewing current standards, enact and implement stormwater management ordinances and comprehensive stormwater management master plans. This strategy would help to reduce stormwater pollutant loading (sediment, toxics, and nutrients). Currently, there is little regulation of stormwater runoff in the watersheds of the East End Marine Park. This activity will be implemented by DPNR and completed in Year 1.
STEER Management Plan	
Stakeholder Awareness	Increase stakeholder awareness (give people a chance to change their behavior). Target residents and tourists (boat rentals, charter yachts).
Lagoon Contaminants	Determine the contaminants in the lagoon.
Watershed and Stormwater Management	Watershed and Stormwater Management: Partner with public and private sector (marinas, industrial shops, VIWMA, DPNR, federal agencies) to reduce non-point source pollution.
Fish Bay LAS	
Watershed Management Plan	Review, Revise, and Update Watershed Management Plan for Fish Bay Project Summary: Conduct a watershed assessment that includes a classification of landuse. Prioritize threats to the watershed. (Also listed under Goal 1, Objective 11) BMP campaign for reduction of LBSP in Fish Bay (LINK TO GOAL 1, PROJECT 5: Priority road paving to reduce sediment input to Fish Bay). This project would entail the development and implementation of multiple activities that aim to increasing understanding and use of best management practices to reduce land based sources of pollution in Fish Bay.
Coral Bay LAS	
Enforcement Blitz	Coral Bay Fisheries Enforcement Blitz (incorporated into goal 3, project 1:Watershed and Marine Inspection to Identify Problem Areas). This project has DPNR participate in a watershed inspection in the area of Coral Bay and do a drivearound with residents to look at potential violations or areas where existing management measures don't work. To determine the types and amount of illegal fishing activity, enforcement presence will be increased in the bay by selecting random days each month over a one-year period when DEE and NOAA enforcement officers will patrol the Coral Bay area for illegal fishing activity and NPS will patrol simultaneously in waters of the VI Coral Reef Monument.
Development Regulations	Evaluation of the effectiveness of development regulations (Regulations assessment using current scientific information). Use results of scientific investigations in Coral Bay to assess effectiveness of development regulations and make recommendations as to how regulations should be revised to ensure they are adequately protecting the coral reef ecosystem.

USVI Current Activities

Project (Source)	Description
Watershed Inspection	Watershed and Marine Inspection to Identify Problem Areas. This project would encourage DPNR participation in a watershed inspection in the area of Coral Bay and do a drive-around with residents to look at potential violations or areas where existing management measures don't work. To determine the types and amount of illegal fishing activity, enforcement presence will be increased in the bay by selecting random days each month over a one-year period when DEE and NOAA enforcement officers will patrol the Coral Bay area for illegal fishing activity and NPS will patrol simultaneously in waters of the VI Coral Reef Monument.
Erosion and Sediment Control	Erosion and Sediment Control Training and Promotion Program for Engineers, Contractors, Heavy Equipment Operators, Developers, Architects, and DPNR permit inspectors and reviews in Coral Bay and Fish Bay. The project would entail the development and implementation of a training program targeted at all parties involved in all stages of development projects from the design phase through implementation. The training would include proper techniques for site planning and the application of best management practices to reduce erosion and sediment control.
Coral Bay and Fish Bay LAS's	
Going Coastal Guide	Demonstration project to help develop the Residential Guidance document "Going Coastal: A guide to going crazy on land-based sources of pollution." Select low cost, low-tech, low-risk approaches for homeowners to reduce sediment and implement projects. Revised USVI DPNR Environmental Handbook. Revise the USVI DPNR Environmental Handbook to include updated recommended BMPs, guidance for both residential and commercial users, technical worksheets and designs for recommended BMPs. Provision of design specifications and templates for design and BMP placement/installation will allow applicants and agency staff to work from a common point.

