

# Comprehensive Conservation and Management Plan for Clearwater Harbor and Saint Joseph Sound

Prepared for:  
Pinellas County  
Department of Environment  
and Infrastructure



Prepared by:  
Janicki Environmental, Inc.

Janicki Environmental, Inc.

&

ATKINS

December, 2011

## **FOREWORD**

This document is provided in fulfillment of Task 10 of the Comprehensive Conservation and Management Plan for Saint Joseph Sound and Clearwater Harbor; Contract No: 089-0222-P.

## PREFACE

Clearwater Harbor, Saint Joseph Sound, and their watersheds are collectively referred to in this document as the “CHSJS”. The CHSJS contains extensive and highly valued natural resource attributes. The Pinellas County Department of Environment and Infrastructure and the Southwest Florida Water Management District (SWFWMD) recognized the need to develop a Comprehensive Conservation and Management Plan to summarize existing information on the status and trends of natural resources, synthesize existing management efforts, and establish goals, actions, strategies, and priorities to ensure future stewardship of natural resources within the CHSJS. With funding support from the United States Environmental Protection Agency, SWFWMD, Pinellas County, and several municipal governments within the watershed, this report, the Clearwater Harbor and Saint Joseph Sound Comprehensive Conservation and Management Plan, is a culmination of those efforts to develop protection and restoration strategies to ensure future stewardship of CHSJS natural resources.

This document comes at a unique period in Florida’s history. The United States economy is in the midst of the worst recession since the 1930’s. State and national budget deficits have resulted in dramatic reductions in funding on federal, state, and local levels. Funding has been eliminated for management of several of the Florida’s aquatic preserves including those in the CHSJS and budgets for environmental restoration and land acquisition programs has been drastically reduced. Under these circumstances, natural resource protection will require diligence by natural resource managers, private entities, and community based environmental volunteerism. Fortunately, in the past two decades substantial natural resource management efforts within the CHSJS have been implemented to reduce anthropogenic nutrient loadings to the estuaries, stabilize erosion in tidal tributaries and restore wetland function to areas historically impacted by development of the watershed during its rapid expansion in the 1960’s and 1970’s. Over 20 million dollars have been spent on improving wastewater management in the watershed to reduce nutrient loading to the estuaries. Likewise, substantial efforts have been dedicated to increasing the treatment of nonpoint source runoff to reduce estuarine nutrient loadings. As a result, the estuaries of the CHSJS have seen improving seagrass and phytoplankton trends resulting in as much as a 25% increase in seagrass extent over the past decade. While there is much “good news” about the condition of the CHSJS estuary, there is also much that can still be accomplished to protect existing resources and restore ecosystem function in a manner that is consistent with both the ecological integrity and economic prosperity of the region. This CCMP has identified a host of mechanisms to efficiently and effectively manage the CHSJS among independent entities in a collective fashion to allow for local control and provide collective benefit to the CHSJS.

An “Action Plan Database” has been created as a central repository of information to document information on past and current environmental projects within the CHSJS. This database will allow managers to conveniently access the breadth and scope of past management activities and track success over time in meeting the goals and objectives of the CCMP. Water quality targets have been identified and a reporting tool has been provided to allow resource managers and decision makers access to a concise summary on the current status and trends in estuarine water quality throughout the CHSJS. Specific “Action Plans” have been identified that outline strategies for the protection and restoration of Bay Habitats, Watershed Habitats, Water Quality, Estuarine Fauna, Sediment Management, and Public Education and Outreach. The natural resources of the CHSJS generate substantial revenue both within and outside its geographic boundaries and a specific action plan has been dedicated to trying to quantify the contributions of natural resources to the

local economy such that informed cost benefit decisions can be made when evaluating future public works projects.

Natural resource protection agencies must continue to look for ways to offset anthropogenic pressures to conserve the natural heritage of the CHSJS. These natural treasures include extensive seagrass meadows, barrier island preserves, critical sea turtle and bird nesting areas, mangrove forests, and forested and non-forested wetlands. This CCMP provides a management framework and priorities from which local governments can most effectively utilize their individual and collective resources to address natural resource protection for the collective benefit to the CHSJS.

## ACKNOWLEDGEMENTS

This report would not have been completed without contributions from a number of local scientists and water resource managers. Janicki Environmental, Inc. would like thank project managers Kelly Hammer Levy and Melissa Harrison of Pinellas County, Kris Kaufman of the Southwest Florida Water Management District, and Rhonda Evans of the United States Environmental Protection Agency for their oversight and insights into the successful completion of this report. Cooperative funding for this project was supplied by Pinellas County, the Southwest Florida Water Management District, the Pinellas-Anclote River Basin Board, the United States Environmental Protection Agency and many of the stakeholder groups listed below. The stakeholder group and Technical Advisory Committee for the CCMP provided immeasurable contributions to the success of this project. The Technical Advisory Committee included representatives of the City of Tarpon Springs, City of Dunedin, City of Clearwater, City of Largo, Pinellas County, Florida Department of Environmental Protection, the United States Environmental Protection Agency, and the Southwest Florida Water Management District. Janicki Environmental would also like to acknowledge the contributions of their sub-consultants on this project, specifically, David Tomasko, Pam Latham, Kathy Anamisis, and Doug Robison of Atkins Global for their contribution to the sections of the report detailing the recommendations for land use, seagrass, and managed lands. Further, Ann Hodgson and Ann Paul of the Audubon of Florida's, Florida Coastal Islands Sanctuaries program contributed the recommendations concerning the conservation and management of bird populations and bird habitats. Lastly, this report would not have been possible without the dedicated field data collection and compilation efforts of the staff of the Pinellas County Ambient Water Quality Monitoring Program of the Department of Environment and Infrastructure.

# TABLE OF CONTENTS

## Contents

<b>INTRODUCTION .....</b>	<b>1</b>
NEED FOR A CCMP .....	1
RESOURCE DIVERSITY IN THE WATERSHED.....	3
DEFINING THE CHALLENGE .....	5
CONSERVING OUR NATURAL HERITAGE.....	6
<b>GEOGRAPHIC EXTENT AND STAKEHOLDERS.....</b>	<b>8</b>
GEOGRAPHIC EXTENT.....	8
CCMP STAKEHOLDERS.....	11
<b>STATE OF THE RESOURCE.....</b>	<b>12</b>
FOCUS ON THE ESTUARY .....	12
ESTABLISHING HISTORICAL BENCHMARKS .....	13
BAY HABITATS.....	13
WATERSHED HABITATS.....	16
WATER QUALITY .....	17
QUALITATIVE TARGETS FOR ESTUARINE FAUNA.....	20
<b>STATE OF RESOURCE MANAGEMENT .....</b>	<b>24</b>
<b>GOALS AND PRIORITIES.....</b>	<b>27</b>
NATURAL RESOURCE GOALS AND APPROACHES .....	27
BAY HABITATS.....	28
WATERSHED HABITATS.....	30
WATER QUALITY .....	30
SEDIMENT MANAGEMENT .....	33
PUBLIC EDUCATION.....	34
<b>ACTION PLANS.....</b>	<b>36</b>
BAY HABITATS ACTION PLANS .....	37
WATERSHED HABITATS ACTION PLANS.....	48
WATER QUALITY ACTION PLANS .....	56
ESTUARINE FAUNA ACTION PLANS.....	61
SEDIMENT MANAGEMENT ACTION PLANS .....	67
DREDGING AND DREDGE MATERIAL ACTION PLANS .....	71
PUBLIC EDUCATION ACTION PLANS.....	73
<b>PROJECTS AND THE ACTION PLAN DATABASE.....</b>	<b>80</b>
<b>DATA AND INFORMATION GAPS.....</b>	<b>82</b>
<b>IMPLEMENTATION AND MONITORING.....</b>	<b>85</b>
<b>LITERATURE CITED.....</b>	<b>90</b>

## INTRODUCTION

This document, the Comprehensive Conservation and Management Plan (CCMP) for Clearwater Harbor and St. Joseph Sound, is intended to provide a comprehensive framework for the future protection of Clearwater Harbor and St. Joseph Sound natural resources to conserve their natural heritage for future generations. For the purposes of this document, the Clearwater Harbor St. Joseph Sound study area is collectively referred to as the "CHSJS". The CHSJS includes the mainland watershed, estuarine waters and coastal islands. The CHSJS provides a wealth of ecosystem services that contribute to the ecological, cultural and economic benefit of this portion of Pinellas County. The history of this area was founded on its connection to its estuarine and coastal waters. To this day, the estuaries maintain much of their historical attributes providing a myriad of recreational opportunities including boating, fishing, and birding which contribute to the area's aesthetic and economy. This document provides a comprehensive, long-term strategy for the resource management to ensure that the CHSJS remains a viable natural resource area that is conserved and protected for future generations to enjoy.

### Need for a CCMP

Despite its regional importance the CHSJS has not had the benefit of a unified management structure dedicated specifically to the protection and restoration of natural resources within its boundaries. This portion of Pinellas County (Figure 1) is outside the boundary of the Tampa Bay Estuary Program's (TBEP) CCMP, and was not identified as a Surface Water Improvement and Management (SWIM) waterbody by State legislators in the State's 1988 legislation. There are management plans that address natural resources within the CHSJS, including the Pinellas County Aquatic Preserve Management Plan and plans for individual waterbodies (e.g., Stevenson Creek Watershed Management Plan, Cedar Creek Restoration Plan). What was lacking was a synthesis of all available data and management needs, and a mechanism for regional coordination for the entire area, thus the need for the CHSJS CCMP. The CHSJS CCMP is modeled after the Tampa Bay Estuary Program's Comprehensive Conservation and Management Plan entitled "Charting the Course" (TBEP 1996) that provided recommendations and developed partnerships that have resulted in dramatic improvements in ecosystem health of Tampa Bay.

The CHSJS includes extensive and diverse natural resources including seagrasses, parks and preserves, and avian migratory flyways among others. However, the CHSJS also contains some of the most densely populated urban land in the state. This dichotomy inevitably results in conflicts between the need to protect natural resources and to provide infrastructure, protection from flooding, and public safety. The CHSJS includes numerous local government jurisdictions including both municipalities and the unincorporated County. The individual entities may have widely varying differences of opinion regarding urban growth and resource protection. These potential conflicts can be much more effectively resolved if an overarching management approach, such as the CCMP, is in place. Good examples of the type of conflict that can arise are the dredge and fill residential projects that were constructed between the 1950s and 1970s. Although these activities provided a significant amount of desirable housing and boosted the area's economy, large areas of bay bottom habitat were lost and tidal circulation patterns were permanently altered. The recognition of the value of preserving natural areas was eventually recognized and the practice of widespread dredge and fill for residential development has not occurred since the early 1970s.

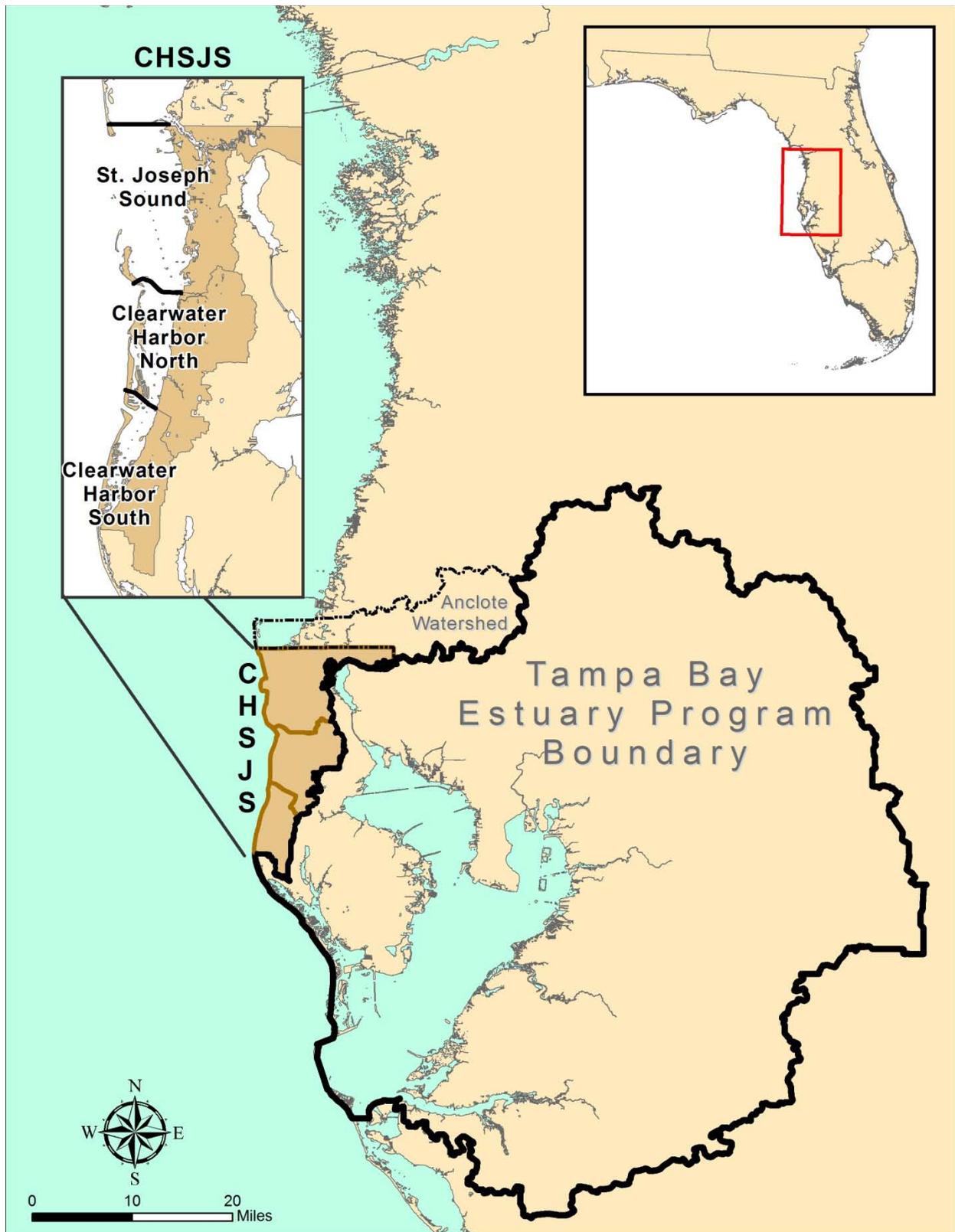


Figure 1. Map of the Clearwater Harbor-St. Joseph Sound study area relative to the Tampa Bay Estuary program boundaries. The broken line indicates that portion of the Anclote watershed within Pasco County.

