An Analysis of Issues Affecting the Management of Coral Reefs and the Associated Capacity Building Needs in Florida

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NOAA CORAL REEF CONSERVATION PROGRAM

An Analysis of Issues Affecting the Management of Coral Reefs and Associated Capacity Building Needs in Florida

PREPARED FOR:
Coral Reef Managers in Florida &
National Oceanic and Atmospheric Administration's Coral Reef Conservation Program

PREPARED BY:
Glenn G. Page, President/CEO, SustainaMetrix
Audrey Swanenberg, Ecosystem Governance Analyst, SustainaMetrix

With advice, input and guidance by the members of the Florida Jurisdictional Capacity Assessment Team:
Chris Bergh, Steve Blair, Kurtis Gregg, Erin McDevitt, Jamie Monty,
John Tomczuk, Joanna Walczak, and Dana Wusinich-Mendez

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Acknowledgements

We acknowledge the many contributions of all those who participated in the process of this capacity assessment including the two site visits, multiple phone calls, emails and assorted connections across a wide range of colleagues in Florida. The kindness, hospitality, honesty and warmth that was displayed by all serves as the foundation for this document and hopefully creates the energy needed to implement a postassessment action plan that includes a series of implementable activities for short- and long-term capacity building for effective and adaptive coral reef management. Specifically, we acknowledge the involvement of Jason Andreotta, Jennifer Baez, Ken Banks, Drew Bartlett, Rene Baumstark, Jeff Beal, Chris Bergh, David Bingham, Steve Blair, Jim Bohnsack, Karen Bohnsack, Christopher Boykin, Kevin Claridge, Chuck Collins, Paul Davis, Beth Dieveney, Richard Dodge, William Fisher, Pamela Fletcher, Dave Gilliam, Kurtis Gregg, Lisa Gregg, Richard Harvey, Julio Jimenez, Terri Jordan-Sellers, Jocelyn Karazsia, Chris Kelble, Mike Kennedy, Linda Knoeck, Vladimir Kosmynin, Lisa Krimsky, Bob Leeworthy, Audra Livergood, Kate Lunz, Jessica McCawley, Gil McCrae, Erin McDevitt, Ron Messa, Keith Mille, Cheryl Miller, Jamie Monty, Sean Morton, Jennifer Peterson, Melissa Recks, Bernard Reigl, Patricia Rose, Kelly Samek, Jena Sansgaard, Melissa Sathe, Jen Schull, Marty Seeling, Manoj Shivlani, Jennifer Smith, Kent Smith, Kristina Trotta, Tom Twyford, Joanna Walczak, Brian Walker, Lauren Waters, Melody White, Amber Whittle, as well as National Oceanic and Atmospheric Administration's Coral Reef Conservation Program (NOAA CRCP) staff Dana Wusinich-Mendez and John Tomczuk.

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 the integrated ecosystem approach. This shift from more traditional approaches to resource management is neither easy nor inexpensive to practice and requires continued investments in building capacity. The methods applied in this document draw from many sources including the work of Stephen B. Olsen, Director Emeritus of the Coastal Resources Center at the University of Rhode Island, a key author of Increasing Capacity for Stewardship of Oceans and Coasts: A Priority for the 21st Century (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 NOAA CRCP.

Cover Photo Credit: Annelise Hagan

Acronym List

Use of Acronyms in the Document: For the purpose of consistency and brevity, acronyms will be used wherever possible and are spelled out in detail below. We recognize that there are some acronyms that may cause confusion such as the distinction between a national agency and a state agency (e.g.,Coral Reef Conservation Program), for the national agency the prefix of the national agency acronym will be used (e.g., NOAA CRCP) the prefix of the state agency acronym will be used (e.g., FDEP CRCP). If full names of acronyms presented below are spelled out in the document, even after the acronym has been used, it is done so for the purpose of increasing clarity.

AA	Awareness and Appreciation
BMP	Best Management Practices
BNP	Biscayne National Park
CAMA	Coastal and Aquatic Managed Areas
CEIF	Collaboration Evaluation and Improvement Framework
CEPP	Central Everglades Planning Project
CI	Cooperative Institute
CoRIS	Coral Reef Information System
COSEE	Center for Ocean Science Environmental Education - Florida Chapter
COTF	The Southeast Florida Coastal Ocean Task Force
CRCP	Coral Reef Conservation Program
CREMP	Florida Keys Coral Reef Evaluation and Monitoring Project
CSI	Crime Scene Investigation
CSO	Community Support Organization
DOI	Department of the Interior
EFH	Essential Fish Habitat
EMRTF	Ecosystem Management and Restoration Trust Fund
ENP	Everglades National Park
ERP	Environmental Resource Planning
ESA	Endangered Species Act
FDEP	Florida Department of Environmental Protection

FDOU	Fishing, Diving, and Other Uses
FKNMS	Florida Keys National Marine Sanctuary
FRRP	Florida Reef Resilience Program
FTE	Full-time Equivalent
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
J-CAT	Jurisdictional Capacity Assessment Team
JCP	Joint Coastal Permitting
LBSP	Land-Based Sources of Pollution
LAS	Local Action Strategies
LEEF	League of Environmental Educators of Florida
MICCI	Maritime Industry and Coastal Construction Impacts
MOU	Memorandum of Understanding
NERRS	National Estuarine Research Reserve System
NCRI	National Coral Reef Institute
NCRS	Natural Resources Conservation Service
NGO	Non-government Organization
NMFS	NOAA National Marine Fisheries Service
NMS	NOAA National Marine Sanctuaries
NOAA	National Oceanic Atmospheric Administration
NPS	National Park Service
OCRM	Ocean and Coastal Resource Management
OFR	Our Florida Reefs
OSHA	Occupational Safety and Health Administration
PSD	Priority Setting Document
RIPR	Reef Injury Prevention and Response Program
RSMAS	Rosenstiel School of Marine and Atmospheric Science (University of Miami)
SEAFAN	Southeast Florida Action Network
SEFAST	Southeast Florida Action Strategy Team

SECREMP	Southeast Florida Coral Reef Evaluation and Monitoring Project
SEFCRI[1]	Southeast Florida Coral Reef Initiative
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USCRTF	U.S. Coral Reef Task Force
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USVI	U.S. Virgin Islands
VINE	Virgin Islands Network of Environmental Education

[1] SEFCRI refers to the "Southeast Florida Coral Reef Initiative" that covers the four-county region of Miami-Dade, Broward, Palm Beach and Martin counties. We refer to the "SEFCRI or southeast Florida region" as those four counties and their offshore reef ecosystem.

Summary of Major Findings and Recommendations

This capacity assessment, commissioned by the Coral Reef Conservation Program of the National Oceanic and Atmospheric Administration (NOAA CRCP), follows the coral reef management priority setting process that NOAA CRCP initiated in Florida in 2009. In Florida, the priorities summarized in the 2010 publication of "Florida's Coral Reef Management Priorities" serve as the guide for the capacity assessment process. While the geographic scope of the Florida PSD encompasses the entire Florida Reef Tract, for the purposes of this capacity assessment we were directed to focus on the region currently targeted by the Southeast Florida Coral Reef Initiative (SEFCRI). This Southeast Florida region encompasses four counties (Miami-Dade, Broward, Palm Beach and Martin counties) and includes the northern third of the Florida Coral Reef system from the northern border of Biscayne National Park (BNP) to the St. Lucie Inlet. It is also important to emphasize that the Florida Department of Environmental Protection Coral Reef Conservation Program (FDEP CRCP) developed a strategic plan in July 2011 (entitled the FDEP CRCP 2011-2016 Strategic Plan), and builds off of work accomplished through a series of projects called Local Action Strategies (LAS). Since each of these strategic planning documents are recognized as guidance for coral reef management, the focus of the capacity assessment shifted to include a far broader focus which was challenging and required a more macro-lens to appreciate the multiple strategic directions.

As outlined in **Section One** of this report, the consultant team facilitated a rapid, largely qualitative, participatory approach to gain the perspectives of a representative group of resource users, managers, upper-level administrators and funders who are engaged in coral reef management in the SEFCRI region. The primary purpose of this assessment is to examine the issues that affect coral reef management capacity in the SEFCRI region as it relates to implementing the priorities expressed in the PSD and associated strategic plans in order to present a set of near-term recommendations for addressing persistent capacity gaps and barriers. Thus, the scale of the analysis was not focused on the capacity of any given set of individuals or specific institutions, rather the scale that was required needed to be far broader exploring capacity of the multiple partners, institutions and agencies involved in coral reef management in this region.

Section Two of this report presents the context for coral reef management and the critical importance of coral reefs and their associated habitats to the economy, culture and future of the Southeast Florida region. As in other parts of the world, the coral reefs in this region are fragile, and subject to increasing global pressures as well as local and regional drivers of over harvesting of marine resources, water quality decline from land use in adjacent watersheds, and a wide range of impacts associated with coastal development and tourism. They are also providing a vast array of services to the many millions of residents and tourists to the area. The coral reefs are less well known than the reefs in the Florida Keys, face enormous pressures, and yet still provide remarkable and free ecosystem services.

Section Three presents findings related to coral reef management capacity that is currently dedicated to coral reefs in the Southeast Florida region. We briefly review the recent progress that has been made here in coral reef management and we analyze both "process" and "outcomes" as tools to explore the development of adaptive capacity for the management of these coral reefs. These conceptual frameworks are applied to help illustrate the capacity performance story and shape capacity-building recommendations presented in Section Four.

A timeline has also been developed as a tool to understand the developmental nature of capacity built in this region.

The timeline illustrates a clear trend over the past 20 years of increasing capacity to manage coral reefs in the Southeast Florida region. The timeline and extensive interviews conducted as part of this assessment also foreshadow the challenges ahead. It has become clear through interviews that the challenges are becoming increasingly more complex and issues more interdependent, with few clear solutions. While capacity has been built over the years, the complexity of management challenges has increased dramatically with uncertain and unpredictable outcomes. Often referred to as "wicked" problems, coral reef management requires a new range of capacities and competencies, many of which are not taught in graduate school. Capacity is needed to manage across multiple scales, engage stakeholders, understand tradeoffs, consider governance dimensions and provide clear and effective communication to decision-makers within a dynamic and constantly shifting political, economic and cultural climate.

Indeed, the challenges facing coral reef management in the Southeast Florida region, and the rest of the world, will require awareness of and connection to the existing governance system where decision-making is often focused on economic development priorities. Making the case for the management and protection of a system that has high interconnection with local, regional and global drivers of change is a complex challenge. As the context for resource management becomes more complex, uncertain, and less predictable, a broader range of core competencies are needed. In the Southeast Florida region there are a many existing and potential stakeholders, offering different perspectives, articulating competing values, and often posing different solutions. While not uncommon, controversy can be both positive if facilitated well and potentially negative. The more points of view there are and the greater the debate among different stakeholders, the more socially complicated the situation becomes. Some of the disagreements center on the technical challenges associated with understanding reef function, current and future reef health and strategies for restoration and mitigation. Other disagreements center on a perception of fundamental value differences relating to access, safety, and deep concerns around restricting use. The depth and source of disagreement can pose particularly challenging situations, and the current governance structure is not well positioned to continually mediate, negotiate and facilitate compromise and create consensus. As a result, within the current context forces of fragmentation will likely grow. Promising new initiatives such as OFR that focus on perceptions, behavior and collective action are being adaptively implemented with success. Nurturing these efforts and learning from them will be paramount.

While this report focuses on building capacity within the current management paradigm, the recommendations are intended as a step toward rethinking the core governance dimensions and what may be possible to further grow to face the uncertainty ahead. Currently, coral reef management issues in the SEFCRI region are being addressed by many agencies and organizations, each with their own mandates, policies, goals and objectives, some of which are complementary to what other agencies are doing, and sometimes competing or disconnected. Fragmentation is not uncommon. Some of the most pressing interagency problems identified involve issues surrounding political will, supportive and informed constituencies, effectiveness of enforcement and compliance, staff recruitment and retention, science to inform policy, procurement barriers, and improving relationships with local government and the Florida legislature. There are a number of issues well outside any agency's control such as ocean acidification, sea level rise, increasing climate variability associated with global drivers of ecosystem change. Issues are becoming more and more interrelated with fewer clear cause-effect relationships identified. Addressing these issues require a higher quality of collaboration.

Today's challenges have no real historical analogue for the multi-scale and rapid pace of change. While integrated engineering solutions are essential, today's challenges require the capacity to deal with uncertainty through issue analysis, selecting options that match capacity, and securing formal commitment for a plan of action. Implementing that plan in a shifting context while having the time, energy and methods to adaptively learn along the way is essential. Interpersonal competencies are also needed such as creative conflict resolution that fosters effective collaboration. Addressing these persistent capacity challenges takes time, resources and collective commitment. Such competencies are not easy to build, and there is no clear and obvious path or training program that will solve all the issues at once. Nevertheless, recommendations are provided to encourage an investment in long-term development of adaptive management capacity.

Section Four begins with a "reality-check" of the limited financial resources available and presents a set of recommendations divided into three groups. The first group involves decisions that are highly political in nature. However, we believe these actions are the most critical for building long-term adaptive capacity to manage coral reefs and for promoting a transition toward an ecosystem approach of coral reef management. This group of recommendations is also the most complex because they feature difficult political decisions that need to be made by senior officials in the SEFCRI region and with their agency leadership in Tallahassee or Washington, D.C., who must factor in a wide range of extenuating circumstances.

These recommendations include specific steps to build capacity within FDEP CRCP and Florida Fish and Wildlife Conservation Commission (FWC). Progress has been made in moving towards more integrated management of coral reefs in this region, however, more integration is recommended both within the SEFCRI region and across Florida as agencies are being asked to do more with less. A set of recommendations regarding increasing capacity for enforcement and compliance associated with coral reefs ecosystems is presented with specific steps that would increase essential capacity needed to promote compliance. Engaging political leadership through the Southeast Florida Coastal Ocean Task Force is recommended to raise awareness of the issues that are central to this region and build appreciation for the urgency of coral reef management to senior administrators. In order to achieve support, a business case for the improved management of coral reefs in Southeast Florida is essential.

The second group is focused on the capacities that may be needed at the scale of coral reef managers, such as the need for increasing progress toward a community-supported organization that directly supports the SEFCRI process. Recommendations in this group include a focus on valuing ecosystem services, and building the necessary databases to house and share technical information on both the biophysical condition of coral reefs and the social science needed to understand human interactions and realize stewardship potential. Government has a central role to play in providing leadership and creating the enabling conditions for building adaptive capacity. However, bridging institutions that operate on the edge of different domains of practice can help build trust and transform management.

With limited resources, strategic priorities need to follow a more sequenced and prioritized structure with success metrics that can be easily tracked and shared with tools such as scorecards. The development of a cooperative research institute is also recommended to build a stronger platform for applied science to better inform management in this region. Finally, this set of recommendations includes a detailed scenario planning exercise that defines the likely trajectories of the health of coral reefs and the different management and governance responses possible.

The third group of recommendations provides a range of actions that can be done at the scale of committees, task forces, within organizations, and by groups of individuals. They include actions that contribute to building capacity for an education and outreach and for and a detailed systems map for who is doing what regarding coral reef management, where, and to what effect. The Section concludes with recommendations for building increased capacity for high-quality collaboration and conflict resolution. While this group is more commonly associated with the traditional capacity-building tasks of developing and improving knowledge, skills and competencies, we believe investment here will have far greater return in the first set of recommendations are implemented.

Section Five concludes the report with a strategy for developing a long-term, capacity building action plan requiring contributions from all stakeholders to fully implement these recommendations. Creating capacity-building action plans allows the wide range of implementing partners in government, civil society and market forces to more effectively preserve and protect coral reefs. Committing to a long-term capacity-building strategy will require support and participation from resource management agencies, local to federal, from civil society, from coalitions and funding partners, from resource users who depend on the coral reefs of the SEFCRI region for their livelihood, and from upper-level administrators.

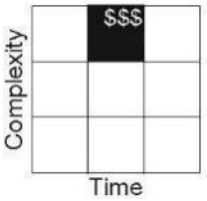
The recommendations are offered in an appreciation of the management context and multiple challenges and opportunities associated with coral reef management in the SEFCRI region. Implementation of the recommendations will require an adaptive strategy. Based on emerging information, some recommendations may well be dropped, others prioritized, and others still needed to address a context that may not have been anticipated as part of this process. Capacity is needed in how we appreciate, account for, and sustain the ecosystem function that is provided free of charge by coral reefs in the Southeast Florida region. Building adaptive capacity will require alignment between traditional adversaries; adoption of entirely new ways of seeing, changing behaviors and practices; and new policy frameworks that create incentives and ground rules to increase stewardship of coral reefs.

LEGEND

TIME SCALE	COMPLEXITY SCALE	MONETARY SCALE*
Short = <1 year	**Simple** = Somewhat context independent recommendations such as "best practices" and "standard operating procedures" that have fairly high certainty of building capacity.	**$** - Less than $50,000
Medium = 1 to 2 years	**Complicated** = 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.	**$$** - Between $50,000 and $100,000
Long = >2 years	**Complex** = Context is highly dependent and the recommendation may require strategies that are adaptively implemented and address dynamic, emergent, non-linear and complex conditions.	**$$$** - Between $100,000 and $250,000
		$$$$ - Greater than $250,000

*This scale has been adjusted for the SEFCRI region capacity assessment. All other U.S. Flag coral jurisdiction capacity assessment reports have a consistent Monetary Scale ($ - Less than $5,000; $$ - Between $5,000-$20,000; $$$ - Between $20,000 and $100,000; and, $$$$ - Greater than $100,000).

EXAMPLE



This graphic shows project time scale of one to two years (**Medium**) with complexity scale equal to **High** and monetary scale between $100,000 and $250,000 (**$$$**).

PRIORITIZATION

The prioritization was developed in consultation with the Florida Jurisdictional Capacity Assessment Team (J-CAT) members who were asked to rate each recommendation. The resulting top recommendations are presented in order of priority in this table and in this document. Please note, while prioritized, the recommendations are not intended to be implemented sequentially as a checklist. Rather, in complex and dynamic systems, adaptive capacity will be about building momentum with investments in relatively simple, inexpensive and quick forms of capacity building, and marking progress toward the larger systemic changes that are needed to effectively build adaptive capacity.

Eight priority management goals identified in the Florida PSD

GOAL A1: Manage the Florida Reef Tract and Ecosystem using an ecosystem-based approach, including zoning/marine spatial planning and other appropriate tools;

GOAL A2: Build political will and public support to establish the governing policies and administrative structure needed to make reef conservation a priority for Florida;

GOAL C1: Reduce pollutant loading to south Florida coastal waters;

GOAL C2: Restore and preserve coastal estuarine habitats that aid in naturally improving water quality and support the life histories of coral reef biota;

GOAL C3: Educate the public and elected officials on the need to maintain coral reef habitats and coastal water quality. This includes opportunities for economic development in tourism and recreation;

GOAL D1: Develop and implement conservation programs to increase the size, abundance and protection, as appropriate, of coral reef species (both fish and invertebrates), including targeted species critical to reef health and ecological function, such as, but not limited to, game species and organisms collected for aquaria;

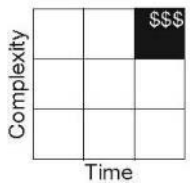
GOAL D2: Reduce physical marine benthic impacts from recreational and commercial activities and marine debris; and,

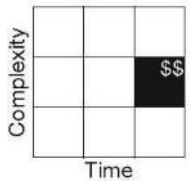
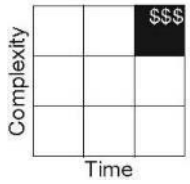
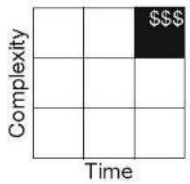
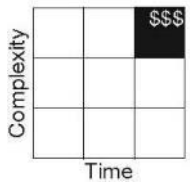
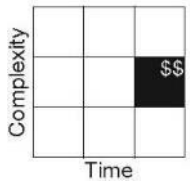
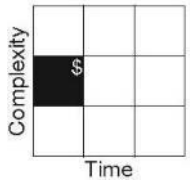
GOAL D3: Improve the efficacy of law enforcement activities.

GROUP 1 RECOMMENDATIONS

Politically Challenging Goals for Improving Formal Commitment to Coral Reef Conservation

The recommendations in this Section are politically challenging, and in many respects, accomplishing them will require actions beyond the reach of NOAA CRCP, FDEP CRCP, FWC, SEFCRI Team partner agencies and the larger coral reef management network in Florida. Nonetheless, there are concrete measures that all partner agencies can take to improve the likelihood of success and can lead to an improved climate for coral reef management and marine conservation in the State. A top priority to build the capacity for effective coral reef conservation in Southeast Florida is to generate high-level institutional and political support for coral reef conservation and management.

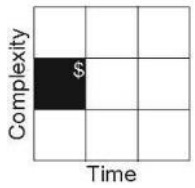
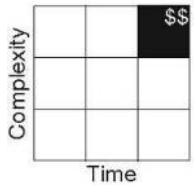
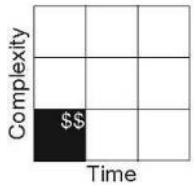
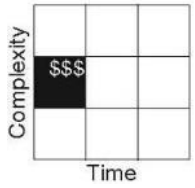
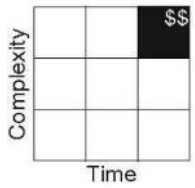
Page #	Capacity Building Strategy / Recommendation / Potential Partners		Complexity / Time / Cost
72	A	**Increasing FDEP CRCP Capacity** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead: FDEP** Agency Leadership in Tallahassee **Potential Partners:** FDEP CRCP, NOAA CRCP, FDEP Regulatory	

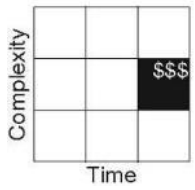
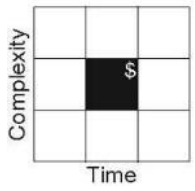
Page #	Capacity Building Strategy / Recommendation / Potential Partners		Complexity / Time / Cost
75	B	**Build FWC Capacity** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FWC Agency Leadership in Tallahassee **Potential Partners:** FDEP CRCP, NOAA CRCP	
76	C	**Integrated Management for Florida Reef Tract and SEFCRI Region** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FDEP Florida Coastal Office – Tallahassee, FDEP CRCP and Florida Keys National Marine Sanctuary **Potential Partners:** FDEP CRCP, FWC, NOAA CRCP, BNP, Florida State Parks, USFWS	
77	D	**Coordination and Management Across the Florida Reef Tract** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FDEP Florida Coastal Office – Tallahassee, FDEP CRCP and Florida Keys National Marine Sanctuary **Potential Partners:** FDEP CRCP, FWC, NOAA CRCP, BNP, Florida State Parks, USFWS	
78	E	**Coherent Enforcement and Compliance Program Across Agencies** **Related PSD Goal:** D **Recommended Lead:** FWC **Potential Partners:** FDEP, NOAA CRCP	
79	F	**Engage Political Leadership via the Coastal Ocean Task Force** **Related PSD Goal:** A **Recommended Lead:** Coastal Oceans Task Force **Potential Partners:** County governments, coastal city governments, Governor's Office, OFR, SEFCRI	
80	G	**Business Case for Improved Coral Reef Management** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FDEP CRCP **Potential Partners:** NOAA CRCP, FWC, TNC, NCRI, SEFCRI County government natural resource management departments	

GROUP 2 RECOMMENDATIONS

Using a Common Management Framework to Pursue Ecosystem-based Management at Priority Sites

This group of recommendations will require a collaborative and coordinated approach to implementation from leaders across management agencies and will likely involve interconnected systems and engagement with multiple resource users, government entities, NGOs and funders.

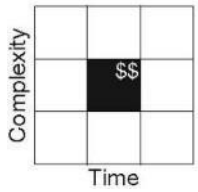
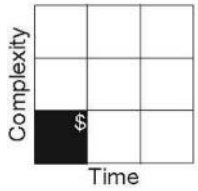
Page #		Capacity Building Strategy / Recommendation / Potential Partners	Complexity / Time / Cost
82	H	**SEFCRI Community Supported Organization (CSO)** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FDEP CRCP **Potential Partners:** TNC, Nova Southeastern University	
83	I	**Biophysical and Human Dimensions Science Database** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FDEP CRCP **Potential Partners:** Nova Southeastern University, FDEP CRCP, private contracting companies	
84	J	**Support the Further Development and Role of Bridging Institutions** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** Florida Sea Grant **Potential Partners:** SEFCRI, FDEP CRCP, County government natural resource management departments	
85	K	**Sequence and Prioritize Management Actions of SEFCRI** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FDEP CRCP staff **Potential Partners:** OFR, SEFCRI, FWC, Institution of known competence in training on the practice of ecosystem governance	
86	L	**Valuing Ecosystem Services and Socio-economic Database** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FDEP CRCP **Potential Partners:** Nova Southeastern University, FDEP CRCP, private contracting companies	

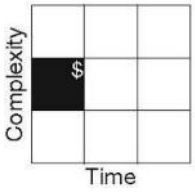
Page #	Capacity Building Strategy / Recommendation / Potential Partners		Complexity / Time / Cost
87	**M**	**Cooperative Research Institute** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** Nova Southeastern University **Potential Partners:** NOAA CRCP	
88	**N**	**Scenario Planning Exercises** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FDEP CRCP **Potential Partners:** SEFCRI, FWC	

GROUP 3 RECOMMENDATIONS

Tractable Projects

This group of recommendations will require a degree of control over their implementation that can be expressed by an individual, a small group of people, an organization or a network of organizations. This group of recommendations includes programs and trainings that focus on building a range of technical, financial, social, institutional and political capacities.

Page #	Capacity Building Strategy / Recommendation / Potential Partners		Complexity / Time / Cost
89	**O**	**Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region** **Related PSD Goals:** A, C, D **Recommended Lead:** FDEP CRCP **Potential Partners:** VINE, La Tasaungi, LEEF, COSEE, Environmental Education Providers of Miami-Dade County and the National Science Teachers Association, NOAA CRCP	
90	**P**	**Systems Map** **Related PSD Goals:** A, C, D **Recommended Lead:** Florida Sea Grant and proposed cooperative institute **Potential Partners:** SEFCRI, FDEP CRCP, FWC	

Page #	Capacity Building Strategy / Recommendation / Potential Partners		Complexity / Time / Cost
91	**Q**	**High Quality Collaboration and Conflict Resolution** **Related PSD Goal:** Builds capacity for all PSD priority goals **Recommended Lead:** FDEP CRCP **Potential Partners:** SEFCRI, Sea Grant, NOAA CRCP	

Section One: Introduction

1.1 Scope and Purpose of this Assessment

This capacity assessment is a component of the coral reef management priority setting process facilitated by the NOAA CRCP and initiated in 2009. The stated purpose of this process is "to develop place-based, local coral reef management priorities" for the seven United States (U.S.) state and territorial coral reef jurisdictions, including Florida. In Florida, the priorities were identified in the 2010 publication of "Florida's Coral Reef Management Priorities." A key purpose of this strategy was to create priorities for management recognizing that resources were limited and the management challenges were increasing. Thus the publication that was generated was referred to as a priority setting document, henceforth, the acronym "PSD" will be used to relate to this document. The Florida PSD forms the lens for the capacity assessment process although it is important to underscore the importance of the FDEP Coral CRCP Strategic Plan that was prepared in July 2011, as another priority setting document and thus adds an additional layer to the capacity assessment process. While the geographic scope of the Florida PSD encompasses the entire Florida Reef Tract, for the purposes of this capacity assessment the area of focus was determined to be the SEFCRI region. This four county region that includes Miami-Dade, Broward, Palm Beach and Martin counties, includes the northern one third of the coral reef tract from the northern border of BNP to the St. Lucie Inlet. The PSD includes, in Appendix Three, a brief summary of governance capacity issues in Florida entitled "Preliminary Identification of Capacity Gaps." In September 2011, NOAA CRCP selected SustainaMetrix as part of a competitive bid process to conduct a more detailed assessment across all seven jurisdictions including Florida, which expands on this initial intent to address capacity gaps in ecosystem governance for coral reef management in Florida. This report summarizes the findings of our capacity assessment conducted in Florida between September 2013 and February 2014, including a seven-day site visit to the SEFCRI region in South Florida from October 20th to 26th, 2013, a subsequent three-day site visit to Tallahassee from November 14th to 16th, 2013 and review of over 100 background documents, over 50 interviews, and ongoing collaboration with an ad-hoc steering committee established to help inform this process named the Florida Jurisdictional Capacity Assessment Team or J-CAT.

The PSD and FDEP Strategic Plan 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. From this starting point, the consultant team adaptively deployed a set of methodological tools aimed at building an understanding of the coral reef management system and illuminating current capacity gaps, as well as persistent barriers to building capacity, as they related to realizing the goals and objectives in the PSD and FDEP Strategic Plan.

The 2009 NOAA document "Coral Reef Conservation Program Goals and Objectives 2010-2015" acknowledged that while threats to coral reefs are diverse and operate at a range of scales, from local fishing pressures and regional pollution impacts to the global drivers of climate change and ocean acidification, the document concluded that "within each threat…[there is a] common need to select and work in priority coral reef areas to ensure a holistic and integrated management approach to support healthy, resilient coral reef ecosystems." In Florida, the Southeast Florida Coral Reef Initiative (SEFCRI) was initiated in 2003 as a result of the US Coral Reef Task Force (USCRTF) initiative to develop Local Action Strategies (LAS). The initiative was managed within FDEP CRCP and led to the development

of four focus teams: Awareness and Appreciation (AA); Fishing, Diving, and Other Uses (FDOU); Land-based Sources of Pollution and Water Quality (LBSP); and, Maritime Industry and Coastal Construction Impacts (MICCI).

As discussed in more detail at the end of this Section (Section 1.6), one of the challenges of this capacity assessment, which we believe mirrors, in many ways, the challenges of coral management, has been to balance the need to aim our inquiry flexibly across multiple scales and topics with the critical need to preserve focus on the more circumscribed issues laid out by the PSD goals and objectives as well as the FDEP Strategic Plan. Experience with building adaptive capacity around the world suggests that Ecosystem-based Management is complex, does not follow even the best prepared strategic plans, and interactions can be unpredictable and unknowable in advance. Thus, the lens for the capacity assessment is both the PSD and FDEP Strategic Plan prepared in 2011 recognizing that in complex management challenges, some strategies that are featured in plans may well be dropped, others prioritized and acted upon as planned and others picked up along the way needed to address an emerging issue that may not have been anticipated as part of the initial planning process.

1.2 Our Approach: Ecosystem-based Management

Our approach to conducting this capacity assessment, which we believe aids in creating the required flexibility, is described in the document prepared by SustainaMetrix "Coral Reef Management Capacity Assessment Methodology" which was submitted to, and approved by, NOAA CRCP in February 2012. Our methodology builds off of a conceptual framework known as "Ecosystem-based Management", or simply "the ecosystem approach" (NRC, 2008; Olsen et al., 2009; McLeod and Leslie, 2009). The ecosystem approach has been expressly endorsed by NOAA CRCP in its 2010-2015 Goals and Objectives document and in the language included in the preliminary capacity assessment appendices in most of the jurisdictional PSDs (including Florida). Simply put, the ecosystem approach acknowledges that ecosystems and the people that live within and in proximity to them, and depend on them for goods and services, must be understood and managed as a dynamically linked, interdependent system. The ecosystem approach requires a fundamental management paradigm shift that transcends single-species management, as well as the more holistic consideration of larger natural systems (e.g., watersheds, coral reefs), to explicitly include the human and social dimensions. It further accepts that natural and social systems are dynamically linked and that changes in one realm have impacts in the other and that these impacts can include self-reinforcing feedbacks (Figure 1).

In our approach to the assessment of adaptive capacity to the practice of the ecosystem approach, we have complemented a core philosophy with a peer-reviewed set of tools, methods and a common vocabulary to achieve the goal of a rapid diagnostic approach that can generate a set of actionable recommendations (please see Appendix A: For More Information). The common vocabulary terms are defined in Appendix B: Glossary. These methods are designed for application in a variety of locations, embracing the local context as well as the complexity and dynamism of the coupled social and natural ecosystem. Our purpose is to help assess capacity of a given management system's readiness and capability to pursue management actions that are realistic with the current operational realities and that seek a more holistic approach to understand, consider and adapt to changes in the coupled human/natural system. This capacity assessment process is done in a relatively rapid and synoptic manner. Our goal is to provide products and services that can generate useful recommendations for short-term action, one to three years, and that have the

best likelihood of meaningful success given current situational dynamics and politics. Among these tools are two related frameworks for assessing the maturity of a program based in the ecosystem approach and its progression along a series of steps toward program advancement, growth and long-term goal attainment. We have designed these to be simplifying frameworks that feature systems thinking and complexity concepts to enhance innovation in management and use of findings.

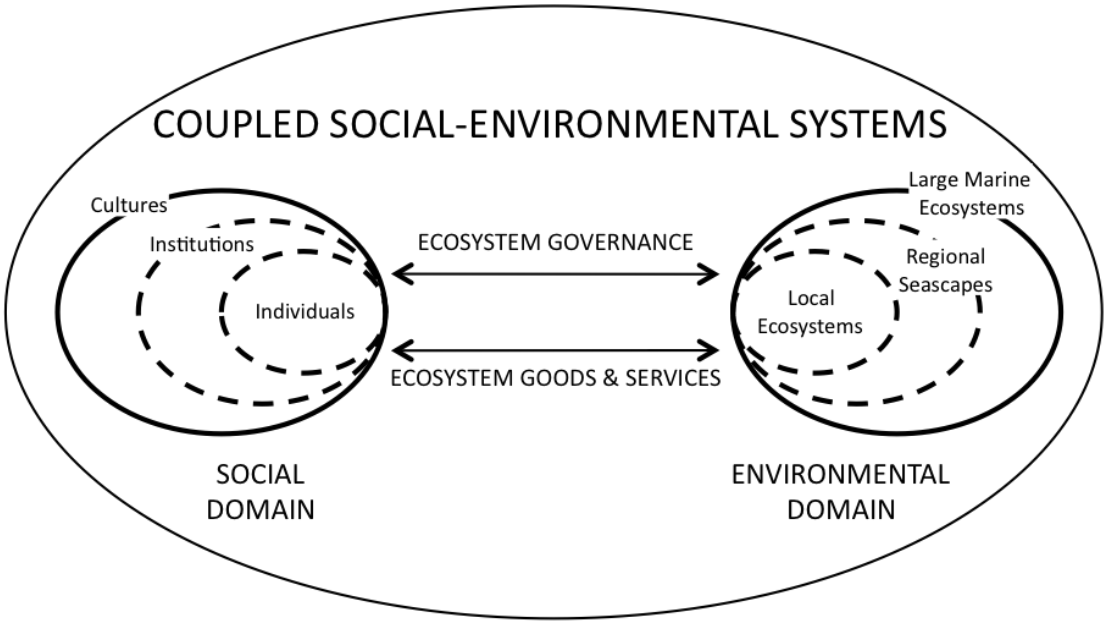


Figure 1: *Dynamic human and ecological systems are referred to as "coupled social-ecological systems." Interactions between the social and ecological domains occur over multiple geographic scales, and understanding connections across scales is critical to long-term success. Figure adapted from McCleod and Leslie (2009).*

The first of these tools is the **Management Cycle** (Figure 2), which gives a clear and straightforward presentation of the main steps through which a program should progress through linked cycles of adaptive management.

These steps are:

- Analysis of problems and opportunities (Step 1);
- Formulation of a course of action (Step 2);
- Formalization of a commitment to a set of policies and a plan of action and the allocation of the necessary authority and funds to carry it forward (Step 3);
- Implementation of the policies and actions (Step 4); and,
- Evaluation of successes, failures, learning and a re-examination of how the issues themselves have changed (Step Five).

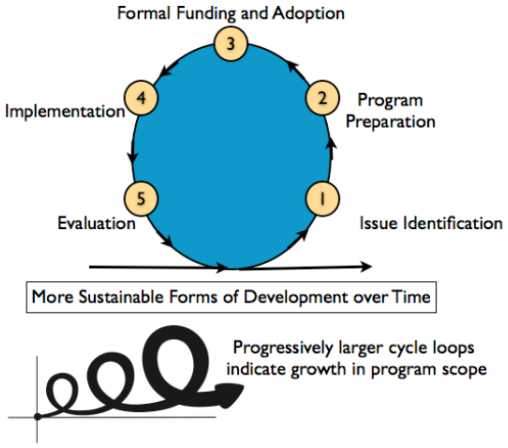


Figure 2: *The Management and Learning Cycle.*

These steps are imagined as a cycle. Ideally the steps are conducted in a sequence and conclude as a cycle in that

evaluation and learning in Step Five should inform a new round of analysis, staring a new "generation" of program implementation. Ideally, thoughtful progression through these linked cycles facilitates true "adaptive management."

The second tool, **Outcome Analysis**, is envisioned as a complement to the Management Cycle and is intended to help focus analysis clearly on the specific, intended outcomes of programs that seek to work generally to achieve societal and environmental goals (Figure 3).

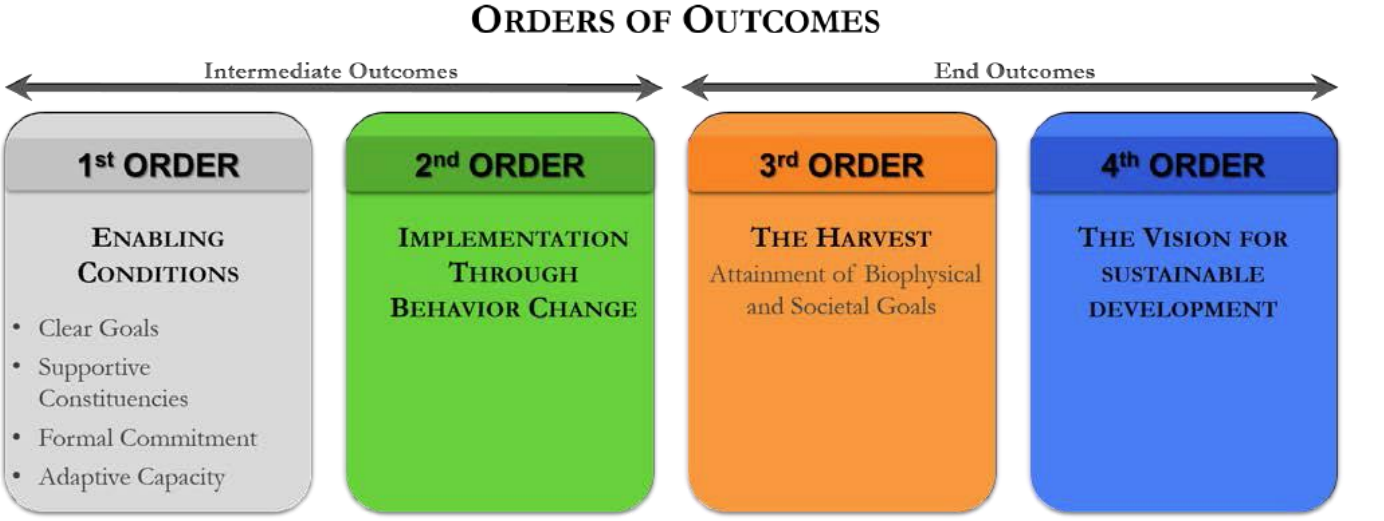


Figure 3: *Orders of Outcomes analysis helps focus analysis clearly on the specific, intended outcomes of programs that seek to work generally to achieve societal and environmental goals (Olsen et al., 2009).*

This heuristic helps to disaggregate and characterize the goals of a program into well-defined Orders of Outcome that can be readily discussed, analyzed and compared across multiple settings (e.g., priority areas or the seven U.S. Flag coral jurisdictions). Within the Orders framework, the four Orders of Outcome progress from assembling the enabling conditions to the realization of long-term, sustained social and natural systems health, with two intermediate steps:

- **First Order Outcomes:** Assembling the enabling conditions for the successful implementation of a plan of action;
    1. Clear, time-bound and unambiguous goals that describe both realistic and desired societal and biophysical conditions that may be reached in the near-term (such as 5-10 years);
    2. Supportive and informed constituencies for attainment of the desired goals;
    3. Formal commitment for a desired plan of action to meet the goals; and,
    4. Sufficient institutional capacity to implement the plan of action to meet the goals.
- **Second Order Outcomes:** Successful program implementation resulting in the desired behavioral change that is required to meet the goals;
- **Third Order Outcomes:** Achievement of target environmental and societal conditions as defined in the 1st Order - this is fully expected to be adaptive; and,

- **Fourth Order Outcomes:** Guiding long-term vision towards a purpose, such as sustainable development of South Florida that incorporates resilience to sea level rise, and adaptation to change in ecosystem function that may include adapting target outcomes over the long-term.

The enabling conditions are clearly defined in Appendix Three of the Florida PSD "Preliminary Identification of Capacity Gaps" and makes explicit reference to the necessity of addressing capacity gaps and enabling conditions in coral reef management for program success. This guiding document emphasizes that assembling the key enabling conditions is a 1st Order Outcome must be achieved as programs develop if program leaders seek to change behaviors (2nd Order), in order to achieve targeted social and environmental outcomes (3rd Order), which can then be institutionalized to mark progress toward a more resilient community who have adopted principles of sustainable development (4th Order).

With respect to this (or any) capacity needs assessment, it is important to recognize that having the capacity present within an organization (e.g., FDEP CRCP) is only one piece of a larger whole that also includes setting clear and realistic goals, having supportive constituencies, and obtaining formal commitment across all levels of the government. That said, FDEP CRCP is at the center of a larger, and growing system of coral reef management entities within Florida, including local government, several NGOs and other local as well as federal managing agencies. This necessitates a broader view of "capacity" beyond the financial, personnel and equipment resources that reside within the target organization.

For this capacity assessment, we apply these analytical tools (the Management Cycle and the Orders of Outcome) to create a common language in order to examine the capacity present in the coral reef management system in the SEFCRI region. While the concepts and vocabulary may be unfamiliar to some, we believe that they provide a clear and well-developed methodological framework for both process and outcomes that will help coral practitioners across the SEFCRI region, from local site managers to high-level government officials, and will clearly evaluate and compare plans and programs that intend to improve social and environmental outcomes.

1.3 Our Approach: Adaptive Capacity

Employing the tools and language of an ecosystem approach can add great clarity to the process of identifying issues, developing goals and the plans to accomplish them. The approach also requires engaging stakeholders in meaningful reflection and learning, and recognizing that the process is inherently complex, dynamic and highly contextual. Social and environmental conditions are undergoing constant change, and the nature of this change, and how best to respond to it, can vary significantly from place to place. Acknowledging this, and creating robust methods to detect, understand and respond to change in a contextually relevant manner (i.e., "adaptive capacity") is essential.