Appendix D: Timeline

Event	Start Date	End Date	Description
United States purchased the Virgin Islands from Denmark	1917		A naval administration is introduced. Territory is managed by War Department for a variety of strategic military needs, such as Panama Canal protection. This is the beginning of an era of significant amounts of dredging over coming decades.
A Quaker from the US mainland is appointed governor	1931		Governors are appointed until the first democratically elected governor in 1968
US National Park Service recommends that St. John to become a new national park	1939		No follow-up action is taken
US Underwater Demolition Team tests on reefs	1940	1950	Large numbers of dead fish wash up on beaches
Fairchild gives 58 acres to USVI for a park at Magens Bay	1943		A plan is developed for an independent Park Management Authority
First VI native governor, Morris Fidanque de Castro, is appointed	1949	1954	From this point on, only people who are native to islands are appointed governor. The result of this is leadership with more of an interest in the wellbeing of the island's resources.
The population in the territory fluctuates over the next decades as economic opportunities arise and drop off	1950		This causes demographic changes and makes enforcement difficult.
Rockefeller develops concept for a "park system" on St. John	1952		He establishes a 600 acre resort at Cancel Bay.
Virgin Islands National Park is established	1956		Rockefeller donates the of lands adjacent to his resort to the National Park Service
Population in territory doubles	1960	1970	It goes from 32,000 to 75,171, or from 224 ppl/sq.mi to 577 ppl/sq.mi
Immigration of West Indians to the territory	1960	1970s	The immigration is due to tourism, heavy manufacturing, and allied construction. The heterogeneous population makes management difficult because of diverse attitudes and behaviors.
Study	1960		Survey of recreational needs, sites, and services in USVI
Buck Island Reef National Monument is established	1961		Designated by USDOJ to set example for the territorial government
Subdivision Regulations First Adopted	1961		
2,287 hectares of marine territory added to VINP	1962		VINP is one of first MPAs in world
Harvey Alumina opens on St. Croix.	1962		
Shift in immigration due to new industries on St. Croix.	1965		Before, most immigrants went to St. Thomas.
Hess Oil (HOVENSA) refinery opens on St. Croix.	1966		Becomes one of the main employers on the island.
Study	1968		Survey of resources for recreation, tourism, and open space in USVI
Republican Governor Melvin Herbert Evans elected.	1969	1975	First democratically elected governor.
TEKITTE saturation diving project in Lameshur Bay, St. John	1969		Project initiated by DOI, but due to absence of local political support, program eventually moves to Puerto Rico.

Event	Start Date	End Date	Description
West Indies Laboratory of Fairleigh Dickinson University (FDU) built	1969	1971	
Study	1970		Survey of "The Virgin Islands and the Sea"
Tourism industry and economy grows	1970	1980	US government aims to build the "American paradise". This also leads to population growth. After the boom in the 1970s, the growth continues at a slower rate.
Sea turtle species listed on Endangered Species Act	1970	1980	
Economic recession leads to mass deportations	1970	1980	Many undocumented immigrants had come to the USVI for work
Introduction of major fishing gear, charters, etc.	1970	1980	Leads to increased impacts on fish and reefs
West Indies Laboratory of Fairleigh Dickinson University (FDU) in operation	1971	1989	
Current Zoning Code Adopted	1972		Between 1972 and 2012, the table of permitted uses is updated 15 times
Senate Act proposing Territorial Park System	1972		Act calls for reorganization of Department of Conservation and Cultural Affairs (now DPNR). Leads to a serious planning effort, but no followup implementation
Study	1973		Survey of public recreational sites in the USVI
White Band Disease first observed on St. Croix	1975		Observed by W. Gladfelter
Territorial Marine Reserves as part of Territorial Park System	1975		Is proposed by DCCA Director of Planning and Development
Study	1975		Survey of priority conservation sites in the USVI
Convention on International Trade of Endangered Flora and Fauna (CITES) goes into effect	1975		This bans the trade of Sea Turtles
Governor Cyril Emmanuel King in office	1975	1978	Affiliated with the Independent Citizens Movement
Caribbean Fisheries Management Council (CFMC) is established	1976		This is one of eight regional fishery management councils established under the Magnuson-Stevens Act for the conservation and orderly utilization of the fishery resources in the USA.
Study	1976		Work plan for implementing Territorial Park System
West Indies Lab (WIL/FDU) is one of 6 regional centers of the Seagrass Ecosystem Study (SES)	1976	1982	Of the International Decade of Ocean Exploration (IDOE), NSF
Study	1977		Ecosystem inventory of USVI
1st Draft of USVI CZM Program is completed	1977		This effort includes a Survey to ID Areas of Particular Concern (APCs) and Special Natural Areas (SNAs)
USVI Department of Commerce report on population is published	1977		Document shows that population doubled between 1960 and 1970, from 32,000 to 75,000
NOAA NURP Hydrolab operations at WIL/FDU	1977	1986	
Completion of Economic Impact and Analysis for VI National Park	1978		Posner, Cuthbertson et. al 1981
VI CZM Act becomes law	1978		Written by Darlan Brin