## Resource Diversity in the Watershed

Natural resource diversity is the cornerstone of ecosystem health. Fortunately, the CHSJS encompasses a wealth of natural resource diversity that contributes both ecological and economic services to the community. To appreciate the critical nature of protecting the CCMP area's resources it is beneficial to focus on some of the local natural resource features and attractions. Below is a brief summary of several important natural resources in the CHSJS.

- **Anclote Key** – Four islands make up Anclote Key Preserve State Park - Anclote Key, North Anclote Bar, South Anclote Bar and Three Rooker Bar. These preserves form the western boundary of St. Joseph Sound and are accessible only by private boat or ferry. The 403-acre park (including submerged lands) is home to at least 43 species of birds, including the American oystercatcher, bald eagle, and piping plover. A picturesque 1887 lighthouse stands as a sentinel on the southern end of the island.



- **Anclote River** – The Anclote River is the largest freshwater body in the CHSJS. Although many coastal areas in the river watershed have been developed, there are still abundant opportunities for boating and access to the Gulf of Mexico. Additionally, there are several parks and preserves within the river watershed including Anclote River Park, North Anclote River Park and numerous hiking and biking trails.

- **Honeymoon Island** – Honeymoon Island has been a recreational destination since the early 1940s. Now a state park, Honeymoon Island supports diverse native habitats including gulf beaches, mangrove forest, and pine woods as well as numerous threatened and endangered species such as Bald eagles, ospreys, and numerous species of shore birds and wading birds.

Recreational opportunities include picnicking, hiking, swimming, and world class bird watching. Although accessible via the Dunedin Causeway, the island also hosts a ferry to adjacent Caladesi Island that has no land-based access.



➤ **Caladesi Island** - One of the few natural islands remaining along Florida's Gulf Coast, Caladesi Island State Park supports a white sand shoreline that was rated America's Best Beach in 2008. Beach lovers can enjoy swimming, sunbathing and beachcombing. Saltwater anglers can cast a line from their boats or surf fish. Nature enthusiasts can spot wildlife while hiking the three-mile nature trail into the island's interior or paddling a three-mile kayak trail through the mangroves and bay.

➤ **Aquatic Preserves** – The entire estuarine portion of the CHSJS is designated as part of the Pinellas County Aquatic Preserve with sovereign submerged lands including mangroves, oyster bars, seagrass and several species of coral. The aquatic preserve designation helps to ensure protection of these important assets but requires active management which is currently threatened due to financial constraints.

➤ **Gulf Islands GEOPark** - Audubon of Florida has recognized the CHSJS as highly valuable for its avifauna by listing "Clearwater Harbor-St. Joseph Sound" and the "Gulf Islands GEOPark", as Important Bird Areas (IBAs) of Florida. A unique assemblage of colonial waterbirds and shorebirds uses the CHSJS. Located on the Atlantic Flyway, these waterways, beaches, and shorelines are extremely important stopover and over-wintering sites for birds. Some species nest as far north as the Arctic tundra, but retreat south in the winter to find their fish, shellfish, insect, and invertebrate prey. At least 25 bird species, including several taxonomic groups of colonial waterbirds and territorial birds, breed in CHSJS coastal habitats. Eleven of these species are federally or state-listed as "endangered", "threatened", or "species of special concern."



➤ **Seagrass** - Seagrass communities are keystone indicators of estuarine health in sub-tropical systems such as Clearwater Harbor and St. Joseph Sound. Seagrass health and success depend on good water quality and water clarity. Seagrasses support a complex trophic food web and a detritus-based food chain, providing nutrient filtration, sediment stabilization, and breeding and nursery areas for finfish and shellfish such as bay scallops. The CHSJS estuaries support some of the largest expanses of seagrass in southwest Florida and are a principal focus of management efforts.



- **Turtle Nesting/ Manatee Watching** – Although most sea turtles lay their eggs on the gulf side of the barrier islands, their proximity to the CHSJS makes them vulnerable to activities in the watershed. Manatees are commonly seen in coastal waters, especially around the cooling water discharge of the Anclote Power Plant which is located just north of the Anclote River mouth. The power plant area also provides excellent fishing opportunities.



- **Boating** – Marine-related industry was the primary source of economic revenue in the early development of the CHSJS watershed. Tourism and recreational boating have largely replaced commercial boating activity, with the exception of charter fishing operations. Several marinas and boat ramps now facilitate access to the CHSJS estuary, with the Intracoastal Waterway allowing navigation for larger vessels, as well as providing convenient access to the Gulf of Mexico.

- **Recreational Fishing** – Along with boating, fishing is a major recreational activity in the area. Fishing from boats, or along the local causeways and bridges is popular with residents and tourists, and is a significant source of income to the area.

- **Intracoastal Waterway (ICW)** – The portion of the ICW connecting Tampa Bay, Clearwater Harbor, St. Joseph Sound, and the Anclote River was completed in 1962. Since then the ICW has served navigational purposes for recreational and commercial vessels alike. Dredged material from the channel was used to form spoil islands that have been colonized by mangroves and are now important bird nesting habitat within the CHSJS. Erosional forces are impacting these spoil islands throughout the CHSJS and thereby threaten important bird habitats in this critical nesting and foraging refuge.



## Defining the Challenge

The purpose of this CCMP is to provide a path forward to integrate current management activities within the CHSJS, identify critical natural resource protection and restoration strategies, and provide a framework to prioritize and implement management strategies for the comprehensive conservation and management of the CHSJS. Protecting and managing natural resources is no small challenge. Agricultural development began in the watershed nearly 100 years ago. Farming and land development practices altered surface water flow patterns, destroyed native upland

vegetation, and reduced the number and extent of wetlands. More recently, the transition of the CHSJS watershed from agricultural land uses to residential and commercial development increased the amount of impervious surfaces such as roads, parking lots, and buildings which in turn further altered local hydrology. Many stream channels have been channelized to facilitate drainage of the land and wetland habitats have been destroyed or fragmented. Aside from the northeast portion of SJS and public lands, most of the watershed has been developed for urban or residential uses.

In addition to development pressures, human population increases have resulted in the introduction of pesticides, metals, petroleum products, and nutrients including nitrogen and phosphorus into the environment. These anthropogenic impacts contribute to the degradation of water and land, and result in direct and indirect adverse impacts to fish and wildlife. Because estuaries are inextricably linked to watershed processes, estuarine receiving waters are impacted by watershed alterations. Historically, disposal of human waste contributed to declines in water quality and estuaries bore the brunt of this minimally treated sewage. However, tremendous improvements in technology have been made in the treatment and disposal of human waste and wastewater since the 1970s, and the advanced wastewater treatment technologies currently employed by water reclamation facilities within the CHSJS are now among the most sophisticated in the United States. Despite the intense development of the watershed, the estuarine waters of the CHSJS have been buffered to a degree from these impacts due in part to rapid tidal exchange with coastal waters.

The challenge presented to local natural resource managers is to determine the most appropriate course of action to protect those natural resources that remain healthy and largely intact, and to identify restoration goals and objectives to restore and enhance natural resource functions in areas that have been adversely impacted due to development pressures. This document will serve as a tool to achieve these goals. The specific management objectives presented in the following chapters provide a pathway to ensure that cost-effective measures will be successfully implemented to protect and enhance the incredible natural resources in the CHSJS.

## Conserving Our Natural Heritage

At the heart of the CCMP is the recognition that the CHSJS retains incredible natural resource value. From the preserved coastal lands of Anclote Keys and Honeymoon Island State Park to the extensive seagrass meadows and bountiful recreational fishing opportunities of their protected estuaries, the CHSJS is a unique and treasured asset. However, the CHSJS watersheds have experienced intense development pressures and it is undeniable that the natural landscape has been irrevocably altered.

Given that it is unreasonable to expect that the watershed could be converted back to a pre-development condition, a management strategy must be adopted that is directed at conserving the existing natural heritage of the CHSJS for future generations, and restoring natural resources attributes in a cost effective and success-oriented approach. Approaches to natural resource management have evolved over time. Our current state of knowledge recognizes that to be effective, management actions must take a holistic approach that is referred to as ecosystem management. This approach requires that the multiple systems within a watershed be considered as interconnected and interdependent entities, and not as a series of unconnected elements. The ecosystem management approach balances socio-economic, and ecological services and

recognizes the need and role of “stakeholders” and adaptive management for the process to be effective (Lackey 1998).

After the initial implementation of management actions, effective monitoring will be critical to indicate whether or not the actions are having the desired outcome. If progress is not observed then alterations to the activities can be made in an adaptive management approach. Likewise, if monitoring shows that the actions are successful, the results can be documented and the successes reported to local decision-makers to enhance funding support for successful programs.

The strategies for the conservation and restoration of CHSJS natural resources that are outlined in the following chapters are based on sound scientific and resource management principals. These “action plans” are the core of the CCMP. The action plans contain background, rationale, implementation methodologies, and means of measuring success. In addition to the action plans this document includes, a summary of the state of the natural resources in the CHSJS CCMP area, a discussion of existing management efforts to address local resource protection, and an examination of existing data/information gaps with recommendations of future management priorities. The implementation of the CCMP and achievement of its goals will take time and effort. Achievement of the CCMP goals will require public-private partnerships, cooperative efforts, volunteer programs, integration of available resources, and identification of creative funding opportunities. This document provides a unified management strategy from which individual entities can contribute to the collective conservation and management of the CHSJS for future generations.

## GEOGRAPHIC EXTENT AND STAKEHOLDERS

### Geographic Extent

The CHSJS CCMP area is located along the west-central coast of Florida, and includes much of western Pinellas County. The CHSJS contains three segments which include both the estuarine waters and their associated watersheds. The three segments are: St. Joseph Sound (SJS); Clearwater Harbor North (CHN), and Clearwater Harbor South (CHS) (Figure 2).

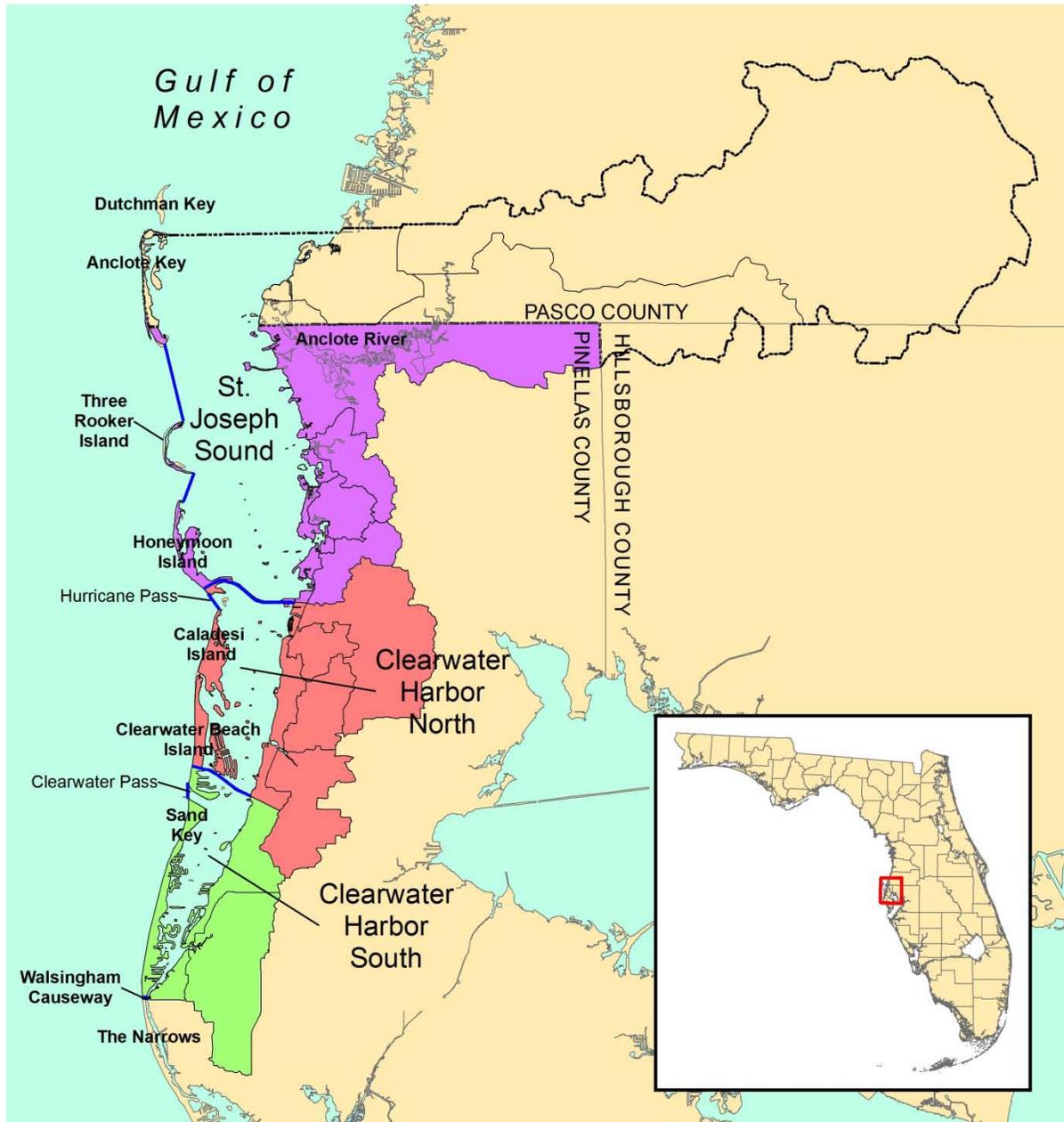


Figure 2. Geographic extent and landmarks of the Clearwater Harbor–St. Joseph Sound Comprehensive Conservation and Management Plan.

The CHSJS is bounded to the north by the Pinellas-Pasco County line and to the south by the Walsingham Causeway at the Narrows. The Dunedin Causeway separates Clearwater Harbor North from St. Joseph Sound, and Memorial Causeway separates Clearwater Harbor South from Clearwater Harbor North.

As shown in Figure 2, the St. Joseph Sound watershed includes the Anclote River basin which extends north and east into Pasco County. The entire watershed was evaluated with respect to hydrologic and pollutant loading because of its influence on St. Joseph Sound. However, analyses and management recommendations for St. Joseph Sound are restricted to areas within Pinellas County.

As shown in Figure 3, the remainder of the SJS watershed lies within:

- City of Tarpon Springs;
- City of Dunedin; and
- Unincorporated Pinellas County.

The CHN watershed encompasses all or parts of:

- City of Dunedin;
- City of Clearwater; and
- Unincorporated Pinellas County.

The CHS watershed encompasses all or parts of:

- City of Clearwater;
- City of Largo;
- City of Belleair;
- City of Belleair Bluffs;
- City of Belleair Beach,
- City of Belleair Shores;
- City of Indian Rocks Beach; and
- Unincorporated Pinellas County.