Accomplishing this in the complex and multi-level system that exists to manage and protect coral reefs in the SEFCRI region presents many unique challenges. Building resilient and flexible management regimes that can sense, learn from, and adapt to operational and strategic issues that emerge and evolve at a variety of scales across federal, state and local natural resource management programs (Figure 4) will be more and more critical to long-term, sustainable and successful management of natural systems around the globe (Armitage, 2005). This process explores both operational

and strategic issues for building adaptive capacity and aggregates the findings by providing a set of actionable recommendations described in Section Four. For this application, the unit of analysis is on the larger coral reef management system, not on specific individuals or specific organizations depth and breadth across these issues of adaptive capacity.

In the remainder of this Section, we review the specific methods we used to gather data about coral reef management in the SEFCRI region and analyze and integrated it into a coherent description of the challenges and opportunities for further developing the adaptive capacity of the system to respond to management issues. We review the findings and explain the development of our recommendations for sequencing and prioritizing capacity building activities that meet the management needs as understood from the perspective of adaptive capacity and an ecosystem approach.

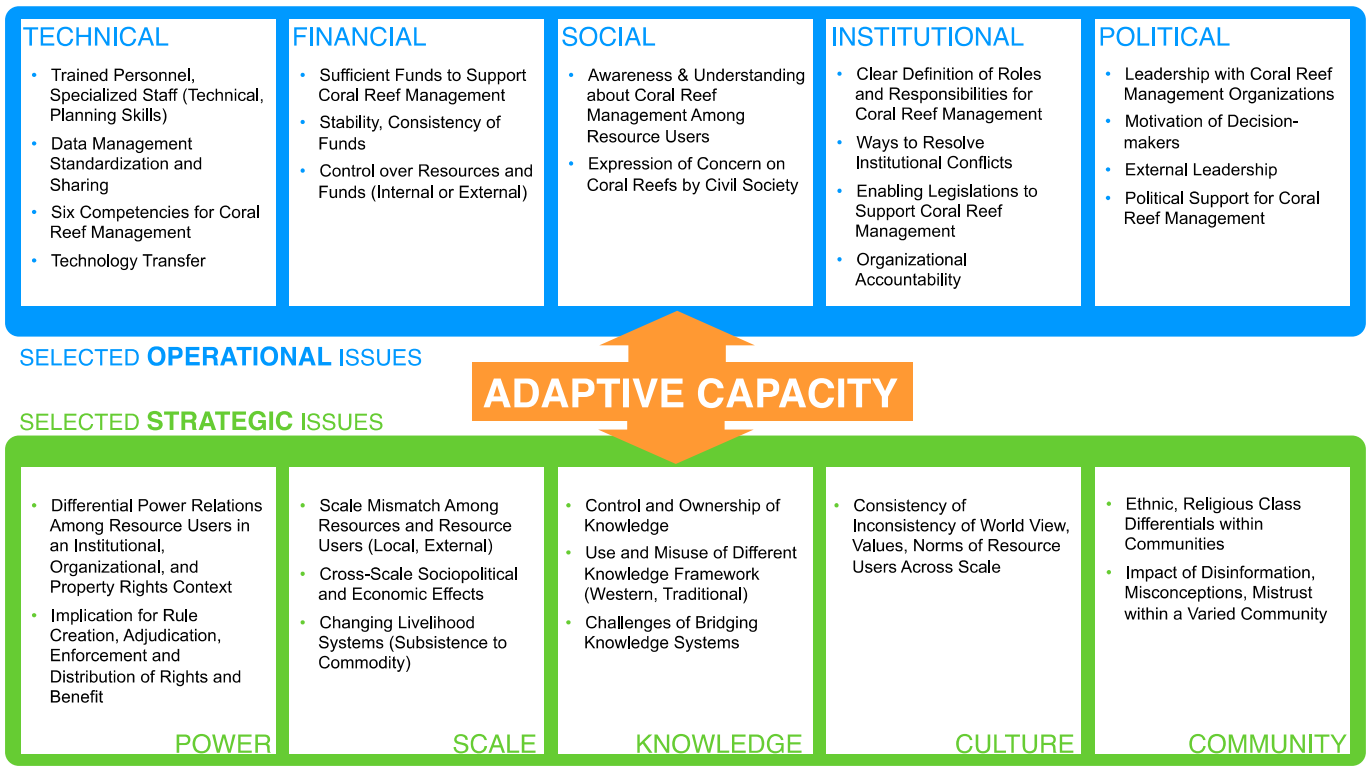


Figure 4: *Adaptive capacity diagram displays the dialectic between operational and strategic issues (adapted from Armitage, 2005).*

1.4 Additional Capacity Assessment Tools

Jurisdictional Capacity Assessment Team: As part of the process of inquiry into capacity needs, we convened a small standing committee of people with in-depth knowledge and deep personal involvement in coral reef management in the SEFCRI region that we dubbed the "J-CAT." We held six meetings with this group, either by conference call or in person, between September 2013 and January 2014 including one during our October 2013 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 within the current context of coral reef management in the SEFCRI region.

Our goal was to build an ad hoc group of coral reef managers from the region and engage in a collaborative process that has a clear beginning, middle and end to the process and provide extensive opportunity for input along the way. It is important to note that while consensus was a common outcome from the J-CAT, the consultant team made it clear that the role of the J-CAT was as a supportive and guiding function across all aspects of the process, not formed with the specific goal to arrive at consensus. This document has been developed, reviewed, prioritized and edited in consultation with the Florida J-CAT.

Goals and Objectives for Coral Reef Management in Florida: The Florida PSD identifies eight priority management goals (please refer to the original PSD for goals that were not deemed priority goals):

- **GOAL A1:** Manage the Florida Reef Tract and Ecosystem using an ecosystem-based approach, including zoning/marine spatial planning and other appropriate tools;
- **GOAL A2:** Build political will and public support to establish the governing policies and administrative structure needed to make reef conservation a priority for Florida;
- **GOAL C1:** Reduce pollutant loading to south Florida coastal waters;
- **GOAL C2:** Restore and preserve coastal estuarine habitats that aid in naturally improving water quality and support the life histories of coral reef biota;
- **GOAL C3:** Educate the public and elected officials on the need to maintain coral reef habitats and coastal water quality. This includes opportunities for economic development in tourism and recreation;
- **GOAL D1:** Develop and implement conservation programs to increase the size, abundance and protection, as appropriate, of coral reef species (both fish and invertebrates), including targeted species critical to reef health and ecological function, such as, but not limited to, game species and organisms collected for aquaria;
- **GOAL D2**: Reduce physical marine benthic impacts from recreational and commercial activities and marine debris; and,
- **GOAL D3**: Improve the efficacy of law enforcement activities.

In the FDEP CRCP 2011-2016 Strategic Plan for the Coral Reef Conservation Program the following categories of goals were defined:

- Build (FDEP) CRCP capacity with the defined objective to:
- Sustain and improve (FEDP) CRCP core services (general operations, programs and projects).

- Identify gaps in (FEDP) CRCP capacity and resources needed to fulfill the (FEDP) CRCP Strategic Plan, and where possible, fill identified gaps.
- Develop education and outreach with the defined objective to:
- Build upon the existing (FEDP) CRCP Education and Outreach Program to expand coral reef awareness and protection with emphasis on, but not limited to:
    - Expanding upon existing LBSP education and outreach efforts.
    - Incorporating the latest science about climate change and ocean acidification into education and outreach activities.
    - Increasing awareness of applicable local, state and federal regulations.
    - Integrating monitoring data results into education and outreach strategies to inform stakeholders about impacts on resources and recommended abatement measures.
- Work with local municipalities to establish higher environmental standards (e.g., greening programs, water reuse, sewage treatment, etc.).
- Support continued development and implementation of the USCRTF National Action Plan, resolutions, working group recommendations and other initiatives, as appropriate for Florida.
- Support external efforts and partnerships that foster coral reef conservation.
- Increase coral reef conservation with the defined objective to:
- Define and recommend management options for the mainland Southeast Florida reef system based on management goals, best available science, monitoring results and stakeholder input.
- Work collaboratively with partners to develop, implement and support action plans including monitoring, research, stakeholder communication and response strategies to support management of the Florida Reef Tract as a holistic system.
- Reduce the impacts of LBSP on the Florida Reef Tract.
- Reduce impacts from extractive and non-extractive recreational and commercial uses.
- Support efforts to reduce coastal development impacts on coral reefs and associated reef resources (e.g., vegetated sand dunes, wetlands, mangroves, etc.) and improve mitigation efficacy.
- Increase capacity to prevent and respond to coral reef injuries associated with vessel impacts and non-regulated activities.
- Support and, where possible, strengthen agency capacity and authorities to conserve coral reefs.
- Promote the development and implementation of new SEFCRI LAS projects by SEFCRI Team members, which include tangible outcomes and performance measures.

An early step in the capacity assessment was to review the current LAS as well as site-based management plans, as appropriate. Plans and reports on coral reef management across the SEFCRI region were used to better understand the wide array of coral reef related projects in the system, 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.

After building background knowledge of coral reef management in the SEFCRI region we developed a list of questions associated with the various initiatives and projects across the SEFCRI region and developed a plan to interview J-CAT members. Interviews with J-CAT members built our understanding of projects, context and how specific projects fit 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 current coral reef management initiatives became a primary, but not the only line of inquiry for the interviews conducted during the site visit.

Timeline for Coral Reef Management in the SEFCRI region: We assembled a timeline of key events affecting coral reefs in the SEFCRI region, and their management, beginning in 1513 with the arrival of explorer Ponce de León to the present with attention to the events that signaled increase in capacity for coral reef management. A brief analysis is presented in the next Section. The timeline also includes events that affect capacity to manage coral reefs such as large cyclones and bleaching events, as well as key governance milestones, from political events like the establishment of Florida as a U.S. state, to laws and rulings that directly affect coral management, such as the Florida Coral Reef Protection Act of 2009. The timeline was based upon interviews and anecdotes as well as published information from social science, humanities and natural science.

We printed out, on a large format plotter a sheet of paper (about 10 feet) that served as a physical timeline and brought it with us to meetings during the site visit for review and input. The timeline proved to be of great interest to most interviewees, who often expressed gratitude for the compilation of information and level of detail regarding coral reef management in the SEFCRI region. 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 H: SEFCRI Region Timeline for a tabular representation of the timeline). The timeline not only presents 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. The timeline reveals that there has been a positive trend of increasing capacity that has been built to manage coral reefs as well as major policy initiatives and a blossoming of role of civil society and market forces that depend upon the health of the coral reefs. However, analysis of the timeline since World War II, a few trends appear. Focus on biophysical aspects of reef health has increased dramatically over the years, yet there does not exist a broad set of clear and consistent time series of indicators for fisheries or water quality. Most studies are time bound and geographically focused. A wide

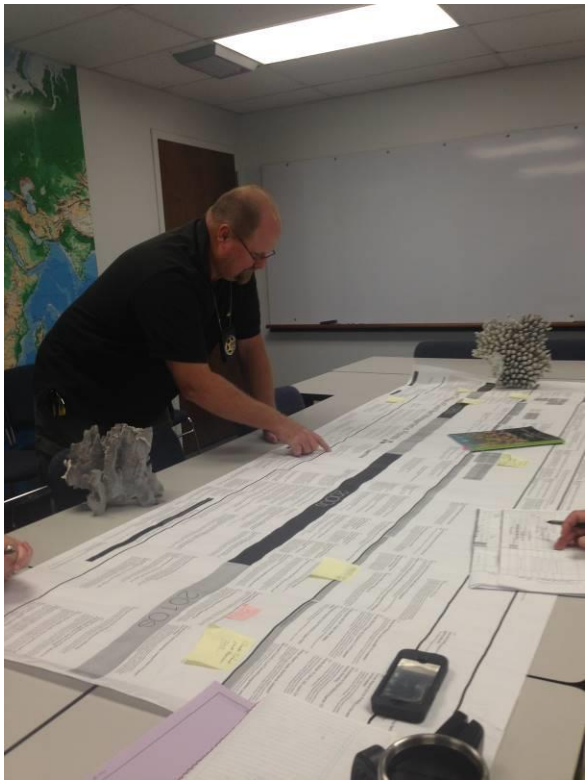


Figure 5: *Investigator David Bingham of FWC reviewed and added to the SEFCRI region timeline of coral reef management. (Photo credit: Audrey Swanenberg, SustainaMetrix.)*

range of political and legislative accomplishments have occurred to establish the FDEP CRCP as well as an increasing presence of a wide range of other agencies involved in the coral reef management process. Beach renourishment projects that began in the 1970s, at locations such as Broward County at Pompano Beach, have become numerous and continuous and are a beach management approach that that will not likely end anytime soon. A range of biophysical events such as the *Diadema* die off in the early 1980's, regular blooms of macroalgae, repeated hurricanes and ship groundings and invasive species such as lionfish and orange cup coral in the recent past all present an increasing challenge for management of coral reefs in SEFCRI region.

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 realities encountered during the site visit and during interviews. Our semi-structured interview approach and comprehensive approach to seeking input from across the coral reef management system worked well. 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 SEFCRI region. Finally, we conducted an internal analysis of the enabling conditions (1st Order), which includes reflections on what may be needed regarding changes in behavior and social norms (2nd Order) required to effectively build capacity and improve coral reef management in the SEFCRI region.

Our investigation of current activities yielded 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 over 110 documents relevant to the system (please see Literature Cited and Appendix A: For More Information);
- Over 55 in-depth interviews with key actors in the system (please see Appendix C: Interview List for full interview list);
- Development of the timeline (with over 350 entries) and review of current activities as defined above;
- Our discussions with, and feedback from, the J-CAT, which spanned over six meetings held on: September 4th, 2013; September 18th, 2013; October 2nd, 2013; October 25th, 2013 (in-person); November 20th, 2013; and, March 4th, 2014;
- Our immersion in and contributions to the professional literature of adaptive capacity, ecosystem-based management, ecosystem governance, capacity assessment, organizational behavior and other related disciplines; and,
- Our professional judgment, informed by similar assessments in other U.S. Flag coral jurisdictions and locations around the world.

Generation and Prioritization of Recommendations: The recommendations in Section Four were generated to serve as the core of a comprehensive capacity building strategy. Section Five presents a capacity building "road map" of how to move from this report to an action agenda with an overview of elements that would serve as main

ingredients for a long-term capacity building strategy. Together, they represent a range of tasks that should not be viewed as another long list of things to do in the short run and consider the task complete. Rather, they are presented as core elements needed to transition towards an ecosystem approach that recognizes that context is dynamic and ever changing, and investment in adaptive capacity is needed to build resilience and response to ecosystem change. Therefore sequencing and prioritizing what is done to build momentum for capacity building is crucial. The recommendations presented in this report were generated after careful consideration of the need to sequence and prioritize, and in close coordination with the Florida J-CAT, based on the current context of what is possible within the current coral reef management system.

Section Two: The Context for Coral Reef Management in the Southeast Florida: Trends and Current Conditions

Assessment of capacity to manage coral reefs in the SEFCRI region is highly dependent on the socio-ecological context within which such management is taking place. This calls for an understanding of the pressures on coral reef systems, the current state or condition of the reefs, and likely trends in the reef condition. This work also requires an appreciation of the human dimensions such as understanding who is using the reef systems and why, the value that reef users place on the reefs, and the economic contributions of the reefs to the local economy. From an institutional perspective, the context also includes comprehension of the larger governance dimensions that are responding to the drivers/pressures and state of the coral reef resource (Adger and Vincent, 2005). This consideration of the broader context of capacity for coral reef management is a central tenet of the ecosystem approach. Understanding interactions across spatial and temporal scales is essential to interpreting the context of coral reef management in the SEFCRI region. This analysis helps to ensure that recommendations in later chapters of this report are grounded in the awareness that specific attributes and determinants of adaptive capacity may be scale-dependent, culture and place specific (Adger, 2003), and may involve tradeoffs (Folke et al., 2002; Allison and Hobbs, 2004; Pelling and High, 2005).

Figure 6: *Map of the SEFCRI region, which extends from the northern border of the Biscayne National Park to the St. Lucie Inlet in Martin County (source: SEFCRI website).*

In this Section we briefly characterize the context for coral reef management in the SEFCRI region across these dimensions. We use the term drivers to include natural or human induced factors that cause changes to the state of the reefs of the SEFCRI region. Direct drivers unequivocally influence ecosystem processes while indirect drivers cause ecosystem change by influencing one or more direct drivers (Millennium Ecosystem Assessment, 2005).

2.1 Intro to Context in SE Florida SEFCRI Region

The Florida Reef Tract includes the coral reefs from the Dry Tortugas in the Florida Keys National Marine Sanctuary (FKNMS) and Dry Tortugas National Park to the St. Lucie Inlet in Martin County. Approximately two-thirds of the Florida Reef Tract is included in the FKNMS, established in 1990 (Gregg, 2013). The approximately 105 miles north of BNP and continuing until the St. Lucie Inlet is an area commonly referred to as the "SEFCRI region." This region derives its name from the SEFCRI administered by the FDEP CRCP. Unlike other sectors of the Florida Reef Tract (FKNMS, Dry Tortugas National Park, and BNP), there "is currently no legislative mandate to develop a management plan for the portion of the Florida Reef Tract north of BNP" (Gregg, 2013). The SEFCRI region is also unique in that its management is not place-based management like the more geographically specific state-wide network of Aquatic Preserves or the marine managed areas of BNP or the FKNMS. Rather, FDEP CRCP uses a combination of research and education and is starting to engage in more activity-based management to "reduce or prevent adverse effects from an activity to natural resources or to direct human activities in ways to reduce user conflicts" (Gregg, 2013) but is in the process of moving towards an ecosystem approach. The four county region (Miami Dade, Broward, Palm Beach and Martin) is a highly populous and urbanized area with diverse demographics as shown below in Table 1.

Table 1: (Source: Collier et al., 2007, with data from U.S. Census and Johns et al., 2004.)

County	Miami–Dade	Broward	Palm Beach	Martin	Total
Land area (mi^2)	1,946	1,205	1,974	556	5,681
Population (2000)	2,253,362	1,623,018	1,131,184	126,731	5,134,295
Housing units (2000)	878,448	763,267	576,418	68,037	2,286,170
Density ($People/mi^2$)	1,157.9	1,346.5	573.0	296.4	903.77
Boat registrations (FY 2004)	49,794	38,797	38,097	14,735	141,423
Number of tourists (million) (FY 2004)	10.9	9.4	4.4	N/A	24.7

2.2 Importance of Cultural, Social, Economic and Historical Context

The SEFCRI region is a densely populated and urbanized area with "a mosaic of urban communities, light industry and agriculture, and it experiences intensive tourism, particularly in the coastal areas" (Collier et al., 2007). The region contains approximately one third of Florida's population (Collier et al., 2008) with 6.2 million people (U.S. Census, 2010). The coral reefs are a critical component of the SEFCRI region's economy and are an attraction that draws tourists to the region. The natural resources associated with the coral reef ecosystem help make tourism and recreation two of Florida's more important industries. Recreational activities include diving, snorkeling and fishing which support local businesses such as dive shops, fishing stores, hotels, retailers and restaurants, which in turn contribute thousands of jobs to the local economy. There is livelihood dependency on the reef resources due to these businesses; however, there is not significant subsistence fishing. Since Florida is closely linked to a global economy, food security at the moment does not seem to be a major issue driving the fisheries associated with the coral reefs of the SEFCRI region. While other socio-economic studies have been proposed recently (Leeworthy personal

communication), the most recent detailed socio-economic study was published in October 2001 for Monroe, Miami-Dade, Broward and Palm Beach Counties and in 2004 for Martin County.

Figure 7: *A 1961 promotional photo for the Silver Sailfish Derby of West Palm Beach Fishing Club, which has drawn tens of thousands of tourists to the region since the tournament's establishment in the 1930's (source: West Palm Beach Fishing Club archives website).*

According to this report by Johns et al., "the capitalized reef user value for all Southeast Florida reefs is $8.5 billion". This figure includes information from Monroe and Martin Counties. The authors note that "visitor and resident reef users in all four counties are willing to pay $255 million per year to maintain both the artificial reefs and the natural reefs in Southeast Florida in their current condition by maintaining water quality, limiting damage to reefs from anchoring, and preventing overuse of the reefs. When the projects to protect the artificial and natural reefs are considered separately, visitor and resident reef users in all four counties are willing to pay $85 million per year to protect the artificial reefs and $228 million per year to protect the natural reefs in Southeast Florida" (Johns et al. 2001).

The region's demographics include a large portion of second homeowners, retired individuals and immigrants from Latin America and the Caribbean. The demographics of the region are also marked by stark socioeconomic disparities, ranging from affluent yacht owners of Palm Beach to recent immigrants struggling to find livelihoods in Miami-Dade County. The entire SEFCRI region is home to approximately 6.5 million people, and Miami-Dade County is the most populous county in the state of Florida with approximately 2.5 million people. The population progressively decreases heading northward through Broward County, Palm Beach County and Martin County (NOAA CoRIS, 2008). Palm Beach County has the highest median household income and Miami-Dade has the lowest median household income in the SEFCRI region (NOAA CoRIS, 2008).

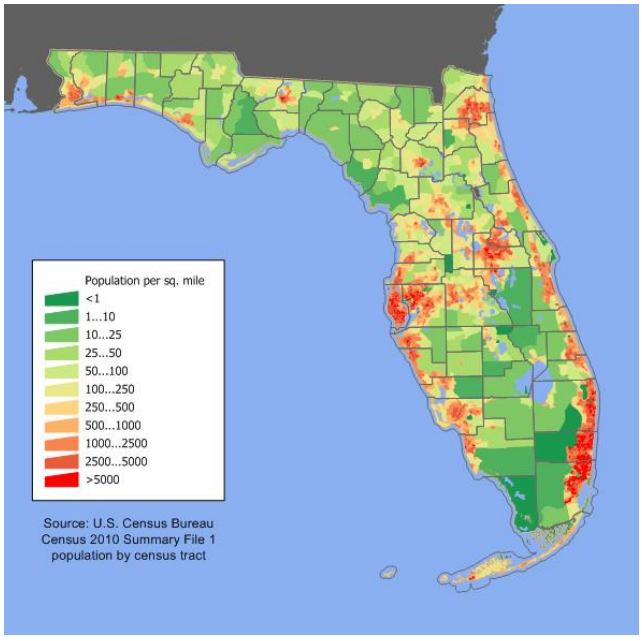


Figure 8: *Population density in southeast Florida is very pronounced, and the SEFCRI region is home to approximately 1/3 of Florida's population (source: U.S. Census, 2010).*

Due to the 2008 economic downturn, Florida has been dealing with issues of economic uncertainty and high unemployment (see Figure 9 below). However, even prior to that, the approach to ecosystem management has been described as one of control versus an adaptive ecosystem approach. In reference

to the governance of the Everglades, Lance Gunderson and Stephen Light published an article in 2005 that described the core philosophy for resource management in Florida:

> *The history of water management in the Everglades has been one of increasing control over the water resources of the region. The manipulation of water resources has enabled urban and agricultural development. Yet, that control has led to a loss of ecological resilience, and a series of ecological crises, or failures in policy. Responses to ecological crises have been large scale, expensive and technologically based solutions. The system appears to be locked into a single response to crises. That response focuses on spending more money on more control of water in order to sustain economic and agricultural development while protecting or restoring environmental functions. Yet, the environmental values that are an important social objective remain at risk. An adaptive management strategy has been drafted for the Everglades CEPP and large-scale experiments are being designed and budgeted for at the technical level. Leaders must embrace uncertainty and should foster a culture that seeks and encourages opportunities for learning through experimentation. Without managing the uncertainties in the social and political relationships in a way that integrates the ecological concerns of the area, restoration will continue to founder on the shoals of special interests. Without experimentation supported by broad-based stakeholder engagement, stalemate will continue in restoration efforts. Meantime, ecological values continue to deteriorate. The implications of embracing uncertainty and the opportunities for learning and experimentation and discovery are huge. The Everglades is a flagship for regional restoration efforts in the U.S. Timing, attention and politics have converged to make this effort in sustainability a saga that no one can put down. Adaptive approaches in management and governance are critical components for recovery of the ever-changing Everglades.*

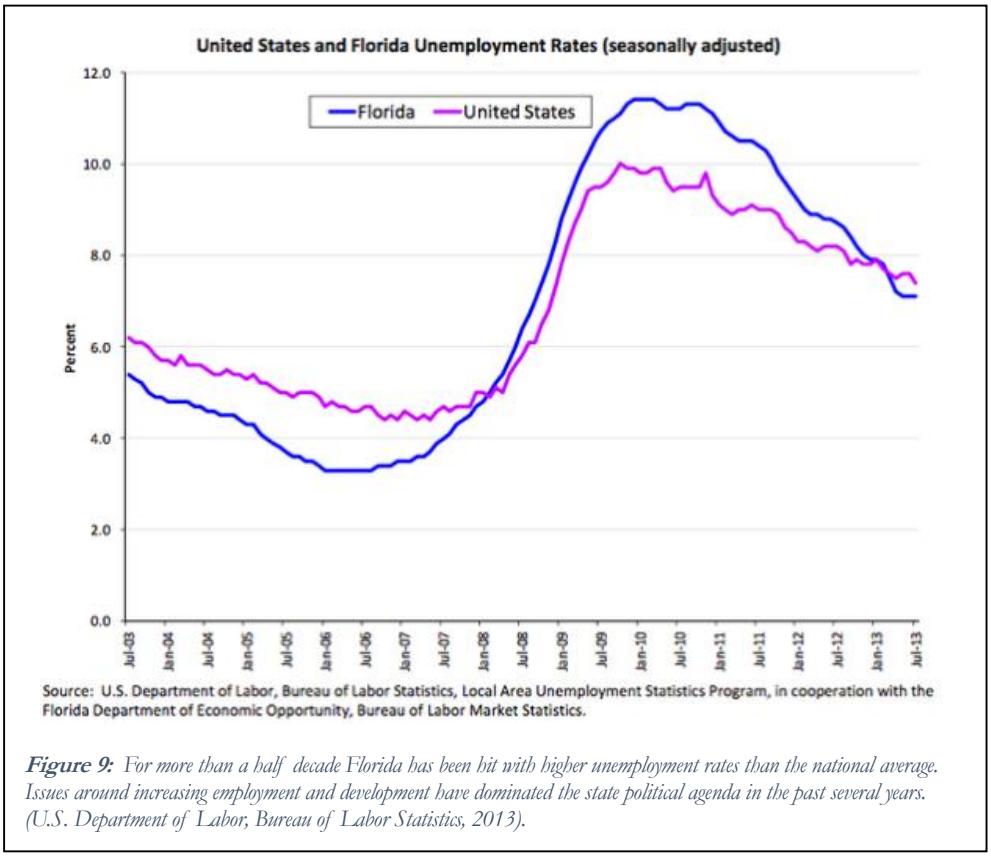


Figure 9: *For more than a half decade Florida has been hit with higher unemployment rates than the national average. Issues around increasing employment and development have dominated the state political agenda in the past several years. (U.S. Department of Labor, Bureau of Labor Statistics, 2013).*

2.3 Brief Summary of the Current State of the Coral Reefs in the SEFCRI Region

The SEFCRI region is at the convergence of the temperate and subtropical climate zones. The Gulf Stream has a major influence on water temperature and the flora and fauna of the region. It is closest to the Florida coast off of Palm Beach County. The Gulf stream "with its influx of warm water, enables favorable conditions for coral reef development off the Florida coast, while also acting as a transport path for larvae from the Caribbean to Florida" (Collier et al., 2007). This phenomenon highlights the importance of regional connectivity with the Caribbean coral reefs.

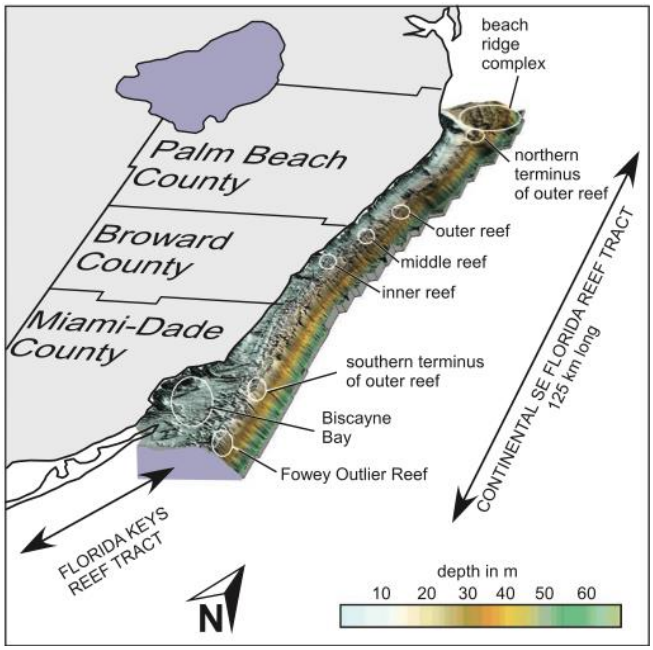


Figure 10: *The linear nature of the Florida reef tract in the SEFCRI region, with the inner, middle and outer reefs extending from the northern border of Biscayne National Park to the St. Lucie Inlet (Source: Banks et al., 2008).*

The reefs of the SEFCRI region are the highest latitude reefs along the western Atlantic seaboard. As stated previously, the Florida Reef Tract extends from the Dry Tortugas in Monroe County to the St. Lucie Inlet in Martin County. The coral reefs north of BNP have linear reef structures, sometimes referred to as reefs, tracts or terraces that run parallel to the shore. Additionally, there are nearshore and hardbottom ridges between the reefs that provide additional habitat. There are three areas of the reef: 1) Inner Reef, or "First Reef"; 2) Middle Reef, or "Second Reef"; and, 3) Outer Reef, or "Third Reef" (see Figure 8).

Hardbottom areas, patch reefs and worm reefs of the nearshore reefs include a multitude of octocoral (i.e., gorgonian), macroalgae, stony coral and sponge assemblages. From Miami-Dade County to Palm Beach County, the coral reefs assemblages occur on linear Holocene Acroporid mid-shelf and shelf margin reefs. Anastasia Formation limestone ridges and terraces with reef biota make up the reefs from Palm Beach County to Martin County (Collier et al., 2008). The fast growing staghorn and elkhorn corals (Acroporids) once dominated the Florida Reef Tract, but have been in decline since the 1970s. While some recovery of staghorn coral has been documented in the SEFCRI region, both species are now listed as threatened under the ESA. There are currently coral nursery projects located across the Florida Reef Tract that contribute to Acroporid restoration projects in the region.

Generally, there is a larger amount of stony coral in the southern portion of the reef tract while octocorals and sponges dominate the northern portion of the reef tract. The SEFCRI region coral reefs also are subject to more pollution and algal blooms than the FKNMS coral reefs, due to their close proximity to shore and to the large population along the SEFCRI coast.

For more information, please see: Section II of Rapid Response and Restoration for Coral Reef Injuries in Southeast Florida: Guidelines and Recommendations (Collier et al., 2007), The State of Coral Reef Ecosystems of Southeast Florida (Collier et al., 2008).

2.4 Major Biophysical Pressures and Drivers

Maritime Industries and Coastal Construction Impacts

The four-county SEFCRI region is highly urbanized and the coastal-construct impacts affect the coral reefs. The karst topography furthermore makes the area susceptible to impacts from maritime industries and coastal construction activities. The negative effects of coastal construction include loss of habitat, cumulative impacts, sediment issues, etc. The SEFCRI region's population is projected to grow (Bureau of Economic and Business Research, 2009) accompanied by increased development pressures. These projects include, but are not limited to, dredging for navigation, construction of marinas, beach renourishment, geotechnical drilling, installation of pipelines and cables and various other construction projects that can affect coral reef ecosystems.

In the SEFCRI region dredge and fill activities, especially beach renourishment, is a common strategy to mitigate the effects of tropical storms and hurricanes and to maintain the sandy beaches that draw tourists to the region. However, beach renourishment has potential negative effects of turbidity and smothering of the reefs. The SEFCRI region is home to three major commercial ports: Port Miami, Port Everglades and Port of Palm Beach. The amount of marine vessel traffic affects the marine environment, and port expansion projects can potentially directly affect many acres of coral reef habitat. The demand for expanding these major ports in the SEFCRI region is also expected to continue in the coming decades.

For more information please see Status of the Coral Reef Ecosystems of Southeast Florida (Collier et al., 2008) and the MICCI focus area on the SEFCRI website.

Fishing, Diving and Other Uses

Recreational fishing and diving/snorkeling are two main activities in this region (Johnson et al., 2007; Ault and Franklin, 2011; Behringer & Swett, 2011). Based on a presentation by Jaime Monty in January 2012, (**Southeast Florida Coral Reef Initiative,** Integration & Coordination of Efforts to Monitor Reef Fish Populations Along the Florida Reef Tract) recreational fisheries-dependent data show that trends in landings and fishing effort have remained unchanged between 1990-2009. Commercial fisheries-dependent data show landings decreasing between 1990-2006, perhaps due to increases in fishing effort. Generally, fisheries data has some key gaps in the SEFCRI region. Namely, fisheries-independent monitoring is needed to "understand how natural and manmade stressors are changing reef fish populations and communities" and the connection of this data with fishing data from the FKNMS. The Reef Visual Census methodology that has been applied in the Key for over 30 years to assess reef fish communities is now being applied to the SEFCRI region to understand the status of reef fish populations in the northern reef tract. Findings from a stakeholder perceptions study completed by Manoj Shivlani (2006) also identified that diving and other use issues are of great importance.

For more information please see the Fishing, Diving and Other Uses (FDOU) focus area on the SEFCRI website.

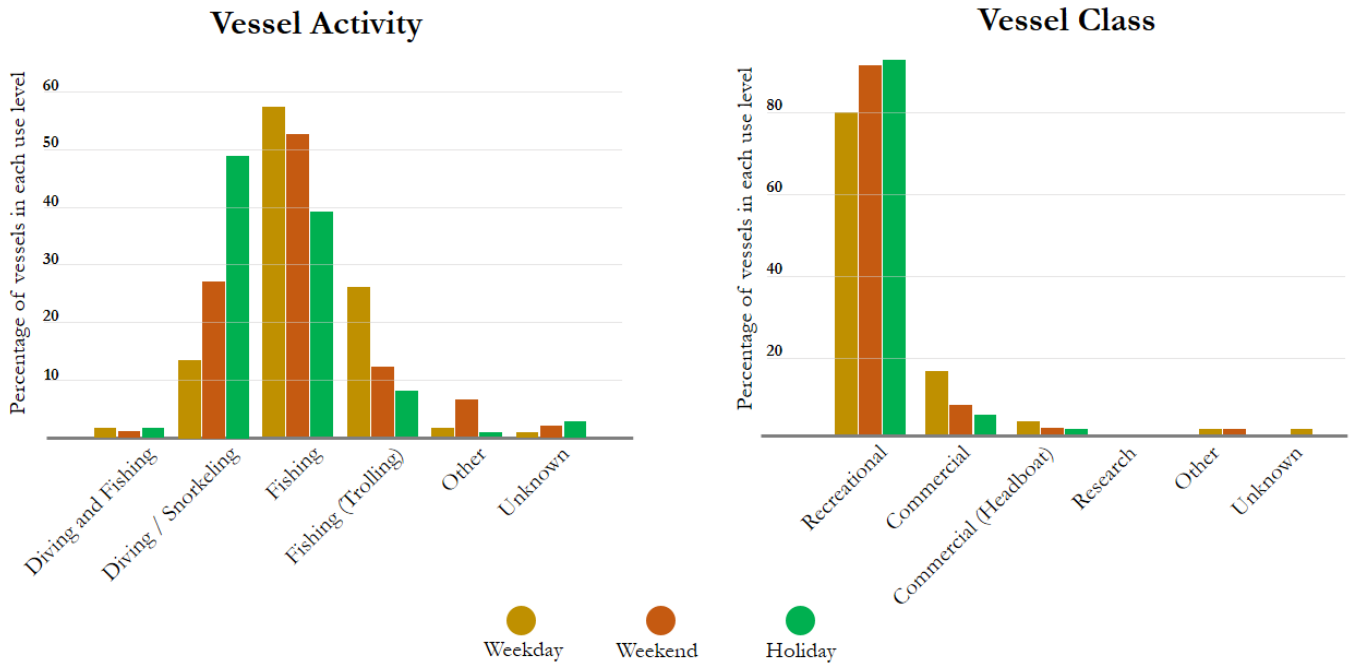


Figure 11: *Recreational diving, snorkeling and fishing on the weekends and holidays are the main uses and peak times for activities in the SEFCRI region. Source: presentation by Jaime Monty in January 2012, (**Southeast Florida Coral Reef Initiative,** Integration & Coordination of Efforts to Monitor Reef Fish Populations Along the Florida Reef Tract)*

Awareness and Appreciation

In 2006, the SEFCRI Coral Reef Needs Assessment Study was conducted. General findings include:

- Residents were generally more aware of the SEFCRI region coral reefs than visitors;
- Most respondents identified the coral reefs of the Florida Keys, while fewer were able to identify that the SEFCRI region also contains coral reefs;
- Most recognized that coral reefs are in decline and in poor condition;
- There was not cross-county agreement as to a single cause for coral reef decline; and,
- Nearly a quarter of the marine industry organizations and members did not consider their activities to adversely affect coral reefs.

For more information please see SEFCRI Awareness and Appreciation (AA) focus area website.

Land-based Sources of Pollution (LBSP)

The SEFCRI area is a densely and highly developed coastal, residential and commercial area with a variety of chronic anthropogenic stressors from the land that affect the coral reefs. LBSP can negatively impact coral reefs by causing detrimental effects to water quality and introducing pollution to the coastal waters. These impacts have been linked to significant macroalgal blooms, increased presence of coral-boring sponges, and increased turbidity (see timeline in Appendix H for examples).

In 2009, Palm Beach County's Reef Rescue, a local NGO, monitored algae blooms that formed near the Boynton-Delray wastewater outfall. Based on their data and analysis, there is published evidence that nutrient pollutants from the outfall fueled algae blooms that affected coral health. The outfall was reported to discharge 14 million gallons of treated (secondary) sewage a day, 365 days a year. Reef Rescue's lobbying efforts lead to the passage of the Advanced Wastewater Treatment (AWT) bill in 2008, which lead to the closing of the Boynton-Delray outfall on April 1st, 2009. All discharge of domestic wastewater through ocean outfalls is prohibited after December 31, 2025, except as a backup discharge that is part of a functioning reuse system or other authorized wastewater management system

For more information please see Delray Outfall Sewage Stopped (Palm Beach County Reef Rescue, 2009), and Ocean Outfall Study (Koopman et al., 2006) and Status of the Coral Reef Ecosystems of Southeast Florida (Collier et al., 2008).

2.5 Governance Context and Institutions Involved in Coral Reef Management

The SEFCRI region is home to a wide range of decision-making groups in the four-county area, particularly with respect to coral reef management. These include state, federal, NGO, community-level, market forces, civil society, county government, mayors, governor, industry, unions, etc. Understanding the power dynamics at play within the nested system of communities, cities, counties, the State of Florida and nationally has been a necessary yet informal capacity that has been developed to identify what is truly important to the people of the place. As many of the interviewees recognize, this capacity is critical for coral reef management in the SEFCRI region.

As Garmestani and Benson noted in a 2013 publication on adaptive governance, matching governance and ecosystems is an enduring challenge that requires aspects of adaptive management, adaptive governance, and reflexive mechanisms, e.g., monitoring and iteration of policy. The authors cite Florida Bay as an example and characterize the responsibilities of management agencies at a variety of scales as providing a better understanding of the "fit" between governance and the environment. They note that the Bay, like the SEFCRI region, is governed by multiple federal, state, and local agencies and NGOs at many scales, and "sound environmental governance appears to depend upon creating the conditions that allow for synergism between the hierarchy of organizations and institutions, rather than creating a broad, top-down arrangement that has the capacity to stymie creativity and innovation."

The three major expressions of governance in the system are government, market forces and civil society. These are expressed at different scales. Government expresses its power through laws and regulations, taxation and spending policies, and educational outreach. Market forces are expressed through differently sized corporations and businesses. Their power is expressed through profit-seeking activities, ecosystem service valuation, and cost-benefit analyses. Civil society includes organizations and institutions whose geographic and programmatic scopes vary. Examples include large international NGOs, mid-sized civic organizations and small local community organizations. Their power within a governance system is expressed through advocacy and lobbying activity, vote casting and stewardship activities.

Sources of Ecosystem Governance

The first step in characterizing management of the SEFCRI region is to delineate the management levels and social-ecological scales that affect the system. The SEFCRI region itself is the smallest scale, the four counties (Miami-Dade,

Broward, Palm Beach and Martin) are the next scale up, followed by Florida, and the United States. There are multiple federal agencies with coral reef ecosystem related management responsibilities and authorities in the SEFCRI region, e.g., USACE, NOAA, USFWS, USCG, and USEPA. At the scale of the State there are two major entities involved in coral reef management, e.g., FDEP and FWC, and a wide range of other institutions that are tangentially linked. At the local scale, county and municipal natural resource entities contribute to resource protection. There are a limited number of NGOs and graduate-level academic institutions, described in more detail below.

As a Governor's agency, the FDEP is the lead state natural resource agency for coral reefs. Through the Florida Coastal Office's Southeast Region, FDEP has oversight of two coral-related programs: co-management of the FKNMS with NOAA, and the formally mandated coral reef conservation program, the FDEP CRCP which SEFCRI is administered under. The Southeast Regional Administrator is also the Governor's appointed Florida Point of Contact for the USCRTF and US All Islands Coral Reef Committee.