Event	Start Date	End Date	Description
Governor Juan Francisco Luis in office	1978	1987	Party affiliation is Independent Citizens Movement through 1979, after which it becomes Independent/Nonpartisan
APC Program initiated	1978		CZMA calls for designation of APCs. For more history on the APCs, see timeline on VI MPAs ppt pdf by Paige Rothenberger.
Fairleigh Dickinson Territorial Park established	1978		Land acquired through private donation
Hurricane David	1979		Category 5 hurricane
Hurricane Frederick	1979		Category 4 hurricane
SocioEconomic Survey of Recreational Boating and Fishing completed in the USVI	1979		By Dr. David Olsen
NOAA proposes marine sanctuary at Jersey Bay	1979		NOAA gains the support of other Federal agencies, engages local NGOs and stakeholders, but then faces resistance from fishing community, ending in a stalemate. No action is taken.
First fisheries management plans	1980	1990	A series of amendments to these plans are then made over the years by the Caribbean Fisheries Management Council.
Hurricane Allen	1980		Category 5 hurricane
A National Marine Sanctuary is proposed	1980		By Olsen and Foster
New management questions raised by changes in environmental quality due to development, overfishing, sediment, and pollution	1980	1990	
Resistance from St. John residents to VI National Park	1981		Push back regarding restrictions and high land costs
Economic Impact Analysis performed for the VINP	1981		Shows that the marine component of VINP contributed significantly to economic productivity
2nd attempt to create Virgin Islands Park System fails	1981		
Virgin Islands Resource Management Cooperative established	1983		13-member institutional collaboration created to perform comprehensive studies
DCCA publishes "Proposed Rules and Regulations for Territorial Marine Parks and Reserves"	1983		This leads to no action
Sea Grant VIMAS established at UVI in St. Thomas	1984		
Subdivider's Handbook guidance document published	1985		
1st mass coral bleaching noted in Puerto Rico and St. Croix	1985	1986	
Department of Planning and Natural Resources established	1986		DCCA is reorganized and renamed to become DPNR, Department of Housing and Department of Parks and Recreation consolidated.
WIL/FDU organizes the Caribbean Coastal Marine Productivity (CARICOMP) program	1986		A program of cooperating marine laboratories monitoring the physical environment and structure and functioning status and trends of coral reefs, sea-grass and mangroves. Program operational from 1991-2007
St. Croix Environmental Association (SEA) is founded	1986		

Event	Start Date	End Date	Description
1st congressional hearing on coral bleaching	1897		U.S. Senate, Committee on Appropriations (Weicker and Hollings), November 10, 1987: "Coral bleaching in the Caribbean: Causes and a strategy for action."
Marine Reserve and Wildlife Sanctuary Act	1987		Act 5294. DPNR Commissioner is given authority to establish marine reserve and wildlife sanctuary areas.
Governor Alexander Anthony Farrelly in office	1987	1995	Democratic
NOAA NURP Aquaris built and operated in St. Croix by FDU	1987	1989	
Caribbean regional scientific meeting on mass coral bleaching organized by WIL on St. Croix	1988		(Ogden, J.C. and R.L. Wicklund. (eds.) 1988. Mass bleaching of coral reefs in the Caribbean: A research strategy. NOAA National Undersea Res. Prog. Research Report 88-2, 51p)
Hurricane Hugo	1989		Category 4/5
Population declines post-Hurricane Hugo	1989	1999	This is the beginning of a trend in which native born USVI comprising less than 45% of population
The establishment of seasonal closure at Red Hind Marine Conservation District	1989		The closure is revised in 1999 to become a year-round closure.
Rules and Regulations proposed for a Virgin Islands Marine Reserve System by DPNR DFW	1990		This is one of several R&Rs established for various marine reserves and wildlife sanctuaries over a number of years that were never implemented.
Population density is 741 people per square mile	1990		
Sea Grant VIMAS established at UVI in St. Croix	1990		
TNC opens VI office	1990		
Study	1990		Looking at damage from Hurricane Hugo. The suggestions coming from this report are ignored in coming decades.
CARICOMP program operates	1991	2007	
Shoreline is cleared of vessels from Hugo	1991		
CZM Program APC Management Plans developed	1991	2001	The plans include studies and reports for each APC. Process is forced by NOAA/OCRM. Focus of management plans is on achieving management goals not on the process for achieving those goals (i.e. interagency and public involvement). APC management plans have potential to provide conservation guidelines and site protection strategies at 18 sites in coastal zone, but process turns out to be a drawn out, complex, and disappointing planning exercise.
1st meeting of the Coral Reef Task Force in the USVI	1991		
Compass Point Marine Reserve and Wildlife Sanctuary (MWRS)	1992		
MacClean Marine Science Center opens at UVI in St. Thomas			
US Omnibus Territories Act	1992		Creates Salt River Bay National Historical Park and Ecological Preserve and VI Territorial Park Commission
VI Territorial Park Commission	1992		Commission established with a mandate to "see that all park management development and interpretation activities should be guided by a single management plan"