The coastal barrier islands form the western boundary of the CHSJS. Barrier islands in the SJS include Anclote Key, North Anclote Bar, South Anclote Bar, Three Rooker Bar, and Honeymoon Island. The CHN watershed includes Caladesi Island and much of Clearwater Beach Island. The CHS segment contains the southernmost part of Clearwater Beach Island and Sand Key south to the Walsingham Causeway bridge.

The Intracoastal Waterway is a dredged channel extending the length of the CHSJS estuary. Spoil islands formed from this dredging activity are scattered throughout the CHSJS estuary but are principally located in the northern half of the area. These islands currently support substantial bird rookeries and mangrove fringe forests, and are an important management feature of the CHSJS. The entire CHSJS estuarine area is included in the Pinellas County Aquatic Preserve.



Figure 3. Political jurisdictions within the CHSJS CCMP area (from 2010 Pinellas County municipal layer).

## CCMP Stakeholders

Implementation of this CCMP will require the collective efforts of multiple stakeholders working both individually and as a group. A stakeholder is defined as a person, group, or organization that has a direct or indirect interest (“stake”) in a process because the stakeholder can affect or be affected by the process outcomes. Key stakeholders in a resource management process may include federal, state, and local governments (counties and cities), private interest groups, utilities, private corporations, and individual citizens. Potential stakeholders are listed below in addition, participants of inter-local agreements and those entities that are thought to be future participants in implementation of the CCMP recommendations area listed below

### List of Stakeholders

#### **Federal Government**

US Environmental Protection Agency  
(EPA) (\*)

#### **Local Government**

Pinellas County (\*)  
Pasco County  
City of Tarpon Springs (\*)  
City of Dunedin (\*)  
City of Clearwater (\*)  
City of Largo (\*)  
City of Belleair  
City of Belleair Bluffs  
City of Belleair Beach  
City of Belleair Shores  
City of Indian Rocks Beach

#### **Private Citizens**

Individuals  
Homeowner and neighborhood  
associations

#### **State/Regional Government**

Southwest Florida Water Management  
District (SWFWMD) (\*)  
Florida Department of Environmental  
Protection (FDEP) (\*)  
Florida Fish and Wildlife Conservation  
Commission (FWC)  
Florida Department of Health (FDOH)

#### **Private Interest**

Audubon of Florida (\*)  
Sierra Club

#### **Utilities**

Progress Energy  
Tampa Bay Water

#### **Private Corporations and Businesses**

Waterfront business owners (marinas and  
boatyards, hotels, restaurants and bars,  
retail stores, etc.)

(\*) Active participants in CCMP development and implementation.

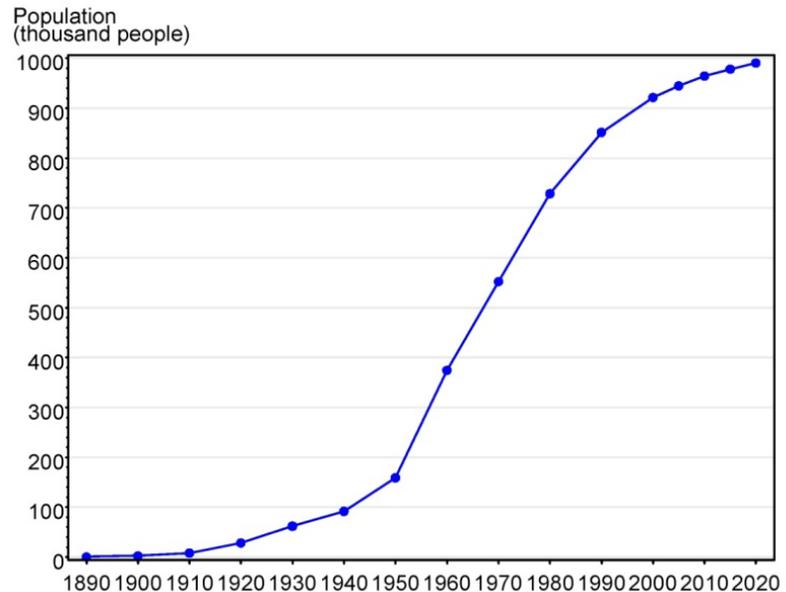
## STATE OF THE RESOURCE

The CHSJS contains some of the most extensive natural areas and preserves in southwest Florida. However, northwestern Pinellas County is also one of the most densely populated areas in all of Florida. Coinciding with the advent of air conditioning, watershed development increased 135% in Pinellas County between 1950 and 1960. This was the largest increase ever recorded in the County and was followed by commensurate increases in residential development and immigration in each of the next three decades (Figure 4).

As the population grew, environmental impacts due to land development activities led to the establishment of regulatory agencies in the early 1970s. During this same period, portions of northeastern Pinellas County and northwestern Hillsborough County were leased for wellfield development in response to saltwater intrusion into coastal water supplies. In 1975, the Local Government Comprehensive Planning Act was enacted by the Florida Legislature and in the late 1970s, Pinellas County began identifying environmentally significant lands with the intent of "...adopting the necessary and appropriate regulatory land use designations to preserve their environmental significance."

### Focus on the Estuary

Estuaries are among the most highly productive biological systems on earth and are a major focus of the CCMP because of their ecological and economic value to the area. Estuarine health and productivity are driven by the combination of freshwater inputs, nutrient delivery, sediment processes, water circulation, emergent vegetation, submerged aquatic vegetation, and the support of benthic and pelagic food webs. Tidal circulation prevents stagnation of water and increases mixing, although it can increase turbidity and therefore decrease water clarity. High residence times provide a period for organic detritus to contribute nutrients to the food chain but can lead to reduced dissolved oxygen concentrations. Therefore, estuarine water quality and overall productivity rely on a delicate balance of sediment and nutrient inputs, nutrient uptake and cycling, and mediating influences such as circulation and residence times. In the sub-tropical estuaries of the CHSJS, water quality conditions are partially related to the expression of phytoplankton which contribute to overall productivity, but can also contribute to deleterious conditions and harmful algal blooms if allowed to proliferate. Phytoplankton concentrations (as measured by chlorophyll a concentrations) are thought to be limited by nutrient concentrations or nutrient loads to the estuary from the watershed, as well as light availability. Phytoplankton concentrations can also reduce light availability and thus affect the health and success of seagrass. Ocean currents and sediment



**Figure 4. Pinellas County permanent population - historical, current and projected future. (Pinellas County Planning Department, 2008).**

transport also play a role in the health and success of seagrass within the study area. In the CHSJS estuary, the health of seagrass serves as a critical nursery area for juvenile fishes of both recreational and commercial species and therefore contributes greatly as an economic resource. In addition to its influence on seagrass, water quality impacts the temporal and spatial extent of water column habitat availability for those organisms whose survival and reproductive strategies are dependent on specific water quality conditions (e.g., specific salinity ranges, dissolved oxygen (DO) requirements, and water clarity).

## Establishing Historical Benchmarks

One objective of the CCMP was to provide historical context to the current state of natural resources in the CHSJS. To that end, historical aerial photographs circa 1942 such as the photograph of Belleair (Figure 5) were acquired from the National Archives and Records Administration in Washington D.C. This was the earliest record available with complete coverage throughout the CHSJS area. These photographs were digitized and georectified so that the areal extent of natural resources including seagrass, mangroves, forested and non-forested freshwater wetlands and native uplands could be estimated. Comparisons were then made to more recent aerial surveys of land cover and seagrasses conducted by SWFWMD. The following sections summarize the current state of natural resource elements in the CHSJS and provides historical context to assess losses or gains relative to historical conditions.



**Figure 5. Historical aerial photograph of agricultural land use near what is now Belleair Country Club and Golf Course.**

### BAY HABITATS

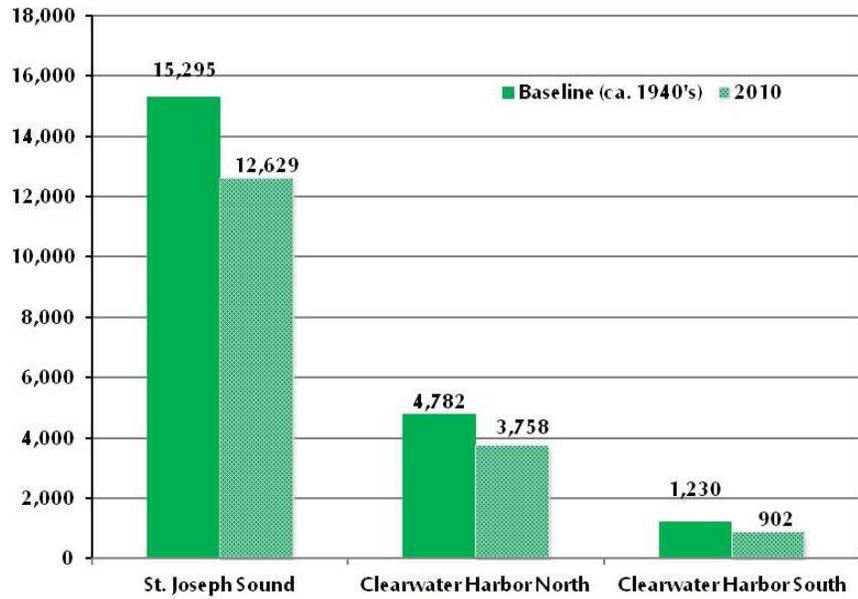
#### Seagrasses

Seagrass communities are keystone indicators of estuarine health in sub-tropical systems such as Clearwater Harbor and St. Joseph Sound. Seagrasses support a complex trophic food web and a detritus-based food chain, as well as provide sediment and nutrient filtration, sediment stabilization, and breeding and nursery areas for finfish and shellfish. The health and success of seagrass communities depends on good water quality and water clarity as well. A vast array of estuarine and marine organisms relies upon seagrass habitats for a portion or all of their life cycles. The canopy of the seagrass bed provides protection and cover for fish in their juvenile stages, serving as a nursery ground. Primary production within seagrass beds also provides food for recreationally and commercially important fish species and serves as a trophic foundation for the ecosystem. Seagrass meadows are also a direct food source for the West Indian manatee (*Trichechus manatus*),

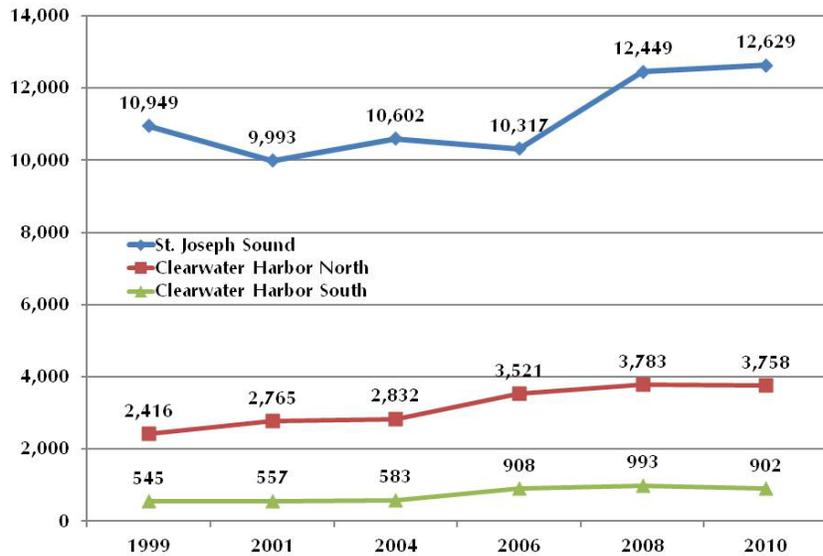
green sea turtle (*Chelonia mydas*), and ecologically important invertebrates such as the variegated sea urchin, *Lytechinus variegates*. Together these attributes make seagrass communities good indicators of overall ecological health.

Historical photography was used to develop a historical seagrass coverage for the open bay segments of CHSJS. Based on this analysis, current seagrass areal extents are 83%, 79% and 73% of historical estimates for St. Joseph Sound, Clearwater Harbor North and Clearwater Harbor South, respectively after accounting for non-restorable areas (Figure 6). While Clearwater Harbor South has lost the largest proportion of seagrasses relative to estimates of historical conditions, St. Joseph Sound lost more acreage than the other segments.

Despite these losses relative to historical estimates, the areal extent of seagrass has increased throughout Clearwater Harbor since 1999, and there have been substantial recent gains in St. Joseph Sound (Figure 7). The most recent seagrass mapping efforts were completed in 2010 and indicate that in St. Joseph Sound, seagrass cover in 2010 was 15% higher than in 1999, an increase of 1,680 acres (Figure 7; Table 1).



**Figure 6. Comparison of historical and 2010 seagrass acreage for each CHSJS estuarine segment.** Note: The numbers reported above do not include seagrass acreage west of the barrier islands or in the Anclote River and are therefore different from the seagrass acreages reported by the Southwest Florida Water Management District.



**Figure 7. Change in seagrass areal extent between 1999 and 2010 for each CHSJS estuarine segment.** Note: The numbers reported above do not include seagrass acreage west of the barrier islands or in the Anclote River and are therefore different from the seagrass acreages reported by the Southwest Florida Water Management District.

In Clearwater Harbor North, seagrass acreage increased 56%, from 2,416 acres in 1999 to 3,758 acres in 2010. Seagrass cover in Clearwater Harbor South increased 66%, from 545 acres to 902 acres between 1999 and 2010. These substantial increases in seagrass acreage are concurrent with improved water quality between 1999 and 2010 relative to conditions in the early 1990's.

<b>Table 1. Seagrass acreage within each segment for all years.</b>							
<b>Segment</b>	<b>Adjusted Baseline</b>	<b>1999</b>	<b>2001</b>	<b>2004</b>	<b>2006</b>	<b>2008</b>	<b>2010</b>
St. Joseph Sound	15,295	10,949	9,993	10,602	10,317	12,449	12,629
Clearwater Harbor North	4,782	2,416	2,765	2,832	3,521	3,783	3,758
Clearwater Harbor South	1,230	545	557	583	908	993	902

Note: The numbers reported above do not include seagrass acreage west of the barrier islands or in the Anclote River and are therefore different from the seagrass acreages reported by the Southwest Florida Water Management District.

Historical areal seagrass estimates were used to develop CCMP management targets for Clearwater Harbor North and Clearwater Harbor South. Given the recent increase in seagrass acreage in these segments, the historical acres were thought to be reasonable estimates of potential gains in seagrass. In St. Joseph Sound, physical disturbances such as barrier island movement, the dredging of the ICW and its associated impacts on current velocities, depth and wave energy, as well as the potential effects of a previous biological perturbation that mobilized sediments (Hine et. al. 1987) resulted in a larger loss of seagrass which could not reasonably be expected to return. Given these considerations, it was deemed unrealistic to develop a target for St. Joseph Sound that was based on historical conditions. Therefore, the seagrass areal target acreage for St. Joseph Sound is an average of the two most recent surveys (i.e. 12,539 acres) representing the highest acreage recorded in recent history.