Florida is the only jurisdiction of the seven U.S. coral reef jurisdictions that has a formalized coral reef program solely dedicated to the conservation of coral reef ecosystems. The FDEP CRCP includes multiple sub-programs and projects:

- **Reef Injury Prevention and Response Program**. This program is tasked with coordinating responses to coral reef and hardbottom injuries (e.g., vessel groundings and anchor drags) in the SEFCRI region and developing strategies to prevent coral reef injuries. (Note: The Florida Coral Reef Project Act of 2009 codified the legal action against perpetrators of coral reef injury, see next section for more information.)
- **Southeast Florida Coral Reef Initiative (SEFCRI).** SEFCRI is a team of 64 interagency and non-agency marine resource professionals, scientists, resource users and other stakeholders. The SEFCRI Team has four focus areas: 1) AA, 2) Fishing, Diving and Other Uses, 3) LBSP, and 4) Maritime Industry and Coastal Construction Impacts. A new focus area - Reef Resilience - is currently emerging.
- **Our Florida Reefs (OFR).** OFR is a community planning process for the SEFCRI region, hosted by SEFCRI. This process brings together local residents, reef users, business owners, visitors and the broader public of the SEFCRI region and is designed to increase public involvement in the future management of Southeast Florida's coral reefs by seeking input from these community members on the development of recommendations that can become part of a comprehensive management strategy to ensure healthy coral reefs in the future. - See more at: http://ourfloridareefs.org
- There are other projects such as Southeast Florida Action Network (SEAFAN), a reporting and response program for marine events and marine debris collection and removal. SEAFAN is designed to improve the protection and management of Southeast Florida's coral reefs by facilitating early detection, response, and assessment of marine incidents affecting the reefs and surrounding ecosystems. SEAFAN uses telephone hotline and internet report forms that rely on an "Observer Network" that includes resource users such as divers, fishermen, boaters, resource professionals and others (Bohnsack, 2012). SEAFAN increases stakeholder awareness and engagement with resource managers.

In addition to FDEP, FWC is also a state natural resource agency with jurisdiction over coral reef resources. The FDEP manages sovereign submerged land and its habitats, while the FWC manages the organisms that inhabit the

submerged land. FWC, through the FWRI, also leads research efforts on Florida's coral reefs ecosystems. FDEP ultimately falls under the leadership of the Governor of Florida and FWC falls under the leadership of its own commission, known as the FWC, which is made up of appointed professionals.

Florida has a variety of legislative actions that recognize the value of the resource and that guide management actions, as well as federal laws that are applicable to the SEFCRI region. Select federal and state laws relevant to the management of coral reefs in the SEFCRI region include:

- Rivers and Harbors Act (1899) – Administered by the USACE, and regulates the excavation, filling, or alteration of waterways in the U.S.
- The Randall Act (1967) – Established procedures regulating previously unrestricted dredge and fill activities on state owned submerged lands.
- Coastal Zone Management Act (1972) - Established to encourage coastal states to develop and implement coastal zone management plans. This act was established to preserve, protect, develop, and where possible, restore or enhance, the resources of the Nation's coastal zone.
- Endangered Species Act (1973) – Protects endangered species from the "consequence of economic growth and development untempered by adequate concern and conservation."
- Magnuson-Stevens Fishery Conservation and Management Act (1976) – Primary law governing marine fisheries management in the U.S.
- Clean Water Act (1978) – Primary law governing water pollution in the U.S.
- Sustainable Fisheries Act (1996) – Amendment to the Magnuson-Stevens Act, included changes to the purpose of the act, definitions and international affairs. Also included for Essential Fish Habitat provisions including coral reef habitats.
- Executive Order 13089 (1998) - President Bill Clinton signed Executive Order 13089 establishing the United States Coral Reef Task Force to lead U.S. government efforts to preserve and protect coral reefs. As Florida contains a large portion of U.S. coral reef ecosystems, the State of Florida recognized the importance of the Executive Order and the need to protect and preserve the biodiversity, health, heritage, and socio-economic value of the reefs and the marine environment.
- Executive Order 13158 on Marine Protected Areas (2000) – Established a national network of marine protected areas.
- US Coral Reef Conservation Act (2000) - "authorized appropriations to NOAA for coral reef protection and management through 2004. The Coral Reef Conservation Act provided NOAA with additional authority to undertake a number of activities to understand, manage, and protect coral reef ecosystems by authorizing five major activities." To learn more, follow this link to NOAA CRCP website.
- Florida Statue Chapter 403 Pollution Control (2004) – Regulates the discharge of pollution and ensures that water quality levels remain acceptable.
- Florida Antidegradation Policy (2004) – Prohibits unpermitted discharges into the waterways of Florida.

- Florida Statute 258.008 Coral Protection in State Parks (2008) – Provides protection for coral reef ecosystems within state parks, and provides explanation of penalties if injury occurs.
- Florida Coral Reef Protection Act (2009) – Authorizing FDEP as the lead trustee for coral reef resources, to protect coral reefs through timely and efficient assessment and recovery of damages, including civil penalties, resulting from vessel and grounding impacts to coral reefs.
- Environmental Resource Permitting (ERP) Amendment, Florida Statue 161.054 Joint Coastal Permit (2010) – Regulates the usage and processing of permits and licenses needed for coastal construction projects, marine activities and other related activities.
- Florida Statute 403.021 (2011) - Clean Water Bill for the State of Florida.
- Rule Chapter: 68B-42.009 – Marine Life (2011) – Removal and possession of wild live rock, coral, common and Venus sea fans, and fire coral in state waters is prohibited unless user has special activity license from FWC.
- Environmental Resources Permitting Amendment (2012) – Requires an environmental resource permit before land use or construction activity that could affect wetlands, alter surface water flows, or contribute to water pollution in the State of Florida.

Additionally, there are a variety of federal agencies that participate in coral reef conservation in the SEFCRI region. These federal agencies are NOAA CRCP, NOAA NMFS (including their divisions of Protected Resources, Habitat Conservation, Sustainable Fisheries, and Restoration Center), USACE, USCG, USEPA, USDA NRCS, and USFWS. NPS does not have any place-based management in the SEFCRI region; however, their proximity to the SEFCRI region with BNP and ENP is important. Similarly, the FKNMS, co-managed by FDEP and NOAA NMS, comprises the southern two thirds of the Florida Reef Tract.

Context of Major Market Forces

The fishing and diving industries are major drivers of reef-related activity that help bring tourism to the area, and spur resident expenditures. From June 2000 to May 2001, approximately $4.5 billion was spent on reef related activities across Palm Beach, Broward, Miami-Dade and Monroe counties (Johns et al., 2001). Yachting and cruising vessels often enter port in the SEFCRI region, and the associated industries occur there as well. Hotels and restaurants benefit from the tourism that coral reef activities bring to the region. The fishing industry supports local tackle shops and boat stores. Luxury real estate development is an important component of the local economy, particularly in Palm Beach County and certain areas of Miami-Dade County.

Context of Civil Society and NGO Partners

A small but vocal group of people with a shared goal of protecting the reef system emerged in the early 2000s. Numerous NGOs such as Reef Rescue Team, the Reach Research Team and Cry of the Water were established during this period. The groups built capacity to address issues that mattered most to them, engaged in lobbying activities and raised public awareness to address the issue of ocean outfalls that routinely deliver treated wastewater directly into the waters of the SEFCRI region (please see Section 2.4 for more information).

At the international NGO scale, TNC is a major participant in coral reef conservation efforts in the Florida Reef Tract. TNC leads the Florida Reef Resilience Program and partners with a variety of government agencies (i.e., BNP) and academic institutions (i.e., University of Miami RSMAS, Nova Southeastern University, etc.). The FRRP is a collaborative effort among managers, scientists, conservation organizations and reef users to develop resilience-based management strategies for coping with ocean warming and other stresses on Florida's coral reefs. This program conducts annual coral-bleaching monitoring and was the first monitoring program in Florida to use the same protocol to survey the entire Florida Reef Tract. TNC also coordinates a reef tract-wide effort utilizing underwater nurseries to grow threatened staghorn and elkhorn corals for restoration projects aimed at improving reef habitat and recovering the species' populations. Beginning in 2005, these young corals were used in restoration projects off Key Largo, and the project now covers the Florida Reef Tract from Dry Tortugas to Broward County.

The SEFCRI region also has a large number of academic institutions, including University of Miami - RSMAS, Nova Southeastern University and the associated National Coral Reef Institute (NCRI), Florida Institute of Technology - Jensen Beach Campus, and Florida International University, among many others. These academic institutions frequently partner with natural resource management agencies on coral reef conservation monitoring and other initiatives.

2.6 Context of Institutions' Recent Development Over Time

While the modern expression of coral reef management in Florida has been present since the mid-20th century largely centered on reefs in the Florida Keys, it has only been in recent decades that the need to expand management to include the SEFCRI region has been recognized. There were several management locations in southern Florida that were established for coral reef protection beginning with John Pennekamp Coral Reef State Park, established in 1960, and continuing with Biscayne National Monument designated in 1968, Key Largo National Marine Sanctuary in 1975 and Looe Key National Marine Sanctuary in 1981. Threats during the 1980s, including oil drilling, reports of deteriorating water quality and evidence of the declining health of coral reef ecosystems, led Congress and President George H. Bush to establish the FKNMS in 1990. The Tortugas Ecological Reserve was added to the FKNMS in 2001, increasing the total coverage of the Sanctuary to approximately 2,900 square nautical miles (FKNMS website).

In the mid-1990s, the Florida Department of Environmental Regulation was merged with the substantially larger Department of Natural Resources, creating the current FDEP. The FWC was established on July 1, 1999 as a result of an amendment to the Florida Constitution approved in 1998. The FWC was created by a merger between the former offices of the **Marine Fisheries Commission**, **Division of Marine Resources** and **Division of Law Enforcement** of the FDEP, and all of the employees and Commissioners of the former **Game and Fresh Water Fish Commission**. FDEP and FWC later split and there was little clear guidance of roles for coral reef management since coral reef ecosystems are defined as both land/habitat and a complex of organisms. Recently, this situation has evolved to a point where, in general, FDEP focuses on management, policy and regulatory issues (permitting and enforcement) for land/habitat and ecosystems, while FWC focuses on research, management and law enforcement for animals and their habitats/ecosystems, a point of overlapping oversight with FDEP.

The FDEP CRCP was originally established in 2004 to lead the SEFCRI, but was not given any legislative mandate or

authority to do so. Since then, as their regional presence has grown, local community and agency leadership expectations for the FDEP CRCP have grown significantly, while staff capacity, resources, and program authorities have not kept up with the demand (e.g., tasked with reef injury response in 2006 with no additional agency support). Expected to function at a level comparable to older state programs, the FDEP CRCP is often forced to produce results that other programs have two to three times the staff-capacity to handle. This burden weighs heavily on the existing staff and ultimately results in high staff turnover. See Section Three for more information.

Section Three: Findings Related to Coral Reef Management Capacity in Florida

3.1 Brief Description of Recent FDEP CRCP/SEFCRI History

In 2000, the U.S. Coral Reef Task Force (USCRTF) adopted a National Action Plan to conserve coral reefs that featured a recommendation to develop LAS. With guidance from the Task Force, the FDEP and the FWC formed the SEFCRI Team in response to the recommendation by the USCRTF. The SEFCRI Team included a group of marine resource professionals, scientists, and stakeholders from government agencies and other organizations first gathered in May 2003 to define potential LAS projects focusing primarily on coral reef resources extending north of BNP from Miami-Dade County through Martin County. This region was specifically chosen due to the lack of information about its coral reefs and lack of any regionally coordinated coral reef management. Until the FDEP CRCP was established to lead SEFCRI, no one knew the true extent or health of the reefs located in this region. Popular belief at the time was that the Florida Reef Tract ended in the Florida Keys. With guidance from this group, FDEP and FWC coordinated the formation of a team of interagency and non-agency marine resource professionals, scientists, resource users, and other stakeholders to focus on an area of the Florida Reef Tract north of BNP that was not under a strategic management plan. The reefs form a largely linear ridge complex that runs parallel to shore. A typical cross section off Broward County features inshore hardbottom that leads to an inshore reef ridge at approximately three meters depth roughly 700 meters offshore. A middle reef ridge is located roughly 1400 meters offshore at a depth of roughly 12 meters. An offshore reef ridge roughly 2100 meters from shore is at a depth of roughly 15 meters. The reef ridges are separated by sand. The reef ridge complex is just offshore of a densely populated and highly urbanized area. The SEFCRI process was initiated to better understand these reef resources and to develop a comprehensive and coordinated management plan.

In this Section, we briefly review the recent progress and what may have been events that have contributed to the evolution of coral reef management in the SEFCRI region, beginning in May 2003 (FDEP, 2004). The Management Cycle, described in detail in Section One, will be used to explore the process and adaptive nature of coral reef management. The SEFCRI story is complicated with many different cycles ongoing at many different scales. However, the capacity for learning and adaptation is clearly evident with each successive generation of coral reef management. For example, a key motivation from the start has been to better understand what was known about the reef system. Meanwhile, a wide-range of projects have been planned and implemented to try to address the issues that impact the health of the reef system. Further questions have arisen leading to a need for basic information such as long-term water quality and fisheries data as well as more information about the long-term dynamics of the system (likely trends of health, resilience, anticipated effects of climate change, etc.).

For this analysis of management process in the SEFCRI region, we place emphasis on the analysis of issues that include both challenges and opportunities, and the transition from issue analysis and planning (Steps One and Two) to securing formal commitment for a course of action (Step Three), and then on to exploring the degree to which implementation of a plan of action has occurred (Step Four). Following Step Four, if an action plan has been

implemented, then an emphasis is placed on ensuring it has been followed by a commitment to learn about the management plan's effectiveness through reflection and assessment (Step Five). When management actions are linked together in such a cycle, we believe the process provides evidence of adaptive coral reef management capacity. For this analysis, we have selected priority issues. It is important to note that these are not absolute definitions, as the LAS process is still underway with projects that are ongoing. The major point of using this image is that the sequence of the LAS process has overlapped with other planning efforts such as the PSD process, as well as the recent FDEP CRCP strategic plan. The OFR process is separate from these other planning efforts since it will not be based on any of the previously identified management issue documents but on the issues identified by the stakeholders, indicating an adaptive nature of coral reef management in Southeast Florida.

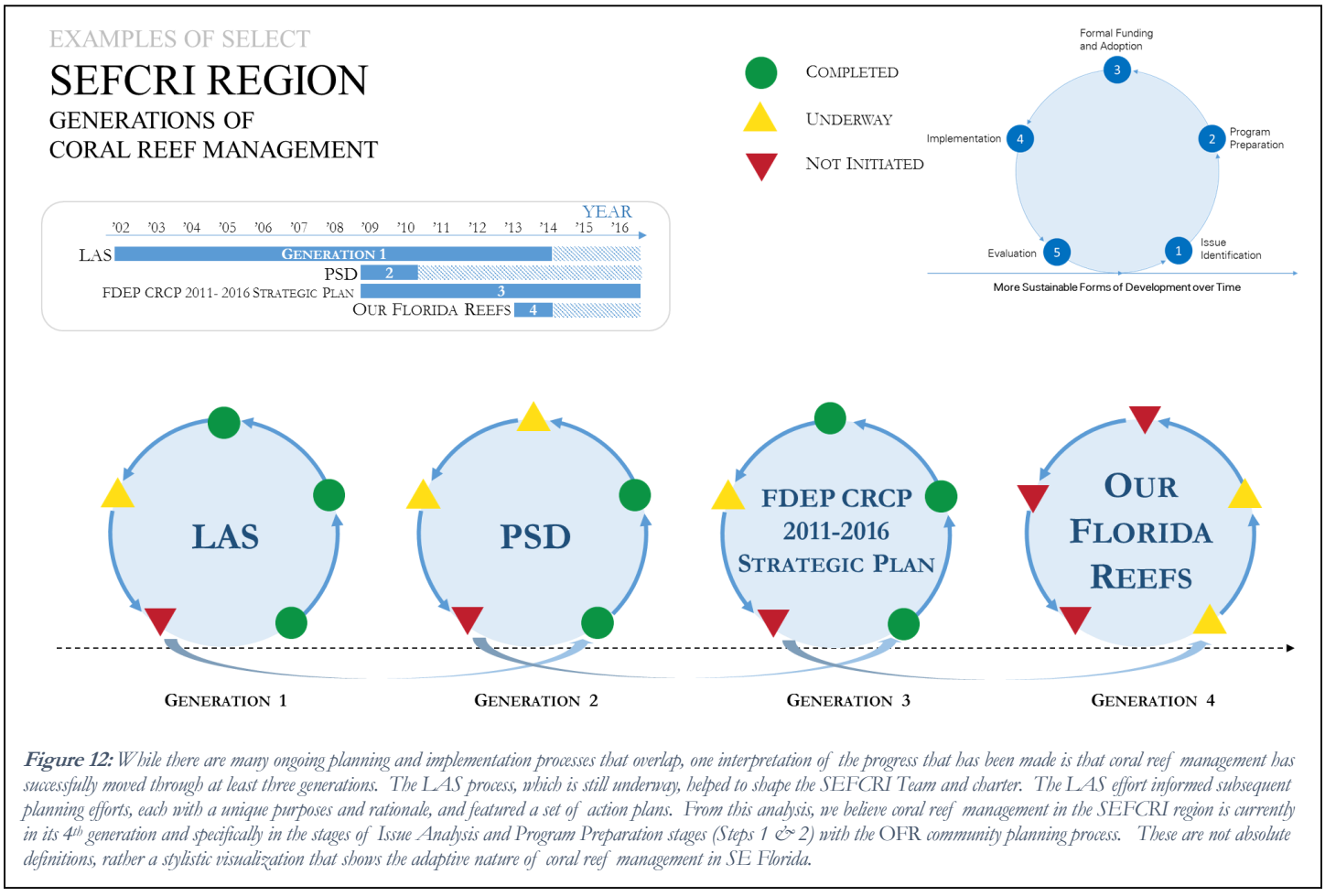


Figure 12: *While there are many ongoing planning and implementation processes that overlap, one interpretation of the progress that has been made is that coral reef management has successfully moved through at least three generations. The LAS process, which is still underway, helped to shape the SEFCRI Team and charter. The LAS effort informed subsequent planning efforts, each with a unique purposes and rationale, and featured a set of action plans. From this analysis, we believe coral reef management in the SEFCRI region is currently in its 4th generation and specifically in the stages of Issue Analysis and Program Preparation stages (Steps 1 & 2) with the* OFR *community planning process. These are not absolute definitions, rather a stylistic visualization that shows the adaptive nature of coral reef management in SE Florida.*

1st Generation - LAS

Step One – Issue Identification- In 1998, President Clinton signed Executive Order #13089 that established the USCRTF. The USCRTF along with the State of Florida recognized the need to protect and preserve the coral reefs and the marine environment in Southeast Florida. In 2002, the "Puerto Rico Resolution" of the USCRTF called for the development of LASs at each of the seven U.S. coral reef jurisdictions. The geographic scope of the Florida LAS was chosen to address the issues related to coral reef management for the northern one-third of the Florida Reef Tract because it lacked a coordinated management plan. With guidance from the Task Force, the FDEP and FWC formed

the Southeast Florida Action Strategy Team (SEFAST). The SEFAST Team, now nested under FDEP, first gathered in May 2003 to develop the LAS. SEFAST initially included only agency representatives, but in 2004 was expanded to include non-agency representatives as well when the FDEP CRCP took over leadership. According to the LAS (FDEP 2004), the Team gathered in 2003, analyzed a wide range of issues, and developed four areas of concern:

- Issues Linked with AA;
- LBSP;
- Fishing, Diving and Other Uses; and,
- Maritime Industry and Coastal Construction Impacts

Step Two – Assessment of Options/Program Preparation – In May 2004, FDEP hired a Manager to establish the FDEP CRCP office in Miami. In 2004, SEFAST was renamed SEFCRI, and includes over 70 local, state, and federal partners from natural resource management agencies, universities, user groups, and NGOs. The LAS that was prepared and published in December 2004 and featured 140 distinct projects under the four focus areas defined above. Approximately 75% of the projects were related to further analysis of the issues and gathering data to better understand the dynamics of the system. Approximately 25% of the projects were conservation management initiatives. The following provides a breakdown of the LAS plan developed in 2004 that is still ongoing:

- AA Action Plan: featured two key issues, goals and objectives under each issue and a total of 38 projects;
- LBSP and Water Quality Action Plan: featured five key issues, goals and objectives under each issue and a total of 24 projects;
- Fishing, Diving and Other Uses Action Plan: featured five key issues, goals and objectives under each issue and a total of 50 projects; and,
- Maritime Industry and Coastal Construction Impacts. Action Plan: featured four key issues, goals and objectives under each issue and a total of 27 projects.

Step Three – Formal Funding and Adoption – The FDEP CRCP is funded through a cooperative agreement between NOAA CRCP and the State of Florida. The State provides a 1:1 match through a recurring Legislative Budget Request. Continued or even increased funding from state government remains a constant challenge and while the program secures external funds, there is an ongoing need to identify funding for the implementation of the LAS, which is one contributing factor to the delay in its implementation of several of the LAS projects. A charter for SEFCRI participation was crafted at the start of the LAS process (and updated in 2012) to formalize the commitment, structure and function of the SEFCRI Team, a critical component for participants in the process to secure approval for their involvement.

Step Four – Program Implementation –While there are several examples of the successful implementation of projects for the LAS process, implementation is ongoing and not complete. Currently, the program still has 12 unfunded LAS projects, and continues to seek funding for implementing and completing these projects and is linked to NOAA CRCP funding requests. Some innovations have occurred to generate funds for implementing projects. For example, in 2006, CRCP was tasked with responding to reef injuries in this region, and has since created the Reef Injury Prevention and Response program (RIPR) to create mechanisms for responding to reports of vessel groundings,

anchor damages, and other types of unpermitted reef injuries. Through the Florida Coral Reef Protection Act of 2009, FDEP (via CRCP) has received legislative approval to recover funds in successful cases through the collection of civil penalties and fees as compensatory mitigation.

Significantly, some of the items in the LAS listed as "projects" have become programmatic elements in FDEP CRCP. One example is the SECREMP that includes benthic habitat monitoring data to contribute to management decisions. CRCP and SEFCRI recognized from the start that project implementation and success is dependent on securing appropriate levels of support, which remains a constant challenge.

Step Five – Reflection and Evaluation – On an annual basis, in preparation for grant proposals, FDEP CRCP reviews progress on LAS projects. While there is routine reflection and adaptive adjustments made periodically, a formal evaluation of the LASs was not conducted and was also not required. An internal process was conducted at an annual SEFCRI meeting in 2011 that informally explored the success of the LAS process and the charter. This informal process led to an update of the SEFCRI charter based on the lessons-learned in the first generation. While the informal reflective process is an excellent example of the adaptive capacity needed to make routine adjustments, the lack of resources needed to conduct a formal assessment is an example of a capacity gap. Those who implement the LAS initiatives must constantly focus on keeping the individual projects and overall program moving, and there is little internal capacity to conduct high quality reflection practices other than making the necessary course corrections and preparing for the next round of funding requests. Reflection and evaluation is something program leaders currently have to hire a contractor to perform, as there has been limited financial and human resource capacity to do in-house. Currently, this is not identified as a priority.

2nd Generation – Priority Setting Document

Step One – Issue Identification – In 2009, NOAA CRCP initiated a process "to develop place-based, local coral reef management priorities" for each U.S. coral reef jurisdiction, including Florida. This followed an evaluation process that occurred at NOAA CRCP and was to feature a linked capacity assessment as part of the process. This effort began in Florida as the first jurisdiction to participate in this process. Priority issues were identified by a representative group of coral reef managers facilitated through a workshop process led by a consultant for NOAA. During the workshop, shared priorities of "place-based reef managers" (e.g., FKNMS, BNP, and SEFCRI region managers) were identified. The geographic scope included the Florida Keys and therefore identified issues and provided recommendations to address these issues at a broader geographic scale beyond the SEFCRI region.

Step Two – Assessment of Options/Program Preparation – In 2010, a document was produced titled "Florida's Coral Reef Management Priorities" and has been referred to as the priority setting document (PSD). The draft PSD was based on the goals and objectives that were written at the workshop held to define the priorities. All of the workshop participants were asked to review the draft PSD and provide comment and many of them provided significant edits. All voted on a prioritization of the goals and objectives. The priority issues were integrated reef management, impacts of climate change, LBSP and fishing, diving and other uses. Nineteen additional management plans were specifically cited in the document and "are of equal importance on the local scale and their priorities may not be represented in this document" (State of Florida and NOAA CRCP, 2010).

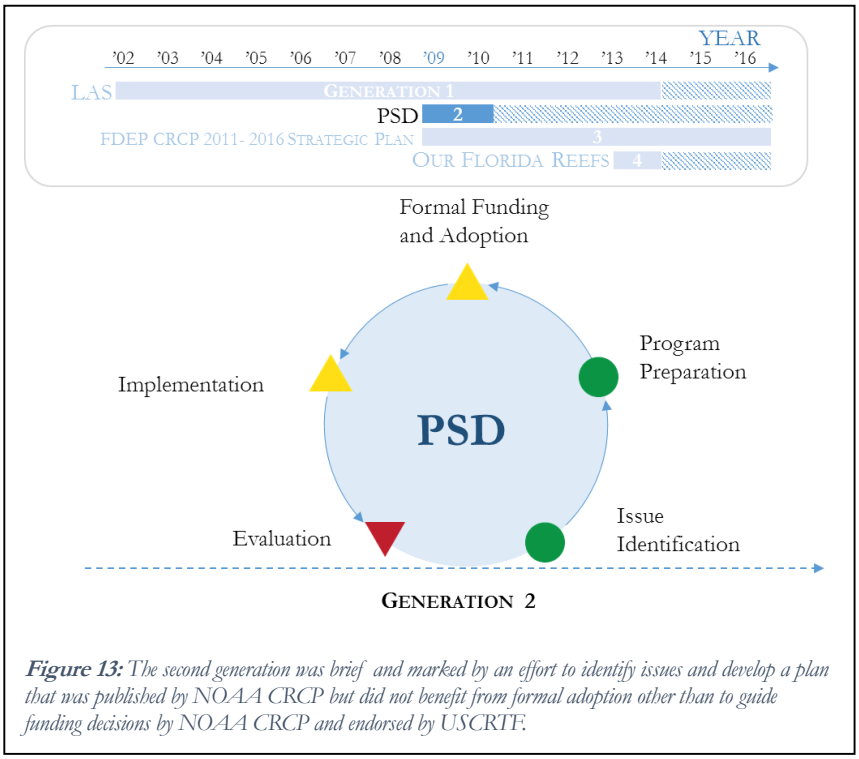


Figure 13: The second generation was brief and marked by an effort to identify issues and develop a plan that was published by NOAA CRCP but did not benefit from formal adoption other than to guide funding decisions by NOAA CRCP and endorsed by USCRTF.

Step Three – Formal Funding and Adoption – The document was an important planning tool for the NOAA CRCP program, however, there was no formal mandate or other expressions of political will at the scale of the State of Florida to implement the priorities as set forth in the document. While the PSD reflects some of the shared priorities of the Florida Keys, National Parks, and SEFCRI region managers, the PSD did not effectively provide clear implementation guidance nor was it to replace the LAS being implemented in the SEFCRI area. As such, there has been limited use of the document among natural resource managers and the PSD has not resulted in driving management prioritization.

Step Four – Program Implementation – NOAA CRCP uses the document to help inform funding decisions for coral reef management in the entire Florida Reef Tract and inform decisions about ongoing efforts such as the LAS projects.

Step Five – Reflection and Evaluation – The capacity assessment process was the result of the PSD process and serves as a potentially valuable reflective tool that hopefully will contribute to the building of adaptive capacity.

3rd Generation – Strategic Plan (FDEP CRCP 2011-2016 Strategic Plan)

Step One – Issue Identification – While effort was being directed to the development of the PSD described above, a parallel strategic planning effort was also initiated in 2009 with the review of "current local, regional, state and national coral reef conservation strategies, priorities and recommendations to identify the most relevant coral reef conservation targets for inclusion in the strategic plan" (FDEP CRCP, 2010). The issues set forth in this strategic planning effort were based upon the mandate of FDEP CRCP and their focus on the SEFCRI region. The distinction is important, as it was not intended to supersede any other planning effort such as the PSD. The planning team created a strategic plan to help prioritize some of their efforts since expectations of the CRCP far exceeded their staff capacity.

Step Two – Assessment of Options/Program Preparation – In 2009, FDEP CRCP staff developed draft goals, objectives and strategies for the plan and sought review and comment on the draft content from the SEFCRI Team members and stakeholders through an online process. Three hundred fifteen individuals responded to a survey that included a rating of priorities and 158 general comments on the draft plan. These results informed a prioritization process for a five-year plan. Strategies that did not meet prioritization criteria were deferred for future planning

processes. According to the plan, the scope "is contingent on sustaining or acquiring adequate programmatic capacity and support of program partners, where appropriate…. As the CRCP approaches completion of the 2004 SEFCRI LAS, it must balance the development and implementation of new initiatives and projects with its mandate to sustain core regional coral reef management and conservation services" (FDEP CRCP, 2010). Thus, the plan was not intended to be a document that defined the SEFCRI process, but rather a document that defined the strategy for the FDEP CRCP and how the SEFCRI is a core program of the CRCP.

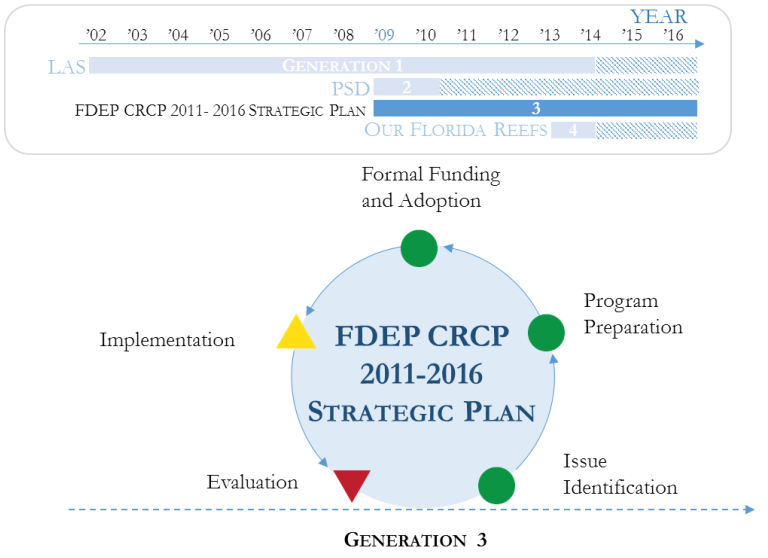


Figure 14: *The FDEP CRCP 2011-2016 Strategic Plan has successfully been implemented and many projects within the Strategic Plan are now underway by FDEP CRCP. No formal Evaluation and Reflection Practice is currently planned.*

Step Three – Formal Funding and Adoption – Publication of the *Florida Department of Environmental Protection Coral Reef Conservation Program 2011-2016 Strategic Plan* on July 1, 2011, by FDEP was the formal adoption of the strategic plan. Other than ongoing legislative approval of the funding for FDEP CRCP, there was no formal mandate for this strategic plan.

Step Four – Program Implementation – The strategic plan lists a series of programmatic elements to be completed within a five-year term, ending in 2016. Many of the proposed programmatic elements have been initiated and incorporated into FDEP CRCP, and program activities are well underway and linked to the NOAA CRCP funding requests. The FDEP CRCP strategic plan lays out CRCP priorities.

Step Five – Reflection and Evaluation – On an annual basis, in preparation for grant proposals, FDEP CRCP reviews progress on its strategic plan. While not an evaluation, this capacity assessment process is a formal reflective practice that could be considered as part of an evaluative effort augmenting informal in-house reflection on the progress towards the goals of the Strategic Plan, and could take place during FDEP CRCP meetings (held once or twice per year) or sometimes more. A formal evaluation would mark the completion of this step in the cycle and could be done in 2016 at the end of the capacity assessment process to mark the transition phase to the next generation.

4th Generation – OFR

Step One – Issue Identification– Based upon 10 years of adaptive learning from the SEFCRI process, such as LAS projects, a key issue identified was the need to engage stakeholders in the process of determining a management strategy. This intention provided the basis and justification for the launching of a two-year initiative focused on a detailed public engagement process relating to the issues of coral reef stewardship and what specific changes may be needed in behavior to achieve target goals. The initiative is based on public and stakeholder perceptions of the health of reefs in the SEFCRI region and the need to engage more stakeholders in a comprehensive reef management

planning process. The members of the SEFCRI Team decided to initiate a four-step "OFR Community Planning Process" in order to fulfill the requirements of the SEFCRI Team's FDOU LAS Project 26. A series of carefully designed listening sessions and stakeholder involvement meetings have been (Step One), and will be (Step Three), held to gather input from a wider cross section of stakeholders across sectors. The recommended management actions from the OFR Community Working Groups (Step Two) will lead to the development of a comprehensive reef strategy for the SEFCRI region (Step Four), and ultimately will contribute to achieving the mission of SEFCRI*: to develop and support the implementation of an effective strategy to preserve and protect Southeast Florida's coral reefs and associated reef resources, emphasizing balance between resource use and protection, in cooperation with all interested parties.*

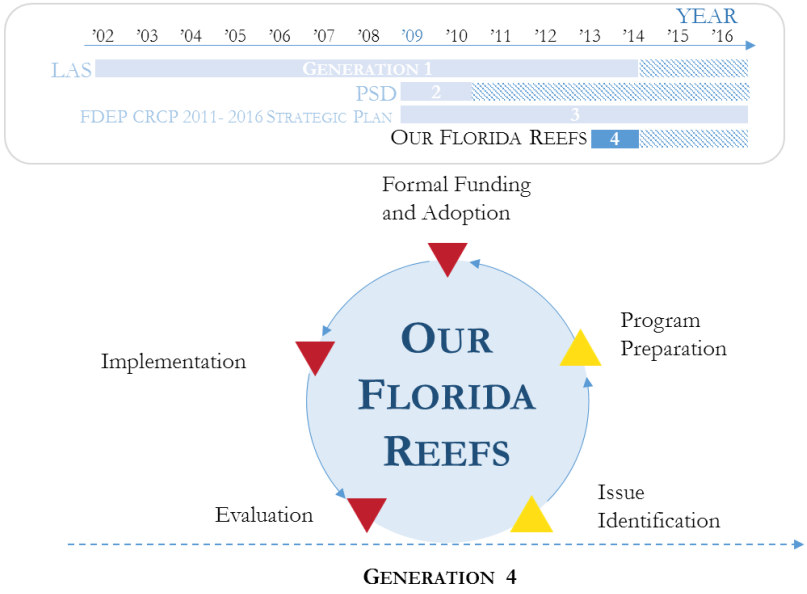


Figure 15: Our Florida Reef *is currently in Program Preparation – Step 2 of its 4th generation, and has begun the process implementing Community Working Group meetings, who will be making recommendations for the future of coral reef management in the SEFCRI region.*

Step Two – Assessment of Options/Program Preparation – OFR has assembled the team of individuals who will comprise the Community Working Groups. Through monthly in-person meetings and through the use of an online Decision Support Tool, these groups will be given access to a wide range of information that FDEP CRCP and SEFCRI have collected over the last decade, e.g., reef location maps, data from existing monitoring programs (SECREMP, FRRP, Reef Visual Census), use patterns, etc. The groups will assimilate the information and provide FDEP CRCP with a prioritized list of management action recommendations that will shape the future of coral reef conservation in the SEFCRI region. The effort is currently in this step of the management cycle.

Step Three – Formal Funding and Adoption – Currently, it is unclear what will be the intended expression of formal adoption and approval for the recommendations to be put forth by OFR. Adoption depends on the content on the recommendations put forward. It is anticipated that there will be some level of support commitment from each of the local, state, and federal agencies actively participating in the SEFCRI Team and OFR Community Working Groups.

Step Four – Program Implementation– The strategy is to complete Step Two, move into Step Three by successfully navigating formal commitment from key leadership and stakeholders, and then move into the implementation stages.

Step Five – Reflection and Evaluation – Routine reflection and adaptive management is anticipated as part of this process, and formal reflection and evaluation is recommended for the OFR effort to signal an end to this generation and the start of a 5th generation.

Figure 16: The four-step community planning process for the Our Florida Reefs program. (Source: *http://ourfloridareefs.org/our-florida-reefs-process/*)

3.2 Capacity Issues Analysis

Building adaptive capacity is scale-dependent. At one extreme, there is a limited local capacity to address the 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 due to increased carbon saturation in the upper levels of the oceans water column. These issues, as well as the increased likelihood of severe storm events add significant uncertainty to coral reef management in the future. 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 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 address local issues such as port expansion including contentious issues surrounding the mitigation of the proposed construction, issues of LBSP including challenges associated with residential coastal construction, beach renourishment, etc., and issues associated with water quality, such as managing the nutrient loading from the St. Lucie Inlet, require a high level of coordinated management capacity at the scale of the SEFCRI region.

The challenge of building capacity to address issues at a regional scale, and how to deal with cross-scale dynamics and multi-level interactions, becomes a massive capacity challenge. 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, socioeconomic 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). For the purposes of this issue analysis, we will focus on issues that are within the realm of management for the jurisdiction.

As described in the Climate Change Action Plan for the Florida Reef System (2010-2015), published as part of the FRRP, two major factors will dictate the future health of the reefs. The first factor is the rate and extent of climate change. The second factor is the resilience of Florida's coral reef system to that change. Effectively addressing the first factor is largely beyond the scope of state action. However, "the resilience of Florida's coral reefs is under direct influence of local management strategies and reef users' activities" (FRRP 2010).

The issues presented below are both challenges and opportunities. They are also largely complex and interrelated. These types of issues are best described as "wicked", which means that they are difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize (Rittel, 1972). There can be resistance to resolution of these issues based on competing values and interests. Moreover, the effort to solve one aspect of a wicked problem may reveal or create other problems. These issues are not listed in any prioritized order - these are all priority issues. The first four issues are related to what may be enabling conditions for coral reef management in the SEFCRI region described in Section One (1st Order of Outcomes). The first four generations of coral reef management have acknowledged many of these issues, and they remain a constant challenge and will increase in their intensity over time. It will require strategic collective thinking in order to prioritize and sequence action to

continue to address these issues. Section Four of this report describes recommendations aimed at the near-term. Section Five of this report describes the beginning of a road map for a sequenced and prioritized future management regimen working towards Ecosystem-based Management.

Each issue in this Section and recommendation in Section Four is accompanied by a table that highlights related issue(s) or recommendation(s) so that the connection between issues and recommendations is made clear. Please refer to Appendix D for a complete correlation matrix between issues and recommendations.

1. Supportive and informed constituencies for effective coral reef management

According to the 2012 US Census, the population of the four counties that border the Southeast Florida reef tract was 5.91 million, a population larger than 30 of the 50 US states. In 2008, Miami-Dade was the eighth largest county in the US, Broward was 16th and Palm Beach was 29th. According to the South Florida Regional Planning Council, the average rate of growth across all four counties is 10% and continues to grow at a pace faster than the nation as a whole. International migration has been the primary source of net growth in the region for the last two decades. The racial and ethnic diversity of the Region's population also continues to increase with a corresponding increase in the diversity of languages being spoken. Southeast Florida's residents are older than the rest of the nation, and the numbers of elderly residents is expected to grow as a proportion of the overall population, along with the rest of the nation, over the next 20 years. While the highly urbanized coastal zone contributes a number of human-related impacts to the reef communities, the sheer numbers of people is both a massive challenge as well as an opportunity.

According to those who were interviewed who work on reef awareness programs, residents have an overall low level of awareness of the reef's existence and describe a low overall sense of the effects of water pollution, over-fishing, coastal construction activities, vessel anchoring and groundings, etc., on the region's reefs. Ideally, such a broad population base could serve as a key constituency in support of a reef protection/restoration program and would understand and actively support its goals. At the local level, groups of resource users who are both supportive and informed of coral reef management strategies do exist but are limited. If support by these groups continues to be relatively small as compared to the general population, then the task of implementing current policies and imposing the new policies and regulations on an unwilling and uninformed society will continue to escalate and will be costly in terms of enforcement.

Furthermore, interviewees identified a gradient of involvement with the resource users, with the most involved comprising individuals who derive their livelihoods from the natural resources. Several described an active group of resource users who frequent the reef for recreation: dive boat operators who bring thousands of guests to snorkel and dive the reefs. Many of these people who engage with the resource are tourists and thus have limited voice in long-term stewardship activities. Several who were interviewed described a lack of a clear voice and vision for reef management and protection from the resource user community, which can result in a sense of fragmentation and lack of clear direction for management. While total agreement among key constituencies is likely impossible, the impressive demographics suggest that a collective voice is possible and that success lies in constructing a program that is perceived to be addressing issues important to the people of the SEFCRI region in a manner that is seen to be both fair and effective.

Building AA for the coral reef ecosystems' role as a driver for economic development and ecosystem services is integral to the issues of supportive and informed constituencies, along with science to inform management (human dimensions) and political will. Several who were interviewed noted that there is much to learn about the social science and human dimensions research necessary to better understand the potential of a collective voice to advocate for protection of the coral reefs in the SEFCRI region. Appreciation for their ecological services (i.e., wave breaking for private property protection, limiting sand erosion to reduce the need for expensive beach renourishment projects) is underappreciated and not fully understood.

Capacity Issue Examples:

- Outreach and communication is a major priority of FWC and FDEP staff as well as a wide range of SEFCRI partners. People are now working together under a common vision to raise awareness and support for coral reef protection. For example, one SEFCRI activity has been ongoing over the past few years to design and implement workshops to train teachers and provide much needed curriculum support. This particular program engages teachers and provides them with education "trunks" that are filled with curriculum elements and teaching tools. This particular program also highlights the need for additional staff as there is currently only one coordinator who implements all of the ongoing coral reef outreach and education projects and initiatives for the entire SEFCRI region;
- Outreach and communication requires the use of multiple languages as well as addressing the values and needs of a vast economic spectrum from extremely affluent to the economically marginalized; and
- Outreach and communication also require geographic specificity as many resource users are often loyal to particular inlets/areas, but may not be concerned with the health of the natural resources along the entire Florida Reef Tract.

Examples of Building Capacity to Increase Supportive and Informed Constituencies:

- A coral reef valuation study was conducted in 2001. The purpose of this project was to provide local, state and federal agencies in charge of managing the artificial and natural reefs of the coasts of Southeast Florida with information on both the market economic impact (e.g., sales/output, income and employment) and non-market economic value (consumer's surplus) associated with reef use. The results were used to support public education campaigns that highlighted the economic contribution of the reefs to the coastal counties. The information has been used to justify continued state and local funding and support for conservation efforts. Coral reef managers and SEFCRI partners have recently identified the need to update this valuation study to provide more accurate and recent numbers on the value of these reefs.
- The SEFCRI has created a Speakers Bureau which features a wide range of SEFCRI partners presenting current information of coral reef management in the region to engage local community groups.
- OFR is a stakeholder engagement project for SEFCRI. The purpose of this program is to engage stakeholders in "OFR Community Working Groups" that will develop management options leading to a comprehensive management strategy for the SEFCRI region to ensure healthy coral reefs in the future.