Event	Start Date	End Date	Description
Establishment of MPA at Mutton Snapper Spawning Site	1993		This MPA is jointly managed by federal and territorial governments.
Year-round Red Hind closure (STX)	1993		An MPA established at Lang Bank
Cas Cay/Mangrove Lagoon MRWS	1994		
St. James MRWS	1994		
Motorboat Speed Restrictions go into place	1994		
Hurricane Marilyn	1995		DPNR facilities struck
562,000 overnight visitors, 1,171,000 cruise ship passengers in one year	1995		
Salt River Bay MRWS	1995		Jointly managed by federal and territorial governments.
Governor Roy Lester Schneider in office	1995	1999	Independent
Magnuson-Stevens Act amended	1996		It becomes the Sustainable Fisheries Act
Fisheries Reserve is proposed to be sponsored by CFMC in San Juan	1997		Proposal drops after facing opposition by local fishers and little support by VI Government
Rapid SocioEconomic Evaluation of Proposed Marine Conservation District on St. John	1997		by Downs and Peterson, 1997
Study	1998		Study of the longer-term effects of Hurricane Hugo
Bleaching event	1998		
Tourism accounts for 70% GDP (WRI)	1998		
USGS Study	1999		Leads to recommendations for creation of a Virgin Islands Coral Reef National Park and Replenishment Areas
Federal/Local/Academic agreement for new marine facility on St. Croix	1999		Initiated by Secretary Babbit
Harvey Alumina closes on St. Croix	1999		Ending aluminum processing
Martin Mariata	1999		
SEA's Southgate Coastal Reserve established	1999		100 acres due to private donation
SEA Salt River Bay Mangrove Restoration	1999	2001	Response to Hurricane Hugo, with tons of high school volunteers
Vialco	1999		verify date
Governor Charles Wesley Turnbull in office	1999	2007	Democratic
Renaissance Park	1999		
Center for Marine and Environmental Studies established at UVI	1999		
CRTF meeting in USVI	1999		
Beginning of Territorial Coral Reef Monitoring Program	2000		As funded through NOAA. UVI has also done work with funding through DEP predating this project. The TCRMP as it is currently incorporates the previous work that was funded through DEP since that funding source disappeared.
Small Pond at Frank Bay MRWS	2000		
Establishment of NOAA CRCP	2000		
VIWMA leads USVI sewer system upgrades	2001	2012	No more primary treatment plants, all advanced secondary plants
Act Establishing St. Croix East End Marine Park	2002		Most recent St. Croix EEMP Management Plan

Event	Start Date	End Date	Description
Management Framework for USVI MPA System	2002		Published by Lloyd Gardner and UVI for DPNR CZM
Socio-economic Assessment Completed for DPNR CZM	2003		By UVI and consultant
St. Thomas Fishermen's Association established	2004		
Southgate Coastal Reserve Studies	2004		A series of 10 technical reports produced through the Coast and Harbor Institute at Woods Hole. Links to reports can be found at: http://www.stxenvironmental.org/scrdocs.html
USVI Comprehensive Fisheries Management Plan	2005		1st official comprehensive fisheries management plan to guide the work of DPNR, especially DPNR DFW
Establishment of MPA at Grammanik Bank	2005		
2nd CRTF meeting in USVI	2006		
Governor John de Jongh in office	2007	2012	Democratic
Gillnet buyback plan	2008		To be followed in 2012 by a socio-economic assessment
St. Croix Community Fishermen's Association established	2008		
Lionfish Management Assessment	2008		by Barbara Kojis and William Coles
NOAA CRCP Priority Setting Process	2009		
NOAA CRCP CREIOS Workshops	2009		NOAA Coral Reef Ecosystem Integrated Observing System Identified 2 monitoring needs to support management in USVI: 1. hydrodynamic models and water quality monitoring to understand LBSP issues 2. bathymetric and benthic habitat maps of near-shore marine environments and shallow bays
ARRA \$ for coral restoration goes to TNC	2009		
ARRA \$ for watershed restoration and installation of BMPs to reduce/mitigate erosion and LBSP goes to V.I. RC&D Council	2009		
Acropora species listed on ESA	2010		
St. Thomas and St. Croix are designated as Fishing Communities	2010		by Brent Stoffle
Fish Bay and Coral Bay LAS draft documents are developed	2010		Documents come out of facilitated workshops supported by NOAA engaging multiple managers and stakeholders.
STEER Management Plan published	2011		
TNC's Sustainable Finance Plan for St Croix EEMP	2011		
Report on Economic Value of Coral Reef Ecosystems in USVI	2011		IVM Institute for Environmental Studies
HOVENSA refinery closes abruptly	2012		Causes massive unemployment, and will likely lead to increased fishing pressure
Government layoffs	2012		Teachers, nurses, emergency personnel being laid off due to economic situation. This will likely lead to increased pressure on resources (extraction and pressure to develop coastal areas).
Trammel and Gillnet buyback/ACL process	2012		
VI MPA Network formed	2012		

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NOAA
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