#### Mangroves and Salt Marshes

Mangroves and salt marshes are vital components of the estuarine ecosystem of the CHSJS. These habitats trap sediments, attenuate nutrients, provide critical refuge habitats for fish and benthos species, and provide foraging and nesting habitats for many bird species. Mangrove forests and salt marshes occur on both coastal barrier and spoil islands, and in the estuarine portions of the mainland watershed. The CHSJS is close to the northern geographic limit for mangrove forests in southwest Florida. Mangroves have limited tolerances for temperatures below freezing and mangrove forests generally do not occur north of CHSJS. The mangrove community in southwest Florida includes three mangrove species: red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*), as well as a species that is variously classified as a mangrove or a mangrove associate, buttonwood (*Conocarpus erectus*). Their landward distribution is limited by competition from other plant species that are better able to compete for resources and, thus preclude the mangroves from expanding inland.

Salt marshes are non-forested estuarine wetlands under tidal and non-tidal conditions with salinities greater than 0.5 ppt. (marshes with less than 0.5 ppt salinity are considered freshwater). Gulf coast salt marshes occur along low-energy shorelines, at the mouths of rivers, and in bays and bayous. Salt marshes along the southwest coast of Florida are characterized by predominantly needle rush (*Juncus roemerianus*) at higher elevations and smooth cordgrass (*Spartina alterniflora*)

in the lower, more frequently inundated marshes. Other species include saltwort (*Batis maritima*) and seashore paspalum (*Paspalum vaginatum*). Salt marshes function in primary production, food sources, habitat, sediment stabilization, and surface water filtration. In addition to providing nursery areas for fish, shellfish, and crustaceans, salt marshes buffer the effects of storm surges and limit damage to uplands.

Despite being near their northern geographic limit, mangrove forests in the bay habitats of the CHSJS have remained near their historical estimates in both St. Joseph Sound and Clearwater Harbor North. Historical acreage estimates for mangroves as bay habitats was 145, 413, and 281 acres for St. Joseph Sound, Clearwater Harbor North, and Clearwater Harbor South, respectively. Based on 2010 land use assessments by SWFWMD these acreages are 153, 389, and 24 acres, respectively. Clearly, Clearwater Harbor South has lost much of its historic mangrove forest due to development while much of the historic mangrove forests remain in Clearwater Harbor North and St. Joseph Sound. Lost mangroves in Clearwater Harbor South have been principally the result of development of the eastern shores of Sand Key and Belleair Beach where they have been replaced primarily by residential development.

Salt marshes also remain near their historic acreages. Currently there are 77, 13, and less than 1 acre of salt marsh habitats in St. Joseph Sound, Clearwater Harbor North and Clearwater Harbor South, respectively. This compares with 76, 13 and 7 acres estimated in 1942. There were also approximately 15 acres of salt barren habitat in 1942 that has since been displaced by other habitat types along the coastal islands.

#### WATERSHED HABITATS

Historically, the CHSJS watershed was dominated by pine flatwoods, dry prairie, forested and non-forested freshwater wetlands, and near the coast, salt marsh and mangrove habitats. Based on an analysis of historical aerial photography, by circa 1942 65% percent of the watershed remained in one of these types of "native lands". In 1942 34% of the watershed was classified as developed lands which were predominantly developed for agriculture. Urban land uses within the watershed at the time included residential, commercial, and municipal development. In many areas within the CHSJS, agricultural development had converted native uplands and wetlands and consequently altered the natural hydrology of the watershed to irrigate crops. Since the 1940's, urban development increased dramatically replacing historic agricultural areas and destroying more native uplands and wetlands. Today less than 20, 10, and 5% of historical native lands remain in St. Joseph Sound, Clearwater Harbor North and Clearwater Harbor South, respectively.

Natural areas in CHSJS are now limited primarily to the northeast portion of the SJS watershed and within public lands including the barrier island state parks. Increased urban and residential development has increased impervious land surface that is associated with adverse stream impacts, including reduced stream stability, habitat degradation, water quality degradation, and a loss of biological diversity. The losses of uplands and wetlands in the three CHSJS watersheds have also reduced available habits for listed species including the gopher tortoise and colonial waterbirds as well as the Bald Eagle and Red Cockaded Woodpecker.

Given the extensive loss of both native uplands and wetlands to urban land uses, it was considered unreasonable to expect the CCMP to have a goal of restoring the historic acreage of these natural resources. Instead, current acreage estimates for watershed habitats are provided below. These current acreages are considered minimum acceptable acreages, and restoration strategies are

outlined later in the CCMP to increase both the acreage and the balance of watershed habitats types within the CHSJS.

➤ UPLANDS HABITATS

Upland habitats currently occupy 2,258 acres in the watershed portion of the CHSJS with 1,500 acres in St. Joseph Sound, 517 acres in Clearwater Harbor North, and 241 acres in Clearwater Harbor South.

➤ FORESTED FRESHWATER WETLANDS

Forested wetland habitats currently occupy 1,842 acres in the watershed portion of the CHSJS with 1,567 acres in St. Joseph Sound, 252 acres in Clearwater Harbor North, and 23 acres in Clearwater Harbor South.

➤ NON-FORESTED FRESHWATER WETLANDS

Non-forested freshwater wetland habitats currently occupy 759 acres in the watershed portion of the CHSJS with 536 acres in St. Joseph Sound, 137 acres in Clearwater Harbor North, and 86 acres in Clearwater Harbor South.

➤ MANGROVES

Mangrove habitats currently occupy 236 acres in the watershed portion of the CHSJS and 567 acres along coastal island habitats. In total there are 362 acres in St. Joseph Sound, 393 acres in Clearwater Harbor North, and 48 acres in Clearwater Harbor South.

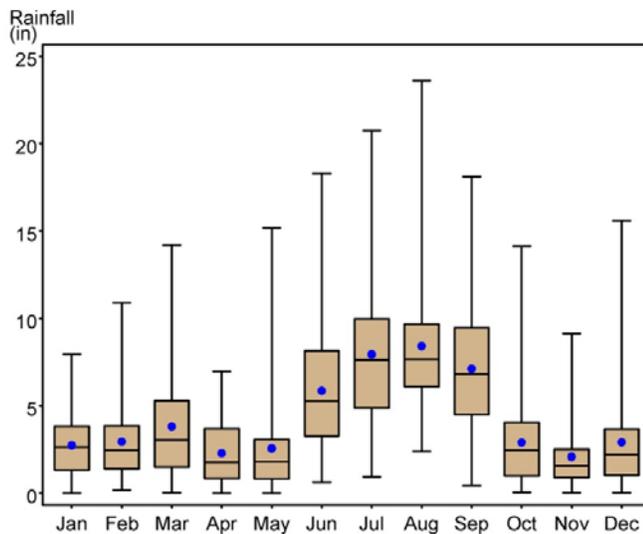
➤ SALT MARSHES

Salt marsh habitats currently occupy 454 acres in the watershed portion of the CHSJS and 90 acres along coastal island habitats. In total there are 525 acres in St. Joseph Sound, 16 acres in Clearwater Harbor North and 2 acres in Clearwater Harbor South.

## Water Quality

Hydrologic processes have a profound effect on water quality and ultimately the ecology of the estuary. Transport of nutrients and sediments to coastal waters of the CHSJS estuary is largely determined by the amount of rainfall over monthly, seasonal, and annual time periods. Rainfall directly impacts surface water flows, is a significant source of directly deposited nitrogen and phosphorus from the atmosphere, and can increase the amount of suspended solids in adjacent waterbodies through sediment erosion and transport to surface waters.

The CHSJS watershed receives approximately 127 cm (i.e., 50 inches) of rainfall annually with nearly half of the total occurring over four months between June and September (Figure 8). The timing, volume, and distribution of freshwater inflows to Clearwater Harbor and St. Joseph Sound are affected by land use and hydrologic alterations that have occurred in the watershed, as well as by precipitation patterns. Extensive alteration to the watershed's hydrologic features has changed how freshwater is delivered to the receiving water. Channelization of historical coastal streams and development of coastal wetlands has increased peak flow rates and velocities, and reduced opportunities for pollutant removal and groundwater recharge. Higher peak flows and reduced attenuation has also increased the potential for channel and coastal erosion.



**Figure 8. Distribution of monthly rainfall at City of Tarpon Springs rain gage based on a 75 year period of record.**

The largest source of freshwater inflow into the CHSJS estuary is the Anclote River. Both natural and anthropogenic factors influence discharges from the river. Other freshwater sources are smaller creeks and small magnitude coastal springs including Klosterman Creek, Curlew Creek, Cedar Creek, Spring Branch, Stevenson Creek, Smith Creek (Bee Branch), McKay Creek and Wall Spring. While these tributaries deliver a much lower volume of freshwater than the Anclote River, they remain ecologically important and contribute significant loads of freshwater, nutrients, and sediments to the estuary.

Total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS) and biological oxygen demand (BOD) are four of many "pollutants" measured to evaluate water quality. These pollutants are measured as concentration in streams and estuarine waters throughout the CHSJS by the Pinellas County Department of Environmental and Infrastructure. Pollutant concentrations are generally expressed as milligrams per liter of water (mg/l) and can be used to estimate the mass of pollutant entering waterways and the estuary.

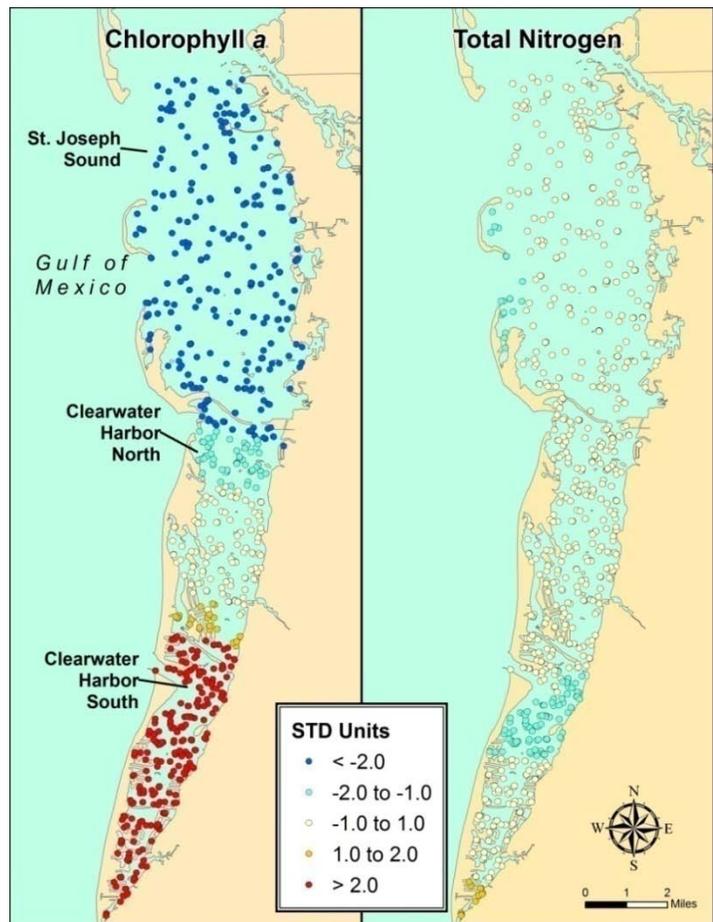
Phytoplankton concentrations are an often used indicator of the system response to nutrient pollution. Phytoplankton (algae) concentrations are typically estimated by measuring the concentration of chlorophyll a (the photosynthetic pigment in phytoplankton). Chlorophyll a concentrations are reported in micrograms per liter ( $\mu\text{g/l}$ ). Chlorophyll a concentrations in the CHSJS estuary have been improving (i.e., decreased concentration) since 1992. Nutrient concentration trends (both TN and TP) have also been improving over that time in many stations within the freshwater tributaries to the CHSJS.

Descriptive and quantitative statistical analyses suggest that neither nutrient concentrations nor nutrient loadings alone were confident predictors of the chlorophyll concentrations used as an indicator of estuarine health. While within-segment analysis did not reveal a direct link between nutrients and phytoplankton concentrations, descriptive plots suggested a north/south gradient in chlorophyll a concentrations that appeared to be principally a function of residence times. The

direct influence of tidal exchange with the Gulf of Mexico is most pronounced in St. Joseph Sound and least pronounced in Clearwater Harbor South. The increased residence time of water in the Clearwater Harbor South segment seemingly allows a higher concentration of phytoplankton for a given level of nutrient concentration as shown in Figure 9. In this plot the chlorophyll a concentration and TN values are standardized so that they are on the same scale (i.e., units of standard deviation). Therefore, blue filled circles represent lower than average concentrations and red filled circles indicate higher than average concentrations.

For the purposes of the CCMP, the estuary water quality goal was established to ensure that water quality conditions in the estuary are protective of two critical indicators of estuarine health: seagrasses and dissolved oxygen (DO). Given the results of analysis described above, and the fact that seagrasses are currently stable or improving throughout the CHSJS estuary it was concluded that recent water quality conditions are sufficient to maintain full aquatic life uses in the estuary. Therefore, a “reference period” approach was used to establish management targets and thresholds used to monitor water quality in the estuarine open bay waters of the CCMP. The reference period was defined as the 2003-2009 time period.

Target chlorophyll a values for each CHSJS estuarine segment were defined by the average of the annual geometric means for each constituent during the reference period). A “threshold” value for these constituents was defined as a value that would indicate that water quality was significantly higher than that observed over the reference period based on statistical theory. Therefore, the threshold values (Table 2) are criteria against which to evaluate future annual water quality data. Any annual geometric mean higher than the threshold value would be considered an excursion for that water quality constituent.



**Figure 9. Spatial distribution of chlorophyll a (left) and TN (right). Red dots indicate significant clustering of higher than average values and blue dots indicate statistically lower than average values.**

The annual geometric mean should be derived strictly from water quality sampling conducted according to Pinellas County’s probabilistic water quality sampling design in designated strata “W1”, “W2” , and “W3” corresponding to St. Joseph Sound, Clearwater Harbor North, and Clearwater Harbor South, respectively and differences in minimum detection limits will affect outcomes related to these thresholds. The thresholds are not to be considered as end of pipe criteria for point source discharges within the CCMP for regulatory purposes. Further, a single

excursion of the threshold value does not necessarily mean that there has been significant degradation of water quality. The analyses presented in section 5.2 of the State of the Resource report (Janicki Environmental, 2011) suggests that there have been times when estuarine water quality values for these constituents historically exceeded the proposed threshold values and yet the estuarine waters were meeting “full aquatic life” uses according to FDEP. However, in keeping with the spirit of EPA’s anti-degradation policy and given the special nature of these estuarine waters, the threshold values were chosen as the appropriate management level criteria for these segments.