Issue Relates to Proposed Recommendations in Section Four such as:

Increasing FDEP CRCP Capacity	**Build FWC Capacity**	Integrated Management for SEFCRI Region	Coordination and Management Across the Florida Reef Tract	Coherent Enforcement and Compliance Program Across Agencies
Engage Political Leadership via the Coastal Ocean Task Force	Business Case for Improved Coral Reef Management	**SEFCRI Community Supported Organization (CSO)**	Biophysical and Human Dimensions Science Database	**Support the Further Development and Role of Bridging Institutions**
Sequence and Prioritize Management Actions of SEFCRI	Valuing Ecosystem Services and Socio-economic Database	Cooperative Research Institute	Scenario Planning Exercises	**Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region**
Systems Map	High Quality Collaboration and Conflict Resolution			

2. Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management

The commitment by government to the necessary authorities and resources required to implement a program is a critical capacity issue that requires continual attention. The passage of Florida's Coral Reef Protection Act that went into law effective July 1, 2009, was a statement of commitment and political will by the Florida legislature that the entire Florida Reef Tract is an important resource to the people of the State. The legislation responded to stakeholder recommendations from a 2006 public workshop facilitated by SEFCRI held to compile information on the process and adequacy of existing emergency protocols for response to, and restoration of, coral reef injuries caused by commercial vessels dragging cable, groundings, or vessels anchoring on Southeast Florida's coral reefs. Coral Reef Protection Act, which authorizes the FDEP as the state's lead trustee for coral reef resources[2], addresses impacts and pertains to both commercial and recreational vessels that transit state waters within Martin, Palm Beach, Broward, Miami-Dade and Monroe Counties. Several who were interviewed noted that Coral Reef Protection Act legislation, while it has provided the regulatory authority to prosecute offenders and receive funds for damages, it has limited statutory authority and provides a minimal level of protection for the coral reefs.

Together, the two state entities (FWC and FDEP), each with management authority over coral reefs, participate in SEFCRI and routinely address jurisdictional and programmatic boundaries to avoid overlap and maximize collaboration. Several who were interviewed noted that this collaborative process requires effective coordination on the ground in the SEFCRI region as well as high-level coordination in Tallahassee at the agency headquarters. The SEFCRI program has no statutory authority to define the jurisdictional boundaries between the two organizations, and

[2] DEP is the lead trustee pursuant to 403.93345(4), Florida Statute of the Coral Reef Protection Act: "It is the intent of the legislature that the department be recognized as the state's lead trustee for coral reef resources located within waters of the state or on sovereignty submerged lands unless preempted by federal law. This section does not divest other state agencies and political subdivisions of the state of their interests in protecting coral reefs." The Coral Reef Protection Act only applies to the sovereign submerged lands that contain coral reefs and hardbottom communities in Monroe, Miami-Dade, Broward, Palm Beach, and Martin Counties.

conflicts do occur. Many who were familiar with the issue agreed that SEFCRI has been quite effective in building a forum for collaboration decision-making and action, but there seems to be a need to clarify jurisdictional overlap by state agencies first and then with federal partners.

Often, the challenge of building political will extends well beyond government and includes leaders of businesses, tourism operators, trade unions, faith-based organizations, etc., that are linked in some way to the use of coral reefs. Several who were interviewed noted the imbalance of private industry's influence, such as recreational fishing, over decision-makers in state government. Furthermore, many noted that coral reef conservation does not seem to receive a great deal of attention in comparison to other pressing economic issues. Priority interests of the State include stimulating economic growth and reducing unemployment, among others. Allocating additional resources to coral reef management and protection is often seen as being at odds with these priorities. As such, there is limited political will for reallocating the modest available resources. This issue is linked with a relatively low level of awareness and recognition among key constituencies regarding the importance of coral reefs. Many agree that if there was a stronger collective voice coming from key constituencies in support of coral reef protection, more attention would be paid by the legislature. In addition, in order to make the political case for coral reef protection and to help to build momentum for coral reef management, many noted the critical need for updated information about the economic value of the coral reef resource.

Due to the realities of four-year election cycles changing leadership across the resource management spectrum in state government, the political landscape is always in flux. What may be strong political will for reef protection in one administration may shift dramatically in another. Incoming administrations appoint leaders who seek briefings from experts on the current wide range of resource management issues. This constant change is like a massive "refresh" button of the entire political landscape with changing priorities and shifting agendas. There is often a large amount staff turnover and significant effort taken to brief new appointees so they are "up to speed" and aware of past, current and upcoming management efforts and priorities. Additionally, many of the natural resource management agencies in Florida have recently undergone restructuring.

Several who were interviewed noted the tensions that arise over the use of terms such as sea level rise, climate change, marine spatial planning, etc. All seemed to agree that improved management requires making better choices about how resources are utilized and to not accelerate their decline. Gaining support to simply use terminology to engage in meaningful dialogue is critical. Without the ability to use terms that may describe future scenarios, adaptive management is severely limited.

Capacity Issue Examples:

- Decision-makers welcome feedback from constituents who are able to make a compelling and clearly stated case for increased investment for resource protection. Many who were interviewed suggested that in the SEFCRI region, great progress is being made but for a variety of reasons, the population is generally unaware of the depth of the issues affecting coral reef health and often do not make a clear and compelling case to decision-makers.
- Decision-makers also rely upon accurate information and statistical evidence from within the state resource agencies to help them make the case to build capacity for improved coral reef management.

Many noted that the information to make the case is dated and limited in scope and needs to be updated and expanded in order for the messages to be meaningful to decision-makers. A related issue is that this type of monitoring data is not often rewarded in the academic system with few reliable funding sources creating disincentives from the academic community to engage in this process. Integrating the value of ecosystem services that coral reefs provide into the case for building capacity for improved reef management is an important ingredient but can be subject to controversy of accepted methods and approaches.

- High profile resource management issues that are in the news cycle such as whale strandings or manatee deaths in Indian River Lagoon can draw political attention away from less high profile issues such as long-term protection for coral reefs. Also, several noted that high-level long-term initiatives such as the Everglades restoration and FKNMS have typically received more attention from senior political officials, as they are seen as large drivers of tourism (and thus, economic development) and subject to media attention and constituency concern. Several people interviewed noted that natural resource management in Florida could be characterized as a more reactive crisis-management response that generates projects that are often strategic in a short-term time frame rather than a focused long-term programmatic perspective to face the issues that are well beyond the time held in an elected office.

Examples where capacity has been built:

- Compared to the other six US Flag Jurisdictions that manage coral reefs, Florida is the only jurisdiction that has a formal coral reef conservation program that is combined with consistent matching of state funds to the NOAA CRCP grant allocation.
- Nova Southeastern University and the associated NCRI have assisted with preparing available information to make the case for increased management and have proven their willingness to shift to a more cooperative research model to engage others from across disciplines and respond to specific management conundrums.
- Creation of the Southeast Florida Intergovernmental Coastal Oceans Task Force is an example of an organization that is intended as a critical communication pathway bridge from FDEP CRCP staff and SEFCRI. The primary focus is local elected officials the secondary focus is the agency leadership, legislature, and state government officials through the local elected officials, and ultimately to agency leadership, the state legislature and the Governor. While this structure is being built to improve an understanding and action on key decision-making, it is still in the education stage with no clear action items on the current agenda.

This Issue Relates to Proposed Recommendations in Section Four such as:

A Increasing FDEP CRCP Capacity	**B** Build FWC Capacity	C Integrated Management for SEFCRI Region	D Coordination and Management Across the Florida Reef Tract	E Coherent Enforcement and Compliance Program Across Agencies
F Engage Political Leadership via the Coastal Ocean Task Force	**G** Business Case for Improved Coral Reef Management	H SEFCRI Community Supported Organization (CSO)	**I** Biophysical and Human Dimensions Science Database	**J** Support the Further Development and Role of Bridging Institutions
K Sequence and Prioritize Management Actions of SEFCRI	**L** Valuing Ecosystem Services and Socio-economic Database	M Cooperative Research Institute	N Scenario Planning Exercises	O Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region
P Systems Map	Q High Quality Collaboration and Conflict Resolution			

3. Integration and coordination among managers across the Florida Reef Tract and within SEFCRI Region

The Florida Reef Tract is one system ecologically but from a governance perspective there are currently at least four or five different management units. Management units to the south of the SEFCRI region include BNP, John Pennekamp Coral Reef State Park, the FKNMS, Dry Tortugas National Park, and the USFWS National Wildlife Refuge Complex, actively manage the southern two-thirds of the Florida Reef Tract.

Prior to the SEFCRI process there was little to no regional coordination on coral reef management issues in the northern third of the Florida Reef Tract. FDEP CRCP was the first to look at all four counties holistically. Today, there are a number of organizations, federal, state and local agencies and organizations engaged in the analysis and management of coral reefs in this region. Over the past 10 years, the natural resource management community of Southeast Florida has grown, and now operates at multiple scales that include leadership oversight from outside the region, from Tallahassee to Washington, D.C. With the growth of community interest in improved coral reef management, the quantity and quality of collaboration has generally increased. Collaboration is widely recognized as an essential strategy for addressing complex social ecological issues. Although collaboration is viewed as an imperative, the role of collaboration for coral reef management is particularly important in this highly populated region with many resource users and many management challenges. Collaborative efforts require time and attention and identify overlapping and sometimes conflicting mandates. Some degree of fragmentation along institutional and geographic lines is expected in a highly populated region of the US where there are multiple interconnected resource management issues. The SEFCRI process has built essential capacity towards a shared purpose and has provided an opportunity to explore the potential benefits of more integrated management. However, many who were interviewed noted that gaps remain regarding more effective integration and coordination among managers across the Florida Reef Tract.

With more natural resource management actors, increasing the quality of collaboration is a primary strategy for cultivating innovation, conserving economic resources, building relationships, addressing complex problems, and

reaching essential coral reef management outcomes. It is through high quality collaboration that organizations address societal issues, accomplish tasks, and reach goals that fall outside the grasp of any individual entity working independently. While there has been progress in the quality of collaboration through the SEFCRI process and the new OFR initiative, the potential for higher quality collaboration is a continued capacity issue.

Capacity Issue Examples:

- Few projects have generated a need for conflict management; however, building capacity for conflict resolution will likely be a need for the future. The ongoing Port Everglades project is an example where natural resource trustee agencies at the state level are generally in agreement yet periodic differences with Federal partners have been noted and conflict resolution has been attempted.
- The Florida Reef Managers group, place-based managers who work on Florida's coral reef issues from across different management units of the Florida Reef Tract, used to meet informally to share updates and lessons-learned, and was an example of capacity that had been built, but was lost due to turnover in agency leadership roles. This was an effective way of increasing communication pathways among a variety of key natural resource agencies within the Florida Reef Tract.
- The Coral Reef Management Fellowship program that was supported by NOAA CRCP provided important capacity and expertise that has helped Florida in the implementation of priority LAS projects and contributes to a wide range of actions including administrative support such as assisting in the coordination of meetings, events and ongoing communication to increase quality of collaboration. Due to budget challenges this program ended and efforts are underway to reinstate it.

Examples where capacity has been built:

- The SEFCRI Team and the dedication of an updated charter describing clear roles and responsibilities, expectations, and overarching principles, has effectively served to create a forum for stakeholders from government, market forces and civil society to meet routinely and increase the quality of their management collaboration. With periodic updates to the charter, this seems to be an effective model demonstrating adaptive regional management.
- NOAA CRCP's placement of a Coral Reef Management Liaison and a Fisheries Liaison in Southeast Florida was a major contribution to local capacity and has increased the quality of collaboration and integration across the agencies. These positions work intimately with FDEP CRCP and FWC staff to develop and move place-based management priorities forward.
- When the position was created for the Southeast Regional Administrator of the Florida Coastal Office at FDEP, it merged two previous positions that had effectively separated management responsibilities across the northern and southern portions of the Florida Reef Tract into one position. While challenges of co-management remain, this is evidence of progress toward improved integration.

This Issue Relates to Proposed Recommendations in Section Four such as:

Increasing FDEP CRCP Capacity	**Build FWC Capacity**	**Integrated Management for SEFCRI Region**	**Coordination and Management Across the Florida Reef Tract**	Coherent Enforcement and Compliance Program Across Agencies
Engage Political Leadership via the Coastal Ocean Task Force	Business Case for Improved Coral Reef Management	SEFCRI Community Supported Organization (CSO)	Biophysical and Human Dimensions Science Database	**Support the Further Development and Role of Bridging Institutions**
Sequence and Prioritize Management Actions of SEFCRI	Valuing Ecosystem Services and Socio-economic Database	Cooperative Research Institute	Scenario Planning Exercises	Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region
Systems Map	**High Quality Collaboration and Conflict Resolution**			

4. Science to inform management and policy

While major advances in understanding the extent, health and drivers of coral reef decline have been well-documented, comprehensive trends in fisheries, water quality and response and resilience to multiple stressors remain a focus of scientific inquiry. The SEFCRI region is fortunate to have a large quantity of academic institutions with campuses or research interests in the four county region. These institutions include the University of Miami, as well as Nova Southeastern University and their associated NCRI, among many others. There are many professionals with credentials and degrees in marine science in the region and many on the SEFCRI team (see Appendix E). However, major data gaps remain, notably in long-term time series of fishery-independent fish population and water quality data. Many who were interviewed felt that these data gaps need to be closed in order to improve coral reef management in the SEFCRI region. Lack of funding remains as the major capacity challenge to close these gaps. Another limitation on monitoring may be the inherent incentive structures in academia, with its emphasis on pure (not necessarily applied) research, and limited investment by academic researchers in translating scientific findings into actionable information for managers.

Many within the academic and management communities described the persistent issues associated with sharing of data, lack of common protocols, lack of data portals where large data sets are available for common use. Some who were interviewed urged stronger collaborative research featuring engagement with the fishing community and recreational divers. Four Coral Reef Institutes, located strategically in US coral reef jurisdictions, were designed and funded to serve a bridging role of linking applied science and research with practical management of US coral reefs. The mission of these Institutes includes developing direct relationships with the local resource management agencies through the local Point of Contact within their region and to set an agenda to provide science that informs local management decisions. The goal was to conduct ecosystem-scale research important to the nation and to work within U.S. Coral Reef Task Force member jurisdictions. The current CRIs include: the NCRI managed by the Oceanographic Center of Nova Southeastern University in Florida; the Hawaii Coral Reef Initiative Research Program managed by the Social Science Research Institute of the University of Hawaii at Manoa; the Caribbean Coral Reef

Institute managed by the University of Puerto Rico-Mayagüez; and the Western Pacific Coral Reef Institute managed by the University of Guam. The experience in Florida with the local Coral Reef Institute seems to be quite positive and achieves the original intent of building capacity for science to inform management. The NCRI at Nova Southeastern University handles many of the SEFCRI projects as they are well equipped to do the work that is requested and their contractors have provided excellent service. This experience is not the norm at other US coral jurisdictions.

Work in the social sciences has generated key findings emphasizing the importance of the coastal ecosystem to the tourism-based economy and documenting the fact that many retirees have second homes in South Florida due to the recreational activities provided by the marine and coastal ecosystem. Kildow (2006) found that "77% of the coastal economy is tied to its shoreline", and also noted that "Americans rank Florida first in the nation as a destination for coastal recreation." The studies show there is a dollar value associated with ecosystem services, the quality of the ecosystem is important to residents and visitors, and ecosystem quality has the potential to impact the local and regional coastal-based economy.

Over the past 15 years, some work has been done in the social sciences to provide a richer picture of the degree of concern and willingness to pay for coral reef resource management. For example, in 2006, a needs assessment of coral reefs from Miami-Dade County north to Martin County was conducted. Residents and visitors on beaches and surveying boaters were interviewed to document knowledge of coral reefs (Shivlani 2006). This work included exploring beliefs about coral reefs, perceived fisheries impacts and willingness to pay to protect coral reefs in Florida. Visitors and residents on beaches and those boating had a good general knowledge of coral reefs, more so than knowledge on the local SEFCRI portion of the Florida Reef Tract. A majority of beach visitors were willing to pay to protect reefs, while a majority of residents were not willing to pay an additional sales tax.

Additional investigation in the governance dimensions may also be warranted if the next generation of management is to include a focus on changing human behavior towards increased protection of coral reefs. Such work could focus on understanding and improving compliance and enforcement, improving bureaucratic function, and improving outreach, education and communication effectiveness. There is great potential for the academic community to contribute in a meaningful way to understand capacity gaps for coral reef management in the SEFCRI region. Working collaboratively across disciplines is a persistent challenge in higher education and changing the culture of the academy to more directly address management concerns remains a major capacity challenge for coral reef managers.

Currently, there seems to be a shift further away from an evidenced-based and data-driven culture when it comes to resources management. While more natural science will be needed to increase the accuracy and precision of coral reef trends and make the case for management action, shifting public values, conflicting priorities and politics appear to be far more significant in limiting the use and application of scientific knowledge.

Capacity Issue Examples:

- Since SEFCRI staffers have no authority or rule to require research coordination, they are often unaware of science that is being conducted in the region. This is not the case at the FKNMS, where researchers have to apply for a permit to do science in the NMS and report on their findings. Furthermore, funding

for scientific research generally does not include a specific requirement for translating the results to managers. When it does occur, many noted during the interviews that it is uneven in quality.

- Data sharing among private consultants, academic researchers and reef managers is a persistent capacity challenge and currently there are few good mechanisms and examples for data sharing.
- Interdisciplinary training in higher education is limited yet essential for coral reef managers of the future. Some examples include Nova Southeastern University's coastal management degree track. There are few project management courses in its graduate curriculum yet many of its graduates aspire to and successfully become managers. The University of Miami has a Marine Affairs and Policy graduate degree program that is making progress in building an interdisciplinary curriculum.

Examples where capacity has been built:

- FWC receives money from the USFWS State Wildlife Grant Program, which they (FWC) then grant out in a targeted, competitive process through FWC State Wildlife Grants. One of the focus areas is on coral reefs, and an example of a project funded under this focus area is a prioritization of research needs for reef restoration in a guiding document for the SEFCRI partners.
- Several successful monitoring programs have been developed. Examples include the SECREMP that is an extension of the CREMP. The Florida Reef Resilience Program's Disturbance Response Monitoring is a model interdisciplinary and collaborative program that tracks widespread disturbances such as coral bleaching. This is a robust program led by TNC, in concert with the reef managers, academic partners, and other NGOs. It was developed in 2005 and annually monitors reef conditions during peak periods of thermal stress. The Reef Visual Census fish assessments (NOAA, FDEP CRCP, FWC, University of Miami and Nova) are also examples of consistent monitoring approaches used across the reef tract. These monitoring programs use the same sampling protocols to ensure continuity of data across the entire Florida Reef Tract. The partners for this project include NCRI (funded by NOAA Center for Sponsored Coastal Ocean Research), FDEP and FWC FWRI.
- While not directly related to SEFCRI, NOAA has invested in the development of Cooperative Institutes at select research institutions that also have a strong education program with established graduate degree programs in NOAA-related sciences. Typically, a Cooperative Institute engages in research directly related to NOAA's long-term mission such as coral reef management. Institutes require substantial involvement of one or more research units within the parent organization or other organizations and one or more NOAA programs. Ideally, the Cooperative Institute provides significant coordination of resources among all non-government partners and promotes the involvement of students and postdoctoral scientists and resource users in NOAA-funded research to achieve mutual benefits for all involved.

This Issue Relates to Proposed Recommendations in Section Four such as:

Increasing FDEP CRCP Capacity	Build FWC Capacity	**Integrated Management for SEFCRI Region**	**Coordination and Management Across the Florida Reef Tract**	Coherent Enforcement and Compliance Program Across Agencies
Engage Political Leadership via the Coastal Ocean Task Force	Business Case for Improved Coral Reef Management	SEFCRI Community Supported Organization (CSO)	**Biophysical and Human Dimensions Science Database**	**Support the Further Development and Role of Bridging Institutions**
Sequence and Prioritize Management Actions of SEFCRI	**Valuing Ecosystem Services and Socio-economic Database**	**Cooperative Research Institute**	**Scenario Planning Exercises**	Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region
Systems Map	High Quality Collaboration and Conflict Resolution			

5. Sustainable financing of coral reef management

There are a myriad of issues identified in the capacity assessment process associated with financial support for coral reef management. These issues include the structures in place to generate revenue for coral reef management, the challenges to state agencies in using financial resources and procuring goods and services, the legislative authority to generate and use additional funds and the potential of innovative mechanisms that may be able to generate sustainable long-term sources of funding.

As noted previously, Florida is the only jurisdiction of the U.S. coral reef jurisdictions that has a formalized coral program with dedicated staff in FDEP and which provides matching funds (roughly $1.2 million per year in both federal and state funds) to the cooperative funding provided by NOAA CRCP. The scope of the Cooperative Agreement between NOAA CRCP and the State can therefore be larger based upon this formal commitment. FWC also receives federal aid funding through various grants, and their website lists 10 sources including the Sport Fish Restoration Program that provides grant funds for fishery projects, boating access and aquatic education. Funds from revenue generated by the recreational Florida saltwater fishing license also contribute to resource protection, enforcement, research and public awareness activities by the FWC, which includes coral reef management.

However, many who were interviewed noted that the state's annual allocation does not meet growing programmatic needs. Currently, state leadership is working to shrink the role of government, and as such wants to increase the role of the private sector and civil society to contribute to resource management. Several interviewees mentioned that securing additional federal or state funds for coral reef management is not generally perceived as positive from those in upper administration as the funds are ultimately from a tax derived source, and greater effort is needed to identify alternative (i.e., private) sources of additional funds for resource management. For example, the concept of private-public partnerships is increasingly suggested as a solution to reduce tax-dollar expenditures by the state or federal government. The continuity of the necessary investments in programmatic infrastructure and institutional capacity by the state government is uncertain.

Once funding is secured, many who were interviewed noted that there are a wide range of challenges associated with procurement of goods and services for coral reef management. While outside of the control of FDEP or FWC, the Division of Administration within Florida state government oversees the use of financial, human and operational resources. Audits are routinely conducted to ensure consistency with state rules. However, they also serve to identify the challenges faced by natural resource agencies in responding to emerging issues, working under a wide range of contractual obligations, creatively addressing difficult project management decisions and simply using the resources to buy goods and services. This is a systemic challenge that has no clear solution other than to acknowledge the mismatch between the state requirements for financial accountability and the reality of natural resource management.

Capacity Issue Examples:

- Employment within state resource agencies is largely based on credentials and strong backgrounds in biology, environmental science, education, and outreach. There is an expectation that as staff develop and become leaders, they will oversee and administer contracts and manage grants. While there are some training opportunities across the State, particularly for more senior staffers, there are few training opportunities that build the necessary competencies to work effectively with the rules set forth by the Division of Administration.
- Staff turnover across state resource agencies and pay scales seems to be a chronic issue with multiple contributing factors. Compensation is often described as inadequate for the high cost of living in South Florida, and unequal within the respective agency programs. With high turnover comes the added responsibility of training new staff, building much needed experience in the local context of South Florida and growing an overall *esprit de corps*. Administrative restrictions such as out-of-state travel and attendance at trainings or scientific conferences makes it increasingly more difficult to develop committed and well-trained staff.
- The Coral Reef Protection Act of 2009 was a crucial step for codifying a revenue stream derived from natural resource damages associated with discrete impacts to coral reefs from the responsible party. However, while FDEP CRCP has a small annual allocation of funds from these damage settlements, access to those funds is limited.

Examples where capacity has been built:

- FDEP has begun discussions on creating a Community Support Organization (CSO) that would link across many of the programs associated with coastal management such as aquatic preserves and coral reef management. CSOs, commonly referred to as "friends groups," have been established at over 80 state parks and provide support by coordinating volunteers, educating visitors, hosting events and raising funds for specific park projects. These groups and the volunteers donate their time to help provide support functions at the state and local level. This may be a vehicle to secure resources from a wide constituency. However, due to legal constraints state employees cannot receive money, or spend it, without legislative appropriation regardless of where it comes from. Engaging private industries (e.g., the tourism industry) to create sustainable financing mechanisms or create philanthropic opportunities for activities such as coral reef management is needed. Innovative concepts such as fee-based ecotourism associated with state trust

lands and resources and licenses for nonextractive uses of coral reef resources (such as divers) is often discussed.

- A "Florida Specialty License Plate" that features an image of a shark, and silhouette of a diver on a coral reef is already in place with a portion of the funds going to Harbor Branch Oceanographic Institute Foundation, Inc. and the Guy Harvey Research Institute at the Nova Southeastern University's Oceanographic Center. While this example may contribute to management capacity indirectly, this type of program has generated revenue in other states that could serve as a model for more direct sustainable funding to local reef management.
- The Wildlife Foundation of Florida, Inc. was formed in September 1994, as a nonprofit CSO to provide assistance, funding and promotional support to Florida's fish and wildlife resources and their habitats. They are the citizen-support organization of the FWC. According to their website, their mission "is to partner with the FWC to ensure the conservation and enhancement of Florida's fish and wildlife resources so they survive and thrive for current and future generations of Florida residents and visitors." The Foundation raises funds and builds support for the FWC and other organizations engaged in science-based nature conservation, management, education, and research activities, builds partnerships with communities, businesses, organizations, and people throughout the State, supports finance programs that preserve and restore the unique, diverse plants, animals, and natural communities of Florida, and creates opportunities for residents and visitors to use, enjoy, and learn about the State's fish and wildlife resources.

This Issue Relates to Proposed Recommendations in Section Four such as:

Increasing FDEP CRCP Capacity	Build FWC Capacity	Integrated Management for SEFCRI Region	Coordination and Management Across the Florida Reef Tract	Coherent Enforcement and Compliance Program Across Agencies
Engage Political Leadership via the Coastal Ocean Task Force	**Business Case for Improved Coral Reef Management**	**SEFCRI Community Supported Organization (CSO)**	Biophysical and Human Dimensions Science Database	Support the Further Development and Role of Bridging Institutions
Sequence and Prioritize Management Actions of SEFCRI	Valuing Ecosystem Services and Socio-economic Database	Cooperative Research Institute	Scenario Planning Exercises	Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region
Systems Map	High Quality Collaboration and Conflict Resolution			

6. Effective enforcement and compliance for management of fisheries and coral reefs

Natural resources management enforcement issues are wide ranging. They include the enforcement of existing rules, laws and regulations, insufficient conditions written into permits by regulators, issues of permit compliance, and the training and experience of the judiciary with those regulations, to name a few. There are many laws, but they are difficult to enforce based on the way the laws are written. Administrative and civil penalties exist but are not frequently enforced to create a deterrent. Regulatory enforcement decisions frequently outweigh the concerns of

those responsible for the management of the coral reefs. Current laws, rules and regulations related to species and gear types are subject to frequent change.

The number, presence and focus of law enforcement officers creates another major set of issues. Compared to other US coral jurisdictions, there is significantly more enforcement presence in Florida. However, the degree of enforcement is multifaceted and the net effect is limited enforcement directed at coral reef management. For example, the US Coast Guard is quite active in this region with a strong presence but their role is largely focused on issues related to homeland security. FWC has many enforcement officers but they are spread across the counties working on many terrestrial and marine-based natural resource issues with minimal presence on the water. Local county enforcement is focused on criminal and civil issues with very little focus on natural resources. Many counties do not have on-the-water enforcement. Several who were interviewed noted that while there is overall enforcement capacity, there are a number of challenges with enforcing the Coral Reef Conservation Act such as a lack of officers that are allowed to actually get in the water and document reef damage. The FWC Officers' dive team disbanded in 1995 due to OSHA regulations.

FWC law enforcement officers have multiple priorities including educating youth and the public and enforcing state and federal fisheries and wildlife laws; protecting threatened and endangered species and habitats; managing captive and nonnative wildlife; investigating fish and wildlife crimes; enforcing boating rules and regulations and coordinating boating safety campaigns and education; managing public waters and access to them; conducting boating accident investigations; identifying and removing derelict vessels; and investigating vessel theft and title fraud.

From a judicial perspective, one person interviewed who has vast experience in Florida law and specifically with the Coral Reef Protection Act noted that there has not been a great deal of coral reef case law that has gone very far in the legal review process. Therefore coral reef issues are handled mostly through administrative law that governs the activity of administrative agencies of government. As a result, coral resource management issues are primarily handled by a small number of administrative law judges, few if any are trained in coral reef science, and most if not all are unfamiliar with resource management issues. Continuing education for judges has not been institutionalized to broaden the knowledge base on issues associated with natural resource laws. Natural resource law is perceived as highly specialized and somewhat secondary to the types of cases most commonly heard in courtrooms. We were told that it is not uncommon for judges to dismiss cases when they don't perceive there to be a victim or that precisely define who's harmed when a vessel rams into a reef, or an anchor drag destroys a coral head.

Accurate and well-documented cases that show cause and effect relationships are necessary for effective rulemaking and enforcement. Several officers who were interviewed noted that a consistent and quality-assured fisheries data set is crucial for "making the case" for location-specific regulations.

Additionally, basic education and awareness is needed to increase compliance. A "shifting baselines" phenomena has been documented in the Florida Keys region, as a majority of residents have not lived in the region for more than a few decades, and many do not know the state of the natural resources from years past. They are unaware of the steep decline in the health of the natural resources in the last half-century and therefore are less informed about the importance of compliance. In 2009, Loren McClenachan at the Scripps Institution of Oceanography documented trends for 13 groups of recreationally caught "trophy" reef fish with historical photographs taken from 1956 to 2007

in Key West, Florida. The mean fish size declined significantly and there was a major shift in species composition over the study period. She was able to show that large groupers and sharks dominated landings from 1956 to 1960. In contrast, she documented that landings in 2007 were composed of small snappers and the average length of sharks declined by more than 50% over 50 years. She concluded that customers paid the same amount for a less-valuable experience as declines in the size of fish caught were not reflected in the price of fishing trips. While this work was conducted in a different region of South Florida, it provides insight into the need to make the case to increase education and awareness that may increase compliance and be useful in the SEFCRI region.

Capacity Issue Examples:

- After 2008, staff turnover was high in FWC law enforcement (some noted significant shifts lowering wage compensation) and new staff joined. With the periodic increase in new staff and the challenge of training them, there is a significant loss of institutional knowledge and of certain capacities such as a trained law enforcement dive team.
- FWC Officers' dive team disbanded in 1995 due to OSHA regulations. Previously, the FWC Officer dive team was trained in underwater police sciences, including coral reef damage assessment. Currently, law enforcement officers are not capable of making a case that will hold up in a court of law for an activity they cannot visibly see, therefore the FWC has opted out of enforcing the Coral Reef Protection Act. New technologies such as drop cameras are possible replacements but making a good case still requires creating a compelling evidence package that can be used in court. Highly regimented patrols start and stop at the same time making it easier for those who intend to fish illegally to avoid enforcement officers. Shift presence is reduced on the weekends when the use of the resource is at its highest.
- Currently, there is little support for place-based management approaches that present alternatives to the many challenges of enforcing species-specific and gear-specific regulations.

Examples where capacity has been built:

- The timeline in Appendix H outlines a series of examples where laws, rules and regulations have been passed to address the need to increase regulatory oversight regarding resource protection. For example, in 1993, rules were passed by the Marine Fisheries Commission (now the FWC) and approved by the Governor and Cabinet to prohibit live rock harvest, in response to an increase in the collection of live rock for the aquarium industry. Fisheries rules remain largely linked to species and gear types which can be more difficult to enforce rather than place-based which is largely about keeping use away from a geographical area.
- The SEFCRI region now has a multi-agency team of divers trained in CSI that can respond to grounding incidents. In 2012, FWC staff received FDEP CRCP's CSI training. One FWC staff is a forensics expert in the Division of Law Enforcement. Prior to this course, no one (including FDEP) had this training (with the exception of the one FWC forensics investigator).
- Fishing Regulations Apps have been created and are readily available to fishers and law enforcement officers to increase both compliance and enforcement. (Source: Floridasportsman.com)

This Issue Relates to Proposed Recommendations in Section Four such as:

Increasing FDEP CRCP Capacity	**Build FWC Capacity**	Integrated Management for SEFCRI Region	Coordination and Management Across the Florida Reef Tract	**Coherent Enforcement and Compliance Program Across Agencies**
Engage Political Leadership via the Coastal Ocean Task Force	Business Case for Improved Coral Reef Management	SEFCRI Community Supported Organization (CSO)	Biophysical and Human Dimensions Science Database	Support the Further Development and Role of Bridging Institutions
Sequence and Prioritize Management Actions of SEFCRI	Valuing Ecosystem Services and Socio-economic Database	Cooperative Research Institute	Scenario Planning Exercises	Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region
Systems Map	High Quality Collaboration and Conflict Resolution			

7. Effective management of land-based sources of pollution and water quality (LBSP)

Land-based sources of pollution and water quality, quantity, and timing are significant issues in the SEFCRI region. The SEFCRI region is highly populated and developed atop porous karst topography. Water quality data was often cited as a key scientific gap in the region, and is perceived by stakeholders to be the issue most affecting coral reef health. Reducing impacts to coral reef ecosystems by reducing terrestrial sediment and pollutant inputs and improving water quality is a broad goal and will require building capacity across the coral reef management and governance of the region. While upgrading existing infrastructure will begin to address some of the issues, these issues extend beyond the biophysical and include the need for enhanced compliance and enforcement, regulatory and zoning reform, increased public stewardship values, and improved bureaucratic function. The ongoing and damaging discharges to the St. Lucie estuary and Indian River Lagoon are examples where existing systems do not sufficiently address environmental concerns.

The South Florida Water Management District is the regional governmental agency that oversees the water resources in the southern half of the State, covering 16 counties from Orlando to the Florida Keys. Initiated in 1949, the agency is responsible for managing and protecting water resources of South Florida by balancing and improving water quality, flood control, natural systems and water supply. A key initiative is the restoration of America's Everglades – the largest environmental restoration project in the nation's history. The District is also working to improve the Kissimmee River and its floodplain, Lake Okeechobee and South Florida's coastal estuaries. FWC has no authority relating to issues of water quality. Through FDEP's regulatory authorities, the State has input into ways to improve water quality but

water quality is generally perceived to be outside of the control of FDEP coral reef managers. The CRCP has no direct say in water quality issues, however the agency has recently taken steps to reorganize and combine programs that are water related in the last year. For example, the coral program was put into the same Division (Office of Water Policy and Ecosystem Restoration) that oversees all of Florida's Water Management Districts and Everglades restoration projects. There is greater potential for increased alignment and direct conversations with these staff to share the issues associated with coral reef management. Based on our interviews, there seems to be a disconnect between the line offices that do the water quality work/coastal management work and the permitting staff on the regulatory side specifically relating to projects in the region.

Capacity Issue Examples:

- In addition to widespread development, the region also supports an aging wastewater treatment infrastructure and a lack of funds and political will to modernize it.
- There is an overall limited understanding among the general public and developers about the connection between water management practices and reef health.
- Effective, practical measures that should be employed to reduce sediment and nutrient in stormwater runoff coming off of the landscape (i.e., building and road construction sites, land clearing and agriculture, etc.) are frequently referred to as "best management practices" or BMPs. In general, the widespread use of BMPs in the SEFCRI region is not constrained by a lack of technical know-how, but rather limited personnel capacity to effectively communicate, promote, fund and regulate BMPs as well as routinely monitor and maintain them.

Examples where capacity has been built:

- Given that coral reef managers have limited authority in water quality, coastal restoration projects have been an effective tool such as the work done at Lake Worth Central Lagoon, filling the dredge holes to elevation and restoring vegetation and oyster habitat. This is a multi-agency partnership that is intended to generate 10 acres of seagrass habitat, one acre of saltmarsh, 0.3 acres of mangroves, and oyster reefs that have been largely depleted in this area. This should contribute to the improvement of water quality in the lagoon and ultimately the water reaching the offshore coral reefs.
- Targeted research projects are being completed by NOAA and Nova Southeastern University to better understand the various inputs of LBSP to the reef system, including inlets, outfalls, and groundwater among others along with their relative contributions. This will help managers to target their limited resources and priority areas for BMP implementation and pollution reduction.

This Issue Relates to Proposed Recommendations in Section Four such as:

Increasing FDEP CRCP Capacity	Build FWC Capacity	Integrated Management for SEFCRI Region	Coordination and Management Across the Florida Reef Tract	Coherent Enforcement and Compliance Program Across Agencies
Engage Political Leadership via the Coastal Ocean Task Force	Business Case for Improved Coral Reef Management	SEFCRI Community Supported Organization (CSO)	Biophysical and Human Dimensions Science Database	Support the Further Development and Role of Bridging Institutions
Sequence and Prioritize Management Actions of SEFCRI	Valuing Ecosystem Services and Socio-economic Database	Cooperative Research Institute	Scenario Planning Exercises	Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region
Systems Map	High Quality Collaboration and Conflict Resolution			

8. Reef Injuries and Response

Reef injuries occur from both permitted and unpermitted activities. From a management perspective, these are two separate issues, each with protocols and laws are intended to effectively guide response. This Section examines some of the capacity issues associated with response to both permitted and unpermitted injury issues.

Unpermitted Injuries:

In 2006, FDEP CRCP was mandated responsibility for responding to, assessing, restoring, and enforcing unpermitted injuries to coral reefs in the SEFCRI region. Unpermitted activities that can result in reef injury are often associated with recreational boating misuse, commercial vessel groundings, injury from anchoring, propeller wash, and salvage efforts. FDEP CRCP created the Reef Injury Prevention and Response (RIPR) program to create mechanisms for responding to reports of vessel groundings and anchoring damage. The program is led by the FDEP CRCP but involves all of the resource trustees, including FWC, and representatives from each of the respective counties. In 2009, the Florida Coral Reef Protect Act was enacted which created financial and legal mechanisms to recover civil penalties and fees for compensatory mitigation. Funds from these cases are used to restore injuries to the coral reef resources in Southeast Florida.

The coral reefs adjacent to the Port Everglades Anchorage Area have been subject to many vessel groundings and anchor drag events over the years. According to a 2007 SEFCRI report, from 1993 to 2006, there were 11 groundings and six anchor drag cases resulting in impact to over 11 acres of coral reefs (FDEP, 2007). While the eventual relocation of the anchorage was a major success, the issues remain on overall reporting, a well-coordinated response, effective restoration and agreement on acceptable mitigation when impacts to coral resources are anticipated in advance.

Regulatory Permitted Impacts:

Permitted activities require authorization from local, state and federal regulatory agencies and include beach renourishment, dredging, surveying, pipeline construction, port maintenance and expansion, communication cable installation, and geotechnical drilling. Ideally a permit will contain conditions that will require the minimization of injury to nearby reef resources as well as compensatory mitigation for lost ecosystem services for permitted injury.

As an example, the maritime industry is involved in many of these permitted impact issues and is a major contributor to Southeast Florida's local economy. The SEFCRI region is home to three major commercial ports: Port Miami, Port Everglades and Port of Palm Beach. The current amount of commercial vessel traffic affects the marine environment as well as potential port expansion projects. There are ongoing arrivals and departures of merchant and cargo vessels as well as cruise ships. In 1967, Florida legislature passed the Randall Act, Chapter 67-393, Florida Law that established procedures regulating previously unrestricted dredge and fill activities on state owned submerged lands. Mitigation of coral reef ecosystem services is far from certain from a technical perspective and far from agreement on when, where and how to do it from a social perspective. This is a complex challenge that has high potential for conflict and significant opportunity for collaboration if clear guidance on mitigation is provided.

For more information, please see Section 2.5 Major Biophysical Pressures and Drivers.

Capacity Issue Examples of Permitted Impact Issues:

- Maritime industries in the SEFCRI region are growing and the expansion of the Port facilities are anticipated to continue to be a major driver of economic growth with continued need to take into consideration impacts to coral reef and hardbottom resources.
- Capacity to gather and share compelling and appropriate socio-economic information is needed to help to make the case for the protection of coral reefs when large-scale construction and facility siting is being proposed. Currently there is little opportunity and resources to define the value of the reef system that may be subject to a permit for construction.
- FDEP regulatory programs (e.g., JCP and ERP) issue permits for coastal construction projects. Communication with reef managers on permit application reviews and other agency initiatives that may impact coral reef resources in the SEFCRI region is inconsistent. Agency leadership and political pressure on the regulatory division often "trump" management recommendations from staff.

Examples where capacity has been built (both permitted and unpermitted impact issues):

- A major success of a project that many of the SEFCRI partners worked on (but was not an official SEFCRI project) has been the relocation of one of the Port Everglades Anchorage Areas. A multi agency working group, led by US Coast Guard and including FWC, FDEP, NOAA, USACE, Port Everglades, Port Pilots, maritime industry representatives, NCRI, etc., collaborated to define and permit an alternative shallow water anchorage for Port Everglades to minimize impacts to the reef from anchoring of large vessels and cargo ships as they wait to enter the port.
- The development and publishing of "Rapid Response and Restoration for Coral Reef Injuries in Southeast Florida: Guidelines and Recommendations" (FDEP, 2007) was a comprehensive approach by SEFCRI to

clarify response to, and management of unpermitted coral reef and hardbottom injuries resulting from vessel impacts such as grounding, anchoring and cable drag events in Southeast Florida. Several have noted the need to update this important document.

- One LAS projects created Coral Reef Awareness trainings for regulatory staff including BMPs and Best Permitting Practices. The goal of these training is to increase local regulatory program staff knowledge of coral reefs and provide examples of successful permit processes. The trainings include presentations from basic information (i.e., location of coral reefs in Southeast Florida) to more advanced information (i.e., types of potential permit related impacts, state and federal statutes protecting coral reef resources, etc.).

This Issue Relates to Proposed Recommendations in Section Four such as:

Increasing FDEP CRCP Capacity	Build FWC Capacity	Integrated Management for SEFCRI Region	Coordination and Management Across the Florida Reef Tract	Coherent Enforcement and Compliance Program Across Agencies
Engage Political Leadership via the Coastal Ocean Task Force	Business Case for Improved Coral Reef Management	SEFCRI Community Supported Organization (CSO)	Biophysical and Human Dimensions Science Database	Support the Further Development and Role of Bridging Institutions
Sequence and Prioritize Management Actions of SEFCRI	Valuing Ecosystem Services and Socio-economic Database	**Cooperative Research Institute**	**Scenario Planning Exercises**	Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region
Systems Map	High Quality Collaboration and Conflict Resolution			

9. Reducing User Conflicts Associated with Coral Reefs

Even within the community of people who are considered users of coral reef resources, such as boaters, spearfishers, divers, and photographers, there are existing and potential conflicts. As the focus of coral reef management shifts to managing the behavior of resource users, increased attention must be paid to reducing user conflict and increasing the capacity for mediation and conflict resolution. Recreational boating has a significant impact on coral reefs. When the quantity of individual boats is high, and few moorings exist, boaters may opt to drop anchor instead of waiting for an available mooring, resulting in the continued loss of coral, further escalating conflict.