Table 2. Threshold concentration values based on expected deviations from reference period geometric averages for chlorophyll a and total nitrogen.

Constituent	Units	St. Joseph Sound	Clearwater Harbor North	Clearwater Harbor South
Chlorophyll a	µg/L	3.10	5.40	7.60
Total Nitrogen	mg/L	0.66	0.61	0.58

With respect to pending numeric nutrient criteria proposed by the EPA and FDEP, the CCMP nutrient thresholds in Table 2 may be considered as site-specific alternative criteria for these waterbodies under the constraints and assumptions described above. However, any designation of impairment should only follow confirmation that seagrass, chlorophyll or dissolved oxygen conditions have deteriorated over the evaluation period. While EPA has stated that the numeric nutrient criteria must be expressed as concentrations others, including FDEP, have argued that the estuarine numeric criteria can and should be expressed as loadings. Therefore, loading-based TN and TP criteria were derived using similar methods described above for concentrations and provided in the State of the Resource Report for completeness.

### Qualitative Targets for Estuarine Fauna

In addition to the quantitative targets and thresholds described above, there were several natural resource components identified for which qualitative goals were developed due to a lack of information necessary to develop numeric targets. These resource components include benthos, fishes, dolphin, turtles, manatee, and birds. For these resource components, descriptive analyses were conducted to describe available information, and qualitative goals were developed to guide management activities associated with the natural resources of concern. Many of these valuable natural resources rely heavily on wetland habitats, seagrasses, and appropriate water quality for which quantitative targets have been developed as described above. Specific management actions for each of these resource components irrespective of whether they have quantitative or qualitative targets are described under the Action Plan section of the CCMP.

#### ➤ BENTHOS

There is a paucity of information on sediment quality in the study area. Consequently, a baseline characterization of sediment quality was performed as part of this study. While collecting information on sediment quality, macroinvertebrate collections were also performed to provide a baseline characterization of benthic macroinvertebrates in the CHSJS estuary. The benthic macroinvertebrate samples contained between 10 and nearly 100 taxa with abundances from 10 to 1,100 individuals per sample. Relative abundances in St. Joseph Sound were frequently higher than those observed in both Clearwater Harbor North and South and the lowest abundances tended to occur in Clearwater Harbor South.

The limited availability of data for the CHSJS estuary precludes establishing quantitative goals or targets for either benthic community integrity or sediment quality. Therefore, the proposed goals for benthic community integrity or sediment quality were to minimize the extent of contaminated and/or hypoxic benthic sediments; to develop a benthic sampling program designed to provide a baseline characterization of sediment quality and the benthic invertebrate community, and to establish sediment quality targets, similar to those developed for the Tampa Bay estuary, that maintain the sediment quality necessary for a diverse benthic community.

➤ FISHES

The CHSJS estuary supports a diverse assemblage of fishes occupying a mosaic of seagrass, mangrove and hard bottom habitats. The close proximity of the Gulf of Mexico to the west and a significant freshwater source, the Anclote River, to the east contribute to a dynamic and productive estuarine system. Several large barrier islands, Anclote Key, Three Rooker, Honeymoon and Caladesi Islands, and Sand Key provide buffer the calm, shallow waters from the Gulf. Strong tidal currents flow through the passes between these islands, scouring the bottom and creating deeper areas through which large fishes, sea turtles, and marine mammals move between the Gulf and the estuary. These passes also transport into the estuary planktonic fish and invertebrate larvae that are spawned offshore and along the beaches. Since the early 1970s, numerous studies have characterized the fish and invertebrate community of the study area including several master's theses on Anclote River estuarine fish assemblages and more recent surveys by the Florida Wildlife Research Institute (FWRI). Based on these studies as well as other information, stressors to fish populations with the CHSJS estuary were identified as: impacts to nursery areas ( e.g., prop scarring of seagrasses, mangrove losses); fishing pressure; water quality degradation; red tide events, and cold stress.

The Florida Wildlife Research Institute (FWRI) collects information on fishing pressure using creel surveys. There were 3 different types of anglers recorded in this data: charter anglers, private boat anglers, and shore anglers. Clearwater Municipal Marina experienced the highest amount of charter boat pressure while private vessel anglers exhibited greater pressure at sites within St. Joseph Sound, and Clearwater Harbor. Areas that experienced a higher than average number of on-shore anglers were near, or on, passes or channels and also at the Clearwater Pier/Big Pier 60.

The Molluscan Fisheries Program of FWRI has monitored the status of the bay scallop population in St. Joseph Sound since 1994 and has tracked recruitment by scallop spat since 1997. From 1994-2006, adult scallop abundances ranged from 0.2 to 47.4 scallops per 600m<sup>2</sup>, but from 2007-2009 abundances more than tripled to 138-174 scallops per 600m<sup>2</sup> (Stephenson and Geiger, 2010). Scallop population restoration efforts involving the rearing and release of scallop spat collected between 1999 and 2006 may have contributed to the increased scallop abundance observed in more recent years.

The limited availability of fisheries data for the CHSJS estuary precludes establishing quantitative targets. However, the proposed goals for the preservation and protection of fish stocks include maintaining the current extent of seagrasses and shoreline habitat (i.e., fisheries habitat) in the estuary; leveraging existing fish research efforts to provide a more quantitative estimate of the relative abundance of fishes over various habitat types within

the study area; encourage participation in existing creel surveys to obtain accurate information on angler pressure; facilitating research into the utilization of the estuarine segments by the bay scallop; and public education to reduce anthropogenic stressors on fish habitat such as prop scarring.

➤ MEGAFUNA

Bottlenose dolphins, Florida manatees, and five species of sea turtles, all of which are federally protected under the Endangered Species Act, utilize the CHSJS estuary. These species are often referred to as “charismatic megafauna” due to their large size and common appeal among humans which tends to evoke a connection with nature and the marine environment. As a result of this connection, these species have been successfully used to promote public awareness and conservation of coastal resources. While there are limited data available for analysis, a characterization of the ecology of these species, their natural and anthropogenic stressors, and identification of management issues is provided in the State of the Resource Report and qualitative goals for these species are adopted within the CCMP. Much of the existing information on marine mammals and sea turtles in the CHSJS comes from research programs at the Florida Fish and Wildlife Conservation Commission (FWC), Mote Marine Laboratory, and the National Marine Fisheries Service (NMFS), though collaborative efforts between these and various other agencies have provided information as well. In Florida, state-wide programs exist to monitor and assess the status of marine mammal and sea turtle populations and to conduct research on the biology and ecology of these species. This information is useful for the management of these natural resources and can be applied to populations that use the estuarine and coastal habitats of Clearwater Harbor and St. Joseph Sound.

Management goals for these species should focus on the protection of the habitat, including water quality, seagrass, and shorelines and sustainable fish populations for bottlenose dolphins. Public education regarding the human interactions with these animals among the boating and fishing community will continue to be an important part of the management strategy for these species and should be emphasized in the future. Facilitating future research into causes of sea turtles and manatee strandings, protecting crucial habitats within the estuaries, and continued monitoring are recommended.

➤ BIRDS

Audubon of Florida has recognized the CHSJS area as highly valuable for its avifauna by inclusion of two of its regions, “Clearwater Harbor-St. Joseph Sound” and the “Gulf Islands GEOPark”, in the Important Bird Areas (IBAs) of Florida. A unique assemblage of colonial waterbirds and shorebirds use the CHSJS region of peninsular Florida. Located on the Atlantic Flyway, these waterways, beaches, and shorelines are extremely important stopover and over-wintering sites for birds that nest further north, some as far as the Arctic tundra, but retreat south in the winter to find their fish, shellfish, insect, and invertebrate prey. At least 25 bird species, including several taxonomic groups of colonial waterbirds and territorial birds, breed in CHSJS coastal habitats. Eleven of these species are federally or state-listed as “endangered”, “threatened”, or as “species of special concern” and many birds that occur in the region are listed on non-regulatory management lists. In 2009, 5,331 pairs (all species combined) nested on islands in the CHSJS. This count does not include colonies of Least Terns and Black Skimmers that nested on scattered beaches and rooftops in this region of Pinellas County.

The CHSJS study area includes critical nesting and foraging habitats for birds. Bird habitats in CHSJS include forested areas (patches of mangroves, coastal hammocks, or pine flatwoods remaining on barrier islands, some natural mangrove islands, and mangroves and coastal hammock communities on some islands created when the ICW was dredged); beaches on barrier islands and dredged spoil material islands; and coastal marshes. The dominant types of nesting habitats within the CHSJS include arboreal (tree), beach, and coastal marshes. Many species of colonial waterbirds use arboreal habitats for nesting including: brown pelican, double-crested cormorant, the herons and egrets, White Ibis, and roseate spoonbill. Colonies of birds nesting in trees generally occur only on small islands that have no resident mammalian predators and are off-shore, separated by open water and deep channels with tidal currents that discourage mammals from swimming to them. Colonial waterbirds will not nest on islands if mammalian predators are present. Three of the larger barrier islands (Honeymoon Island, Caladesi Island, and the northern section of Clearwater Beach) still have relatively undisturbed mangrove forests, coastal hammock communities, salt marshes, beaches, and pine flatwoods. Conversely, most of Clearwater Beach and Sand Key are highly developed and the beach-front communities of condominiums, hotels, and residences on Clearwater Beach, Belleair Shores, Belleair Beach, and Indian Rocks Beach have displaced most native vegetation and shallow water shorelines.

Management and conservation activities conducted by Audubon's FCIS, the Florida Park Service, FDEP, Pinellas County Aquatic Preserves, Pinellas County, and the cities of Clearwater, Belleair Beach, and Indian Rocks Beach, other cooperating agencies, and regional volunteers (Tampa Bay Regional Planning Council's Agency on Bay Management, Clearwater Audubon Society, Suncoast Chapter of the Florida Native Plant Society, Keep Pinellas Beautiful, and boating groups, among others) are addressing some management needs but more work needs to be undertaken.

Goals and specific actions are described in more detail later in this document but include: continuing population estimates; bird colony protection efforts; public education; predator control; cooperation among law enforcement agencies; habitat management; eliminating fishing line accumulation; coordination with public agencies, and protecting nesting islands from erosion.

## STATE OF RESOURCE MANAGEMENT

The following summarizes regulatory programs that affect resource management in the CHSJS. Permits, rules, policies, and guidelines for local, regional, state, and federal entities are presented.

Wetland protection is a critical component of resource management. Federal and State regulations to protect wetlands emerged in the 1970s. The Clean Water Act (CWA), Section 404 is the primary federal protection mechanism for wetlands and seagrasses in the U.S. and authorizes the US Army Corps of Engineers to regulate proposed activities affecting wetlands and navigable waters. Another element of the CWA includes the Total Maximum Daily Load (TMDL) program which identifies water bodies with impaired water quality and sets limits on pollutant loads to those water bodies. In Florida the TMDL program is administered by FDEP.

Under the CWA, counties and municipalities are required to control the amount of stormwater pollution entering surface waters. To this end, local jurisdictions must obtain National Pollutant Discharge Elimination System (NPDES) Multiple Storm Sewer System (MS4) permits. Requirements for Pinellas County and its co-applicant municipalities include identifying major outfalls and reducing pollutants in runoff from industrial, commercial, and residential areas. Further, some individual businesses that discharge industrial wastewater must obtain a Multi Sector Generic Permit (MSGP) regulating a facility's discharges to prevent off-site pollution.

In Florida, the Florida Water Resources Act of 1972 (Chapter 373 F.S.) was developed to prevent harm to the water resources of the State and provide for the protection and regulation of wetlands and continues to provide the framework for water resource regulation in Florida (Pinellas County, 2008). The Florida Department of Environmental Protection (FDEP) and the state's five water management districts are charged with protecting wetlands under delegation of CWA responsibilities. Pinellas County is in the jurisdiction of the Southwest Florida Water Management District, or SWFWMD. Environmental Resource Permits (ERP), administered through FDEP and SWFWMD are required for any alterations to wetlands or state waters in Florida. Also, the Florida Land and Water Management Act of 1972 established a process of regulating large-scale developments, or Developments of Regional Impact (DRI) to provide additional review and oversight, on a state level, of potential environmental and social impacts of development projects.

Pinellas County regulations are consistent with both federal and state wetlands protection rules. The County has also developed a multi-level approach to wetland protection using its Comprehensive Plan (Pinellas County 2008), Future Land Use Map (FLUM), Transfer of Development Rights (TDRs), the Land Development Code, and the site plan review process. The Pinellas County Comprehensive Plan includes provisions for the identification and protection of wetlands and other environmentally-significant areas in unincorporated Pinellas County. The Comprehensive Plan provides protection for wetlands through several of the Comprehensive Plan elements including the Natural Resource Conservation and Management Element and the Coastal Management Element. Environmentally-sensitive properties including both wetlands and natural upland habitats are designated in the Comprehensive Plan as either preservation (development prohibited) or conservation (typically recreation/open space or low-density residential). As of 2007, 6,404 acres were designated as Preservation and 4,432 acres were designated as Preservation-Resource Management on the FLUM for a total of 10,835 acres of lands protected from development in the unincorporated portion of the County. Pinellas County also directs development away from wetlands with TDRs using Land Development Code (LDC)/Site Plan

Review Process regulations which include the Habitat Management and Landscaping criteria (LDC Section 166 Article II).

The County has also adopted the Pinellas County Mangrove Trimming and Preservation Code (LDC Section 166 Article II) which complements the State's "Mangrove Trimming and Preservation Act" and resulted in the state's delegation of the enforcement of the state act to the County. Staff biologists and arborists work closely with homeowners and commercial landscapers to protect the natural functions of these plant communities and to ensure that all trimming is consistent with the County's code.

Other natural resource protection provisions are included in the Pinellas County Code (PCC) and the LDC. Following are sections from the rules that are relevant to resource management in the CHSJS CCMP area.

- STORMWATER AND SURFACE WATER QUALITY (PCC 58 Article VI) – Provides for the protection of stormwater and surface water quality and for the enforcement of the NPDES MS4 program.
- AQUATIC PRESERVES (PCC Section 58 Article X) – Provides protection for the Countywide Aquatic Preserve and the Boca Ciega Aquatic Preserve.
- FERTILIZER ORDINANCE (PCC Section 58 Article XIII) – Puts limits on landscaping fertilizer use including no fertilizer sales or application between June 1 and September 30, keeping a 10-foot setback from water bodies for fertilizer use, no application just before heavy rains, and lists fertilizer content and application criteria.
- MARINE HABITAT MANAGEMENT (PCC Section 58) - Provides for the preservation, recovery, and expansion of marine habitats by minimizing the damage from propeller scarring and by restricting the use of internal combustion engines within the Ft. DeSoto and Weedon Island management areas.
- NATURAL RESOURCES (PCC Section 82) – Regarding water conservation.
- WATERWAYS (PCC Section 130) – Describes Pinellas County's jurisdiction over submerged lands granted by the State's Internal Improvement Trust Fund and summarizes boating safety and manatee protection requirements (no wake zones, etc.).
- ZONING CODE (LDC Section 138) – Details requirements for various land uses within specified mapped zoning areas and provides for further review of potential development impacts on wetlands.
- SITE DEVELOPMENT AND PLATTING (LDC Section 154) – Provides requirements for site plan reviews, easements, and rights-of-way.
- EROSION CONTROL (LDC Section 154 Articles 72 and 73) – Lists accepted erosion control practices and requirements.

- FLOODPLAIN MANAGEMENT (LDC Section 158) and Flood Damage Prevention (LDC Section 170 Article III) – Limits or prevents filling in 25 year and 100 year floodplains and provides structural requirements for buildings intended to limit flood damage.
- MANAGEMENT AND STORAGE OF SURFACE WATERS (LDC Section 166 Article III) – Provides surface water management requirements.
- WATER AND NAVIGATION (LDC Section 166 Article V) – Lists permit requirements for construction of docks and seawalls, and for dredging and filling.

## GOALS AND PRIORITIES

The State of the Resource report has provided a synthesis of existing data in the CHSJS area, assessed the status and trends for each of the natural resource elements, and established targets and thresholds associated with the protection and restoration of key natural resource elements including uplands, wetlands, seagrasses, and water quality which have been identified as core elements of the CCMP. Defining goals for the CCMP allows for strategies, actions, and priorities to be developed and sets a path forward towards developing a comprehensive approach to future conservation and management. There are six major elements that are the focus of the CCMP:

- BAY HABITATS
- WATERSHED HABITATS
- WATER QUALITY
- ESTUARINE FAUNA
- SEDIMENT MANAGEMENT
- PUBLIC EDUCATION

### NATURAL RESOURCE GOALS AND APPROACHES

For each of the natural resource elements, specific goals have been identified. These goals are the result of analysis of existing data, comparisons to relevant regulatory standards, historical conditions, current management practices, and consultation with the CCMP Technical Advisory Committee. The approach and strategy associated with each of the goals varies based on efforts to try and leverage existing management and research and maximize return on investment. The goals are summarized in this section and detailed descriptions for each goal are provided as individual “Action Plans” in the following sections.

Seagrasses are a major focus of the CCMP and the evidence suggests that seagrasses are currently expanding their range within the CCMP over the last decade. Since seagrasses are not currently at their historic extent, historical acreages guided the development of goals for seagrass. However, since seagrass success is primarily related to water quality conditions, and seagrasses have been expanding over the last decade, a goal for water quality was to maintain water quality conditions at levels that have coincided with this increase in seagrass. The physical destruction of historical wetlands requires a different strategy. Given the extensive loss of both native uplands and wetlands to urban and residential land uses within the watershed, establishing goals that call for restoration of the historical (circa 1940s) extent of native habitats appear unreasonable as an achievable goal of the CCMP.

The Tampa Bay Estuary Program discovered a similar problem in that there was no realistic way to recover native habitats to their historic extent. Therefore, the approach they used defined a goal of restoring the balance of habitat types to their historical proportions. The “Restoring the Balance” approach uses historical proportions of habitats to calculate the increase in the more impacted habitats needed to re-establish the historic ratio of areal extent between habitats. Historically, mangroves in bay habitats were, and remain today, the dominant coastal emergent vegetation in the CCMP area. Saltwater marshes and salt barrens made up approximately 30% of these coastal

communities in the St. Joseph Sound, but less than 4 and 3% of the coastal vegetation in Clearwater Harbor North and South, respectively. Current proportions of these habitats are not dissimilar to historic proportions, although salt marshes and salt barrens occur rarely if at all in Clearwater Harbor North or South. If the historic ratio of mangroves to salt marshes was 4:1 and 100 acres of mangroves remain, but only 3 acres of salt marsh remain, then the total acres of salt marshes would be increased to 25 acres to “restore the balance”. A net increase in wetlands would also result. Because there has been a 100 percent loss of salt marshes in both Clearwater Harbor North and South, restoring the historic balance would target salt marsh restoration in Clearwater Harbor North and Clearwater Harbor South.

However, the Restoring the Balance approach does not appear to be a feasible alternative in many cases within the CHSJS. For example, for freshwater wetlands, forested wetlands would be targeted for restoration since they were lost at a higher proportion of the total area relative to freshwater marshes. However, nearly 1,300 acres of forested freshwater wetlands would be required in Clearwater Harbor South alone to restore the balance to historical proportions and over 1,000 acres of forested wetland restoration would be necessary in Clearwater Harbor North. This approach would result in nearly all identified public lands available for restoration being converted to forested wetlands. Further, forested wetlands are the most difficult type of wetlands to restore and take the longest amount of time to assess success. Also, freshwater marshes tend to provide greater attenuation of nutrients than forested wetlands and therefore may provide more return for investment when considering the entire suite of potential benefits from restoration.

The decline in acres of coastal wetlands in the CHSJS reflects the same national decline in coastal wetlands cited by EPA, in spite of the net increase in wetlands nation-wide over the last five years. The EPA 2011-2015 Strategic Plan calls for a focus on coastal wetlands due to this continued decline. Mitsch and Gosselink (2000) propose that wetlands should comprise 3 – 7% of a (temperate-zone) watershed for adequate flood control and water quality values. Historically, wetlands included 18 to 28% of each of the CCMP watersheds. In 2007, the total acres of wetlands in the St. Joseph Sound, Clearwater Harbor North, and Clearwater Harbor South made up 26, 4.9, and 1.4%, respectively, of the watershed. Therefore, using this paradigm, the focus would be on first restoring wetlands in Clearwater Harbor South.

For the CHSJS CCMP, the current number of acres of uplands, forested freshwater wetlands, freshwater marshes, mangroves and salt marshes are identified and proposed as an absolute minimum acreages as a “Protection” strategy. Additionally, for each of these habitat types, specific “Restoration” goals are established and specific actions identified to protect and restore acreage of these habitats based on three principal factors; opportunity, feasibility, and cost to benefit assessment. In the following sections, protection or restoration goals are identified for each of the natural resource elements defined above.

## BAY HABITATS

Bay habitats in the CHSJS include seagrasses, mangrove forests, and some limited salt marshes and salt barrens on both barrier and spoil islands throughout the CHSJS.

Based on most recent estimates of seagrass areal extent, there are currently 17,289 acres of seagrass in the CHSJS. This is more seagrass acreage than currently exists in all the estuarine waters from Sarasota Bay through Lemon Bay and nearly equivalent to the acreage found in the sum of the four

major bay segments of Tampa Bay. Seagrasses currently cover over 50% of the entire available estuarine bottom area of the CHSJS. It should be noted that the seagrass numbers presented here are different than those reported by the Southwest Florida Water Management District in that they do not include areas west of the barrier islands or seagrass acreage within the Anclote River.

Even more impressive is that seagrass acreage has expanded in the last decade from 13,910 acres in 1999 to 17,289 acres currently; a nearly 25% increase in just over a decade. Clearly, it's not all bad news for the natural resources of the CHSJS. However, despite recent gains in seagrass and observed improvements in estuarine water quality throughout the CHSJS since the early 1990s, it does appear that historic acreages of seagrass circa 1940s were greater than today even after accounting for non-restorable areas such as dredge and fill for development and the construction of the ICW.

Therefore, historical acreage estimates for seagrasses were established as targets for two of the three CHSJS segments. In St. Joseph Sound, the dynamic coastal processes associated with longshore transport and erosion made the historical estimates somewhat unrealistic as management targets. For this segment, the target was agreed to be the average acreage of the two most recent surveys. Given the current positive trajectory in seagrass acreage trends over the last decade this protection strategy for seagrass is identified as a goal for the CCMP.

- The specific goal with respect to seagrasses is to ensure adequate water quality and to reduce the impact of boaters on seagrass habitats to provide the best opportunity for seagrass success in the CHSJS.

The CHSJS is close to the northern geographic limit for mangrove forests in southwest Florida. Mangroves have limited tolerances for temperatures below freezing and mangrove forests generally do not occur north of the study area. Despite being at the northern limit, mangrove forests in the bay habitats of the CHSJS have remained near their historical estimates in both St. Joseph Sound and Clearwater Harbor North. However, Clearwater Harbor South has lost much of its historic mangrove forest due to development. Historical acreage estimates for mangroves as bay habitats was 146, 420, and 240 acres for St. Joseph Sound, Clearwater Harbor North, and Clearwater Harbor South, respectively. Based on 2007 land use assessments by SWFWMD these acreages are 153, 389 and 24 acres.

- Given that substantial losses of mangrove forests have only occurred in Clearwater Harbor South, increasing mangrove acreage in this segment has been targeted as a restoration goal as one of the bay habitats action plan.

Salt marshes and salt barrens were already limited in their distribution by the 1940s and are now limited almost entirely to the St. Joseph Sound estuary. Salt marshes and salt barrens provide refuge for migratory birds and are home to biota well adapted to the extremely harsh conditions (Torreterra and Dodson, 2004). Salt barrens are places of storage and release of orthophosphates, transitional sites for plant succession, and habitat for fish and wildlife as an abundance of salt tolerant brine shrimp and other invertebrates that are food for wading birds. While the balance of habitats has not been substantially altered, coastal development has eliminated nearly all salt marsh and salt barrens habitat in the Clearwater Harbor estuary. Consequently, recommendations for restoration of salt marshes, and to some extent, salt barrens, are warranted and appropriate in the Clearwater Harbor North and South estuaries.

- The goal for restoration of salt marsh habitats is to identify those areas where salt marsh restoration would have the highest probability for success and target those areas for future restoration.

## WATERSHED HABITATS

Mangroves and salt marshes occur in the watershed habitats of the CHSJS as well as the bay habitats as described above. However, losses of mangroves and salt marshes in the watershed have been more dramatic than in the bay habitats. Mangrove losses represent the smallest loss among the estuarine wetlands and yet 57, 67, and 98% of historic mangroves have been destroyed or displaced in St. Joseph Sound, Clearwater Harbor North, and Clearwater Harbor South, respectively. Additionally, salt marshes and salt barrens, while limited historically, are now principally only found in the St. Joseph Sound watershed.

Freshwater wetlands in the CHSJS watershed are important to protecting and improving water quality and quantity, providing recharge to groundwater, providing fish and wildlife habitats, sediment stabilization, nutrient transformations, flood protection, maintaining surface water flow during dry periods, and providing recreational, cultural, and economic amenities (Novitsky et. al. 1999, Gosselink 1990, Carter 1989, others). Yet, freshwater wetlands have suffered a similar fate with losses of over 60% throughout the CHSJS watershed. These habitats provide critical functions not only for fish and wildlife (including some endangered species), but they are also a source of organic matter at the base of the detrital food chain, provide breeding areas and nurseries for commercial and recreational marine fisheries. Further, wetlands serve to attenuate storm and flood waters, buffer tidal surges, filter pollutants from storm water runoff entering the estuary and ultimately, the Gulf of Mexico.

- Given the dramatic losses and the fact that there is little remaining open land within the watershed from which to conduct restoration projects, the goals for these watershed habitats are more complex and multi-faceted.
- The Protection targets established in the State of the Resource report should be regarded as an absolute minimum acceptable acreage.
- The goals of the CCMP are to restore watershed wetland habitats using a paradigm of availability, feasibility, and potential water quality benefit.

Degraded historic wetlands that remain in open lands such as public park lands or private agriculture or rangeland within the CCMP should be targeted for restoration. Flanagan and Richardson (2010) identified historic wetland habitats that had been converted to agriculture as good candidate sites for wetland restoration and water quality improvement due to their underlying geomorphology. These areas add up to 706 acres in St. Joseph Sound and 222 acres in Clearwater Harbor.

## WATER QUALITY

The CHSJS watershed is home to an incredible diversity of plants and animals, including humans, all of which require a certain acceptable level of water quality. Historically, the disposal of human

waste has presented the greatest world-wide impact to water quality and was a significant public health concern by the early 20<sup>th</sup> century. In the Tampa Bay area, population increases in the 1950s associated with post-war construction and the advent of air conditioning resulted in increased loadings of minimally treated sewage into area waters. Fortunately, tremendous advances have been made in treatment and disposal technology of human waste since that time. The Wilson-Grizzle Act in the early 1970s and the subsequent Grizzle-Figg Act in the late 1970s mandated advanced wastewater treatment (AWT) throughout the Tampa Bay area. As a result of this legislation, nutrient loadings to local estuarine waters have been significantly reduced and seagrasses have responded positively. Contributions of domestic point source loads of total nitrogen and total phosphorus now represent less than 5% of the total load to St. Joseph Sound, and less than 15% in Clearwater Harbor South. However, in Clearwater Harbor North, domestic point source loads remain a large contributor to the total nitrogen and phosphorus load to that portion of the estuary.

Management of both point source loads and non-point source loads to the CHSJS estuary constitutes a major cost to municipal, regional, and state governments. In addition to current state and federal regulations, Pinellas County and local government agencies have been aggressive in implementing best management practices to reduce nutrient loadings to the estuary. A recently-approved Pinellas County fertilizer ordinance, as well as expansion of infrastructure to direct more highly treated wastewater to reuse for irrigation within the watershed, are two examples of current management activities and capital improvement projects directed towards reducing nutrient loadings to the estuary.

As discussed above, TN, TP, TSS and BOD are four water quality constituents measured to evaluate the quality of water in lakes, streams, and estuaries. In freshwater, TP is commonly the nutrient that limits phytoplankton concentrations while TN generally limits phytoplankton concentrations in the estuarine waters. The CHSJS soils are generally rich in phosphorus and TN is recognized as the limiting nutrient.

Phytoplankton concentrations and dissolved oxygen (DO) concentrations are often used indicators of the system's response to nutrient pollution. Phytoplankton concentrations are typically estimated by measuring the concentration of chlorophyll a (the photosynthetic pigment in phytoplankton). Chlorophyll a concentrations in the CHSJS estuary have been improving (i.e., decreased concentrations) since 1992 and nutrient concentration trends (both TN and TP) in many stations within the tributaries to the CHSJS have been improving (i.e., decreasing concentration) over that time as well. The estuary has not exhibited depressed DO conditions though tidal tributary DO concentrations are often below the state standard.