One can imagine a highly popular reef where a spearfisher is catching fish and encounters a diver group taking pictures of the reef fish population. Identifying the fact that there are many competing uses of the coral reef ecosystem, and that some may not be not compatible, is a potential area of focus in the future. Another example of drift divers who find themselves under a fishers boat may result in a situation where the diver believes the fisher should not be there and the fisher believes that the divers should not be there. Some groups may have negative perceptions of conservation activities, leading to low levels of local participation.

Experience in other parts of the world suggest that conflicts between conservation organizations and local communities are most common where conservation is seen as restricting access to resources, for example fisher people being unable to fish in protected waters and the perceived lack of benefits for local people, as most tourism revenues are collected by business owners who are often from outside the local community (Majanen, 2007). Conflicts can be reduced if areas generate enough funds through tourism revenues for management and maintenance and if tourism and conservation provide long-term and fairly paid employment for local people.

For sustained successful conservation of coral reefs, all local groups must see that there are some benefits of conservation and have a reason to become involved in conservation activities. The researcher suggests several policy lessons regarding conflicts over resource use:

- Application of a zoning structure can help reduce conflicts between different user groups in specific areas
- To avoid conflict, target resource areas should pay for themselves though income generation, or through donor funding. Revenues generated from tourism have the potential to fund conservation efforts, for example diving fees.
- For conservation efforts to succeed, it is important to demonstrate that conservation can benefit local communities.
- Conservation area management and user rights must be clear, and conservation rules must be enforced equally and consistently to avoid inequalities and resentment amongst certain groups.

Policymakers must identify strategies that increase their benefits in particular, and encourage their greater participation in conservation activities.

Capacity Issue Examples:

- The Ft. Lauderdale Sea and Air show is an example of a user conflict where there are many people who navigate their boat to see the show but often drop anchor on a reef as the show is centered around an area the has known coral resources.
- SEFCRI engagement of representatives from the various fishing and boating communities reveals a wide range of "ideal" uses of the reef based upon the values of the different user groups.
- Nearshore real estate values are typically higher and most sought after where there are beach renourishment projects. These are other resource users who may perceive that renourishment projects are unwarranted by pointing to studies showing that sea level rise will continue to increase in the coming decades and the near-term impact on the reefs could be significant.

Examples where capacity has been built:

- Mooring Buoys: Through FDEP CRCP's support of county programs, the number and placement of mooring buoys has increased to reduce anchor damage to coral and makes it easier to see pressure in certain areas.

Issue Relates to Proposed Recommendations in Section Four such as:

Increasing FDEP CRCP Capacity	Build FWC Capacity	Integrated Management for SEFCRI Region	Coordination and Management Across the Florida Reef Tract	Coherent Enforcement and Compliance Program Across Agencies
Engage Political Leadership via the Coastal Ocean Task Force	Business Case for Improved Coral Reef Management	SEFCRI Community Supported Organization (CSO)	**Biophysical and Human Dimensions Science Database**	Support the Further Development and Role of Bridging Institutions
Sequence and Prioritize Management Actions of SEFCRI	Valuing Ecosystem Services and Socio-economic Database	Cooperative Research Institute	Scenario Planning Exercises	Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region
Systems Map	**High Quality Collaboration and Conflict Resolution**			

Section Four: Priority Capacity Building Strategies

4.0 Scope of Available Financial Resources

An assessment of capacity building needs for coral reef management in the SEFCRI region has to balance the responses to identified needs with the scope of the funding and resources that can be brought to bear. In the SEFCRI region, the financial context for coral management can be divided into external resources, principally from NOAA, and financing provided by the State. While it is beyond the scope of this capacity assessment to completely quantify the magnitude of funds that, to varying degrees, may impact coral reef conditions and coral reef management, it is useful to assess the general scope of funds available to address coral reef management needs. These investments include programs and activities that concern the management of fisheries and a diverse array of programs and activities associated with coastal management, nonpoint source pollution, education and outreach, biophysical monitoring, land use, watershed management and other measures to control impacts to coral reefs.

Funding directed specifically at the SEFCRI region for coral reef management from the NOAA CRCP Cooperative Agreement was in the range of $650,000 in FY2012 that is basically matched by the State. Activities funded through the cooperative agreement are the primary focus of this capacity assessment. The balance of funds flowing to the SEFCRI region include various grants and agreements funding scientific monitoring, public education, and staff as well as regional programs that contribute to SEFCRI region coral management. The FDEP CRCP is responsible for managing the NOAA CRCP cooperative agreement, and has an average annual budget of approximately $1.2 million. Roughly 50% of their budget comes from the NOAA CRCP cooperative grant, with the other 50% coming from the hard match from the State of Florida. Approximately half of the budget for FDEP CRCP goes to staff salaries.

The FWC largely depends on state Trust funds and through programs that provide support through entities such as DOI through USFWS. FWC has been successful at bringing in significant funds to the State for restoration but provides little for long-term support and must rely on leveraging resources outside of the State to direct to projects.

Other federal agencies that contribute to work addressing issues that affect coral reefs (towards more sustainable fisheries, reducing LBSP improved coastal management etc.) include the USEPA, the USDA/NRCS, USFWS and other expressions of NOAA (e.g., NMFS, OCRM, etc.). Local funding sources from the State are generally derived from the Florida legislature. Each of the four counties contributes resources to these efforts expressed in a wide variety of ways and often have a staff member or two dedicated to coral reef management issues. For example in Miami-Dade County, there are multiple programs that assist in coral reef protection including coastal resources permitting and compliance programs for construction and development of specific uses in, on, over or upon tidal waters of the county. As a "Home Rule Charter" municipality, the County has established Environmental Ordinances that serve to protect the air land and water resources of the County.

Few NGOs or local organizations in the SEFCRI region related to natural resource management receive consistent core funding, except TNC. The majority of these NGOs are dependent on opportunistic grants from federal agencies, large NGOs, foundations or private donors. Annual budgets for local NGOs typically range from $20,000 to $100,000. TNC has facilitated innovative regional partnerships to address pressing issues such as the Four-County Climate Change Committee that includes representation from the four counties and cities of Miami Beach, Ft. Lauderdale, Key West and Boynton Beach that develop regional action plans, coordinates with state and federal lobbying activities and conducts an annual summit. There are government/ academic partnerships such as NOAA Sea Grant staff that are housed at the University of Miami, that link closely with the Miami-Dade County environmental agencies, and contribute capacity though a dedicated staff person who focuses on coral reef issues including education and outreach with a budget of roughly $100,000.

In sum, there is a wide range of organizations with budget and staff support. From our analysis, we estimate that there are over 45 organizations, some nested within others, that contribute directly or indirectly to coral reef management. For example, the State of Florida invests hundreds of millions of dollars each year in South Florida water resource efforts for projects such as flood control, water quality management projects, stormwater quantity and quality management that indirectly affects coral reef management. This list of agencies that surfaced in our interview process (and likely incomplete) is presented in Appendix F. With a growing range of organizations that contribute resources, both human and financial, there are often great synergies that can form and create great cost savings. However, with a growing number of management agencies, there are also forces of fragmentation, overlap and potential conflicting mandate and jurisdictions. In an age of austerity and fiscal accountability, many of these organizations are being asked to do more with less and better coordinate to reduce inefficiencies and to seek alternative sustainable financing mechanisms. Public-private partnerships are an example of emerging opportunities being sought to develop new streams of financial resources to the program that are not tax-dollar based. While these ideas make great sense, there are few outstanding models that can be replicated. Simply knowing who's doing what, and where, and to what effect is a growing capacity challenge. It is important to restate that Florida is the only U.S. coral reef jurisdiction with a formally constituted program that also provides hard match from the State and serves as a model for the other U.S. coral jurisdictions.

Note on recommendations: The recommendations in this Section have been divided into three groups based upon their complexity, scale, practicality and the degree of control over their implementation. The Group 1 Recommendations are highly political in nature, will require high-level governmental action, and in many respects lies beyond the direct reach of the SEFCRI region coral reef management network. The Group 2 Recommendations will require a collaborative and coordinated approach to management and involve interconnected systems and engagement with multiple resource users, government entities, NGOs and funders. The Group 3 Recommendations are designed to build capacity at an organizational scale where leadership and

control over implementation is relatively high. Each recommendation includes insight on the degree of complexity, cost, and the time required to implement. Section Five presents broader contextual guidance on how to develop a long-term strategy to build adaptive capacity to improve coral reef management in the SEFCRI region.

TIME SCALE	COMPLEXITY SCALE	MONETARY SCALE*
Short = <1 year	**Simple** = Somewhat context independent recommendations such as "best practices" and "standard operating procedures" that have fairly high certainty of building capacity.	**$** - Less than $50,000
Medium = 1 to 2 years	**Complicated** = 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.	**$$** - Between $50,000 and $100,000
Long = >2 years	**Complex** = Context is highly dependent and the recommendation may require strategies that are adaptively implemented and address dynamic, emergent, non-linear and complex conditions.	**$$$** - Between $100,000 and $250,000
		$$$$ - Greater than $250,000

*This scale has been adjusted for the SEFCRI region capacity assessment. All other U.S. Flag coral jurisdiction capacity assessment reports have a consistent Monetary Scale ($ - Less than $5,000; $$ - Between $5,000-$20,000; $$$ - Between $20,000 and $100,000; and, $$$$ - Greater than $100,000).

A. Increasing FDEP CRCP Capacity

Since FDEP is the State's lead trustee for coral reef resources, and the complexity of management is increasing significantly, as demonstrated throughout this report, increased capacity is needed to address these challenges. The following recommendations are framed for implementation in the near future (under three years) and should not supersede any regularly scheduled external evaluation or desk audit of the FDEP CRCP. Implementation will likely require senior-level support from FDEP leadership and perhaps even the Florida legislature. Therefore we fully appreciate that these recommendations will need to be balanced with a much broader portfolio of funding requests. If there is support for increased capacity for coral reef management, we believe these rather modest investments will provide a significant return.

- **Increase Staff Complement:** FDEP agency has experienced turnover and transitions in policies and procedures in the past decade. Competitiveness of FDEP CRCP salaries remains an important issue affecting staff retention and potentially contributing to high staff turnover. FDEP CRCP currently has 12 staff, and capacity could be significantly enhanced with additional FTEs in the next three years. While a precise number should be derived from a strategic planning process, desk audit and other evaluative tools, if protection of coral reefs in Southeast Florida is considered a priority, then an early step would be to provide adequate staff

to support a northern office. Depending upon the priorities defined, this could be accomplished somewhere in the range of three to five additional staff. For the long-term, if protection of the reefs in this area remains a high priority then doubling of the staff in 10 years would mark the development of staff capacity. The implications of such an increase would mean that the Florida legislature would have to approve a Legislative Budget Request that provides sustaining funding (in the range of $1 million) for the creation of these additional FTE positions. A routine desk audit of FDEP CRCP could illuminate issues of workload and compensation as well as staff retention.

- **Northern Office:** Given the current location of the FDEP CRCP office in Miami, the northern range of the SEFCRI area receives far less attention due to the simple fact of geography, especially in light of recent travel restrictions. A relatively simple solution would be to open a satellite office in southern Martin County or northern Palm Beach County. This added capacity would alleviate issues of limited staff space, but also increase presence of FDEP CRCP in the northern section of the SEFCRI area reef tract. This could increase the institutional connections with agencies and organizations in the north, as well as improve outreach and education campaigns facing the northern part of the SEFCRI region. Staffing of the office in 2014 may be modest, but would expand over the year to include coordinators for AA, RIPR, MICCI, FDOU and LBSP. A boat and a vehicle would be two critically important needed infrastructural elements. Looking beyond a 10-year horizon, the long-term goal would be one office per county in the SEFCRI region with about 5-10 FTEs in each county. This capacity would result in a corresponding increase in awareness and stewardship of the resource.
- **Procurement:** As FDEP CRCP's contractual needs expand, it will be important for a well-defined and efficient procurement process to be in place. Currently, the State contracting procurement process presents barriers to basic procurement and often threatens reversion of funds due to extremely long contract initiation timeframes (average of nine months). It would be important to map out the procurement process and identify areas for improvement and identify if there are any acceptable ways to enhance the procurement process. FDEP agency leadership could also consider increasing the staff complement of FDEP agency staff working on contracts (currently there are only three staff to handle these tasks for the entire agency).
- **Grants and Contracts Training:** Within the past few years, many of the administrative staff within FDEP, particularly at the headquarters in Tallahassee who have been essential for contract administration have retired and we were told that there has been a loss of a support system for grants management since that time. As a result, FDEP field personnel are increasingly responsible for grants and contract management. Improved training for staff responsible for grants management could improve the rate at which grants and contracts are processed, as well as illuminate changing policies.
- **Education and Outreach:** Increase coral reef outreach and communications capacity by bringing on additional staff (included in summary above) that can focus outreach efforts for individual counties, and for targeted stakeholder groups (i.e., recreational fishers) and continue to build a more effective network of marine resources educators in Southeast Florida. Capacity is needed for a range of tasks including the need to translate and distribute existing materials into the Spanish language and Creole to reach additional targeted demographics of the population, particularly in the southern portion of the SEFCRI region.

- **Formalize Lessons-Learned Practices:** During the capacity assessment process, it became clear that adaptation and innovation occurs within FDEP CRCP and is documented throughout this report. If there is a desire to capture and document the learning then a routine lessons-learned process should be pursued to document the innovation that has occurred. Such lessons should be archived by the FDEP CRCP to build an institutional memory in a similar manner to how the project deliverables outcomes were filed in a binder prior to 2011. In an environment with high staff turnover it is particularly important to document project process and history. The monthly staff meetings are an excellent opportunity to share current activities and windows of opportunities (i.e., available funding, etc.) and to document persistent issues with implementation of projects however, these meetings are only for FDEP CRCP staff. True sharing of lessons-learned also needs to happen outside FDEP with the wider SEFCRI team.
- **Access to the Ecosystem Management and Restoration Trust Fund (EMRTF):** The mechanisms to use the over $1.2 million in penalties recovered from reef injury events using the Coral Reef Protection Act are increasingly challenging. A small-scale reef restoration project requires funding in the range of $500,000. The FDEP has given CRCP approximately $57,000 in annual spending authority, but any amount beyond that amount requires Legislative approval. Based upon the timing and amount of the request, money may be available for a limited amount of time, which can lead to issues associated with procurement and requests for extension of the deadline. Additionally, money that is deposited into the EMRTF, FDEP CRCP has to pay 8% of the deposit amount towards administration of the trust fund, and no interest is accrued. The recommendation is to comprehensively review the detailed process of access to the funds available in the EMRTF with the purpose of decreasing the difficulties related to receiving the funds from the reef injury money in order to improve the utility of the Coral Reef Protection Act.
- **Building Support for CRCP within FDEP:** Increasing the coordination with FDEP CRCP for JCP and ERP sections would improve the ability to contribute insight on regulatory action and increase coordination between two sections of FDEP (i.e., management and regulatory). Until agency leadership recognizes the importance of management in combination with regulatory approaches, the issue of imbalance will persist. As an example, such coordination could focus on identifying how to better report non-compliance at permitted project development sights to reduce LBSP and MICCI related issues. Additionally, building support for dedicated in-region JCP and ERP enforcement staff (with FDEP Diver status and coral awareness training) is essential.

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FDEP Agency Leadership in Tallahassee

Potential Partners
FDEP CRCP, NOAA CRCP, FDEP Regulatory

- **Time:** Long/On-going
- **Cost:** $$$
- **Complexity:** Complex

Related Issues

4 Supportive and informed constituencies for effective coral reef management	5 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	7 Integration and coordination among managers across the Florida Reef Tract
1 Science to inform management and policy	2 Sustainable financing of coral reef management	3 Effective enforcement and compliance for management of fisheries and coral reefs
9 Effective management of land-based sources of pollution and water quality	8 Reef Injuries and Response	6 Reducing User Conflicts Associated with Coral Reefs

B. Build FWC Capacity

FWC has two staff dedicated to marine and estuarine habitat management, including coral reefs, in Southeast Florida. The two regions covered by these staff include the entire east coast of Florida including all of the Keys and some of the west coast of Florida divided at approximately Jupiter Inlet in Palm Beach County. The regions are extensive and the opportunities to influence marine habitat management are far too many for two people to adequately manage the region. Increasing FWC's capacity to manage this region would allow FWC to more effectively; 1) work directly with FDEP CRCP and NOAA CRCP and 2) focus on conservation and restoration of marine habitats and include fisheries management responsibilities as well. FWC could increase this capacity through additional staff hires or by fostering partnerships with NGO's and other entities that could co-manage staff with FWC with their direct employer as another entity and not FWC. Time and equipment utilized by additional staff could be used as match to leverage additional grants for targeted habitat restoration. As does the current staff, new staff would focus on restoration and conservation of seagrass, mangrove and coral reef habitats, coordination with FDEP CRCP (SEFCRI, vessel groundings, marine debris, etc.), regulatory review, and coordination with NOAA CRCP.

The relationship between FDEP and FWC's Fish and Wildlife Research Institute (FWRI) for rapid response and restoration for coral reef injuries is defined in a Memorandum of Understanding (MOU). This MOU does not include the FWC field support that is currently working with SEFCRI on habitat restoration efforts. Given that the MOU has been recently updated, we recommend updating this MOU at regular intervals to further define clear roles and responsibilities for FWC staff to further contribute to the SEFCRI process particularly during large incidents of grounding response. Note that increased participation by FWC could potentially require increased FWC resources. Updating the MOU could parallel the updating of the 2007 Rapid Response and Restoration for Coral Reef Injuries in Southeast Florida. Updating of the document should describe progress to date and include a detailed staffing analysis to be sure FWC has adequate personnel to respond effectively. Such a document should be revisited every five years or so.

FWC Law enforcement capacity is addressed later in the recommendations.

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FWC Agency Leadership in Tallahassee

Potential Partners
FDEP CRCP, NOAA CRCP

- **Time:** Long, on-going
- **Cost:** $$
- **Complexity:** Complicated

Related Issues

1 Supportive and informed constituencies for effective coral reef management	2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	3 Integration and coordination among managers across the Florida Reef Tract
4 Science to inform management and policy	5 Sustainable financing of coral reef management	6 Effective enforcement and compliance for management of fisheries and coral reefs
7 Effective management of land-based sources of pollution and water quality	8 Reef Injuries and Response	9 Reducing User Conflicts Associated with Coral Reefs

C. Integrated Management for Florida Reef Tract and SEFCRI Region

As described earlier in this report, there are many management agencies operating with varying mandates and jurisdictions associated with coral reefs. A comprehensive and integrated management structure may be needed in the future to foster ecosystem based management of Florida's shallow coral reef system, ensure the exchange of information and that critical management and science gaps are filled and to enable to development of common and consistent messaging for resource users and the public. In the short-term, the first step would involve coalescing the political will to integrate natural resource management efforts within the SEFCRI region.

Clearly, great progress is being made through the SEFCRI process itself but many agree that there is more work to be done in building political will for greater integrated management in the SEFCRI Region. OFR is gaining political and legislative support for next steps towards more coordinated management across the SEFCRI Region and should be considered a potential model towards the creation of a unified management authority. To begin, integration within the SEFCRI region could occur on an issue-by-issue basis. Topics such as fisheries, water quality or socioeconomic data related to tourism could be starting point for the management of the SEFCRI region and then extending lessons-learned based on this experience to other portions of the reef tract to begin integrating their perspectives on integrated management across the wider geography. This recommendation is linked with the recommendation that follows below for improved coordination across the Florida Reef Tract which is a longer term objective to identify a unified management authority across the entire reef tract which is difficult and politically challenging to accomplish but could improve overall management.

FDEP CRCP is the overarching authority for the SEFCRI region (Miami-Dade, Broward, Palm Beach, and Martin counties). NOAA is the overarching authority for the FKNMS. The Florida Coastal Office's SE Regional Administrator is the overarching authority for DEP between the CRCP and FKNMS. Exploring achievable and realistic integration across management units and improved coordination between the regions should be considered as a potential long-term goal. Various models have been proposed such as create an overarching coral reef management area for Southeast Florida, not necessarily a National Marine Sanctuary or a large no-take reserve, but rather an area-based

management approach that encompasses the range of the Southeast Florida coral reef system.

Such a management framework would be more readily identifiable on maps and signage and help the public understand that they are in a special place that requires careful use to sustain its many values. If creating a unified management authority for the Florida Reef Tract is deemed a priority, then an ideal integrated management authority would have the mandate and regulatory stature to implement, link and coordinate across local, state and federal scales. This builds upon goal A1 from the Florida PSD and would create a nested system for ecosystem governance that could begin with a focus solely on the SEFCRI portion of the reef tract.

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FDEP Florida Coastal Office – Tallahassee, FDEP CRCP and FKNMS

Potential Partners
FDEP CRCP, FWC, NOAA CRCP, BNP, Florida State Parks, USFWS

- **Time:** Long, on-going
- **Cost:** $$$
- **Complexity:** Complex

Related Issues

1 Supportive and informed constituencies for effective coral reef management	2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	3 **Integration and coordination among managers across the Florida Reef Tract**
4 **Science to inform management and policy**	5 Sustainable financing of coral reef management	6 Effective enforcement and compliance for management of fisheries and coral reefs
7 **Effective management of land-based sources of pollution and water quality**	8 Reef Injuries and Response	9 Reducing User Conflicts Associated with Coral Reefs

D. Coordination and Management Across the Florida Reef Tract

An informal Florida coral reef managers group once existed with the purpose of coordinating natural resource management leadership in the southern Florida region and the Florida Keys. This informal group was essential for keeping all of the place-based management agencies of the Florida Reef Tract "in the loop" for activities across the region. The reinvigoration of this group could prove successful at integrating management methods, efforts and sharing lessons-learned and to discuss openly the options of a strategic design for a more unified management structure. Identifying key leadership champions for this effort at each of the pertinent natural resource agencies will be critical. The FKNMS is a critical partner for ensuring the utility of such a group. Important members could also include NOAA CRCP, FDEP (CRCP and state parks), county representatives, FWC, BNP, Dry Tortugas National Park the USFWS National Wildlife Refuge Complex, and Everglades National Park (ENP). The more entities involved in a group like this, the harder it is to manage, so a step-wise process may be needed to build momentum and add in partners as the ideas develop.

Integrating management across the entire Florida Reef Tract is a far more complex challenge due to the different mandates of the current management authorities of FKNMS and the SEFCRI region counties. Such an action would likely require a cooperative agreement and long-term strategy to integrate the FKNMS, national and state park units and the SEFCRI reef area into a single comprehensive management unit. A key enabling condition to better integrate and avoid duplication would be to secure robust scientific knowledge on the state of the resources across the Florida Reef

Tract and define the current actors and jurisdictional overlap and gaps in natural resource management. Ideally, the further dialogue surrounding this integration and specific steps and structural design could be a "seed that is planted" by the OFR process and to share lessons-learned by work underway in FKNMS and other areas. The seed will only likely grow in well-conceived neutral forum with interest from all regions (staff and stakeholders) and there is clear intent to collaborate in search of a mutually desirable merger. If these conditions don't emerge with mutual agreement to go forward in good faith; then it should not be implemented. FDEP has already taken the step to combine the two programs under one Regional Administrator. It may not be realistic to think that there will be a cohesive management strategy between the two programs any time soon.

While the Great Barrier Reef Authority is not entirely analogous due to the vastly different contexts, a lessons-learned process from the creation of the Great Barrier Reef Marine Park Authority could be an important source of information for what to consider when setting up an authority for the Florida Reef Tract. There exists an MOA between the State, FKNMS and Australia regarding Reef Resilience and management lessons-learned.

RELATED PSD GOAL
Builds capacity for all PSD priority goals

RECOMMENDED LEAD
FDEP Florida Coastal Office – Tallahassee, FDEP CRCP and FKNMS

POTENTIAL PARTNERS
FDEP CRCP, FWC, NOAA CRCP, BNP, Florida State Parks, USFWS

- **Time:** Long, on-going
- **Cost:** $$$
- **Complexity:** Complex

RELATED ISSUES

1 Supportive and informed constituencies for effective coral reef management	2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	3 Integration and coordination among managers across the Florida Reef Tract
4 Science to inform management and policy	5 Sustainable financing of coral reef management	6 Effective enforcement and compliance for management of fisheries and coral reefs
7 Effective management of land-based sources of pollution and water quality	8 Reef Injuries and Response	9 Reducing User Conflicts Associated with Coral Reefs

E. Coherent Enforcement and Compliance Program Across Agencies

Capacity has been built in both regulatory and enforcement programs, but there remain gaps and persistent barriers in integrating the two. An examination of the structure, functioning and coordination of regulatory oversight and enforcement should be a routine process. Specific recommendations to begin an integrated enforcement program incorporating regulatory compliance are below. A more extensive review is suggested by experts in this domain. In the meantime the following recommendations are provided to build capacity:

- Inventory and network maps of current enforcement coverage and joint enforcement agreements to include all pertinent agencies and their authorities;
- Analysis of alternative enforcement regimes such as the benefits and costs of enforcing gear specific and species specific rules versus enforcement of place-based or activity-based rules to identify the most appropriate enforcement regime for areas within the SEFCRI region;

- Proposal to increase enforcement so that there is constant temporal coverage and so that coverage can be increased at times of peak resource use (i.e., holidays and weekends);
- Education and outreach campaigns to increase awareness of existing rules and regulations pertaining to coral reef resources. This may include promoting the use of existing smart phone "apps" and adding to current outreach events targeting reef stakeholders. Adequate staffing and infrastructure for law enforcement is needed. Cross-deputation that enables sheriffs and police departments with marine units to enforce natural resource laws may improve compliance. Cross-deputation process would ideally include training modules on species identification and other topics. In Southeast Florida, much of the activity that is subject to enforcement action is visible from the shore with the appropriate technology, such as high powered optics and other sensing systems (e.g., radar), though unmanned drones are prohibited from use by law enforcement agencies in Florida. These technologies should be tested and if deemed appropriate, widely used as part of a greater presence on the water;
- Sustained, dedicated funding for FWC for offshore aquatic patrols for 24 hours-seven days a week, with at least adequate coverage per county at all times. One officer is inadequate in any of the four counties. Broward and Dade may be smaller in geographic area but population of users on water is much larger. A minimum of two dedicated marine officers on duty at all times per county is recommended;
- Continuation of the coral reef regulation training for officers across agencies that has been initiated by SEFCRI and consider possible learning exchanges; and,
- Educate offenders. FDEP has developed a Marine Regulation Awareness Program for first time offenders to increase compliance and decrease offenses but is currently lacking staff and the necessary legal authority to implement the program.

RELATED PSD GOAL
D

RECOMMENDED LEAD
FWC

POTENTIAL PARTNERS
FDEP, NOAA CRCP

- **Time:** Long, on-going
- **Cost:** $$$
- **Complexity:** Complex

RELATED ISSUES

1 Supportive and informed constituencies for effective coral reef management	2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	3 Integration and coordination among managers across the Florida Reef Tract
4 Science to inform management and policy	5 Sustainable financing of coral reef management	**6 Effective enforcement and compliance for management of fisheries and coral reefs**
7 Effective management of land-based sources of pollution and water quality	8 Reef Injuries and Response	9 Reducing User Conflicts Associated with Coral Reefs

F. Engage Political Leadership via the Coastal Ocean Task Force

The Southeast Florida Coastal Ocean Task Force (COTF) was created through a recommendation by Mayor Jacobs of Broward County through the Governance and Coordinating Committee of the National Oceans Council. The purpose

of the COTF is to engage elected officials for input into regional conservation strategy development efforts and to specifically build local political support for the SEFCRI *OFR* Community Planning Process. It is comprised of state, county and city elected and appointed officials from the SEFCRI four county region, and key stakeholders. Its purpose is to review the progress of ongoing management activities and alternatives (including SEFCRI), and provide recommendations for appropriate coastal management actions. The program was initially established for an 18-month period; however, the duration may be extended by the COTF. Although the COTF term is relatively brief, it is anticipated that some or many of the suggested recommendations and management actions will require long-term implementation timelines and commitments.

It is our understanding that the goal of the COTF is to create a regionally cohesive and integrated set of recommendations for coastal resource management. These recommendations would become a "unified" plan from the county and city elected officials, and thus contribute to "political will" that will be needed for implementation of the recommendations. The COTF recommendations and master plan should integrate SEFCRI goals and objectives and the outcomes of the OFR community planning process to produce a coordinated approach for implementation. This group may benefit from the Business Case (Recommendation C) to articulate and advocate to decision-making bodies the need for increased support for coral reef conservation. Ideally, the COTF will increase local and regional political will to conserve and manage reef resources for their social, ecological and economic benefits to the county (i.e., tourism, fisheries, etc.). Briefing the Governor and the Governor's cabinet on the findings of the COTF could become a regular feature of its activities to increase political awareness and action. Sound model resolutions that could be drafted and readily adoptable by county governments is an example of a type of output that could come from this process.

Related PSD Goal
A

Recommended Lead
SE Florida Coastal Oceans Task Force

Potential Partners
County governments, coastal city governments, Governor's Office, OFR, SEFCRI

- **Time:** Long, on-going
- **Cost:** $$
- **Complexity:** Complicated

Related Issues

1 Supportive and informed constituencies for effective coral reef management	2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	3 Integration and coordination among managers across the Florida Reef Tract
4 Science to inform management and policy	5 Sustainable financing of coral reef management	6 Effective enforcement and compliance for management of fisheries and coral reefs
7 Effective management of land-based sources of pollution and water quality	8 Reef Injuries and Response	9 Reducing User Conflicts Associated with Coral Reefs

G. Business Case for Improved Coral Reef Management

Given that a common metric is return on investment, we recommend that FDEP CRCP work toward making a clear and concise "business" case for coral reef management targeted to upper level leadership but useful for a variety of audiences. Developing this case would include gathering existing and, if necessary, commissioning new socio-economic studies of the value of coral reefs across sectors including noncommercial reef recreation; fishing, diving, snorkeling,

underwater photography and such practices, etc. Such a case should include the ecosystem goods and services (e.g., fisheries, wave attenuation, etc.) that are provided by well-managed coral reefs but require sound management to maintain. Existing resources include; Socioeconomic Study of Reefs in Southeast Florida (Johns et al., 2001), Socioeconomic Study of Reefs in Martin County, Florida (Hazen & Sawyer, 2004) and Sustainable Financing of Marine Managed Areas: Experiences from Around the World (Cesar and van Beukering, 2004). We believe the case needs to be made in light of the budget realities and political priorities in Southeast Florida that limit government investments in coral reef management at the present time. This business case should use data generated from the proposed updated Socioeconomic Study of Reefs in Southeast Florida and business people should be enlisted in making the case and presenting it to decision-makers.

Finally, a common-sense case is needed to answer the question "Why should we manage coral reefs and plan ahead for the ecosystem changes that are likely in the future?" Ideally, a succinct and clear case for coral reef management will be sufficient to justify allocation of resources from the legislature and others when mandates are issued, encourage greater consultation on legislation and help to engage other potential funding partners such as a "Friends" group or CSO for SEFCRI described in Recommendation H. Such a case statement, when completed, should be a shared document that all FDEP CRCP, FWC and county natural resource management staff can understand. The case should clearly present the vision and goals of coral reef management for the SEFCRI region, strategic implementation plans, types and amounts of expenditures and signs of success. Ultimately it should provide language regarding return on investment and the clear link between natural resources management and improved economic, social and environmental conditions within the State as a whole. This can be quite challenging since returns from more effective ecosystem management often require long time horizons and are often outside of traditional political cycle timeframes. Components of such a business case could include:

- Economic valuation of coral reefs (e.g., dollar value of reef protection, private sector jobs and revenues);
- Losses of the coral reef ecosystem area or condition in recent history;
- Explanation and costs of varied management actions and activities that have shown a positive outcome (to demonstrate that human interventions can have appreciable positive impact), and show the potential gains that can be made from proactive (rather than reactive) management;
- State of Florida bond ratings and future economic growth projections;
- Valuation of ecosystem services of coral reefs;
- Long-term and short-term return on investment for coral reef management and protection and restoration;
- The importance of coral reef management in protecting coastal communities from flooding and erosion in the SEFCRI region;
- Balancing responsible extractive activities and other reef impacts while maintaining ecological integrity of coral reefs;
- Greater coastal protection values in the SEFCRI region than the Florida Keys, due to the highly developed and valuable shoreline real estate;
- Examination of alternatives or additions to effective reef management including retreat from the coast, ecological engineering, and restoration;

- Impacts (social, environmental and economic) on local government (counties and municipalities) operations, tax base and other considerations that generate a case for increased coral reef conservation; and,
- A list of literature that references the source of this information, including but not limited to the coral wave attenuation study, pending Florida Reef Resilience Program economic indicators study and Johns et al., 2001.

Ideally, this business case will grow political will and support for increased coral reef conservation in the SEFCRI region. The natural resource management departments (county, regional, state and federal) could incorporate aspects of this business case into their legislative agendas to reinforce its message with the lawmakers and appropriators as well as to business leaders, private industry, chambers of commerce and other key decision-makers. Separate "business cases" could be tailored to specific decision-makers.

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FDEP CRCP

Potential Partners
NOAA CRCP, FWC, TNC, NCRI, SEFCRI County government natural resource management departments

- **Time:** Short
- **Cost:** $
- **Complexity:** Complicated

Related Issues

1 Supportive and informed constituencies for effective coral reef management	**2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management**	3 Integration and coordination among managers across the Florida Reef Tract
4 Science to inform management and policy	**5 Sustainable financing of coral reef management**	6 Effective enforcement and compliance for management of fisheries and coral reefs
7 Effective management of land-based sources of pollution and water quality	8 Reef Injuries and Response	9 Reducing User Conflicts Associated with Coral Reefs

H. SEFCRI Community Supported Organization (CSO)

We recommend that FDEP CRCP move forward with the initiative to develop a CSO dedicated to supporting the mission of FDEP CRCP and SEFCRI. It is critical to point out that coordination of this group will fall to FDEP CRCP staff, and may justify another (new) staff member to do this. This structure would optimize and maximize the capabilities of the State, particularly if the CSO were set up as a nonprofit format where 100% of the proceeds go directly to support FDEP CRCP/SEFCRI. It is an important component of a sustainable financing plan for FDEP CRCP. Such a nonprofit organization should include clear policies, objectives, framework and mechanisms for distributing funds. It will be important that such mechanisms specifically identify the destination of the funding, so that there is increased accountability and buy-in for supporting specific projects or programs. The funds from this nonprofit could allow increased flexibility and creativity for leadership within the State to try new programs and support innovative programs without the constraints of current limited funding structures from the legislature. The success of such programs could then justify receiving increased funding from the State or other funders. Specifically, high profile potential founding partners should be targeted for recruiting members into the CSO, and messaging could include the issues of shoreline and real estate protection among other values associated with coral reef protection.

In addition, the consistency of funding from such a nonprofit could provide a stream of reliable resources for core

services of FDEP CRCP, specifically supporting new staff hires to ease the workload of current staff. Finding an institutional home for such a CSO would be important. Such an organization would be useful for identifying FDEP CRCP and SEFCRI's strengths and successes and communicating them to potential funders, the legislature, as well as the public at large in order to justify and increase their support across the SEFCRI region. The CSO could make clear connections to investors (including tourists) as to why investment is needed and exactly how the investment supports resource protection, as well as illuminate past successes and future goals.

FDEP's Florida Coastal Office has developed new guidance and templates to guide their sites, including the CRCP, in the process of establishing their own CSO. The next step will be to have the Florida Coastal Office provide staff support for beginning the CSO formation discussions within the FDEP CRCP and SEFCRI region.

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FDEP CRCP

Potential Partners
TNC

- **Time:** Short
- **Cost:** $
- **Complexity:** Complicated

Related Issues

Supportive and informed constituencies for effective coral reef management	Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	Integration and coordination among managers across the Florida Reef Tract
Science to inform management and policy	**Sustainable financing of coral reef management**	Effective enforcement and compliance for management of fisheries and coral reefs
Effective management of land-based sources of pollution and water quality	Reef Injuries and Response	Reducing User Conflicts Associated with Coral Reefs

I. Biophysical and Human Dimensions Science Database

A key capacity need is to build and maintain an accessible database that would allow people to access information on both biophysical and the societal issues. There is currently no shared, integrated science database with biophysical and human dimensions data. Such a database should be created and shared with government, academic and private partners across the region and be publically accessible. Users could analyze and use the data however they chose. One potential function of such a database would be the priority task of showing how ecological reef services support economic development and job growth. Gaps in data sharing should be addressed by developing incentive mechanisms that encourage data sharing among academic and private consulting companies. Currently there is no easy mechanism for private consulting companies to share the site-specific biophysical and monitoring data that they collect. The proposed Cooperative Institute (Recommendation I – Cooperative Institute) could become the ombudsman for managing the data. Integrating this database with existing and forthcoming human dimensions data could lead to a much stronger understanding of the interactions of the natural and human systems in the SEFCRI region reef system as a whole.

A Users Guide to the internet-based research database would include how to query for different data sets, include information for caveats to the datasets, users' guide, and ideas for possible uses for the data. This effort could begin with a pilot group of limited government agencies, academic partners and private consulting companies willing to

pioneer the effort to integrate their data sets. Eventually, it could become a requirement of funding from state agencies that companies or academic partners must be certified in the data sharing protocols in order be contracted by the State.

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FDEP Regulatory

Potential Partners
Nova Southeastern, FDEP CRCP, private contracting companies

- **Time:** Long, on-going
- **Cost:** $$
- **Complexity:** Complicated

Related Issues

1 Supportive and informed constituencies for effective coral reef management	**2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management**	3 Integration and coordination among managers across the Florida Reef Tract
4 Science to inform management and policy	5 Sustainable financing of coral reef management	6 Effective enforcement and compliance for management of fisheries and coral reefs
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J. Support the Further Development and Role of Bridging Institutions

A bridging institution is "[an institution that] brings in resources, knowledge and other incentives for ecosystem management and inter-organizational collaboration (Folke et al., 2005)." SEFCRI itself is an example of a bridging institution designed explicitly for supporting coral reef conservation in specifically this region of interest. Fostering the critical roles of other bridging institutions expands the reach of the SEFCRI process.

For example, the expansion of Sea Grant beyond Miami-Dade County to include a staff complement of one Sea Grant agent in each county of the SEFCRI region would be a strategic capacity increase. Sea Grant should also increase its integration with the county government natural resource management departments. This integration could begin by simply attending monthly staff meetings and expand from there. Ideally, Sea Grant engagement will stimulate discussion of issues, planning and the establishment of collaborative groups. If done well, this work will increase the efficacy of science to inform management. Sea Grant extension agents also have a vast "client base" that they can reach out to for support of coral reef conservation efforts. Sea Grant agents can also act as extension and communications consultants and they have a vast array of available resources.

Sea Grant extension agents can act as a conduit for sharing the recommendations from the OFR process by updating their networks as the process continues and incorporating OFR information into their websites and newsletters. Agents could also send out the recommendations to the extension service client base (includes agricultural extension, horticultural extension, etc.). Given that capacity already exists in Miami-Dade with Sea Grant, the Sea Grant agent could be a conduit for promoting Southern Region OFR recommendations and translating them to the decision-makers in Miami-Dade/Broward. This could serve as a model when new Sea Grant agents are incorporated into the SEFCRI region. Leveraging university and county resources should be considered when brainstorming funding options for Sea Grant positions.

TNC is another example of a bridging organization that is well connected to the work within the SEFCRI region.

TNC currently coordinates three bridging efforts with relevance to Southeast Florida coral reef management; the Florida Reef Resilience Program, regional Acropora coral restoration efforts and the new Shoreline Resilience Working Group of the Southeast Florida Regional Climate Change Compact. The Compact itself serves a bridging function, although its focus on coral reefs is limited. The role and activities of highly effective bridging institutions should be discussed and further developed across these unique types of organizations. These and other bridging institutions may be encouraged to consider building the capacity of smaller NGOs or other entities that seek to provide a unique function as a bridging institution focused predominantly on coral reef management within the SEFCRI region.

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
Florida Sea Grant

Potential Partners
FDEP CRCP, NOAA CRCP

- **Time:** Short
- **Cost:** $$
- **Complexity:** Simple

Related Issues

1 Supportive and informed constituencies for effective coral reef management	2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	3 Integration and coordination among managers across the Florida Reef Tract
4 Science to inform management and policy	5 Sustainable financing of coral reef management	6 Effective enforcement and compliance for management of fisheries and coral reefs
7 Effective management of land-based sources of pollution and water quality	8 Reef Injuries and Response	9 Reducing User Conflicts Associated with Coral Reefs

K. Sequence and Prioritize Management Actions of SEFCRI

Given the relatively limited scope of available financial and personnel resources, and the complex issues of coral reef management that relate to politics, power, scale, knowledge, community and culture, we believe a common conceptual framework is critical. Ideally, such an approach is applied at a demonstration scale and made a condition of grants whereby implementing partners would track progress through a simplified monitoring and evaluation process.

Initially it will be important to conduct working meetings that promote the use of a common framework and language among coral reef practitioners, and encourage its use throughout the larger granting and management infrastructure. These working meetings would highlight the utility of the steps of the Management Cycle to guide the sequencing of management actions. These methods are summarized in Section One of this report. Together, the tools and vocabulary constitute a framework that can guide resource allocation and team-based actions that proceed through the logical steps of the Management Cycle: Step One (issue identification), Step Two (preparation of plan of action) and Step Three (securing formal commitment) should, if effectively completed, generate the enabling conditions for a transition to effective implementation (Step Four) and thoughtful reflection and evaluation as part of adaptive management (Step Five).

Furthermore, a focus on outcomes enables managers and funders to clearly define and analyze the current and desired state of the enabling conditions for successful program implementation as well as the appropriate short-, medium- and long-term program goals. These tools emphasize the importance of taking into account the nature of coral reef

management actions, the target or purpose of the project, the range and scope of other organizations, a concrete implementation strategy and the use of monitoring and evaluation to build adaptive learning.

An institution of proven competence in the practice of ecosystem governance should be selected to provide training modules and customized templates for monitoring progress designed to combine the principles and the practice of the ecosystem approach and build the capacity for core competencies through a curriculum required to build adaptive management capacity for effective coral reef management. The curriculum should emphasize lessons-learned from Florida and other jurisdictions and address in particular the transition from issue analysis and planning (Steps One and Two) to commitment to, and implementation of, a management plan of action (Steps Three and Four). A central theme should be recognition of how the contributions of the natural and social sciences shift with each step. Such courses should strive to attract a diversified participant mix so that each class is exposed to the views and experience of natural and social scientists, managers, lawyers, educators, the NGO community and enforcement personnel. Such a capacity building curriculum could be adapted to feature short courses or seminars for senior administrators, judges, journalists and educators. Sample training modules are suggested in Appendix G.

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FDEP CRCP Staff

Potential Partners
Our Florida Reef, SEFCRI, FWC, Institution of known competence in training on the practice of ecosystem governance

- **Time:** Short
- **Cost:** $$$
- **Complexity:** Complicated

Related Issues

1 Supportive and informed constituencies for effective coral reef management	**2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management**	3 Integration and coordination among managers across the Florida Reef Tract
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L. Valuing Ecosystem Services and Socio-economic Database

According to a recent report by the World Resources Institute, there have been more than 100 valuation studies conducted in the Caribbean's coastal areas and interest in such valuation studies continues to grow (Waite et al. 2014). However, few studies have had an observed influence on policy, management, or investment. The new guidebook identifies 16 cases of influence and reveals a pattern among the ones most successful of providing key information in response to a clear policy question, particularly ones that are tied to issues where there is economic dependence on and threats to coastal resources. Effective valuation studies can inspire stronger stakeholder engagement, improved governance, more effective communications and generate access to decision-makers who are interested in protecting ecosystem services over the long-term.

While no panacea, the concept of ecosystem service accounting is useful for bringing together both technical and societal information. Ideally, ecosystem serves accounting moves beyond cost-benefit type accounting and provides

context for a focus on shared goals across disparate stakeholders. Economic analysis of ecosystem services is still an emerging science and should be used with a wide range of others tools that can support improved coral reef management. It's critical to be clear about what is attempting to be measured, to reveal assumptions and uncertainties, and use the results to tell a story that can be communicated to non-scientists.

Socio-economic dimensions have been described by Johns et al. 2001 and should be updated to include ecosystem goods and services and incorporate concepts of resilience. Such an analysis would point out potential thresholds and likely scenarios if current social, economic, development and global change trends continue in the region. This work would involve questions about the issues of collective behavior, messaging, and how to sustain target behaviors. Defining more precise behavioral changes can be quite challenging but should feature the types of collective behaviors that are desired and how they may make a difference in the biophysical condition of coral reefs given the drivers at multiple sales. Ideally, the work will influence messaging campaigns and address a wide range of resource users including people who boat in the region and drop anchors, fish and dive on reefs. Identifying existing research on what has worked most effectively for changing these behaviors and then pilot behavior change campaigns and adapt as needed would be an important next step.

What gets measured gets managed. Ecological economics can help to rank, weight, prioritize, and choose actions but only if the consequences of those actions are well understood. Defining the ecological capacity of coral reefs to supply ecosystem goods and services to the people of the SEFCRI region is essential to define the inter-relationships with human behaviors and specifically choices people can make to increase stewardship.

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FDEP CRCP

Potential Partners
Nova Southeastern, FDEP CRCP, private contracting companies

- **Time:** Long, on-going
- **Cost:** $$
- **Complexity:** Complex

Related Issues

1 Supportive and informed constituencies for effective coral reef management	2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	3 Integration and coordination among managers across the Florida Reef Tract
4 Science to inform management and policy	5 Sustainable financing of coral reef management	6 Effective enforcement and compliance for management of fisheries and coral reefs
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M. Cooperative Research Institute

NOAA's Cooperative Institute (CI) Interim handbook defines a cooperative research institute as "a NOAA-supported, non-federal organization that has established an outstanding research program in one or more areas that are relevant to the NOAA mission. CIs are established at research institutions that have a strong education program with established graduate degree programs in NOAA-related sciences. A CI engages in research directly related to NOAA's long-term mission needs that require substantial involvement of one or more research units within the parent organization or

other organizations and one or more NOAA programs. The CI provides significant coordination of resources among all non-government partners and promotes the involvement of students and postdoctoral scientists in NOAA-funded research. The CI provides mutual benefits with value provided by all parties."

We recommend that the current NCRI structure be evaluated and potentially transformed to a cooperative research institute given that there are other CI's in Florida that have a coral reef focus as part of their scope such as the Cooperative Institute for Marine and Atmospheric Studies at RSMAS. This proposed CI would contribute to the implementation of the OFR program and explore the human dimensions in cooperative work with social scientists. The key to the success of this CI would lie in the existing network of relationships between local managers, NGOs and stakeholders. If done well, this CI would stimulate improved integration of research and management efforts among federal, state, and local agencies and stakeholders as well as improved public awareness, capacity and political will. In particular, this proposed CI could focus some of its resources on inquiry into the human dimensions and its implications for informing coral reef management decisions.

A parallel recommendation that would be needed if a CI were to be established is the creation of a research coordinator role within FDEP CRCP. National Marine Sanctuaries and NERRS currently have these types of positions to coordinate the efforts of researchers working in the managed areas, and those positions descriptions could serve as a model for the proposed FDEP CRCP position. This position could help, although not ensure, that research gaps are identified, collaborations are fostered and scientific results are communicated to natural resources managers in the SEFCRI region.

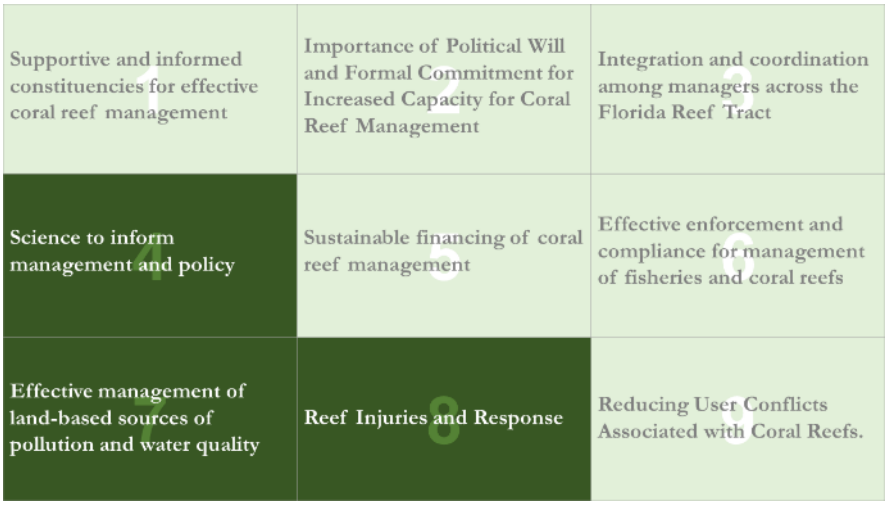
Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
Nova Southeastern University

Potential Partners
NOAA CRCP

- **Time:** Long, on-going
- **Cost:** $$$
- **Complexity:** Complicated

Related Issues



N. Scenario Planning Exercises

We can be certain that the future is uncertain. Sea level rise, climatic shifts, ocean acidification, severity and intensity of storms are all uncertain and unpredictable. The recommendation is to identify and support organizations willing to engage in scenario thinking. The OFR process could be an ideal platform to pilot scenario planning for the future of the reef tract (deciding either to focus exclusively on the SEFCRI region or the entire Florida Reef Tract). This scenario planning should tie in with broader issues relating to a wider range of ecosystem services than just reefs as it is

more practical to insert the values associated with reefs into scenario planning for society, than to ask society to focus on developing reef-centric scenarios. The exercise could result in products that frame the issues associated with individual and group behaviors, societal and economic tradeoffs, and the implications of moving towards a more resilient society in the face of anticipated change. Thoughtful ways of communicating scenarios can also share the message that conservation is not just about reducing the rate at which the ecological resources decline, but rather that it is possible to turn the tide and slowly improve the state of the natural resources over time with concerted efforts and significant behavior change (at the institutional, community and individual levels).

Specific and high profile issues could be selected for dialogue that could lead to greater public awareness of their effects on ecosystem goods and services in the face of a changing planet. For example, as of November 2013, there has been no study on the cumulative effects of beach renourishment projects and the likely scenarios ahead as source material is more and more difficult to find and the uncertainty regarding impacts to coral reefs. A facilitated process that brings together local sponsors, state and federal permitting agencies (i.e., USACE, NOAA NMFS, USFWS, FWC, FDEP), permit applicants and dredging companies should be conducted that provides a summary on the cumulative effects of beach renourishment and the likely future scenarios for sea level rise. This effort should not solely be focused on South Florida, but the State could be divided into six regions (Panhandle, Gulf North Coast, Gulf South Coast, Atlantic North Coast, Atlantic Middle Coast and the SEFCRI region). The outcome of this facilitated process could be a shared protocol for beach renourishment projects. This could also lead to the establishing of a long-term monitoring program between projects to avoid the current variability in data collection. This data could be integrated in a GIS platform along with integrated fisheries dependent and independent data.

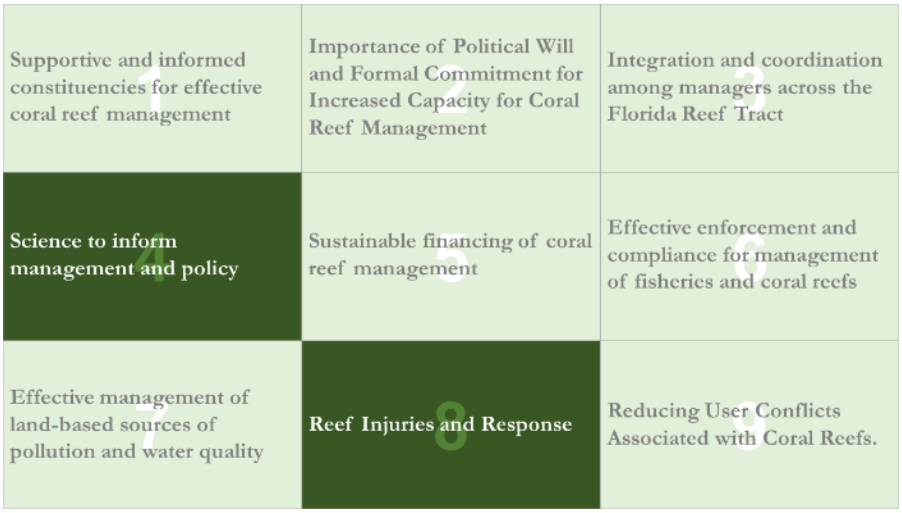
Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FDEP CRCP

Potential Partners
SEFCRI, FWC

- **Time:** Medium
- **Cost:** $
- **Complexity:** Complicated

Related Issues



O. Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region

Establishing a coral reef resources education network for the SEFCRI region builds on the outstanding education and outreach work being conducted at FDEP CRCP. A wider network could ferment worthwhile relationships and idea exchanges. This network would fill the capacity gap of limited cross network engagement and collaboration among the outreach and communications professionals in the SEFCRI region. Lessons can be learned from other coral reef

jurisdictions such as La Tasaungi in American Samoa and VINE in USVI. Membership could draw from the existing networks of LEEF, COSEE, Environmental Education Providers of Miami-Dade County and the National Science Teachers Association.

A key feature of the network could be to promote the concept of the shifting baseline around fishing in the SEFCRI region - since most resident are relatively new arrivals and many don't have a sense of what the condition was within the past few decades. As such, a sense for the prior quality of the natural resources in the region is no longer in the collective conscious. Developing and disseminating a public awareness campaign around the shifting baseline of fishing could be an ideal project for other participants in the network in coordination with FDEP FDOU Coordinator. This project could collect archival photos from local fishing clubs (such as the Palm Beach Fishing Club's museum) and from local guides in the Biscayne Bay area. Part of this project could include anthropological inquiry into the stories of the local fishing guides. This could eventually develop into a web-based timeline with photos, videos and links to documents such as fisheries regulations, laws and research reports.

Related PSD Goal
A, C, D

Recommended Lead
FDEP CRCP

Potential Partners
VINE, La Tasaungi, LEEF, COSEE, Environmental Education Providers of Miami-Dade County and the National Science Teachers Association, NOAA CRCP

- **Time:** Medium
- **Cost:** $$
- **Complexity:** Complicated

Related Issues

Supportive and informed constituencies for effective coral reef management 1	Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management 2	Integration and coordination among managers across the Florida Reef Tract 3
Science to inform management and policy 4	Sustainable financing of coral reef management 5	Effective enforcement and compliance for management of fisheries and coral reefs 6
Effective management of land-based sources of pollution and water quality 7	Reef Injuries and Response 8	Reducing User Conflicts Associated with Coral Reefs. 9

P. Systems Map

A systems map of the various federal and state government partners, county government natural resources departments, private stakeholders, academic partners and other local actors would help clarify the roles, mandates, responsibilities and collaborative initiatives that exist in the SEFCRI region. It would be valuable to develop an orientation binder or online resource on "who is doing what" in coral reef management in the SEFCRI region. This could serve as a concise guide to be used by new staff and contractors when they come on board (i.e., new staff at FWC, FDEP CRCP, county government, etc.). It can identify the legal mandates, roles and responsibilities of each of the different agencies, specifically acknowledging where there is conflict or overlap in mandate. A proper analysis could highlight areas of fragmentation and potential areas for collaboration.

A systems map would also be a valuable resource for identifying opportunities to streamline the permitting process, clearly outlining how the agencies interact, and helping to identify partners for different types of programs and projects. This information should be reassessed every two years to ensure that the information is up to date. Collecting

information could be orchestrated by FDEP CRCP. It may include gaps analysis (e.g., identify issues such as the fact that there is a limited NGO presence in the region) and this analysis could be distributed as one-page briefing papers or in a newsletter style every two years. The outcome of this work could also help develop the case and staffing plan for a CSO.

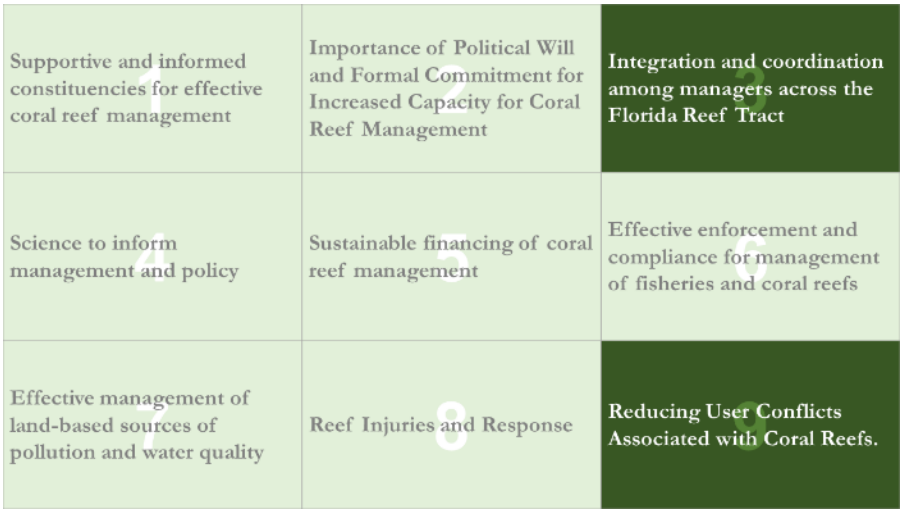
RELATED PSD GOAL
A, C, D

RECOMMENDED LEAD
Florida Sea Grant and proposed cooperative institute

POTENTIAL PARTNERS
SEFCRI, FDEP CRCP, FWC

- Time: Short
- Cost: $
- Complexity: Simple

RELATED ISSUES



Q. High Quality Collaboration and Conflict Resolution

Many collaborative structures around the world, including SEFCRI, could benefit from a framework for improving high quality collaboration and identifying partners who are experts in conflict resolution. One such framework to guide the improvement of collaboration is called the Collaboration Evaluation and Improvement Framework (CEIF) developed by Woodland and Hutton 2012. A charter exists as a critical engagement framework for participating in the SEFCRI team. This is an ideal start from which to add a more robust and nuanced framework such as CEIF could help SEFCRI define "levels of integration" with SEFCRI and the corresponding roles and responsibilities. This framework provides methods for defining, measuring and assessing the quality of collaboration and provides tools for improving the effectiveness of meetings and can be described as a series of phases.

Phase #1 Operationalize Concepts of Collaboration: Collaboration can be characterized by specific attributes and variables to better observe, measure and document the existence, development, quantity, quality and contextual effects of collaboration in support of improved coral reef management. These attributes include essential pre-requisite of a shared purpose of improved coral reef management in the SEFCRI region. Collaboration for improved coral reef management is developmental, evolves in stages over time, and varies in terms of level and degree of integration. Building literacy on collaboration across the coral reef community can be done through defining what distinguishes low versus high quality of collaboration, why the distinction is important and to provide access to relevant literature that relates to the methods to develop high quality collaboration. Printed in both Spanish and English, and distributed widely, the principles and meaning of concepts associated with high quality collaboration (described in more detail below) that includes the levels of integration, stages of development, and cycles of communication. Develop a mapping tool that shows the many different meetings, forums and locations for where coral reef management takes

place and what it means to accomplish core objectives in a collaborative fashion.

Phase #2 Identify and Map Communities of Practice of Coral Reef Management: For more effective management, it's important to gain a more accurate picture of high-leverage groups working together. Specifically who's doing what that is most central to coral reef management? A simple inventory and mapping product can be generated to reveal:

- Teams and committees that make up key strategic alliances within the coral reef management community;
- The purpose and primary task of each group;
- The members of the group and any criteria for membership;
- How often, where, and through what medium each group meets;
- How long each group has been in existence; and
- Relative importance of the group to the purpose of coral reef management in the SEFCRI region.

Phase #3 Monitor Stages of Development: Collaboration moves through predictable stages of development. One stage may go faster than another, or a group can get stuck in one stage for a long time. A team may find itself moving in and out of one stage. Knowing the stages and how to navigate and emerge from each stage of development is critical to building higher quality collaboration. Partnerships first assemble and then develop norms for how they act together as an early stage. Success often hinges on how well they are able to invoke clarity of purpose and then define the decision-making structures, strategies, leadership roles and clear tasks. A code of conduct with clear roles and responsibilities as well as defining what high quality dialogue, decision-making, action and reflection really looks like is extremely useful at early stages. Once the group has assembled and begins to wrestle with purpose and governance, the next stage in development is typically marked by enthusiasm centered around the shared purpose which tends to evoke feelings of urgency, defining the resources, establishing turf boundaries, understanding where the expertise resides and who's really willing to take on tasks. A third stage is the transition to actually performing, often marked by implementing toward the common purpose as well as building and safeguarding resources, strengthening the validity of the collaboration, and infusing energy in pursuit of the shared purpose. A final stage of collaboration is marked by an end of the current collaboration or transformation to another form of collaboration. This typically happens after some milestones have been reached and the group has faced a series of both planned and unplanned events moving to a decision of how to refine, reconfigure or dissolve their collaboration. Knowing where collaborations are in the stages of development is a high leverage capacity that could be applied to coral reef management in the SEFCRI region to improve the overall quality of collaboration.

Phase #4 Define Levels of Collaboration: A fundamental principle of collaboration is that there are levels of integration that exist between and within organizations. More integration is not necessarily better. Better integration is better and the degree should vary according to the purpose and goals. A simple rubric has been developed to gauge integration over time that is based on a total of five levels that moves from no integration to fully integrated and unified toward a common goal. These levels range from independent (no integration) to networking (lowest level of integration such as exploring shared interest) to cooperating (working together rarely simply to ensure that tasks are done) to partnering (using shared resources to address common issues and to reach common goals) to unifying (merging resources to create something new – often requires commitment over long-term period to achieve short- and

long-term outcomes).

Phase #5 Model and Identify High Quality Collaboration: The characteristics of the four core elements of collaboration (dialogue, decision-making, action and reflection) can each be defined through using low, medium or high quality levels. Each collaborative alliance should define what they consider to be the ranges of each. This information is used to inform decisions about how to further develop and strengthen the collaborative process. As the potential for conflict increases, conflict resolution and mediation is an essential capacity to build. Knowledge of the local community, their needs, values and expectations as well as the capabilities of experts in the field of conflict resolution and mediation is likely to be needed in the future. There is already capacity in the system with Sea Grant agents who are trained in conflict resolution.

This recommendation relates to recommendation I. Support the Further Development and Role of Bridging Institutions

Related PSD Goal
Builds capacity for all PSD priority goals

Recommended Lead
FDEP CRCP

Potential Partners
SEFCRI, Sea Grant, NOAA CRCP

- **Time:** Short
- **Cost:** $
- **Complexity:** Complicated

Related Issues

1 Supportive and informed constituencies for effective coral reef management	2 Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	3 Integration and coordination among managers across the Florida Reef Tract
4 Science to inform management and policy	5 Sustainable financing of coral reef management	6 Effective enforcement and compliance for management of fisheries and coral reefs
7 Effective management of land-based sources of pollution and water quality	8 Reef Injuries and Response	9 Reducing User Conflicts Associated with Coral Reefs.

Section Five: Developing a Strategy for Building Adaptive Capacity

5.1 Three Phases of the Assessment of Coral Reef Management Capacity

For the purposes of planning ahead, it is useful to consider the multiple phases that can describe the capacity assessment process: Phase I featured the initiation of the capacity assessment and began with the priority setting process and continued through the development of the FDEP led Coral Reef Conservation Program 2011-2016 Strategic Plan and concluded with the formation of the J-CAT in 2013. Phase II featured collecting and examining information related to capacity, building an understanding of needs across stakeholders, summarizing key issues and prioritizing recommendations. This second phase is concluded with the preparation of this report. Phase III is based upon the distribution of the report, a socialization process that we believe should include soliciting and receiving comments, preparing an action plan based upon response, implementing and monitoring the plan for a defined time period, and evaluating what was learned from the capacity assessment process and defining further action.

Given that building capacity for improved coral reef management is a journey, with no clear and precise destination, this Section is intended to provide the basics for making the transition from Phase II to Phase III.

The importance of Phase III or post-capacity assessment, cannot be overstated because very little will happen if post-assessment activities do not take place. If Phase III is done well, it positions the SEFCRI region and the coral reef management network for improvement and further development toward its intended goals. If results are not acted upon in some manner, it can serve to undermine future processes of stakeholder engagement in the SEFCRI region and underscore the inadequacy of the status quo. Key actions in building an action plan include engaging a team to finalize the sequence and prioritization of the plan, identifying persons responsible, and creating timelines and mechanisms for assessing progress. Such a team might form organically out of the J-CAT process, and additional participants and perspectives should be encouraged to join in the Phase III process. Success will be determined by both the substance of the plan as well as the facilitation process used to broadly communicate and gain support for, adaptively implement, monitor associated activities, and revise it as needed. The following Sections have been developed with insight from experiences in building capacity for the ecosystem approach in other locations around the world and in a wide range of organizational development contexts (Stevahn & King, 2009).

Building capacity requires change. Change, by its definition is acting in new ways, using resources differently, and seeing the world through fresh eyes. This is neither easy nor simple; indeed it is complex and can create discomfort, anxiety, confusion, and possible ineffectiveness when transition occurs from one way of doing something to another. Adaptive capacity is rooted in the ability to collectively work through concerns, anxiety and fears as new practices are tested, new skills developed, and new understandings are revealed (Fullan, 2007). Done well, positive momentum is built and can be leveraged for greater change. Done poorly, it reinforces fear, anxiety and mistrust. A range of literature exists that can guide organizations through the developmental steps of change and selected references are presented in the organizational development Section of Appendix A: For More Information.

The development of a customized plan is recommended which identifies an institutional "home" and most accountable person for overseeing implementation of capacity building efforts. Such a strategy should feature a detailed budget,

timeline, milestones, and contextually relevant principles for capacity building within the SEFCRI region and across all other coral reef management agencies. The strategic plan should be distributed widely and feature clear opportunities and specific budget justifications that could become part of external funding requests to federal implementing partners and foundations. Such a strategy should include a detailed directory of capacity building training modules that currently exist and those that need to be developed (Appendix G: Portfolio of Training Modules).

5.2 Building a Long-Term Action Plan

While there are no panaceas or "silver bullets" for building capacity for coral reef management, an action plan is needed to guide involvement of multiple implementing partners. Capacity building for improved coral reef management is a long-term process and no one group alone will have the power, resources or skills to respond to the increasing issues, challenges and degree of complexity. Likewise, there is no single group that is expected to provide the resources need to build a wide portfolio of tools, methods, trainings etc., to support adaptive capacity and more effective coral reef management. Therefore, a distributed approach to both funding and building adaptive capacity is needed that features both short- and long-term investments. It takes a village.

Implementing less expensive tactical capacity building is a strategy that can be used to build momentum, adding building blocks that address some aspects of the current challenges of coral reef management. Long-term sustained strategies are also needed to address operational issues of staff turnover and retirement, changing political administrations, as well as dynamic trends in social and biophysical health and well-being. Blending strategies that address both short- and long-term capacity building issues should guide the development of an action plan.

The process of building and maintaining adaptive capacity, as a key function of the ecosystem approach, takes far longer than one might expect and is a long-term commitment. It requires the development of an action plan, adaptively implementing and experimenting, and seeking out leaders across the implementing partners who can carry forward its importance. The action plan requires an honest assessment of what can actually be done in a given timeframe and at what scale, constantly assessing and reassessing where the power is in the system and how power may be shifting, where the threats are and how they are shifting, where the windows of opportunities are and how they are opening and closing. Building a shared understanding of these dynamics and acting upon them is a process that develops over time, ideally across organizations. This Section of the report provides a preliminary strategy or the beginnings of a "road map" for the development of an action plan that ultimately can only be developed by the implementing partners based on the shared commitment to build adaptive capacity.

5.3 Lessons-Learned in Building Adaptive Capacity

Elements that have proven useful for building adaptive capacity collaboratively include the following:

- Building values and attitudes among the managers that lead toward a desire to solve problems collaboratively, across a nested system, to clarify how to approach and solve persistent problems and more clearly define the appropriate institutional responses;

- Working with the media to share positive stories as case examples of successful management, describing the challenges and most importantly the benefits of what happens when collaboration across agencies and organizations works well;
- Building a knowledge base that is easily accessible and provides sound, honest and diverse information that can be easily communicated, exchanged, widely shared and debated;
- Recognizing the importance of informal and formal social networks and partnerships that are specifically intended to cross up and down scales of the nested system and horizontally across specific agencies;
- Encouraging the use of market-based instruments to promote the adoption of BMPs as well as increasing the diversity of economic activities at scales of stakeholders and at the scale of the whole watershed; and,
- Encouraging the use of predictive tools and scenario thinking to better understand potential impacts of ecosystem change at the global scale - specifically climate change and its impacts on the coral reefs as well as potential changes in weather patterns that influence many economic activities.

Building capacity is a long-term commitment and measuring progress is a complex challenge. The following actions could be used to assess progress and allow for both qualitative and quantitative description:

- Document changes in capacity through routine assessment that use a consistent set of criteria that allow for comparisons across time and across programs;
- Fund capacity building through diverse sources and coordinated investments;
- Support dynamic and committed leaders identify and track their progress; and,
- Establish and support networks, increase communication and support for capacity building efforts.

Rather than specific numbers, the challenge is to recognize bundles of attributes, processes and practices that support and link adaptive capacity and the effective implementation of an ecosystem approach. Paying attention to patterns in the system such as coastal construction and development trends, ESA listing of coral species, the nature and timing of climate change impacts and response, and scenario planning into the future. Politically, it is important to stay abreast of developments related to leadership regimes changes and stay prepared for opening windows of opportunity. Specifically, it could prove useful to develop scenario plans for such windows of opportunity.

One thing is certain, the coral reefs of the SEFCRI region will be different in 25 years and likely quite different in 50. Building a long-term adaptive capacity strategy is one aspect of a more resilient community that can more effectively respond to the changes that are ahead.

5.4 Key Considerations For Developing A PostAssessment Action Plan

The following are a set of key considerations in the capacity building action plan/implementation process that can help define the necessary logistics, whom to include, networks and norms for communication, and proper methods for information management (Stevahn & King, 2010):

Involvement in a Capacity Building Action Plan

Involvement in the process of defining the capacity building action plan and overseeing its implementation should be carefully considered. Major tasks may include the development of an action plan, making final decisions about when to implement which specific actions, monitoring progress and evaluating the effectiveness of the plan as it relates to goals for building capacity. The first major step is circulating the document and seeking input. The J-CAT members are ideal distribution channels but distribution should not end with this. A distribution strategy and possibly convening a listening session to review responses may elicit useful feedback. Ideally, a small representative group that is invested in seeing resources directed to address persistent capacity issues, barriers etc. should oversee implementation. While it does not need to be precisely the same members as the J-CAT, it serves as a logical starting point from which to build and make recommendations for a longer-standing structure. A capacity building advisory committee could be established and nest within the SEFCRI structure and could routinely report out to the entire SEFCRI Team, the All Islands Coral Reef Committee, and the U.S. Coral Reef Task Force. However, capacity building should be a shared responsibility and needs to have appropriate authority from upper-level administrators to assign activities and delegate tasks so that implementation is a distributed and shared process. A specific individual should be designated as the coordinator for arranging the efforts to craft the capacity building action plan, with additional technical assistance likely needed.

Logistical Concerns

A series of logistical concerns should be attended to that includes maintaining calendars, scheduling committee meetings, preparing agendas, and documenting completion of capacity building activities. A major step is defining who is responsible for managing logistics. One additional FTE would likely be sufficient to oversee this work and could be blended with other related tasks and responsibilities of coordinating capacity building for resource management in the SEFCRI region, to possibly be housed at FDEP CRCP.

High Quality Communication

The culture and quality of communication around the importance of building capacity defines the spirit and intent. Ideally, communication around capacity building is appreciative, open, honest, responsive, and culturally appropriate. Unfortunately, breakdowns and other issues associated with communications are at the heart of organizational conflicts, interpersonal challenges and program difficulties. Establishing agreed upon communication protocols and adhering to them can improve the communications process.

- **Communication within committees**: Good committee behavior is the responsibility of all involved and will only become a norm if it is established from the start and reinforced through periodic reflection. A brief list of best meeting practices should be identified and customized to fit the cultural context, agreed upon and distributed and could include the following: engage all voices, listen respectfully, explore alternatives, raise issues constructively, appreciate each person's skills, unique histories, perspectives, and talents. Assume confidentiality unless otherwise defined and mutually agree on what information is to be shared with others outside the meeting.
- **Communication among committees:** Since there are a growing range of committees that are associated with coral reef management, defining the general guidelines for how to track their progress and ways to best

communicate among them is an essential element of capacity building. Once established, a short and simple protocol may be needed to ensure that this level of communications sharing is maintained.

- **Communication beyond committees:** It is often not made clear what information can be shared outside of coral reef management committee structures such as other administrative hierarchies, governing or advisory boards, private sector operations, program funders, etc. The leadership team should define policies, guidelines and procedures for communication beyond the coral reef management committees.
- **Electronic communication:** Sharing information electronically is rapid, efficient and inexpensive with quick turnaround potential. Given that e-mail and technology overload is a possible downside, set guidelines for electronic communications such as a file naming convention, use shared directories or a shared project website to host information in one location, and describe the situations where e-mail is preferred or face-to-face communication is preferred.
- **Confidentiality**: Transparency fosters trust but can work against confidentiality. It is helpful to appreciate the tension between confidentiality and transparency and by agreeing within the group what information and documents can be shared and what should remain confidential. Be clear and direct on matters regarding confidentiality.

Information Management

Document and keep records of significant capacity building actions that have been taken so there is an easy to follow trail that documents the degree to which resources have been allocated to this end. Such a document trail is useful for reflecting on actions taken and the level of investment allocated. Examples include chronological timetables of various steps in the capacity assessment and capacity building program, records of training, assessment reports and findings, and evaluations of coral reef management and capacity building efforts. Such information is the basis for high quality lessons-learned and ensuring that a knowledge base is maintained in the face of unexpected events such as staff turnover, new leadership, new budget priorities, and program audits.

5.5 Acting on the Grouping of Recommendations

As presented in Section Four, the recommendations that serve as the basis for an action plan are divided into three groups. The first group involves recommendations that require decisions that are political in nature and requires decision-making from senior administrators. The ultimate timing, control and direction for moving ahead with a capacity building strategy needs to be supported from the highest levels within the Florida state government. These actions are the most critical for long-term adaptive capacity to be built into the system of coral reef and other forms of the ecosystem approach. The second group requires the collaborative force of implementing partners working closely with funding partners to model a customized form of Ecosystem-based Management that is based on a shared language and process of management. The outcomes of these actions are in the hands of the implementing partners and can be accomplished largely within a relatively small segment of the coral reef management network. This set of actions is largely independent of progress associated with the first group, although they would be greatly enhanced by accomplishing recommendations within Group 1. Together, the recommendations in Group 2 promote the

collaborative use of a common management framework to sequence and prioritize implementation in select priority sites.

To be effective, this would require linking with funding partners such as USFWS, NRCS, USFWS, NPS and NOAA in the short run to tie funding to the strategy for implementation and adaptive learning. Ideally there are additional federal partners in the future, but in the near-term, this would be applied at a demonstration scale, with select partners that are tied to specific funding opportunities such as the NOAA CRCP Cooperative Agreement. As a condition of the award, the recipients would track progress of implementation through a simplified monitoring and evaluation process. Since this strategy pertains to the preparation of proposals, including how they are written, the setting of priorities and how they are administered, this action requires strong commitment, partnership and a shared agenda among funders and the recipients. In the short run, it is our advice to keep it as simple of a process as possible, provide clear guidance and training for those who are preparing proposals so they are clearly identifying what part of the management cycle they are contributing to, and how they will track progress along the way.

The third group of recommendations includes a range of actions that can be done at the scale of committees, task forces, within organizations, and by groups of individuals. These are important, but their overall impact will only be realized if there is significant progress with capacity building in the other two groups. Actions within this group can be controlled by one or a few organizations and generally don't require significant resources. We believe these are good places to build capacity momentum as long as attention is paid to implementing the first two groups described above.

5.6 Building Adaptive Capacity

As has been shown in this analysis, increasing adaptive capacity for coral reef management requires competencies in at least four key decision environments: the ecological system, the political system, the organizational system and the community system. As a manager, the work requires winning support among a diversity of stakeholders, engaging effectively within one's own organization, securing formal commitment from the political process, and then implementing a plan of action over the long-term. Given this level of complexity, team-based management competencies are required to address a growing range of cross-scale issues outlined in this report. Competencies include, but are not limited to the following:

- How to engage local communities in the analysis of long-term changes in condition and use of coral reef ecosystems;
- How to analyze the governance structures and processes that encompass values, policies, laws and institutions that determine how coral reef ecosystems are conserved and used;
- How to build leadership required to build "political will" to design, adopt and implement plans of action that address complex challenges posed by coral reef ecosystem change;
- How to build strength in facilitation, mediation, stakeholder engagement and public education;
- How to strategically design a transformative program or plan of action that fits within the existing governance dimensions; and,
- How to design and implement a monitoring and evaluation program in support of adaptive management.

In practical terms, this means building capacity for situational awareness, and using conceptual frameworks to distinguish the level of complexity, from simple to socially or technical complicated to complex. For example, if a situation is deemed to be socially complicated then it is critical to move from a standard recipe or BMP and focus on the capacities needed to build high quality collaboration, create bridges between scientists and policy makers, between SEFCRI partners, and employing a common language to build common ground across diverse perspectives. The modern day adaptive manager is best equipped with methods to define the situation and context they are in and apply strategies that are appropriate to the situation.

Building adaptive capacity to manage effectively requires paying attention to both the theoretical and operational implications of the holistic ecosystem approach when responding to the challenges brought by accelerating societal and environmental change. Management requires looking ahead, watching for and nurturing the conditions that enable change and can lead to tipping points. Building this capacity will require scenario thinking, sharing information on how to build momentum, how to see opportunities, how to select a strategic and politically viable management agenda. The work requires sharing lessons-learned on how best to excite the political will and maintain it for addressing complex ecosystem management challenges, connecting with others, building more effective collaborations, paying attention to enabling conditions, committing to a common language across a wide network to sequence and prioritize collective action.

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Appendix A: For More Information

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Appendix B: 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 PSD.

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 PSD. 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): TNC'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 three to five 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 PSD. These goals in general refer to efforts to understand and address the three major threats to reefs; impacts from climate change, fishing, and LBSP 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: 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 well-being of both this and future generations.