In Florida, many have expressed concern regarding the DO standards in both fresh and marine (estuarine) water bodies. The FDEP has initiated research to examine the validity of the DO standards in Florida and has proposed draft amendments to the existing rules governing DO criteria for streams and estuaries. Consideration should be given to matching the DO standards to the various habitats and the biota that are commonly found in them, and considering the time varying (seasonal, diurnal) responses of DO to both nutrient and hydrologic loadings. The result of this approach would result in more effective management of these vital ecosystem components.

- The goal for estuarine water quality is a Protection strategy. Since water quality has been sufficient for the increased acreage of seagrass over the past decade, a reference period

approach has been implemented to maintain water quality conditions similar to that between 2003 and 2009; the “Reference Period”.

- Because estuarine water quality is sufficient for seagrass success and for the estuary meeting its designated use, the goal for nutrient loadings are similarly, a protection strategy based on a reference period approach using annual loads between 2003 and 2009.
- A final goal for water quality is to cooperate with FDEP in understanding the specific water quality interactions that have resulted in several tributaries being listed as impaired water bodies to assess if anthropogenic activities are contributing to compromised ecology of these tributaries to the CHSJS estuary.

## ESTUARINE FAUNA

The goals for estuarine fauna were dependent on the amount of information available for analysis. For example, with respect to avifauna, Audubon of Florida has had a strong presence in the area for a long period of time and has recognized the CHSJS as highly valuable for its avifauna by inclusion of two of its regions, “Clearwater Harbor-St. Joseph Sound” and the “Gulf Islands GEOPark”, in the Important Bird Areas (IBAs) of Florida. Management and conservation activities are conducted by Audubon’s Florida Coastal Island Sanctuaries (FCIS), the Florida Park Service, FDEP, Pinellas County Aquatic Preserves, Pinellas County, and the cities of Clearwater, Belleair Beach, and Indian Rocks Beach, other cooperating agencies, and regional volunteers (Tampa Bay Regional Planning Council’s Agency on Bay Management, Clearwater Audubon Society, Suncoast Chapter of the Florida Native Plant Society, Keep Pinellas Beautiful, and boating groups, among others) are addressing some management needs but more work needs to be undertaken. As described in more detail in the State of the Resource Report, goals to protection of bird populations include:

- continuing population estimates; bird colony protection efforts; public education; predator control; cooperation among law enforcement agencies; habitat management; eliminating fishing line accumulation; coordination with public agencies, and protecting nesting islands from erosion.

The limited availability of data for the CHSJS estuary precludes establishing quantitative goals or targets for either benthic community integrity or sediment quality. Therefore, the proposed goals for benthic community integrity or sediment quality were to:

- minimize the extent of contaminated and/or hypoxic benthic sediments; to develop a benthic sampling program designed to provide a baseline characterization of sediment quality and the benthic invertebrate community, and to establish sediment quality targets, similar to those developed for the Tampa Bay estuary, that maintain the sediment quality necessary for a diverse benthic community.

The CHSJS estuary supports a diverse assemblage of fishes occupying a mosaic of seagrass, mangrove and hard bottom habitats. The close proximity of the Gulf of Mexico to the west and a significant freshwater source, the Anclote River, to the east contribute to a dynamic and productive estuarine system. Several large barrier islands including; Anclote Key, Three Rooker, Honeymoon and Caladesi Islands, and Sand Key provide shelter and buffer energy from the Gulf creating more

quiescent conditions to the east. Strong tidal currents flow through the passes between these islands, scouring the bottom and creating deeper areas through which large fishes, sea turtles, and marine mammals move between the Gulf and the estuary. These passes also transport into the estuary planktonic fish and invertebrate larvae that are spawned offshore and along the beaches. However, the limited availability of fisheries data for the CHSJS estuary precludes establishing quantitative targets. Therefore, the proposed goals for the preservation and protection of fish stocks include:

- maintaining the current extent of seagrasses and shoreline habitat (i.e., fish habitat) in the estuary; leveraging existing fish research efforts to provide a more quantitative estimate of the relative abundance of fishes over various habitat types within the study area; encourage participation in existing creel surveys to obtain accurate information on angler pressure; facilitating research into the utilization of the estuarine segments by the bay scallop; and public education to reduce anthropogenic stressors on fish habitat such as prop scarring.

Bottlenose dolphins, Florida manatees, and five species of sea turtles, all of which are federally protected under the Endangered Species Act, utilize the CHSJS estuary. These species are often referred to as “charismatic megafauna” due to their large size and common appeal among humans which tends to evoke a connection with nature and the marine environment. As a result of this connection, these species have been successfully used to promote public awareness and conservation of coastal resources. While there are limited data available for analysis, a characterization of the ecology of these species, their natural and anthropogenic stressors, and identification of management issues is provided in the State of the Resource Report and qualitative goals for these species are adopted within the CCMP. Management goals for these species should focus on the protection of the habitat, including water quality, seagrass, and shorelines and sustainable fish populations for bottlenose dolphins. Public education regarding the human interactions with these animals among the boating and fishing community will continue to be an important part of the management strategy for these species and should be emphasized in the future. Facilitating future research into causes of sea turtles and manatee strandings, protecting crucial habitats within the estuaries, and continued monitoring are recommended.

## SEDIMENT MANAGEMENT

Erosion is a physical process that, in nature, keeps stream channels dynamic and balanced. However, in a highly urbanized environment such as most of the CHSJS CCMP area, hydrologic conditions may cause excess erosion with subsequent adverse impacts to both freshwater and estuarine resources, as well as increased flooding potential. Alterations to natural surface water features, known as hydromodification, are usually conducted for the purpose of moving stormwater runoff off the landscape as quickly as feasible. This is usually accomplished through any of the following actions;

- Channelizing and straightening naturally meandering streams,
- Filling stream floodplains,
- Creating regular geometric channel cross sections and installing control structures,
- Clearing vegetation from the channel,
- Hardening and smoothing the channel with concrete, rip rap, gabions, etc., and
- Replacing open channel streams with culverts.

Many of the surface water features in the CHSJS CCMP area have undergone the transformation from natural coastal stream systems to urban drainage networks. Additionally, the CCMP area contains areas with significant relief such as the Clearwater and Belleair Bluffs. These features contribute to high rates of erosion and subsequent deposition in the watershed and estuary. Adverse impacts that may result from excess sedimentation include the following;

- property damage by undermining structures (foundations, bridge pilings, etc.) in the watershed,
- destruction of desirable habitat in stream channels,
- increased flooding potential by the reduction in channel flow capacity through deposition,
- impacts to natural resources in the estuary such as seagrass beds and benthic communities through physical smothering or reduction in water clarity,
- reduced circulation and nearshore flushing in the estuary and downstream channel reaches,
- introduction of contaminants into the environment,
- creation of hazards to navigation, and
- degradation of aesthetic values through accumulation of muck.

It should also be noted that several of the freshwater tributaries in the CHSJS CCMP area are on the State's list of Impaired Waters. The impaired water bodies include portions of Klosterman Creek, Bee Branch, Curlew Creek, Cedar Creek, and Stevenson Creek. Controlling sediment loading to these creeks will help improve overall water quality as well as the health of the receiving water estuaries.

- The goal of the CHSJS Sediment Management Plan (SMP) is to reduce degradation to coastal streams and the CHSJS estuary resulting from sediment loading through a comprehensive assessment of erosion sources and problems and the implementation of efficient and cost-effective solutions. A Sediment Management Plan has been developed as part of the CCMP to directly address this goal.

## PUBLIC EDUCATION

Ultimately, the collective wisdom of our citizens, gained through education, will be the most compelling and most successful strategy for environmental management (National Environmental Education Advisory Council 2000). However, studies consistently reveal that the U.S. public suffers from an environmental literacy gap that appears to be increasing rather than decreasing. To address these issues at a local level, Pinellas County has developed an extensive environmental education program to inform residents about the importance of environmental stewardship. The County hosts partnerships with non-profit citizen organizations, educational institutions, and local school districts among other entities. Pinellas County also educates residents using signs and kiosks in many of its parks and environmental lands to inform residents of non-native invasive plant and animal species, seagrasses, mangroves, sand dunes and other habitats. County-operated boat ramps have information kiosks describing manatee protection, educational signs and collection bins for fishing line. However, funding sources for these efforts are comprised by state budget deficits resulting in budget cuts to many of these programs. Therefore, educating the public on

environmental awareness includes the need to educate the public and legislators on the need to fund environmental education programs

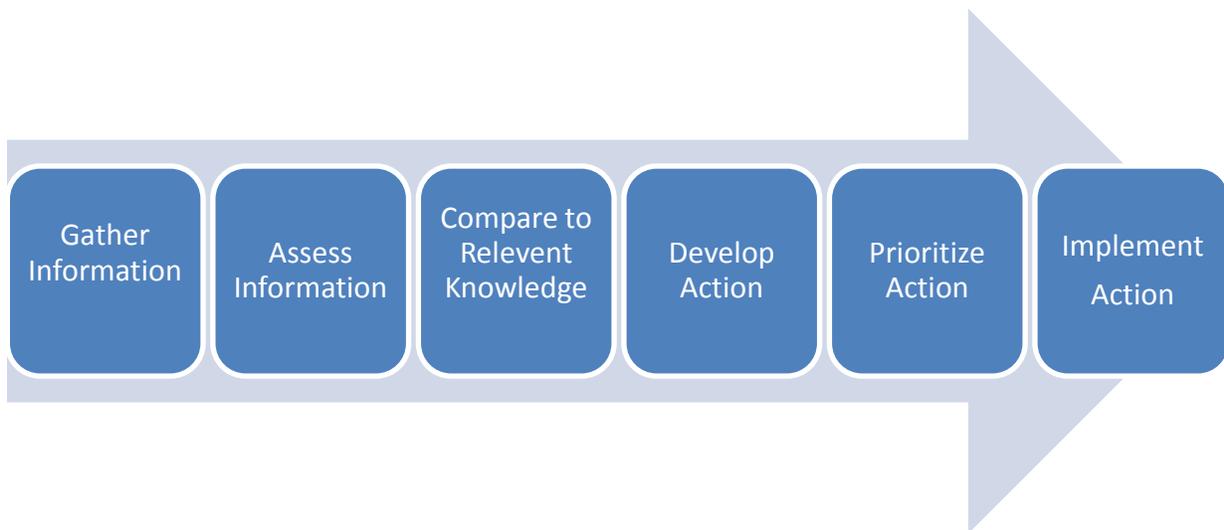
- The goal for the CCMP regarding public education is to ensure that environmental education programs continue to receive funding to provide educational benefits to citizens for the protection and future preservation of the natural resources of the CCMP so that future generations will help foster the activism necessary to conserve the natural heritage of the CCMP.

## ACTION PLANS

Action plans are presented in this chapter to define the most pressing needs of the CHSJS and outline specific management strategies to achieve the goals and priorities set forth in this CCMP. The action plans provide a unified structure from which the CCMP addresses the established goals; however, It will be up to individual stakeholder groups to determine how and when to implement these actions to focus limited financial resources in the most cost-effective and sustainable manner. The action plans are detailed and yet flexible enough to allow stakeholders to adapt based on the dynamic budgetary and political environments over time.

Action plans for bay habitats are presented first as the estuary is the focus of the CCMP. Watershed habitats are presented next due to the intricate link between bay habitats and the watershed. Water quality is a universal concern throughout the CHSJS and the action plans under the water quality section span both estuarine and freshwater features. Action plans for the protection of birds, turtles, manatee, dolphin, fishes and benthos follow water quality. There are also action plans for dredge and dredge material and sediment management. Finally, a public education plan is presented which is more and more becoming a highly-effective and cost-efficient solution to local natural resource management issues.

For each action plan, background information is provided on the basis for the proposed action. Then, a strategy is developed with specific actions to be taken to implement the proposed action. The expected benefits of the proposed action are listed and any anticipated regulatory needs are identified. Conceptually, the development of any action plan follows the conceptual model of Figure 10.



**Figure 10. Diagram of the Action Plan development process.**

## BAY HABITATS ACTION PLANS

Bay habitats include coastal barrier and spoil islands, seagrass meadows, mangrove forests, and salt marsh and salt barren habitats. These habitats are critical to proper estuarine function and are barometers of overall estuarine health. The action plans set forth in this section address specific actions that can be taken to protect and restore these estuarine habitats and their functional role in maintaining the ecological integrity of the CHSJS estuary.

### SEAGRASSES

The CHSJS estuary is represented by two distinct seagrass-containing regions. In St. Joseph Sound, there are extensive seagrass meadows that extend significant distances away from the shoreline. Clearwater Harbor has more limited seagrass cover, and meadows are mostly restricted to the shallower portions of the bay. The extensive seagrass meadows of the CHSJS estuary support a complex food web and a detritus-based food chain. Seagrasses also provide sediment and nutrient filtration, sediment stabilization, and act as breeding and nursery areas for finfish and shellfish. Seagrass meadows are also a direct food source for the West Indian manatee (*Trichechus manatus*), green sea turtle (*Chelonia mydas*), and a variety of local ecologically-important invertebrates



**Bay scallop in turtle grass meadow**

## **BH1: PROTECT AQUATIC PRESERVE DESIGNATION IN THE CCMP AREA.**

### **BACKGROUND:**

Pinellas County Aquatic Preserve was established in 1972 and designated an Outstanding Florida Water in 1979. The Aquatic Preserve encompasses all of the sovereign submerged lands surrounding Pinellas County outside of the Boca Ciega Bay Aquatic Preserve. These areas are ...“set aside forever as Aquatic Preserves or sanctuaries for the benefit of future generations” due to “exceptional biological, aesthetic, and scientific value” (Florida Aquatic Preserve Act of 1975, §258.36, F.S.). The designation as a Preserve is intended to protect coastlines, wildlife habitat, and water-related recreational opportunities such as swimming, fishing, boating, and paddling. The Preserve includes nearshore habitats along sandy beaches, mangrove-dominated shorelines, submerged habitats such as oyster bars, seagrass beds, coral communities, and State-managed islands including those formed from dredge spoil material.

The Florida Aquatic Preserves are administered on behalf of the State by the Florida Department of Environmental Protection’s (FDEP) Office of Coastal and Aquatic Managed Areas (CAMA) as part of a network that includes forty-one Aquatic Preserves, three National Estuarine Research Reserves (NERR), a National Marine Sanctuary (NMS), the Coral Reef Conservation Program (CRCP), and the Florida Oceans and Research Council. This system of protections is intended to provide for the protection of Florida’s most popular and ecologically important underwater ecosystems based on local resources, issues, and conditions. However, recent budgetary constraints have resulted in the elimination of funding for management of several aquatic preserves including those portions within CHSJS. This leaves a gap in protection for the CHSJS estuary.