Appendix C: Interviews

Name	Institutional Affiliation and Title	Method
PRE-SITE VISIT		*dates based on EST
Joanna Walczak	Southeast Regional Administrator, Florida Coastal Office, Florida Department of Environmental Protection (POC)	In Person (02/20/2013)
Jamie Monty	Manager, Coral Reef Conservation Program, Florida Department of Environmental Protection	In Person (02/20/2013)
Joanna Walczak	Southeast Regional Administrator, Florida Coastal Office, Florida Department of Environmental Protection (POC)	Phone Call (04/25/2013)
Dana Wusinich-Mendez	NOAA CRCP (NOAA Liaison)	Phone Call (08/06/2013)
Erin McDevitt	FWC	Phone Call (08/21/2013)
Chris Bergh	The Nature Conservancy	Phone Call (08/22/2013)
Dana Wusinich-Mendez	NOAA CRCP (NOAA Liaison)	Phone Call (08/30/2013)
J-CAT Meeting #1	J-CAT Members	Phone Call (09/04/2013)
Jamie Monty	Manager, Coral Reef Conservation Program, Florida Department of Environmental Protection	Phone call (09/05/2013)
Steve Blair	Department of Environmental Resources Management, Miami-Dade County	Phone Call (09/12/2013)
Dana Wusinich-Mendez	NOAA CRCP (NOAA Liaison)	Phone Call (09/12/2013)
Kevin Claridge	FDEP	In Person (09/16/2013)
J-CAT Meeting #2	J-CAT Members	Phone Call (09/18/2013)
Dana Wusinich-Mendez	NOAA CRCP (NOAA Liaison)	Phone Call (09/24/2013)
J-CAT Meeting #3	J-CAT Members	Phone Call (10/02/2013)
Joanna Walczak	Southeast Regional Administrator, Florida Coastal Office, Florida Department of Environmental Protection (POC)	Phone Call (10/14/2013)
SEFCRI SITE VISIT, DAY 1 (10/21/2013)		
Dana Wusinich-Mendez	NOAA CRCP (NOAA Liaison)	In Person
Joanna Walczak	Southeast Regional Administrator, Florida Coastal Office, Florida Department of Environmental Protection (POC)	In Person
Jamie Monty	Manager, Coral Reef Conservation Program, Florida Department of Environmental Protection	In Person
Jim Bohnsack	Protected Resources and Biodiversity Division, NOAA	In Person
Jen Schull	Office of Science Planning and Coordination, NOAA	In Person
Karen Bohnsack	FDEP CRCP	In Person
Christopher Boykin	FDEP CRCP	In Person
Julio Jimenez	FDEP CRCP	In Person

Name	Institutional Affiliation and Title	Method
Patricia Rose	FDEP CRCP	In Person
Kristina Trotta	FDEP CRCP	In Person
William Fisher	FDEP CRCP	In Person
Lauren Waters	FDEP CRCP	In Person
Jennifer Baez	FDEP CRCP	In Person
Jena Sansgaard	FDEP CRCP	In Person
Melissa Sathe	FDEP CRCP	In Person

SEFCRI SITE VISIT, DAY 2 (10/22/2013)

Ron Messa	NOAA OLE	In Person
Chuck Collins	FWC	Phone Call
Jeff Beal	FWC	Phone Call
Jennifer Smith	FDEP	In Person
Jason Andreotta	FDEP	In Person
Paul Davis	Palm Beach County	In Person
Jocelyn Karazsia and Kurtis Gregg	NOAA NMFS	In Person
Tom Twyford	West Palm Beach Fishing Club	In Person
Mike Kennedy	CCA Florida	In Person

SEFCRI SITE VISIT, DAY 3 (10/23/2013)

Ken Banks	Broward County Natural Resources Planning and Management Division	In Person
Pamela Fletcher	SeaGrant	In Person
Chris Kelble	NOAA	In Person
Manoj Shivlani	Rosenstiel School of Marine and Atmospheric Science	In Person
Lisa Krimsky	Miami-Dade Extension Service, SeaGrant	In Person
Gil McCrae	FWC	In Person
Amber Whittle	FWC	In Person
Rene Baumstark	FWC-FWRI	Phone Call
Kate Lunz	FWC-FWRI	Phone Call

SEFCRI SITE VISIT, DAY 4 (10/24/2013)

David Bingham	FWC	In Person
Audra Livergood	NOAA NMFS	In Person
Cheryl Miller	Coastal Eco-Group, Inc.	In Person

Name	Institutional Affiliation and Title	Method
Richard Harvey	EPA	Phone Call
Richard Dodge	National Coral Reef Institute, Nova Southeastern University	In Person
Dave Gilliam	National Coral Reef Institute, Nova Southeastern University	In Person
Brian Walker	National Coral Reef Institute, Nova Southeastern University	In Person
Bernard Reigl	National Coral Reef Institute, Nova Southeastern University	In Person

SEFCRI SITE VISIT, DAY 5 (10/25/2013)

J-CAT Meeting #4	J-CAT Members	In Person
Joanna Walczak	Southeast Regional Administrator, Florida Coastal Office, Florida Department of Environmental Protection (POC)	In Person
Jamie Monty	Manager, Coral Reef Conservation Program, Florida Department of Environmental Protection	In Person
Dana Wusinich-Mendez	NOAA CRCP (NOAA Liaison)	In Person

POST-SITE VISIT

Bob Leeworthy	NOAA Office of National Marine Sanctuaries	Phone Call (10/31/2013)
J-CAT Meeting #5	J-CAT Members	Phone Call (11/20/2013)
Linda Knoeck	U.S. Army Corps of Engineers	Phone Call (12/02/2013)
Melody White	U.S. Army Corps of Engineers	Phone Call (12/02/2013)
Terri Jordan-Sellers	U.S. Army Corps of Engineers	Phone Call (12/02/2013)
Drew Bartlett	FDEP	Phone Call (12/03/2013)
Kevin Claridge	FDEP	Phone Call (12/03/2013)
Joanna Walczak	FDEP	Phone Call (12/03/2013)
Dana Wusinich-Mendez	NOAA CRCP (NOAA Liaison)	Phone Call (12/03/2013)
Sean Morton	FKNMS	Phone Call (12/05/2013)
Beth Dieveney	FKNMS	Phone Call (12/05/2013)
J-CAT Meeting #6	J-CAT Members	Phone Call (01/07/2014)

TALLAHASSE SITE VISIT (11/15/2013)

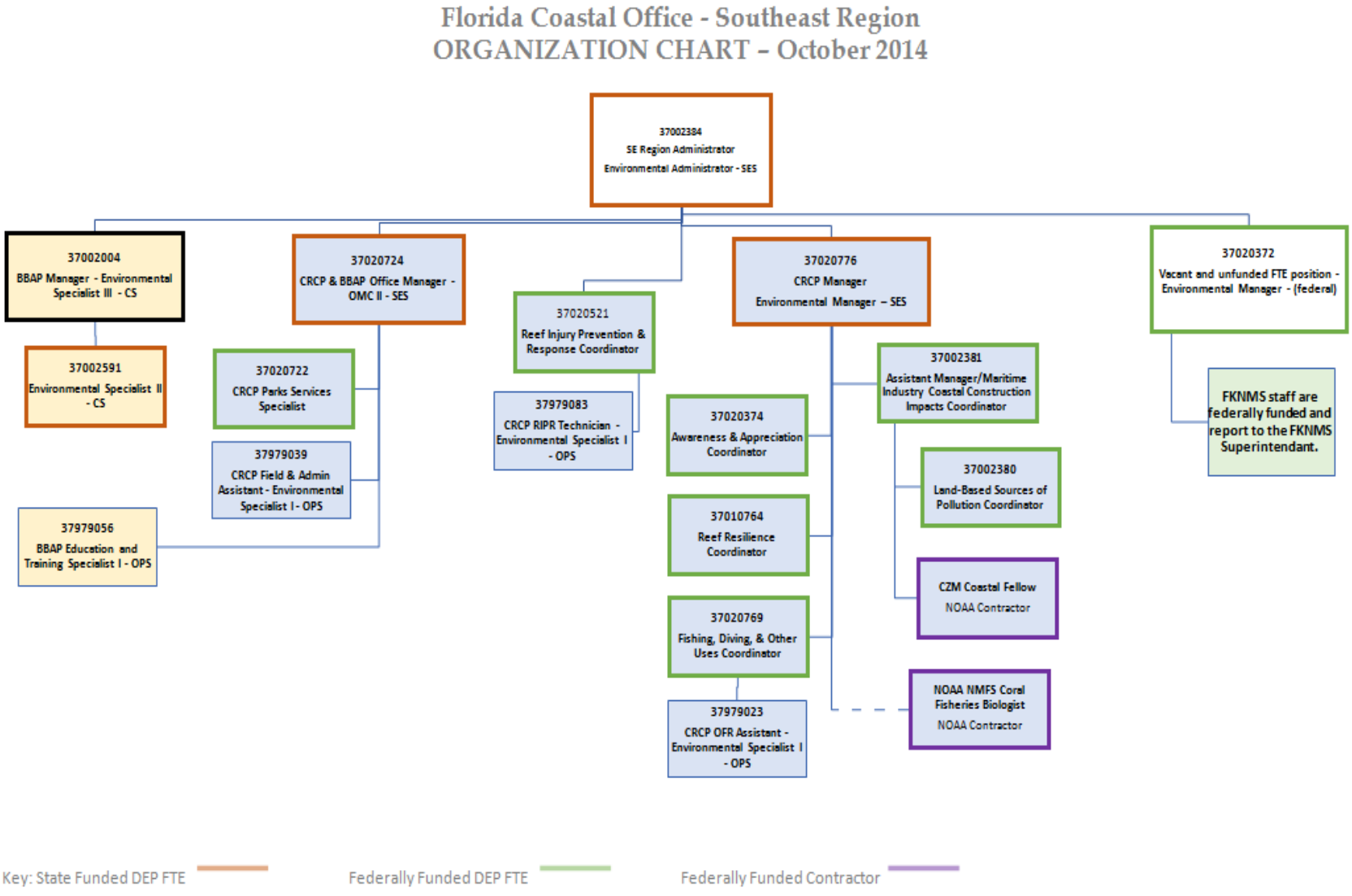
Name	Institutional Affiliation and Title	Method
Lisa Gregg	FWC	In Person
Melissa Recks	FWC	In Person
Keith Mille	FWC	In Person
Jessica McCawley	FWC	In Person
Kent Smith	FWC	In Person
Kelly Samek	FDEP	In Person
Marty Seeling	FDEP	In Person
Vladimir Kosmynin	FDEP	In Person
Jennifer M. Peterson	FDEP	In Person

Appendix D: Recommendation and Issue Matrix

			Increasing FDEP CRCP Capacity	Build FWC Capacity	Integrated Management for SEFCRI Region	NEW REC	Coherent Enforcement and Compliance Program Across Agencies	Engage Political Leadership via the Coastal Ocean Task Force	Business Case for Improved Coral Reef Management	SEFCRI Community Supported Organization (CSO)
			A	**B**	**C**	**D**	**E**	**F**	**G**	H
			4	5	3	3	1	3	2	2
Supportive and informed constituencies for effective coral reef management	**1**	6	TRUE	TRUE				TRUE		TRUE
Importance of Political Will and Formal Commitment for Increased Capacity for Coral Reef Management	**2**	8	TRUE	TRUE				TRUE	TRUE	
Integration and coordination among managers across the Florida Reef Tract	**3**	7		TRUE	TRUE	TRUE		TRUE		
Science to inform management and policy	**4**	7			TRUE	TRUE				
Sustainable financing of coral reef management	**5**	3	TRUE						TRUE	TRUE
Effective enforcement and compliance for management of fisheries and coral reefs	**6**	2		TRUE			TRUE			
Effective management of land-based sources of pollution and water quality	**7**	5	TRUE	TRUE	TRUE	TRUE				
Reef Injuries and Response	**8**	2								
Reducing User Conflicts Associated with Coral Reefs	**9**	3								

Biophysical and Human Dimensions Science Database	Support the Further Development and Role of Bridging Institutions	Sequence and Prioritize Management Actions of SEFCRI	Valuing Ecosystem Services and Socio-economic Database	Cooperative Research Institute	Scenario Planning Exercises	Establish a Coral Reef Resources Education and Outreach Network for SEFCRI Region	Systems Map	High Quality Collaboration and Conflict Resolution
I	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
3	4	1	2	3	2	1	2	2
	TRUE					TRUE		
TRUE	TRUE	TRUE	TRUE					
	TRUE						TRUE	TRUE
TRUE	TRUE		TRUE	TRUE	TRUE			
				TRUE				
				TRUE	TRUE			
TRUE							TRUE	TRUE

Appendix E: Florida's Coastal Office – Southeast Region Organization Chart (October 2014)



Appendix F: Organization List

Agency/Organization	Type
Environmental Protection Agency (EPA)	Federal
Florida Keys National Marine Sanctuary (FKNMS)	Federal/State
National Park Service	Federal
NOAA AOML	Federal
NOAA Coral Reef Conservation Program (CRCP)	Federal
NOAA National Marine Fisheries Service (NMFS)	Federal
NOAA NMFS OLE (Investigator's Office)	Federal
NOAA Sea Grant	Federal
South Atlantic Fishery Management Council	Federal
US Army Corps of Engineers	Federal
US Geological Survey	Federal
USACE	Federal
USFWS	Federal
FDEP Biscayne Bay Aquatic Preserves (BBAP)	State
FDEP Florida's Coastal Office (formerly the Office of Coastal and Aquatic Managed Areas)	State
FDEP Regulatory Beaches, Inlets and Ports	State
FDEP Southeast Regulatory District	State
Fish and Wildlife Research Institute (FWRI), part of FWC	State
Florida Department of Environmental Protection Coral Reef Conservation Program (FDEP CRCP)	State
FWC	State
Florida Oceans and Coastal Council	State
FWC – Law Enforcement	State
FWC-South Region	State
Governor's South Atlantic Alliance (Coastal Marine Spatial Planning)	State
South Florida Water Management District	State
Southeast Coastal Ocean Task Force	State
Broward County Environmental Protection and Growth Management Department	Municipal
Four-County Climate Change Committee	Municipal
Martin County Department of Growth Management, Environmental Division	Municipal
Miami-Dade County Dept of Environmental Resources Management	Municipal
NOAA Sea Grant (University of Miami)	Municipal
Palm Beach County Environmental Resources Management Department	Municipal
Palm Beach County Reef Rescue	NGO
Southeast Coastal Ocean Task Force	Municipal
FWC - FWRI	Academic
National Coral Reef Institute (NCRI) at Nova	Academic

SE Florida Science Center	Academic
Coastal Conservation Association	NGO
Coastal Eco Group, Inc.	NGO
Cry of the Water	NGO
Palm Beach Fishing Club	NGO
Reef Relief	NGO
The Nature Conservancy	NGO

Appendix G: Portfolio of Training Modules

Long-term capacity building requires an explicit focus on systematic learning. While there are a wide range of potential training modules, a defined set of in-person training courses, distance learning modules, and methods to cultivate local leaders are suggested below to focus on current and emergent topics. A key feature of these trainings and continuing education courses should be the building of a common management framework built around the Management Cycle and the Orders of Outcomes framework.

Recommended Standard Florida Coral Reef Management Training Course

On-site training courses are recommended to be conducted every two years, to respond to the staff turnover rate, including the following modules:

- Modules on the causes and drivers of reef decline, including LBSP, fisheries impacts and effects of climate change and ocean acidification;
- Modules on the Management Cycle, and the steps needed to build political will;
- Modules on sustainable financing and coordination of funding across agencies, and grants management;
- Modules on fostering high quality collaboration that includes essential elements of effective meetings, including effective dialogue, conflict resolution and decision-making;
- Modules on codification of good practices for coastal zone management, marine protected areas etc. that are made available to staff and the subject of mini-courses and trainings (e.g., Code of Conduct for Responsible Fisheries (FAO, 2007)); and,
- Modules on dealing with persistent administrative barriers such as staff turnover, improved collaboration, and integration across agencies, and writing SOPs (standard operating procedures).

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 so as to retain institutional knowledge. 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 one source of training materials that may be appropriate for Florida.

Produce Modules for Distance Learning

A set of pre-produced modules and resources are available from a wide variety of sources including Sea Grant, NOAA's Coastal Services Center, Center for Watershed Protection, 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 such as 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, and GEF's capacity building programs.

Strategies for Cultivating Local Leaders

To more effectively practice the ecosystem approach, the following six core competencies are necessary for practitioners:

- Competency in facilitation, mediation, stakeholders engagement, and public education;
- Competency in strategic design/improvement of stewardship initiatives;
- Competency in design and implementation of monitoring and evaluation in support of adaptive learning and acting;
- Competency in analysis of long-term changes in condition and use of ecosystems;
- Competency in analysis of governance structures and processes; and,
- Competency in building leadership required to influence political will.

Traditional approaches of peer-to-peer exchanges, learning journeys, and further investment in professional development is a worthwhile investment for leadership development. We recommend specific criteria to guide, encourage and reward emerging leaders. While a wide range of literature exists, the following set of leadership characteristics is useful to consider (NRC, 2008):

- 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;
- 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.

Principles for Building Adaptive Capacity

- Issues Drive Need for Building Capacity. Building adaptive capacity needs to be directed at a set of issues, as described in this and earlier reports on coupled social biophysical issues relating to coral reef health. 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.

- Define 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). Capacities 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.
- Focus on the Purpose of Building Capacity: 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.
- 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 Florida are mostly similar across the territory, issues play out differently across the mosaic of contexts in Florida.
- Long-Term and Sustained Action, Built on Success: A long-term and sustained commitment to building capacity must address frequent staff turnover, shifts in the social, political and environmental issues, ongoing learning and the need for adaptation. Fortunately, such a long-term perspective seems to be evidenced across current federal, Commonwealth and NGO partners. A long-term strategy must be built on successes within Florida to keep momentum strong.
  - Evoke purpose: "To build 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 unique way of life."
  - Must understand current governance structures – what does exists – and what does not yet exist but may be needed.
  - 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 response to ecosystem change will be an issue into the future. We recommend using a range of effective diagnostic methods 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.
  - Periodically review the issues (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, BMPs and the degree to which there is formal commitment and supportive and constituencies for sustained coral reef management. Excellent facilitation is needed to host the dialogue and invite other key stakeholders from across civil society, market forces such as tourism and other forms of government to engage.

Appendix H: Timeline

Event Title	Start Date	End Date	Description
The first people move into Florida	-12000		Referred to today as PaleoIndians, they moved into the peninsula in search of new food sources. These sources included mastodons, giant armadillos, horses, and saber-toothed tigers. At that time, the end of the last ice Age, Florida was twice the size it is today.
Glaciers began to melt and sea levels began to rise	-9000		
Temperature begin to rise	-7500	-3000	This caused climate changes until Florida eventually reached the temperature it experiences today.
PaleoIndians establish first permanent settlements	-5000		Settlements established primarily on the coast.
Numerous Native American groups inhabit Florida	-1000	1500	Among these included are the Apalachee in the northern panhandle, the Timucuan in the central and northeast area, the Tocobaga along the west coast, and the Calusa in southern Florida. By 1500, over 100,000 Native Indians live in Florida.
Pre-historic settlements along mouth of Biscayne Bay are established by Tequesta Native American tribes	1200	1299	Rock mounds, shell middens, burials, and other sites have been found along the Miami River and Biscayne Bay's shore. The Tequesta people lived primarily on the western coast of Biscayne Bay along an eroded limestone ridge.
Three main Native American tribes live in Florida	1500		The Timucua in Northeast and Central Florida, the Apalachee in the Big Bend area, and the Calusa in South Florida.
Spanish explorer Juan Ponce de León and his expedition land on the Florida peninsula	1513		He landed on the East Coast, near present-day St. Augustine. Ponce de León named the peninsula "Florida" as the season was "Pascua Florida" (Flowery Easter). He then sailed to South Florida, where he was wounded in a fight with the members of the Calusa.
Juan Ponce de León returns to Florida after serving as governor of Puerto Rico	1521		He returned to search for gold and colonize local indigenous groups. He was killed in South Florida.
Spanish explorer Pánfilo de Narváez leads a second expedition into Florida	1527	1536	The expedition was a notorious failure. Alienating Florida's native cultures, the expedition was repeatedly attacked. By 1528, Narváez was dead, and the expedition was grounded due to hurricanes. Four survivors eventually walked to Mexico City, arriving in 1536. Despite the failure, their fantastical tales of mythical cities of gold inspired future expeditions to North America
European diseases decimate Florida's indigenous	1540	1549	Within a century, 90% had died.
French settlers establish Fort Caroline	1564		
The Spanish establish Fort Augustine	1565		In the process, they expel the French. This is the first permanent European settlement in North America.
Native people from Georgia and Alabama move into Florida	1760	1769	
End of the Seven Years War; Florida is transferred from Spain to England	1763		The colony was divided into East and West Florida. British colonist expanded Florida agriculture, especially cotton, rice, and indigo. St. Augustine remains the capital of East Florida, with Pensacola the capital of West Florida. James Grant appointed Governor of British Florida.
William Gerald DeBrahm is appointed Surveyor General of East Florida	1765		He began a six-year survey of the eastern coast of the United States (US), including the area around Biscayne Bay and the Miami River.
The American Revolution begins and Florida's population swells	1776		Florida did not join its fellow thirteen English colonies in the revolution and remained loyal to England. Its previously sparse population swelled overnight as Tories escaped into loyalist Florida, mostly settling in St. Augustine.
American Revolution ends, causing Florida's population to change	1783		In return for Spain's assistance to the colonies, the Treaty of Paris allowed Spain to reoccupy Florida. Most of the English settlers in

Event Title	Start Date	End Date	Description
			Florida left for England and the Bahamas.
Only a few European settlers remain in south Florida	1800	1899	Native Americans, mostly Seminoles, settled in the Everglades as they were displaced from the southern states. They replaced the indigenous tribes who had died or fled during the last hundred years of European occupation.
Transfer of Florida from Spain to the United States	1819	1821	Finalized by the Adams–Onís treaty. The population of Seminoles in Florida is about 5,000 living and hunting throughout the state and providing refuge for runaway slaves.
Florida becomes a US territory	1821		
Florida government is established by Congressional Act	1822		
Tallahassee is established as the Florida capital	1823		
First Florida census: population 34,730	1830		
Treaty of Payne's Landing signed	1832		This was an agreement between the United States government and several chiefs of the Seminole tribes in Florida that the Seminoles would move West if the United States found their land suitable for settlement.
Dade County is created	1836		The name was later changed to Miami-Dade County on November 3rd, 1997 after voters chose to recognize the name Miami because of Miami City.
Florida population reaches almost 55,000 people	1840		African American slaves made up almost half the population. Steamboat navigation was well established and Florida was roughly divided into three areas: East Florida, Middle Florida, and West Florida. The territory's economy was based on agriculture, with plantations concentrated in Middle Florida. These plantations grew sugarcane, cotton, citrus, rice, corn and other vegetables. Lumbering was also a major industry. The first railroads were built, enabling settlers to send their cotton, sugar cane and lumber to ports where it could be shipped to far-away markets.
Florida becomes the 27th state	1845		William D. Moseley is elected the new state's first governor.
The federal government passes the Swamp and Overflowed Lands Act	1850		This grants Florida the right to do what it wants with the Everglades.
Internal Improvement Act is passed	1855		Florida's act offered cheap or free public land to investors, particularly those interested in transportation.
American Civil War	1861	1865	Florida was part of the secessionist movement. It was not ravaged by northern forces like the other southern states, and no decisive battles were fought on Florida soil. After the war, much of the land came under cultivation by tenant farmers and sharecroppers.
New federally-mandated state constitution	1868		
William and Mary Brickwell, along with Julia Tuttle, open a trading post and post office on the south bank of the Miami River	1871		They are considered to be the co-founders of the City of Miami. The Brickell Trading Post became the primary source of trading between settlers and Seminoles in the area.
Tourism begins at Silver Spring	1878		Hullam Jones invents the glass-bottom boat.
Large scale commercial agriculture, cattle-raising and industries such as cigar manufacturing take root	1880		
Florida's population reaches an estimated 270,000	1880		
Florida's railroad building era	1880	1912	Transportation for goods and people improve. Free or cheap public land is offered to investors interested in transportation. Henry Flagler and Henry B. Plant construct railroads throughout the state.
New state constitution; replaces the 1868 constitution	1885		Served as framework for the government until 1968.
Data indicates a decline of rainfall in the Southeast Florida region	1890	2013	

Event Title	Start Date	End Date	Description
City of Miami is incorporated	1896		
Rivers and Harbors Appropriation Act enacted	1899		This is the oldest federal environmental law in the United States. This act prohibits the construction of any bridge, dam, dike or causeway over or in navigable waterways of the U.S. without Congressional approval.
Most of the canals in the SE Florida region are constructed	1900	1950	The canals were constructed mostly for drainage, flood protection, and water storage purposes.
Everglades drainage begins	1901		This act was undertaken to create more farmland.
Start of construction of Henry Flagler's railroad to Key West	1902		The railroad opened in 1912.
Key West National Wildlife Refuge created	1908		
Palm Beach County created	1909		
Atlantic Intercoastal Waterway (AIWW) is dredged in Biscayne Bay	1912		Seagrasses and algal beds were impacted when channels were dug to allow access for ships with deeper drafts as well as when the dredged material, called 'spoil' was piled next to the channels, creating spoil islands.
Immense development and population growth occurs	1912		Swamps were drained and the growing tourist industry attracted people from all over the world. Citrus groves were expanded throughout northern and south-central parts of the state. Florida's population grew considerably at this time.
Lake Mabel Cut was dug out in Broward County	1913		This opened the New River to the sea for small boats. Lake Mabel Cut eventually became known as Port Everglades.
Broward County is created	1915		
Port of Palm Beach is established	1915		It was established under the provisions of the Laws of Florida, Acts of 1915, and Chapter 7081, as amended and supplemented.
Three major ports built along 112 km of coastline	1920	1929	These ports occur in close proximity to shallow reef coral ecosystems.
Population of Florida is 968,470	1920		
Florida land boom	1920	1925	This was Florida's first real estate bubble, leaving behind entire new cities and the remains of failed development projects such as Aladdin City in south Miami-Dade County and Isola di Lolando in north Biscayne Bay
Population and tourism expands	1920	1926	It becomes commonplace to vacation in Florida. Exotic projects spring up in southern Florida with people moving onto land made from drained swamps. Land in Florida is sold and resold with profits reaching inflated levels. Population reaches one million.
Depression hits the economy in Florida	1920	1929	In addition, hurricanes swept through the state, destroying property and killing hundreds of people.
Martin County created	1925		
Baker's Haulover Inlet created in Biscayne Bay	1925		This channel connected the northern end of Biscayne Bay to the Atlantic Ocean.
Florida population is 1,263,540	1925		
Miami Hurricane strikes Florida	1926		This hurricane further exacerbates Florida's economic depression and devastates the city of Miami. Money and credit for land begins to run out, and the economic bubble burst.
Port Miami is dredged	1926	1929	When the Miami Hurricane hit, it split the southern end of Miami Beach creating Government Cut and what is now known as Fisher Island. Shortly afterward, the cut was dredged along with a new channel to what now is known as Bicentennial Park in downtown Miami. This new access to the mainland created the Main Channel which greatly improved the shipping access to the new port. From these original dredged materials which were disposed on the south side of the new Main Channel, new islands were inadvertently created which later became Dodge, Lummus and Sam's Island along with several other smaller islands.
Okeechobee hurricane strikes Florida	1928		Lake Okeechobee is flooded. The official death count is 1,836 although the real number of deaths may have reached as high as

Event Title	Start Date	End Date	Description
			2,500.
Great Depression officially begins	1929		As the state's economy was struggling to recover, the Great Depression occurred in 1929. Banks closed, tourism stopped, and thousands lost their jobs. The U.S. government helped to provide jobs by developing Florida's natural resources.
Mediterranean fruit fly devastates Florida's citrus crop	1929		Florida's citrus production was cut by 60%.
Population 1,468,211	1930		
Florida becomes America's largest citrus producer	1930	1939	
The Okeechobee Waterway is authorized and completed	1932	1938	This was a 155-mile-long waterway from the Gulf of Mexico to the Atlantic Ocean by way of the Caloosahatchee River, Lake Okeechobee and the St. Lucie Canal
Sea levels in Southeast Florida accelerate 2-4 mm per year	1932		
Dave Sholtz is inaugurated as governor	1933		He involved Florida with the Federal New Deal program, with CCC, PWA, and CWA projects in the state Board of State Conservation created.
Fish and Wildlife Coordination Act enacted	1934		FWCA provides the basic authority for the Fish and Wildlife Service's involvement in evaluating impacts to fish and wildlife from proposed water resource development projects.
Florida Park Service created	1935		
Labor Day Hurricane	1935		Killed 408 people in the Florida Keys and destroyed Henry Flagler's railroad
Great White Heron National Wildlife Refuge created	1938		
World War II	1939	1945	Because of its year-round mild climate, the state became a major training center for soldiers, sailors, and aviators of the United States and its allies. Highway and airport construction accelerated so that, by war's end, Florida had an up-to-date transportation network ready for use by residents and the visitors who seemed to arrive in an endless stream. Tourism continued as the state's leading industry and new industries diversified the economy, such as chemical, computers, electronics, and oceanography.
City of Hollywood Southern Regional Wastewater Treatment Plant constructed	1940	1949	Treated wastewater from the Hollywood Wastewater Treatment Plant is discharged through a 60-inch pipe that extends 10,000 feet from the shoreline and reaches a depth of 93 feet.
Spessard Holland is inaugurated as governor	1941		Holland's negotiation of the purchase of Everglades wetland and marshland in 1944 helped lead to the establishment of the ENP in 1947.
Hugh Taylor Birch State Park opened	1941		
US Army Corps of Engineers begin contruction on Cross Florida Barge Canal	1942		The canal is a project to connect the Gulf of Mexico and the Atlantic Ocean across Florida for barge traffic.
Two million people live in Florida	1945		An estimated three million tourists visit Florida yearly as the large-scale tourism industry begins.
Outer Continental Shelf Lands Act enacted	1953		An estimated three million tourists visit Florida yearly as the large-scale tourism industry begins.
Miami-Dade Central District wastewater treatment plant constructed	1956		Miami-Dade/Central Wastewater Treatment Plant is discharged through a 120 and 90-inch pipe that extends 18,800 feet from the shoreline and reaches a depth of 100 feet.
National Key Deer Wildlife Refuge created	1957		
Cuban Revolution launches wave of Cuban immigration to Florida	1959		Thousands of Cubans fled Cuba and settled in Florida. By the late 1960s, most public schools had integrated and several new universities were built.
Florida's population is 4,951,560	1960		The Federal census ranks Florida the 10th most populated state in the nation.
John Pennekamp Coral Reef State Park	1961		

Event Title	Start Date	End Date	Description
created			
Global sea levels rise	1961	2003	Sea level rise averages about 1.8 mm/year (1.3–2.3).
Bahia Honda State Park opened	1961		
The Space Age influences education and industry	1962		The Space Age spreads from Cape Canaveral's launching base and influences the state in many ways, higher education and industry being among the most important.
Recreational fishing increased 444% in South Florida	1964	1998	
Commercial shipping into the ports at Palm Beach, Port Everglades, and Miami increases by 150% and the number of recreational boats in SE Florida increases by 500%	1964	2002	The proximity of reefs to the navigational inlets and commercial ship anchorages leads to a high risk for ship groundings and anchor damage with subsequent reef damage. This reaches an extreme around Port Everglades Inlet where a relatively shallow (d = 20 m) anchorage lies in sand offshore of the middle reef tract.
Hurricane Cleo strikes Florida	1964		Hurricane Cleo, Category 4, first blasted Key Biscayne before moving north along Florida's coastline. The hurricane caused massive flooding, structural damage, and destruction of the citrus crop. A disaster declaration for Florida was made on September 8th.
Hurricane Betsy strikes east Florida	1965		The storm brought a six-foot storm surge that flooded Miami and Fort Lauderdale and is said to have nearly covered the island of Key Biscayne.
Democrat W. Haydon Burns becomes Governor	1965	1967	
Florida legislature creates first aquatic preserve	1966		The first aquatic preserve is known as Estero Bay.
Turkey Point Nuclear Power Plant is built on the shores of Biscayne Bay and Card Bay, 25 miles south of Miami	1967	1973	The Atomic Energy Commission (later known as the Nuclear Regulatory Commission) grants a construction license to Florida Power and Light in 1967 to build the nuclear power plant. There are 4 electric generating units.
Florida legislature passes the Randall Act, Chapter 67-393 Florida Law	1967		
Florida legislature passes Florida Statute 253.03	1967		Gave statutory authority to Florida's Board of Trustees to exercise proprietary control over state owned lands in order to afford better management to their environmental protection.
Florida Board of Trustees establishes a moratorium on the sale of submerged lands to private interests	1967		This action was due to government interest on protecting Florida's productive waterbodies from degradation due to development. An Interagency Advisory Committee was created to develop strategies for the protection and management of state owned submerged lands.
Bill Baggs Cape Florida State Park opens, in Miami-Dade County	1967		
Republican Claude R. Kirk's term as Governor of Florida	1967	/1971	
Investigations into Turkey Point Nuclear Power Plant reveal that the heated water effluent, used to cool the reactors, is being released into Biscayne Bay	1968	1969	These investigations, conducted between the summer of 1968 and the fall of 1969, revealed that the effluent was responsible for the dying plants and decreased populations of animals in the area. Efforts by the US Atomic Energy Commission and Federal Water Pollution Control Administration led to the discontinuation of water effluent into the bay, and the replanting of turtle grass. Instead of releasing the water to Biscayne Bay, the company was permitted to build 168 miles (270.4 km) of cooling canals from 6,800 acres of mangroves.
Complete revision of the state constitution	1968		The revision consolidated the numerous boards and commissions into more streamlined Departments and Divisions, such as Departments of Natural Resources, Environmental Regulation, Education, State, Agriculture, Commerce, and Transportation.
The Republicans hold their national convention at Miami Beach	1968		This is the first national gathering of a major political party ever convened in Florida.

Event Title	Start Date	End Date	Description
The Interagency Advisory Committee issues a report recommending the establishment of 26 aquatic preserves	1968		
Coupon Bight & Lignumvitae Aquatic Preserves created	1969		
Florida Board of Trustees establishes 16 aquatic preserves	1969		The Board of Trustees also adopts a resolution for the statewide system of such preserves.
The state government is reorganized	1969		Over 170 separate agencies become 22 operating departments.
St. Lucie Inlet Preserve Park opens, in Martin County	1969		
First beach restoration project completed in Broward County, at Pompano Beach	1970		This involved dredging sand from offshore "borrow sites" and pumping sand onto target beaches.
Population of Florida is 6,789,443	1970		
Miami-Dade North District wastewater treatment plant constructed	1970	1979	The Miami-Dade/North Outfall consists of a 90-inch reinforced concrete pipe. It extends 11,700 feet from shoreline and discharges effluent through 12 ports at a depth of 108 feet.
Regular nourishment of beaches in Southeast Florida begins	1970	2013	
Waste Water Treamtent Changed/Improved	1970	1980	
President Richard M. Nixon orders a halt to the Cross Florida Barge Canal	1971		$50 million has already been spent on the canal, and it is 1/3 of the way complete.
Walt Disney World opens	1971		Walt Disney World is Florida's first major theme park, and the number one travel destination in the world.
Democrat Reubin Askew term as Governor of Florida	1971	1979	
Tropical Storm Agnes lands in Florida	1972		The storm, although only a category 1 hurricane, caused extensive damage.
Clean Water Act enacted	1972		The primary federal law that governs water pollution. Under the section 404(b) 33 CFR 323.2(e), the discharge of dredge or fill materials in US waters is regulated.
Marine Mammal Protection Act enacted	1972		All marine mammals are protected under the MMPA. The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.
Coastal Zone Management Act enacted	1972		The Act provides for management of the nation's coastal resources, including the Great Lakes, and balances economic development with environmental conservation.
Creation of the John U. Lloyd Beach State Park, located in Broward County	1973		
Record number of tourists visit Florida	1973		Despite fuel shortages in the latter part of the year, Florida sets an all-time record for influx of visitors, when 25.5 million people visit the Sunshine State.
"Freedom flights" from Cuba end	1973		After seven and one-half years and nearly 260,000 refugees, the "freedom flights" from Cuba come to an end on April 7th. The airlifts, bringing refugees into Miami at the rate of 48,000 a year, help transform the ethnic makeup of Dade County by adding at least 100,000 Cubans to the 150,000 already there.
Fort Pierce Inlet State Park opened	1973		
The Barnacle Historic State Park opened	1973		
Broward County undertakes an expansion project to the Osborne artificial reef	1974		About 1-2 million tires were placed in the ocean to create an artificial reef environment, but the expansion was a failure. The tires were bound together with nylon/steels clips, which soon corroded in the saltwater. This caused the tires to drift lose, preventing any marine life from latching on. In addition, with any tropical storms and cyclones, the tires would collide with natural reefs up to only 70 feet away.

Event Title	Start Date	End Date	Description
Biscayne Bay Aquatic Preserve established	1974		
City of Boca Raton wastewater treatment plant constructed	1974		Treated effluent from the WTP is discharged through 3 sizes of pipe sections 42, 30 and 36-inch diameters. The line is 5,166 feet from the shoreline and reaches a depth of 90 feet.
Boyton-Delray South Central Regional watewater treatment plant constructed	1974		Treated effluent from the Boynton-Delray Wastewater Treatment Plant is discharged through a 30-inch pipe that extends 5,200 feet from the shoreline and reaches a depth of 90 feet.
Key Largo National Marine Sanctuary created	1975		
Broward County North Regional Broward/North wastewater treatment plant constructed	1975		Treated effluent from the Broward/North Wastewater Treatment Plant is discharged through a 54-inch pipe that extends 107 feet from the shoreline and reaches a depth of 7,300 feet.
Biscayne Bay-Cape Florida to Monroe County Line Aquatic Preserve established	1975		
Florida Aquatic Preserve Act passed	1975		This act brought existing preserves under a standard set of management criteria. This ensured that aquatic preserves' natural condition may endure for the enjoyment of future generations.
The state unemployment rate hits a 25-year high in January	1975		The unemployment rate is 8.3%, and eventually reaches 9.3%.
Unprecedented, slow biophysical changes occur to coral reefs on a Caribbean-wide scale	1975	1989	Acropora die-off (elkhorn coral, staghorn coral) and loss of extensive Acropora 3-D habitat structure. Loss of fastest-growing reef framework-builders in the Caribbean.
Caribbean-wide loss of live coral cover	1975	2013	The loss was due to white band disease and bleaching.
Magnuson-Stevens Fishery Conservation and Management Act enacted	1976		This is the primary law governing marine fisheries management in United States federal waters. It was originally adopted to extend control of U.S. waters to 200 nautical miles in the ocean; to phase out foreign fishing activities within this zone; to prevent overfishing, especially by foreign fleets; to allow overfished stocks to recover; and to conserve and manage fishery resources.
Severe cold devastates citrus and vegetable plants in Florida	1977		
Savannas Preserve State Park established	1977		
Bob Graham is elected as Florida's 38th governor	1978		Bob Graham was a Miami businessman and former State Senator. Graham launched the most extensive environmental protection program in the state's history, focused on preserving endangered lands. During his tenure thousands of acres of threatened and environmentally important lands were brought into state ownership for permanent protection. His keystone accomplishment was the establishment of the Save the Everglades program, which has now been joined by the federal government in a commitment to restore the Everglades. He is reelected in 1982.
Miami-Dade County Water Quality Monitoring Network initiated	1979		The Network monitors status and trends in water quality parameters to evaluate progress toward achieving/maintaining water quality standards and protecting/restoring living marine resources in South Florida coastal waters. It is limited to Biscayne Bay and associated canals and tributaries.
Miami Beach reports a record resort tax collection for its fiscal year	1979		Taxes received from hotel rooms, food and beverages reach a record high of $3,727,380.
Mariel boat lift	1980		The Mariel boat lift increases Cuban immigration to Florida, bringing about 140,000 Cubans to Florida.
Biscayne Bay National Park established	1980		
Board of Trustees adopts Chapter 18-18, Florida Administrative Code (F.A.C.), Biscayne Bay Aquatic Preserve	1980		The boundaries, management authorities, and rules for Biscayne Bay Aquatic Preserve are established in this Florida Administrative Code. This is the first aquatic preserve rule that the Board of Trustees adopted.
Decline in the number of steel vessels and barges deployed as artificial reefs	1980	1989	This is due to increased costs to clean and prepare vessels as well as increased value of scrap steel.

Event Title	Start Date	End Date	Description
Dramatic increase in use of concrete modules in SE Florida	1980	1989	While there generally is a higher cost per ton associated with designed modules, the ability to manipulate design parameters affords numerous benefits for fisheries research as well as practical construction and deployment considerations. Palm Beach, Broward, and Miami-Dade counties have used designed mitigation modules to offset impacts to natural reef habitat caused by activities such as telecommunications cables, vessel groundings, and dredging.
Broward County initiates a reef monitoring program	1980		The reef monitoring program starts off with 18 sites.
Proliferation of coral diseases throughout Florida	1980	1999	
"Throughout the 1980s, oil drilling proposals, reports of deteriorating water quality, and evidence of declines in the health of the coral reef ecosystem continued to mount."	1980		
Board of Trustees adopts Chapter 18-20, F.A.C., Other Aquatic Preserves	1981		This code administers all other aquatic preserves other than Biscayne Bay. These rules apply standards and criteria for activities in the aquatic preserves, such as dredging, filling, building docks and other structures that are stricter than those of Chapter 18-21, F.A.C., which apply to all sovereignty lands in the state.
Looe Key National Marine Sanctuary created	1981		
Board of Trustees adopts Chapter 18-20, F.A.C., Florida Aquatic Preserves	1982		This Florida Administrative Code highlights the maintenance and management of Florida's aquatic preserves.
9 conduits and 11 cables have been installed off of the Southeast Florida coast	1982	1994	
Dagny Johnson Key Largo Hammock Botanical State Park established	1982		
Beach restoration projects in Broward County, in Pompano Beach and Lauderdale-by-the-Sea	1983		This involved dredging sand from offshore "borrow sites" and pumping the sand onto target beaches.
Diadema sea urchin die-off	1983	1984	The disease began off the Caribbean coast of Panama, and eventually spread its way throughout the Caribbean and to the Florida reef system. It was widespread and virulent, with a 98% mortality rate. No causative agent for the pathogen has been conclusively identified.
Palm Beach County Environmental Resource Management Reef Monitoring Program (PBCERM) begins	1983		This is a long-term non-destructive in situ monitoring of fish composition, abundance and size structure on artificial reefs. Benthos monitoring was added in 1998 and fish and benthos on natural reefs were added in 2004. Offshore reef monitoring was expanded in 2006. Pilot coastal water quality monitoring program targeting wastewater outfalls and Lake Worth Inlet began in 2008.
Creation of Marine Fisheries Commission	1983		Fisheries management was done legislatively prior to 1983
National Fishing Enhancement Act passes	1984		This bill established national standards for the construction and siting of artificial reefs in the waters of the United States in order to enhance fishery resources and fishing opportunities and for other purposes. It resulted in the 1985 National Artificial Reef Plan.
South Boca Raton shoreline nourished in Palm Beach County	1985	1986	In 1985-6 and 1995, the City of Boca Raton dredged the ebb shoal of the Boca Raton Inlet of 220,000 yards of sand and placed it on the beach to the south. Renourishment occurred in 2002. Biological monitoring of offshore reefs, nearshore hardbottom and nearshore mitigation reefs occurred in 2010.
Formation of Palm Beach County's Artificial Reef and Environment Enhancement Committee (AREEC)	1985		Created by the Board of County Commissioners, local government officials, commercial and recreational anglers, SCUBA divers, scientists, and conservationists review, discuss, and make

Event Title	Start Date	End Date	Description
			recommendations for artificial reef and estuarine enhancement projects.
National Artificial Reef Plan published	1985		The plan set national standards and guidelines for permitting procedures, siting, constructing, monitoring and managing artificial reefs in U.S. coastal waters.
Florida's state park system marks its 50th anniversary	1985		Begun during the Depression with nine parks, the system now includes 92 park and recreation areas.
Pillar coral is added to the State of Florida's Endangered Species List	1985		
A series of Aquatic Preserve Management Plans are designed and implemented	1985	1989	These Aquatic Management Plans serve to guide and set directions for the overseeing of Florida's Aquatic Preserves.
Oleta River State Park opened	1986		
Formation of Palm Beach County's Department of Environmental Resources Management	1987		The Palm Beach County Board of County Commissioners created the Department of Environmental Resources Management. Today, ERM administers nineteen environmental programs and employs over 140 people organized in five divisions.
Hurricane Floyd makes landfall in Florida	1987		The effects of the hurricane were more like those of a powerful summer storm and caused minimal damage.
An especially strong El Niño occurs	1987		The El Niño corresponded with coral stress bands in 1988. This illustrates the connection between coral growth and global-scale climate patterns.
Creation of Shore Protection Section of the Coastal and Wetlands Division of Palm Beach County's Department of Environmental Resources Management	1987	1998	Their responsibility is to direct countywide erosion efforts, through which there can be environmental impacts on offshore reefs.
Bob Martinez is the first person of Spanish ancestry to become governor of Florida	1987		Martinez initiated America's largest environmental land acquisition program, Preservation 2000. He proposed the Surface Water Improvement Management act that protects Florida's surface waters, including Lake Okeechobee, Tampa Bay, Lake Jackson, the Kissimmee River, and other areas. He helped get Florida's first solid waste management law passed and implemented Florida's Growth Management Act. He was an advocate of laws and rules that protected manatees and dolphins.
Florida becomes the fourth most populous state	1987		The U.S. Census Bureau estimates indicate that Florida has surpassed Pennsylvania to become the fourth most populous state in the nation. It is predicted that Florida will be the third most populous state by the year 2000.
Avalon State Park opened	1987		
12 acres of nearshore reef are damaged during pipeline installation	1988	2008	
North Boca Raton shoreline is nourished	1988		The shoreline along the north end of the City of Boca Raton was nourished in 1988 (1.1 million yards) and 1998 (600,000 yards). In 1992, the dune was restored at Spanish River Park. The federally sponsored project, managed by the City with financial support from the County and State, is scheduled for renourishment in 2006-8. Monitoring of offshore and patch reef habitats adjacent to the borrow site for North Boca Raton is conducted bi-weekly during project construction (in 2010).
Miami-Dade Sunny Isles beach renourished, with construction of mitigation reef	1988		
Devastating cold front hits state in December	1989		The cold front closed airports and interstates and caused statewide power shortages.
Extensive blooms of Codium isthmocladum	1989		These blooms affected deep (37-45 m) reefs off northern Broward County and Palm Beach County, and were adapted to low light levels and developed seasonally in the late spring and summer.
John D. MacArthur Beach State Park opens to the public, in Palm Beach County	1989		

Event Title	Start Date	End Date	Description
Dunes in Coral Cove Park in Palm Beach County restored	1989		The project was expanded in 1993 to include the shoreline north of the park to the Martin/Palm Beach County line. The project consisted of exotic vegetation and road-bed removal, fill placement, revegetation (9.6 acres), and construction of 4 dune walkovers at a cost of $997,484 (County $272,273, State $582,080). Construction is scheduled every six years with next project in 2004.
FKNMS created	1990		Called for the development of a comprehensive management plan
FKNMS and Protection Act passed	1990		
Beach renourishment project at town of Bal Harbour in Miami-Dade County	1990		During the construction of this project, excessive sedimentation was discovered over 100,000 m2 of reef adjacent to the borrow area. As a result, the Florida Department of Environmental Protection (FDEP) conducted an impact assessment in 1994 including a 'lost service' evaluation of the impacted reef, and determined that 2938 m2 of artificial reef material would be required as mitigation.
President George Bush signs law deauthorizing Cross Florida Barge Canal project	1990		The law changed the purpose of the project into recreation and conservation.
Florida's population reaches 12,937,926	1990		This is a 34% increase from 1980.
Oil Pollution Act enacted	1990		The OPA improved the nation's ability to prevent and respond to oil spills by establishing provisions that expand the federal government's ability, and provide the money and resources necessary, to respond to oil spills. The OPA also created the national Oil Spill Liability Trust Fund, which is available to provide up to one billion dollars per spill incident. In addition, the OPA provided new requirements for contingency planning both by government and industry.
Johnson and others complete an 11 year study profiling all commercial and recreational marine fisheries in the SEFCRI region	1990	2000	• 261 species, including reef fish, coastal, offshore pelagic, and invertebrates, were recorded in landings in Southeast Florida. • Mean total annual landings for all fisheries was 21.4 million pounds per year (range 17.7-26.9) • Landings by sector: 66% recreational, 31% commercial, and 3% headboat landings. • Total finfish landings declined 22% (23.2 to 18.1 million pounds) over the study period (p = 0.022). • For reef fishes total annual landings from all sectors averaged 4.79 million pounds and were composed of 68% recreational, 27% commercial, and 5% headboat landings. • No significant trend was detected in total annual reef fish landings for the recreational sector, while significant declines were detected for both headboat and commercial sectors.
Concrete recycling becomes more prominent	1990		Large, portable concrete crushers are readily available for use directly at construction sites, reducing the cost-savings incentive for donations of secondary-use concrete for artificial reef construction. As a result, the use of secondary concrete for artificial reef construction has reached a plateau in Southeast Florida. Reduced use may be expected in future years.
Fisheries for Goliath grouper, Nassau grouper, and queen conch close	1990	1999	
Southeast Florida fishery landings data collected and published	1990	2000	Mean total landings for all fisheries was 21.4 million lbs/year. 66% was recreational, 31% was commercial, and 3% were headboat landings. Total finfish landings declined 22%. In the recreational sector, no statistically significant trends were observed. In the headboat sector, total annual landings/fishing trips declined 48%,

Event Title	Start Date	End Date	Description
			and in the commercial sector, total landings declined 33%. For REEF FISHES, there were no trends in the recreational sector, but there were significant declines in the commercial and headboat sector.
Anchorage enforcement actions established	1990		
Palm Beach County Reef Research Team established	1991		This is comprised of a group of volunteer sport divers operating under the auspices of the Palm Beach Zoo, a nonprofit conservation organization. The team monitors artificial reefs on a regular basis, using funding supplied from the State of FWC.
The Governor and Cabinet of the State of Florida sign a resolution agreeing to the terms of the Federal deauthorization bill on the Cross Florida Barge Canal project	1991		The resolution was signed on January 22nd. This action ultimately led to the creation of the Cross Florida Greenway State Recreation and Conservation Area.
Water Quality Monitoring Network (FIU/SERC) created	1991		The goal of the network is to oversee the status and trends of monitoring of water quality parameters to evaluate progress toward achieving/maintaining water quality standards and protecting/restoring living marine resources in South Florida coastal waters.
Curry Hammock State Park opened	1991		
Dry Tortugas National Park created	1992		
Hurricane Andrew hits South Florida	1992		This was the most severe hurricane in the last decade. Major storm effects included changes in the nearshore water quality, localized intense bottom scouring, and beach overwash. The stirring of sediments increased the dissolved phosphate levels, leading to plankton blooms and low oxygen levels. In hard-bottom communities, sponges, corals, and sea whips were sheared from their substrate and deposited among extensive wracks of debris. The juvenile spiny lobsters normally found under sponges and corals in central Biscayne Bay disappeared. On some reefs, the storm scoured the tops, rolling over the 200 year-old coral heads and breaking off branching corals.
Delray Beach shoreline renourished in Palm Beach County	1992	1993	The shoreline from George Bush Boulevard to Linton Boulevard in the City of Delray Beach was renourished with 1.2 million cubic yards of sand, the third such project since 1978. As the federally authorized local sponsor for the project, Palm Beach County provides the local share of funding. The City of Delray Beach manages the $6.4 million project, which is scheduled for renourishment in 2001-2.
Seabranch Preserve State Park opened	1992		Pennkarp Cpral Reef SP | St. Lucie Input Preserve SP | John V Lloyd SP | Bill Baggs/Cged FL SP
Florida Department of Environmental Protecton created	1993		FDEP was created by the Florida Environmental Reorganization Act of 1993, merging the former Departments of Natural Resources and Environmental Regulation. The Department's mission is to protect, conserve, and manage Florida's environment and natural resources.
Sea levels rise	1993	2003	Sea level rise increased to 3.1 (2.4–3.8) mm/year. High future sea level rise is predicted. Such high rates could impact corals directly by shifting them to a deeper, lower light position in the water column. Acroporid reefs would drown under these conditions since their sustained reef accretion rates are only about 10 mm/year.
11 ship groundings took place at Port Everglades Inlet anchorage	1993	2007	Port Everglades Inlet has a relatively shallow (d = 20 m) anchorage offshore of the middle reef tract. 40,000 square meters were impacted.
The Reef Environmental Education Foundation (REEF) created	1993		Their mission statement: The Reef Environmental Education Foundation is a grass-roots organization that seeks to conserve marine ecosystems by educating, enlisting and enabling divers and other marine enthusiasts to become active ocean stewards and citizen scientists.

Event Title	Start Date	End Date	Description
11 ship groundings and 6 anchor drag cases in Broward County	1994	2006	This led to 11 acres of damaged reef habitat.
US All Islands Coral Reef Committee (AIC) created	1994		A collaboration of marine resource managers from state, commonwealth, territorial agencies and freely associated states work together with federal agencies to conserve and protect coral reefs in the United States.
Ten acres of dune restored from Carlin Park in Jupiter to Donald Ross Road in Juno Beach in Palm Beach County	1994	1999	The $534,000 project included exotic vegetation removal, 5,000 yards of fill placement, revegetation with native salt tolerant plants, and construction of eight dune walkovers.
The beach and portions of the dune from Jupiter Beach Park through Carlin Park in Palm Beach County are restored	1994	1995	Along 5,534 feet of shoreline was restored. Additional dune planting and installation of 4 new walk over was accomplished in 1997. Four acres of artificial reef were constructed in1998-99 to mitigate for impacts to nearshore hardbottom.
Net limitation Constitutional Amendment Implemented	1995		
Beach nourishment project at Midtown, Palm Beach County	1995		5,400 feet of beach was nourished with 800,000 cubic yards of fill from an offshore borrow area. Several derelict groins were also replaced with new structures. The county provided $695,000 of the $5,195,000 project cost. The Town of Palm Beach funded the remainder. Beach re-nourishment occurred again during 2002-2003 and 2006.
Sustainable Fisheries Act is added as an amendment to the Magnuson-Stevens Fishery Conservation and Management Act	1996		This revision brought new requirements to prevent overfishing and rebuild overfished fisheries. The revised law required that each fishery management plan (FMP) specify objective and measurable criteria for determining when a stock is overfished or when overfishing is occurring, and to establish measures for rebuilding the stock.
13th coral reef monitoring site established in Martin County	1996		Forty-nine individual coral colonies, representing six species were mapped within this site, and images of the colonies will be used to estimate growth and track colony condition.
Worldwide coral bleaching event	1997	1998	Affected up to 16% of the world's reefs.
FKNMS Management Plan approved	1997		
FKNMS Regulations published in the Federal Registrar	1997		
Especially strong El Niño year occurs	1997	1998	Corresponds with coral stress bands in 1998-1999. This illustrates the connection between coral growth and global-scale climate patterns.
Broward County Marine Biological Monitoring Program (BCEPD) begins	1997		This is a long-term fish and coral monitoring program to check relative health of the reef community habitats offshore of Broward County. This program began with 18 offshore reef community transect sites. Five transect sites were later added in 2001 and an additional two transect sites in 2004 for a total of 25 sites.
Beach restoration project in Broward County in the John U. Lloyd Beach State Recreation Area	1997		This involved dredging sand from offshore "borrow sites" and pumping the sand onto target beaches.
First global mass coral bleaching event	1997	1998	Loss in stony coral cover
Beach renourishment at Ocean Ridge Shore in Palm Beach County	1998		Work on the site has included walkover construction and acquisition of land for parking at Ocean Hammock Park, removal of 11 derelict groins, construction of 8 groins and two acres of mitigation reef, placement of 782,745 yards of sand dredged from an offshore borrow area, and the planting of 2.27 acres of additional dune. Funding was provided by the County ($889,146), State ($889,146) and Federal governments ($5,334,875). Re-nourishment of existing beach project is anticipated every 6 years beginning in 2003.
Hurricane George hits Florida	1998		Loss in stony coral cover, mostly within the Florida keys region
Over 40 million tourists visit Florida	1998		
US Coral Reef Task Force (USCRTF)	1998		Established by Presidential Executive Order 13089, its goal is to lead

Event Title	Start Date	End Date	Description
created			US efforts to protect and conserve coral reef ecosystems. The USCRTF is responsible for developing and implementing efforts to map and monitor US reefs, research the causes of, and solutions to coral reef decline; reduce and mitigate coral reef degradation from pollution, over fishing and other causes; and implement strategies to promote conservation and sustainable use of coral reefs internationally.
Son of U.S. President George H.W. Bush, Jeb Bush, is elected governor of Florida	1998	2007	Bush is credited for making many environmental improvements. For example, he signed legislation to protect the Everglades and opposed federal plans to drill for oil off the coast of Florida. In early October 2005, Bush attempted to strike a compromise with fellow Republicans that would allow offshore drilling in an area that stretches 125 miles (201 km) off Florida's coastline and give the state legislature the power to permit drilling closer to the state's coastlines. He is the first Republican governor to be re-elected.
13 conduits and 7 cables have been permitted for four projects in Southeast Florida	1998	2001	Telecommunication lines and fiber optic cables that are constructed offshore can have major detrimental impacts to reef corals.
Hurricane Irene lands in central Florida	1999		Coastal communities experienced rough surf, storm surge, rain and wind gusts.
FWC (FWC) created	1999		The FWC is a government agency charged with managing and regulating Florida's fish and wildlife resources, and enforcing any related laws. Seven Commissioners meet five times a year to hear staff reports, consider rule proposals, and conduct other Commission business in order to enact rules and regulations regarding the state's fish and wildlife resources.
Bal Harbour Mitigation Monitoring Project starts	1999		Long-term monitoring documenting benthic and fish assemblages on a limerock boulder and module reef with comparisons to adjacent natural reefs of the artificial reef constructed near the town of Bal Harbour, Miami-Dade County.
Biscayne Bay Submerged Aquatic Vegetation (SAV) Monitoring (DERM) starts	1999		This is an annual assessment of SAV at 100 stations within central and southern Biscayne Bay and 11 “fixed' stations within central and northern Biscayne Bay.
Broward County yearly monitoring	1999	2013	30 sites
Coral Reef Conservation Act passed	2000		The purposes of this act are to preserve the coral reef ecosystems within US jurisdictions, promote their management and sustainable use, develop scientific information, and provide financial resources for conservation programs.
Decline of sponges	2000	2001	Sponges decline significantly but later stabilize. High rates of concomitant sedimentation in the winter of 2001 may have contributed to sponge mortality.
Study undertaken to measure the economic contribution and value of artificial and natural reefs in Southeast Florida	2000	2001	The study began June 2000 and ended May 2001, and was conducted by distributing surveys to boaters who are recreational fishers (commercial fishers were not included), reef divers, reef snorkelers and/or visitors viewing the reefs on glass-bottom boats. The study was funded by NOAA, FWC, and the four counties in Southeast Florida and employed extensive survey research.
U.S. Coral Reef Task Force (USCRTF) adopts the National Action Plan to Coral Reef Conservation	2000		The National Action Plan is the first U.S. plan to comprehensively address the most pressing threats to coral reef, designed to be the Nation's roadmap to more effectively understand coral reef ecosystems, reduce the adverse impacts of human activities and to serve as a long-term plan and provide the guiding framework for the priorities, strategies, and implementation plans of the Task Force and its members.
Nova Southeastern University takes over reef monitoring responsibility from Broward County	2000		They added 5 new sites, and in 2003 added another 2 sites for a total of 25 sites.
A bloom of Australian spotted jellyfish,	2000		The bloom had a significant impact on the shrimp fishery in the

Event Title	Start Date	End Date	Description
invasive to Southeast Florida, occurs			Gulf of Mexico. While this outbreak was relatively confined, there is the possibility that future blooms may occur over broad areas and potentially affect fish spawning success because the jellyfish preys on the eggs and larvae of many species.
Florida Oceans & Coastal Council created	2000		
Dry Tortugas are incorporated into the FKNMS	2001		
Lowest average monthly temperatures	2001	2002	Average maximum monthly water temperatures in this time period exceeded 29°C in the summers of 2001 and 2002. Elevated water temperatures can induce coral bleaching and while bleaching of some stony corals, octocorals, and *Palythoa caribbeorum* colonies has been observed, mass bleaching events have not occurred since the El Niño of 1997–98.
Small tire retrieval program conducted by Dr. Robin Sherman in Osborne Reef	2001		Dr. Sherman, of the Nova Southeastern University, was able to coordinate the removal of around 1,600 tires at the cost of over $17.00/tire.
Pacific species *Caulerpa brachypus parvifolia* discovered on reef communities off Riviera Beach	2001		This invasion expanded northward to Ft. Pierce, forming thick mats that covered up to 90% of reefs in northern Palm Beach County and resulted in loss of biodiversity and fisheries habitat.
Studies conducted indicate sewage contributed to blooms of *Codium isthmocladum*	2001		Studies conducted in reefs off Palm Beach and northern Browad Counties indicated that land-based sources of nitrogen enrichment (ie. sewage) were more responsible for blooms of *Codium isthmocladum* than natural upswellings. In this study, Caulerpa brachypus parvifolia was discovered in northern Palm Beach County in the deep reef communities.
Beach nourishment project between the Juno Ocean Club Condominium in Juno Beach and the Diamondhead/Radnor Park in Jupiter completed in Palm Beach County	2001		The project renourished a 2.4 mile, 1 million cubic yard beach. Eight acres of new dune was planted and 3.77 acres of limestone reef was constructed nearby to mitigate for the loss of nearshore hardbottom. Renourishment is planned every five years beginning in 2005-6.
Discovery of elevated nutrient enrichment from the Delray outfall	2002	2006	Water quality monitoring data from the experiment shows that there is substantial nutrient enrichment of the environment down from the Delray outfall, which can be one of the causes of the cyanobacteria and algae blooms near Palm Beach County.
USCRTF produces a complementary document to the National Action Plan to Coral Reef Conservation	2002		This document, known as A National Coral Reef Action Strategy (National Action Strategy), follows the same format of the National Action Plan and is designed to address shorter term priorities and strategies for coral reef conservation. The Coral Reef Conservation Act requires NOAA to report to the U.S. Congress every two years regarding implementation of the National Action Strategy.
Data gathered indicates little change in the Southeast Florida coral reef system	2003	2006	
Blooms of cyanobacteria *Lyngbya confervoides* and *L.polychroa* occur offshore of Broward County	2003		
Southeast Florida Coral Reef Evaluation and Monitoring Project (SECREMP) is formulated	2003		This is an extension of the Florida Coral Reef Evaluation and Monitoring Project (CREMP) to the coral reef of Southeast Florida. SECREMP is a long-term monitoring project with 10 sites located off the shores of Miami-Dade, Broward, and Palm Beach Counties. Additional sites are to be added off of Martin County.
Broward County Segment III Mitigation begins	2003	2013	The burial of nearshore reefs due to beach renourishment will be mitigated for through the construction of artificial reefs by placing limestone boulders in nearshore reef sand pockets.
Plans to route undersea fiberoptic cables through coral reef gaps are approved	2003		Governor Jeb Bush and the Florida Cabinet approve the plan, which includes new rules that offer telecommunication companies incentives to route cables through five natural corridors in the reefs off Broward and Palm Beach counties, rather than through denser

Event Title	Start Date	End Date	Description
			coral beds where the cables could cause more damage. The rules prohibit cables off Biscayne Bay and the Florida Keys -- areas with richer stands of coral, sponges and other marine life.
Southeast Florida Coral Reef Initiative (SEFCRI) formulated	2003		A team of marine resource professionals first gathered in May 2003 to develop local action strategies in Southeast Florida--this team was known as SEFCRI. Their mission statement eventually became: To develop an effective strategy to preserve and protect Southeast Florida's coral reefs and associated reef resources, emphasizing the balance between resource use and protection, in cooperation with all interested parties.
Investigation conducted in Broward County by Moyer et al.	2003		The investigation looked into spatial patterns in community structure among reef tracts. Moyer measured relative bottom cover using six replicate, 50 m point intercept transects at 31 sites within three cross-shelf corridors (Broward County north, central and south), each containing all three reef tracts.
FWC completes the "Florida Strategic Artificial Reef Plan"	2003		The state strategic plan is intended to provide a general framework within which local entities can develop their own more comprehensive local or regional plans, based on local needs and management strategies.
State of Florida publishes Artificial Reef Strategic Plan	2003		
AES Ocean Express, LLC is given approval to construct a pipeline in South Florida	2004		The Federal Energy Regulatory Commission (FERC) authorizes AES Ocean Express to build and operate a 54.5-mile, 24-inch diameter pipeline stretching from a proposed LNG terminal in the Bahamas to Broward County.
Calypso US Pipeline, LLC is given approval to construct a pipeline from the Bahamas to South Florida	2004		The Federal Energy Regulatory Commission (FERC) authorizes Calypso US Pipeline to construct the pipeline.
Florida Administrative Code 68B-8 Special Activity License passed	2004		The Marine Special Activity License (SAL) program issues licenses for activities that require a waiver of marine fisheries regulations. Activities that we license include (but are not limited to): scientific research, education, exhibition, aquaculture, the use of non-conforming gear (for research purposes only), the testing of innovative gear, the use of marine chemicals, the release of marine organisms, and the use of dredges for harvesting marine organisms.
Inception of the Florida Area Coastal Environmental (FACE) Program	2004		The FACE program conducts surveys in order to understand the many controlling oceanographic and coastal environmental factors that influence Florida public health and coastal biota, and to provide this knowledge to the area's environmental regulators, resource managers, utility operators, and to the public.
Florida Reef Resilience Program (FRRP) created	2004		The program is designed to improve understanding of reef health in the region of the Dry Tortugas extending all the way up to Martin County, and to identify factors that influence the long-term resilience of corals, reefs and the entire marine ecosystem. A focal area of the program has been filling spatial and temporal information gaps for stony coral bleaching and other bioindicator monitoring data.
SEFCRI begins series of Best Management Practice documents	2004		The goal of the documents are to improve the performance of marine construction activities in Miami-Dade, Broward, Palm Beach and Martin counties in order to enhance protection of natural coral reefs.
Construction of an artificial reef in the vicinity of Phipps Ocean Park, Town of Palm Beach, Florida	2004		The 3.1 acre artificial reef is mitigation for anticipated impacts to 3.1 acres of hardbottom. A biological assessment of the mitigation reef was conducted by Coastal Planning & Engineering, Inc. The principal objective of this study is to compare the benthic community of the mitigation reef with the surf-zone community of anticipated impact to quantify how thoroughly the mitigation reef replaces the ecological functions of the impacted hardbottom.

Event Title	Start Date	End Date	Description
Ocean Chemistry Division of NOAA performs tracer study of Hollywood outfall	2004		Data from the Hollywood outfall study, "Farfield Tracing of a Point Source Discharge Plume in the Coastal Ocean Using Sulfur Hexafluoride" has potential bearing on other outfalls along the south Florida coast where similar conditions exist.
Expanded reef monitoring program extends from northern Dade County to St. Lucie County	2004		Initiated by the Florida Fish and Wildlife Institute and Harbor Branch Oceanographic Institution.
Hurricane Charlie, Frances, Ivan, and Jeanne hit Florida	2004		Wide-spread accumulation of silt/clay size sediment was observed on nearshore hardbottom from Cape Canaveral to Fort Lauderdale. This material filled sand depressions on the inter-reef sand plains and buried patches of nearshore hardbottom and persisted through at least the winter of 2007. Hurricanes Frances and Jeanne temporarily removed the invasive C. brachypus blooms, but the species reestablished itself in winter 2007.
Florida Coral Reef Conservation Program (CRCP) initiated	2004		The Coral Reef Conservation Program (CRCP) coordinates research and monitoring, develops management strategies, and promotes partnerships to protect the coral reefs, hardbottom communities, and associated reef resources of Southeast Florida. CRCP is also charged with the implementation of SEFCRI and through that, the implementation of long-term management programs for Southeast Florida.
Broward County Environmental Protection Program's long-term monitoring program expands	2004		The program now includes 25 sites.
National Coral Reef Institute (NCRI) begins SE Florida regional reef mapping project	2004		The NCRI is part of the Florida Fish and Wildlife Research Institute (FCC). Maps have been completed for Broward County. Palm Beach and Miami-Dade county maps are planned or underway.
A fishery-independent, visual census on natural reef habitats off Broward County is conducted by Ferro et al.	2005		• A total of 86,463 fishes (approximately 130 fish per site) belonging to 208 species and 52 families were observed in counts. • Species richness (number of different species), abundance (number of fish) and biomass of fishes (the amount of fish living in a given habitat, such as kilograms per square meter of reef) increased significantly on reef lines moving away from shore. • Although 232 red grouper were at the 667 sample sites, only two red grouper were above the legal minimum size. No goliath or black grouper were recorded. • A total of 10 gag, yellowfin, or scamp grouper was observed at the 667 sample sites, none were the legal minimum size. • Among six snapper species, 219 of 718 (~30%) were of legal size.
Florida Reef Resilience Program Disturbance Response Monitoring program begins	2005		Through this program, annual surveys are conducted over 8-week periods during summer peak bleaching temperatures by scientific divers. Coral bleaching data from these surveys allow scientists to zero in on which corals and reefs have been more or less resilient in years past by measuring coral species diversity, abundance, and size and how resilient they are at present by assessing their condition.
Hurricanes Katrina, Wilma, and Rita hit Florida	2005		Severe sea conditions during hurricane Katrina resulted in the highest sedimentation rates measured in that year. Sediment resuspension levels did not return to pre-hurricane passage levels even four days after Hurricane Wilma passed.
Southeast Florida accounts for more than 20% all recreational saltwater fishing licenses sold in Florida	2005	2006	
Extensive cyanobacteria blooms subside	2005	2006	Algae blooms subside, although shorter time scale boom/bust

Event Title	Start Date	End Date	Description
			cycles are apparent.
Palm Beach County's Reef Rescue performs coastal water monitoring project off the Delray outfall pipe	2005		Water quality monitoring data from the experiment shows that there is substantial nutrient enrichment of the environment down from the Delray outfall, which can be one of the causes of the cyanobacteria and algae blooms near Palm Beach County.
Broward County Coastal Water Quality Monitoring Program (BCEPD/NSUOC) begins	2005		Three study sites are established around Port Everglades Inlet where nutrients, chlorophyll, salinity, dissolved oxygen, and pH are measured monthly. Data suggests that water exiting through the Port Everglades Inlet has elevated nutrient concentrations as compared to offshore stations.
Broward County Beach Renourishment Segment III Shore Protection Project begins	2005		This beach renourishment included 6.2 miles of the Broward County shoreline, from Hallandale Beach to the John U. Lloyd State Recreation area. Once this project was completed, a biological monitoring plan was put in place for 36 months in order to gage the success of the renourishment.
Lake I releases cause algae blooms in St. Lucie Estuary and coral bleaching on St. Lucie Reefs (outside St. Lucie Inlet)	2005		
Broward Segment II	2005		Beach Norishment
Foster et al. expands the Moyer study with more research	2006		The study was expanded to include community patterns within reef tracts at the three corridors, the effects of sampling scale on the analysis of community structure, and the influence of certain environmental factors on community structure.
Bleaching event occurs near the St. Lucie Inlet in Martin County	2006		The bleaching event affected *Montastraea cavernosa* and *Diploria clivosa* colonies. This may have been due to 14 months of continuous fresh water release from Lake Okeechobee.
Fishery Conservation and Management Amendments added to the Magnuson-Stevens Fishery Conservation and Management Act	2006		A number of changes were made related to establishment of annual catch limits, function of the Scientific and Statistical Committee, the environmental review (NEPA) process, rebuilding provisions, limited access privilege programs, and other areas.
Beach nourishment in Phipps Ocean Park in Palm Beach County begins	2006		The placement of approximately 1,226,600 cubic yards of sand was initiated, covering about 1.4 miles of shoreline. This reach also received an additional 56,000 cubic yards of shoreline during the Post-Fay Dune Reconstruction Project in 2011. A 3.1 acre mitigation reef was constructed between May 26 and June 1 of 2004.
More than 165,000 recreational boats are registered in Southeastern Florida	2006		Many of these vessels anchor on to coral reefs, caushing extensive damage.
FDEP is asked by Coastal America to work on a project to remove the tires in Osborne Reef	2006		Coastal America organized a cooperative project with the US Navy, US Army, US Coast Guard, NOAA, Broward County Environmental Protection and Growth Management Department and FDEP to abate the tire pile that is endangering the Broward County Osborne Reef.
Staghorn and Elkhorn coral species are listed as threatened	2006		The ESA was first created under President Nixon in 1973. Staghorn coral (*Acropora cervicornis*) and elkhorn coral (*Acropora palmata*) that are found in south Florida waters and throughout the Caribbean are listed as Threatened Species under the federal ESA in 2006.
NOAA Marine Debris Program funds a reconnaissance project to develop a strategy for removing and disposing the tires located in Osborne Reef	2006		Retrieval techniques were explored; 30 sample tires were retrieved and examined for processing suitability. Handling, staging and transportation methods were considered; and end uses were explored. As there has not previously been a recovery of waste tires from the ocean of this scale, it was decided that a pilot program (carried out in 2007) was needed to test diver retrieval productivity, loading and transport methods, and tire processing and use.
Baseline Limerock Boulder Reef Monitoring starts	2006		Evaluation of benthic and fish assemblages on five multi-layered limerock boulder reefs throughout Miami-Dade County.
SECREMP expands	2006		SECREMP adds three new sites in Martin County.

Event Title	Start Date	End Date	Description
FDEP-CRCP assumes added responsibility	2006		Their responsibility now includes coordinating and leading response to vessel groundings and anchor damage incidents.
Mooring ball program is launched for shallow water reefs in Palm Beach County	2006		This was a joint effort led by the FWC, the Wildlife Foundation of Florida, and Palm Beach County Environmental Resource Management.
Palm Beach County Reef Research Team initiates work on the natural, deeper reefs	2006		Palm Beach County Reef Research Team had performed routine monitoring and assessment of benthic communities on artificial reefs for 10 years before expanding to the natural, deeper reefs.
Outstanding Florida Waters Rule: 62-302.700: prohibits pollution	2006		Prohibits degradation of water quality in outstanding Florida waters and outstanding natural resource waters.
Florida Anti-degradation policy goes into effect	2006		The policy is comprised of Florida Administrative Code 62-302.300 "Surface Water Quality Standards" and Code 62-4.242 "Permits". Under this policy, the permitting of new or previously unpermitted existing discharges is prohibited where the discharge is expected to reduce the quality of a receiving water below the classification established for it. Any lowering of water quality caused by a new or expanded discharge to surface waters must be in the public interest.
FDEP CRCP tasked with vessel and anchoring incident responses within SE FL region	2006		
Broward Segment III Beach Renourishment	2006		
Caulerpa brachypus spreads into northern Broward County	2007		Harmful algal blooms of *Caulerpa brachypus* have occurred extensively offshore Palm Beach County during the past decade and are spreading. Extensive blooms of cyanobacteria *Lyngbya confervoides* and *L. poly-chroa* have been reported on the reefs offshore of Broward County. These blooms have had a significant impact on reef-associated organisms by smothering and out-competing recruits of sessile benthos
Macroalgae blooms in northern Broward and southern Palm Beach Counties	2007		The bloom comprised of *Cladophora liniformis*, *Enteromorpha prolifera,* and *Centroceras clavulatum*, which formed a thick mat on sand bottom and reef. The cause has not been identified.
A motorized catamaran runs aground in 6 meters of water off northern Miami-Dade County	2007		The 73 feet catamaran attempted to anchor and then partially sank, causing extensive damage to corals and hardbottom habitat.
Boynton-Delray Coastal Water Quality Monitoring program is carried out	2007	Jul-08	Six cruises were undertaken in the Boynton-Delray treated-wastewater plant outfall plume, the Boynton inlet, and the Lake Worth Lagoon in Palm Beach County. The results indicated the water was more acidic and lower in salinity than coastal water, and there were higher concentrations of nutrients.
Broward County contacts the United States Assistant Secretary of Defense for Reserve Affairs about their Innovative Readiness Training (IRT) program for a potential project to clean up Osborne Reef	2007		The IRT looks for civil-military projects that improve military readiness and address the needs of the American public. CWO Donovan Motley said that the cleanup of Osborne Reef met the requirements, and a pilot program was launched with 40 military divers from the US Military and the US Coast Guard and one Landing Craft Utility (LCU) ship in order to determine the priority areas and set a plan for the removal of the tires.
U.S. Coast Guard proposes amended anchorage regulations in Port Everglades	2007		The Notice of Proposed Rulemaking involved eliminating Port Everglades anchorage area A, expanding anchorage area B into deeper waters and away from the reefs, and limiting the time a vessel may remain in the anchorage. The proximity of the anchorage areas to reefs, coupled with navigational error, has resulted in the high number of groundings in this area. The proposed action was a direct result of recommendations by the Port Everglades Harbor Safety Committee, which includes representatives from federal, state and county agencies, and local maritime and environmental stakeholders.
Projecto Coral-Sol	2007		Proposes to control the spread of orange cup coral (invasive species) with the intent of eradicating it in 20 years while adding

Event Title	Start Date	End Date	Description
			value to its extraction and contributing to the sustainable development of coastal communities.
Benthic temperature data loggers are deployed at all SECREMP sites	2007		
Invasive C. brachypus blooms returns	2007		
Charlie Crist inaugurated as 44th governor	2007	2011	Crist announced plans to sign executive orders to impose strict air pollution standards in the state, with aims to reducing greenhouse gas emissions by 80 percent of the 1990 levels, by 2050. Crist appropriated $100 million to continue to restore the Everglades in March 2007.
The US Coast Guard amends anchorage regulations in Port Everglades	2008		The amendment modified the current anchorage area by eliminating that portion of the anchorage closest to sensitive coral reef areas, expanding that portion of the anchorage area that poses less risk to these areas, and limiting the amount of time a vessel may remain in the anchorage area.
Creation of Broward County's Environmental Protection and Growth Management Department	2008		Broward County merged its urban redevelopment and planning functions with those of environmental protection, emergency management and consumer protection and so formulated this entirely new department.
AWT bill passed	2008		Florida legislature passed a bill to end dumping of partially treated sewage onto the reefs of Southeast Florida. Wastewater must meet the higher standard of AWT by 2018 and achieve at least 60% reuse of the wastewater by 2025. New or expanded ocean outfalls will not be allowed and use of the pipes will be prohibited after the 2025 date.
11th Internation Coral Reef Symposium held at the Greater Fort Lauderdale/Broward County Convention Center	2008	7/8/ 2008	The Symposium's goal was better understanding of coral reef ecosystems and consequently effective conservation and management strategies. The Symposium promoted the dissemination of knowledge about reef sustainability and resilience, particularly important to many nations who depend upon coral reefs for their economy and food supply.
Reef Injury and Response Program created	2008		The primary goal of the program is to develop and implement management actions that prevent coral reef injuries associated with commercial and recreational vessels using tools created through the Southeast Florida Coral Reef Initiative and other local action strategies. If damages do occur, then the goal is to ensure that appropriate restoration and/or mitigation is carried out.
First full phase of tire removal operations begin offshore of Broward county	2008		Divers worked an estimated 27 days with 16 dive days cancelled due to adverse weather conditions. An estimated 44,000 tires were removed over the course of the operation by approximately 66 military personnel, including boat drivers and LCU crew.
Lion fish invasion and population explosion	2008		Lionfish is a devastating invasive species to the Atlantic region.
Florida Governor Charlie Crist opposes proposed Calypso pipeline off the Fort Lauderdale coast	2009		According to industry watchers, this likely signals the project's demise.
Boynton-Delray Beach outfall shut off	2009		The outfall was shut off after the passage of new legislation regulating wastewater disposal due to the efforts of Cry of the Water, Reef Rescue, and other environmental groups that have worked for over 10 years to end the discharge of inadequately treated sewage onto the reefs. The remaining outfalls, located in Boca Raton, Pompano Beach, Hollywood, North Miami, and Virginia Key, re planned to be shut down by 2025.
Southeast Florida Coral Reef Water Monitoring Project created	2009		The objective is to evaluate the long-term status and trends of water quality, identify declines or recovery of coastal and offshore water quality, and determine if water quality may be linked to LBSP, or changes in coral condition in Southeast Florida. This program uses SECREMP's 22 monitoring sites in order to use the information to assist resource protection and management decisions.

Event Title	Start Date	End Date	Description
Second full phase of tire removal operations offshore of Broward County	2009		Divers worked an estimated 16 whole or partial days with two dive days cancelled due to adverse weather conditions or equipment failures. An additional 11 days of mission operations were cancelled due to unscheduled mission assignments to support the NASA shuttle launch. An estimated 15,000 to 18,000 tires were removed over the course of the operation by approximately 50 military personnel, including boat drivers and LCU crew.
Florida Coral Reef Protection Act (403.93345 F.S.) passed	2009		The act prohibits damage to coral reef and hardbottom resources from vessel-related impacts like grounding and anchor damage. Any permits associated with deployments, or subsequent monitoring visits, must include specific language regarding any anticipated impacts to reef resources from vessels associated with the permit. Anchoring plans are encouraged to be developed to ensure that there are minimal coral reef or hardbottom resource impacts (i.e., vessels must anchor in the sand). If an inadvertent impact to resources occurs, it is required to be reported to FDEP within 24 hours.
Palm Beach County Mooring Buoy Program begins	2009		The program created a mooring buoy system in several popular reef locations so that boaters, divers, and fisherman can safely moor their vessels to buoys instead of dropping anchor on the reef.
Port Everglades anchorage working group reconfigures	2009		In response to 1993 - 2007 incidents.
MARES process conducted.	2009	2012	SeaGrant facilitated the Marine Estuarine Goal Setting for South Florida (MARES) process from 2009 to 2012.
FDEP study evaluated Miami Anchorage	2009		70 Acres of Coral Habitat
Week of record low temperatures in southern Florida	2010		Temperatures dropped as low as 45 degrees F. These severe temperatures triggered coral bleaching and outright coral death. Following this extreme event, FRRP launched a Disturbance Response Monitoring effort in order to gauge the extent of the damage to the stony corals in south Florida.
Marine Regulation Awareness Program develops	2010		Individuals who have received marine regulation citations (for fishing, diving, or boating) may, at the discretion of the U.S., state, and/or local district attorney's office(s) and the ticketing law enforcement agent, take the Marine Regulation Awareness Program in exchange for having their fine reduced or waived. This program will also be offered for free to the public in order to increase marine awareness.
Climate Change Action Plan for the Florida reef system developed	2010	2015	This plan is intended to guide coordination of reef management across many jurisdictions and serve as a more detailed, Florida-specific companion to the climate change goal and objectives in "NOAA Coral Reef Conservation Program Goals & Objectives 2010-2015." It was formulated by reef users, managers, and scientists as part of the Florida Reef Resilience Program.
Florida population reaches 18,801,310 people	2010		This information is from the U.S. Census Bureau. Population growth has slowed during the current economic downturn, and is expected to reach only 0.85% from 2011–14.
Orange cup coral (invasive exotic species) threatens local coastal biodiversity	2010		The orange cup coral, *Tubastraea coccinea*, is a non-native stony coral in the South Atlantic region.
Cold spell causes bleaching and mortality on Florida reef tract	2010		
Hillsboro/Deerfield Beach Renourishment Project	2011		The Town of Hillsboro Beach, in cooperation with the City of Deerfield Beach, renourished their beaches in Broward County, Florida.
Southeast Florida Marine Debris Reporting and Removal Program established	2011		A joint venture by the FDEP, FWC, and Palm Beach County's Reef Rescue Team, this program encourages local divers and dive shops to report marine debris, then reef clean-up events are organized to remove the debris.

Event Title	Start Date	End Date	Description
Calypso US Pipeline, LLC abandons pipeline project in South Florida	2011		
Florida Statute 403.021 Clean Water passed	2011		Decrees that it is a public policy of the State of Florida to conserve and protect the air and water quality so that it will be safe for humans and the environment.
Florida Statute 258.008 Coral Protection in State Parks passed	2011		In section 3A, it is illegal to damage or mutilate any water-bottom formation or coral in a Florida State Park; in doing so, there will be severe penalties.
Southeast Florida Marine Event Response Program (SEMERP) created	2011		SEMERP is an expansion of the Mote Marine Laboratory's Marine Ecosystem Event Response and Assessment Program (MEERA) in the FKNMS. It will fill the reporting/response gap in the Southeast Florida region and will be designed to provide a similar and continuous response program for the entire Florida Reef Tract. Upon notification of a biological disturbance event, FDEP CRCP will coordinate with regional partners to schedule initial site assessments, implement event response protocols, and analyze samples, where possible and appropriate.
Ault and Franklin conduct a review and synthesis of fishery-dependent information from state and federal agency data sets	2011		These findings indicate that a majority of the exploited reef fish species in the Southeast Florida region are experiencing overfishing and exist at unsustainable levels locally.
Coral Reef Resource Awareness Program established	2011		This program is geared towards training local permitting agencies, construction companies, consulting firms, and industry personnel on the basic biology and ecology of local coral reef ecosystems, as well as the rules and regulations that pertain to reef resources. The goal is to increase the knowledge of regulatory program staff on coral resources so that there will be better permit conditions and deeper understanding and compliance with coral reef laws.
Florida Administrative Code rule 68B-42 is passed	2011		Under this administrative code, removal and possession of wild live rock, coral, common and Venus sea fans, and fire coral in state waters is prohibited unless user has special activity license from FWC.
Rick Scott inaugurated as the 45th governor	2011		
Florida Statute Chapter 403 Pollution Control passed	2011		Defines pollution and sets standards on the prevention of pollution in air, water, and land and sewage disposal. Also sets criteria for punishments in violation of pollution control. In subsection 403.121, The Environmental Litigation Reform Act allows for more efficient use of admin. Process for imposing damages and penalties related to pollution, and outlines administrative penalties for specified violations rules and statutes.
Petition for eight Forida corals to be assigned to the ESA	2011	2012	Six to be listed as threatened and 2 increased to endangered listing.
Port Miami Expansion	2011		
Broward County Coral Permitting regulation passed	2012		The Environmental Protection Growth and Management Department issues and enforces licenses that can involve impacts to corals. Environmental Resource Licenses are required if projects will potentially impact reefs (used for activities such as pipeline or cable construction, dredging, ship anchoring, etc.)
Southeast Florida Fisheries-Independent Program formulated	2012		Fisheries-independent monitoring is a fish monitoring program using standardized sampling methods to examine the population of fishes as a whole. The data collected in Southeast Florida will be based on the Reef Visual Census method, so that Southeast Florida fish data will be comparable to the decade's worth of data from the National Parks and FKNMS. This will be the first time the fish population of the Florida Reef Tract will be looked at holistically.
Southeast Florida Action Network launched (SEAFAN)	2012		SEAFAN is a reporting and response system designed to improve the protection and management of Southeast Florida's coral reefs by enhancing marine debris clean-up efforts, increasing response to vessel groundings and anchor damage, and providing early detection

Event Title	Start Date	End Date	Description
			of potentially harmful biological disturbances.
Florida Statute 253.04 Protection of Sovereign Submerged Lands passed	2012		The Board of Trustees of the Internal Improvement Trust Fund is charged with the acquisition, administration, management, control, supervision, conservation, protection, and disposition of all lands owned by the state, except for lands acquired for certain purposes.
Amendment to Florida Statute Chapter 373 ERP	2012		The amendment requires an environmental resource permit (ERP) before land use or construction activity that could affect wetlands, alter surface water flows, or contribute to water pollution in the state of Florida. The ERP is administered by the Submerged Lands and Environmental Resources Program (SLERP), which is implemented by FDEP and Florida's water management districts.
Florida Statute 161.054 & .055 Joint Coastal Permit passed	2012		Allows the FDEP to concurrently process applications for coastal construction permits, environmental resource permits, and sovereign submerged land authorizations. The consolidation of these programs and the assignment of responsibility to a single bureau (BBCS) has eliminated any potential conflict between agencies.
Surface Water Quality Standards updated	2012		F.S. 302.500: Turbidity cannot exceed 29 Nephelometric Turbidity Units (NTUs) above natural background conditions in Class I – V Waters. Turbidity cannot exceed ambient background conditions in Aquatic Preserves. F. S. 302.530: This rule establishes the criteria for state water quality for all activities. Violation of these standards will require a FDEP permit.
Climate Information needs assessment conducted	2012		
Palm Beach Renourishment Agreement	2012		
Study to Identify Coral Reef Ecosystems for Biogeographical Region	2012		
The Federal Energy Regulatory Commission (FERC) nixes approval for AES Ocean Express pipeline	2013		FERC vacated the authorization it first gave to AES Ocean Express LLC in January 2004 to build and operate a 54.5-mile, 24-inch diameter pipeline stretching from a proposed LNG terminal in the Bahamas to Broward County, Fla., for failure to meet deadlines for starting construction.
The FDEP has ordered the Town of Palm Beach to build artificial reefs and coral nurseries	2013		These reefs are meant as mitigation for the coral damage caused by the 2003 and 2006 Mid-Town beach renourishment projects. As a condition for FDEP to allow future renourishment projects in the area, Palm Beach must build acres of mitigation reef, transplant 5,000 coral colonies and monitor the nurseries for the next 10 years. Project costs are expected to exceed many millions of dollars.
Florida CRCP seeks public input via general meetings	2013		Six meetings, located in West Palm Beach, will allow the public to participate in a process called OFR to collect concrete proposals for reef protection. The meetings, being coordinated by the Florida Department of Environmental Protection, are aimed at plugging a gap in managing South Florida's reefs, vital marine ecosystems that attract boatloads of tourists for fishing, snorkeling and diving.
Port Everglades call for expansion plans that could harm nearby reefs	2013		The $313 million project with the Army Corps of Engineers calls for blasting and dredging through limestone and coral to deepen the port's entrance channel from 42 feet to 48 feet.
Discussions to harmonize regulations and fisheries management structures across South Florida	2013		FWC, Atlantic Fisheries Council, and Gulf Fisheries Council hold discussions to try to harmonize regulations and fisheries management structures for south Florida, particular for the management of certain fish in state waters in South Florida (many of which are reef fish species)
SECREMP expands to three additional sites	2013		Total of 22 sites are being annually monitored.