It is imperative that the status of the CHSJS estuary remain as an aquatic preserve with the protections afforded by that designation. The CCMP should continue to promote the value of this designation and work to ensure that oversight of the aquatic preserve is maintained despite recent budget reductions. Balanced, long-term management can be successful by fostering partnerships and engaging local communities in management planning and implementation, so that responsibility for protection of these resources is shared among those management agencies that remain in place within CHSJS.

### **STRATEGY:**

*Action 1: Protect and enhance the ecological integrity of the Aquatic Preserves.*

*Action 2: Restore active management of the Aquatic Preserves within the CHSJS.*

*Action 3: Encourage sustainable use and foster active stewardship by engaging local communities in the stewardship of aquatic preserves.*

*Action 4: Improve management effectiveness through a process based on sound science, consistent evaluation, and continual reassessment.*

**EXPECTED BENEFITS:** Preservation of unique habitats, balance public use and resource protection, foster stewardship, protect submerged resources, and protect economic value.

**ASSOCIATED REGULATIONS:** None anticipated.

## **BH2: CONTINUE TO SUPPORT SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT BIENNIAL SEAGRASS SURVEYS.**

### **BACKGROUND:**

As part of the SWFWMD SWIM Program, seagrass mapping has occurred on a roughly biennial basis since the late 1980s. District scientists, as well as staff from other resource management agencies, rely on the results from these efforts to track trends in seagrass coverage in the numerous estuaries in Southwest Florida. Regular reports on status and trends of this important biological indicator are used to evaluate trends (if any) in water quality, as well as the impact of ongoing water quality improvement efforts.

According to the District's 2010 seagrass effort, St. Joseph Sound and Clearwater Harbor had a 62-acre increase in seagrass coverage from 2008, a finding that supports the contention of improving water quality in this estuary complex.

### **STRATEGY:**

*Action 1: Continue to conduct seagrass mapping efforts on a biennial basis.*

*Action 2: Continue to coordinate water clarity monitoring efforts with local governments to ensure the greatest value for obtained photography.*

*Action 3: Continue ongoing efforts to supplement District-led mapping accuracy assessments with participation of local government staff.*

*Action 4: In St. Joseph Sound, supplement mapping and ongoing monitoring efforts with site-specific field sampling to ensure that areas of "lost" seagrass in deeper areas are not simply seagrass meadows that are no longer visible in photography. As noted in the State of the Resource Report, seagrass meadows in deeper areas of St. Joseph Sound are characterized by deeper growing meadows of shoal grass (*Halodule wrightii*) which are difficult to accurately map.*

**EXPECTED BENEFITS:** Continued mapping of seagrass resources will allow for the continuation of an independent, resource-based assessment of the status and trends of water quality within the CHSJS estuary. This in turn will allow resource managers to continue to monitor the effectiveness of efforts to protect and preserve water quality through various efforts and programs.

**ASSOCIATED REGULATIONS:** None anticipated.



### **BH3: CONTINUE WATERSHED MANAGEMENT TO MAINTAIN APPROPRIATE WATER QUALITY TO SUPPORT SEAGRASS.**

#### **BACKGROUND:**

Water quality targets have been developed for the protection of seagrasses in the CHSJS estuary. Achieving these targets will allow for maintaining conditions that have corresponded to positive trends in seagrass coverage. Restoration targets for seagrasses in Clearwater Harbor are based on an assessment of current trends, which are suggestive of a response to improving water quality. Although many areas cannot be restored to their historical extent due to shoreline alteration, the construction of the Intracoastal Waterway and the placement of spoil islands, most of the potentially restorable areas of bay bottom in Clearwater Harbor are on track to recover to their historical estimates within a decade or two.

#### **STRATEGY:**

*Action 1: Continue Pinellas County's existing ambient water quality monitoring program in the CHSJS estuary*

*Action 2: Utilize the water quality targets and thresholds for chlorophyll a and light transmission to evaluate annual water quality data against the threshold values.*

*Action 3: Assess any observed seagrass losses from seagrass monitoring efforts to estimate if the losses were due to water quality conditions.*

*Action 4: Foster research activities directed towards understanding the light requirements of the various seagrass species inhabiting the CHSJS estuary.*

**EXPECTED BENEFITS:** Monitoring water quality in the estuary is a method of ensuring that management activities are resulting in conditions necessary for the future health and success of seagrasses in the CHSJS. By establishing appropriate water quality targets, the basis for any positive and/or negative trends in portions of the CHSJS estuary can be identified, and if such trends are negative, potential restorative projects can be identified. Maintenance and expansion of seagrasses should result in increased complexity of the estuarine food web and increase available food and habitats for recreationally and commercially important taxa.

**ASSOCIATED REGULATIONS:** None anticipated

## **BH4: REDUCE BOAT PROPELLER SCARRING IN SEAGRASS BEDS.**

### **BACKGROUND:**

While many boating speed zones were originally established to promote boater safety, these zones are now being established in many cases specifically to protect seagrasses, manatees, or other marine resources. For this reason, increasing emphasis has been placed on participation in regional forums for developing boater education programs; placing educational information at marinas, docks, and ramps; monitoring the effects of education; patrolling designated protection areas; refining certain boating related ordinances to address habitat protection; restricting boat activity and boat speeds in known seagrass areas; and upgrading enforcement activities.

Enforcement of existing boating restrictions and on-going boater education are crucial to more effective protection of seagrass beds in the Clearwater Harbor/St. Joseph Sound (CHSJS) estuary. Signs designating idle speed zones, no wakes zones, etc., must be permitted by the Florida Fish and Wildlife Conservation Commission (FWC), pursuant to 370.12, F.S.

Pinellas County is one of several participants developing protection measures for seagrass in the region. Other participants include the City of Tampa Bay Study Group, the Environmental Protection Commission of Hillsborough County, Manatee County, and the Fish and Wildlife Research Institute of the Florida Fish and Wildlife Conservation Commission (FWC). Pinellas County Water and Navigation has designated seagrass bed protection zones and has instituted corresponding protection measures and regulations. "Seagrass Caution Areas" signage alerts boaters of the need to exercise caution in these areas, and "Combustion Motor Exclusion Zones" preclude the use of combustion motors within the zones as a means of protecting seagrasses from propeller damage. Local protection for seagrass in the CHSJS CCMP area includes submerged lands around Caladesi and Honeymoon Islands.

In addition to local efforts, in 2009 the FWC promulgated a new rule for the protection of seagrass in Florida's aquatic preserves, which include the CHSJS CCMP area. The rule is part of a four-point plan similar to the one enacted in the Florida Keys National Marine Sanctuary and includes boater education, channel marking, increased enforcement, and limited-motoring zones. These actions are all applicable to the CHSJS CCMP area. The new legislation is found in Chapter 253.04(3) Florida Statutes, which states that operating a vessel outside a lawfully marked channel in a careless manner that causes seagrass scarring within an aquatic preserve is a noncriminal offense. Penalties can range from \$50 for a first offense up to \$1000 for a fourth offense occurring within 72 months of the first.

The County is coordinating with FWC to assess the need for additional signage at priority public access points to alert boaters in the CHSJS estuary to the new law. As with previous management efforts, a combination of boater education and reasonable enforcement will help to preserve and enhance local seagrasses. In addition to these efforts, restoration opportunities to overcome propeller scarring should also be considered.

STRATEGY:

- Action 1: Investigate the need for additional channel markers, educational signs, and slow and/or idle speed zones to designate boating areas and seagrass protection zones where boating or personal watercraft activity is high, pursuant to Chap. 253.04(3), F.A.C.. Replace lost or damaged signs and replace sign buoys with pilings. Consider adding "pole and troll" zones.*
- Action 2: Continue monitoring seagrass scarring to evaluate changes in the extent of scarred seagrass areas and to designate additional areas for protection as needed.*
- Action 3: Seagrass protection areas should be periodically re-evaluated based on recent seagrass mapping.*
- Action 4: Pursue restoration opportunities in areas where seagrasses are likely to recover due to existing and new protection designations (Action 1).*
- Action 5: Continue to distribute boaters' guides at boat shows, major marinas, boating and fishing clubs, retail outlets, and boat ramps.*
- Action 6: Continue existing education programs to target boaters outside of Pinellas County.*
- Action 7: Consider developing and distributing a boat decal on prop scarring to boaters, boat rental and sales outlets, and tackle shops.*

EXPECTED BENEFITS: Prop scarring and subsequent loss of seagrass habitat will be reduced as a result of increased education, enforcement, and monitoring.

ASSOCIATED REGULATIONS: FWC permitting for signs, US Coast Guard, Florida Statue 253.04(3)

## MANGROVES AND SALT MARSHES



The importance of mangroves as spawning, nursery, and/or foraging habitat for fish and wildlife is well documented and described earlier in this document. Mangrove habitats remain near their historic extents along coastal barrier and spoil island habitats in St. Joseph Sound and Clearwater Harbor North but have been displaced by development along the coastal islands of Clearwater Harbor South. Therefore, the action plans related to bay habitats for mangroves is aimed principally at restoration of mangroves on Clearwater Harbor South coastal barrier and spoil islands.

Historically, salt marsh habitats along coastal islands were not extensive and are now restricted primarily to the east side of Honeymoon Island as bay habitats. Shoreline stabilization by marsh vegetation remains a valuable function for fish and wildlife habitat as well as human use. Consequently, salt marsh restoration efforts should focus primarily on Clearwater Harbor North and South estuaries in areas with the greatest probability of success. While hydrologic restoration is not a feasible alternative due to existing development, invasive species removal, and spoil removal offer relatively easy restoration options.

The following 4 action plans were identified for the protection and restoration of mangrove and salt marsh habitats within the coastal estuarine portions of the CHSJS.

## **BH5: PROMOTE LIVING SHORELINES.**

### BACKGROUND:

Shorelines are often stabilized with hardened structures, such as bulkheads, revetment, and concrete seawalls. These structures often increase the rate of coastal erosion, remove the ability of the shoreline to carry out natural processes, and provide little habitat for estuarine species. NOAA is working to implement a more natural bank stabilization technique called “living shorelines” using plants, sand, and limited use of rock to provide shoreline protection and maintain valuable habitat (VIMS, 2010). Numerous agencies have partnered in support of this effort nationally and more locally, for example along the northwest coast of Florida. (<http://www.gulfalliancetraining.org/detail.aspx?id=27>).

Living shorelines reduce erosion, have aesthetic appeal, provide recreational value, improve marine habitat and spawning areas, and improve water quality and clarity (NOAA, 2011). Living shorelines address erosion in lower energy situations by providing long-term protection, restoration or enhancement. Strategic placement of stone, sand fill and other structural or organic materials may be used to enhance and encourage growth of stabilizing plants such as mangroves. Living shoreline treatments do not include structures that sever the natural processes and connections between uplands and aquatic areas, but use a variety of structural and organic materials, such as wetland plants, submerged aquatic vegetation, oyster reefs, and coir fiber logs to stabilize banks and reduce erosion. Importantly, living shorelines should mimic to the greatest possible extent shorelines that would naturally exist in the restoration area and provide a net environmental benefit compared to the existing shoreline.

### STRATEGY:

*Action 1: Identify shorelines requiring stabilization in protected Aquatic Preserve or other managed areas and develop living shoreline design based on Living Shorelines Manual (VIMS, 2010).*

*Action 2: Implement shoreline stabilization and restoration using one or more of the following components: manage riparian vegetation using bank grading and fiber logs for stabilization; enhance salt marshes by dune restoration, marsh sills, spoil removal or grading; remove non-native vegetation and plant native marsh species as necessary, and/or cordon off restoration areas until they have stabilized.*

*Action 3: Implement shoreline protection methods through community environmental organizations.*

EXPECTED BENEFITS: Stabilization of the shoreline, protection of surrounding riparian and intertidal environment, improved water quality via filtration of upland run-off, attenuation of wave energy, habitat creation for aquatic and terrestrial species.

ASSOCIATED REGULATIONS: EPA, FDEP, SWFWMD, and local permitting for construction and activities within protected areas.

## **BH6: CONCENTRATE MANGROVE RESTORATION EFFORTS ON COASTAL ISLAND HABITATS IN CLEARWATER HARBOR SOUTH.**

### **BACKGROUND:**

Mangrove restoration projects focus on coastal stabilization, environmental mitigation or remediation, fisheries, and restoration of ecosystem function (Ellison 2000). Over the past 70 years restoration techniques have been refined and rely principally on grading to appropriate elevations of approximately 1.5 feet NGVD and planting propagules while controlling invasive plant species. Consequently, restoring mangroves is not difficult under the appropriate hydrologic conditions and mangroves forests may reach approximations to native biomass, structure, and productivity within two decades (Twilley et al. 2000).

Identification of restoration goals are of primary importance as a first step. In areas as extensively developed as Clearwater Harbor South, finger canals colonized by Brazilian Pepper and *Phragmites* provide opportunities to restore habitat by replacing non-native invasive species with mangroves providing native habitat while protecting and stabilizing shorelines. Restoration efforts have typically focused on stabilization of coastal sediments rather than supporting fish and wildlife habitat, though both are generally achieved as a function of successful restoration.

### **STRATEGY:**

*Action 1: Identify and target locations on public lands along coastal islands, and where possible, canals and shorelines, that presently support Brazilian Pepper, Phragmites, or other non-native invasive species, that may be appropriate for restoration or rehabilitation.*

*Action 2: Consistent with Pinellas County directives, remove non-native invasive plant species by appropriate means (harvesting, herbicides, etc.).*

*Action 3: Grade area to appropriate elevations of approximately 1.5 feet NGVD and plant mangrove propagules.*

*Action 4: Monitor vegetation to evaluate success. Photographic documentation may be adequate.*

*Action 5: Through public education efforts and incentives, encourage similar activities by private land owners.*

**EXPECTED BENEFITS:** Benefits of mangrove restoration efforts include shoreline stabilization, fisheries habitat, bird habitat, and reduced invasion by non-native plant species.

**ASSOCIATED REGULATIONS:** Activities in coastal areas will require appropriate permitting by local, state, and federal agencies (e.g. 404 permits and ERP permits). Application of herbicides in wetlands is restricted.

## **BH7: PROTECT SALT MARSH HABITAT WHERE IT CURRENTLY EXISTS ALONG THE EASTERN SHORE OF HONEYMOON ISLAND.**

### **BACKGROUND:**

Salt marshes are emergent grasses such as smooth cordgrass (*Spartina alterniflora*), salt meadow cordgrass (*S. patens*), seashore paspalum (*Paspalum vaginatum*), and saltwort (*Batis* sp.) that inhabit the intertidal areas of coastal shorelines. Based on 2007 land use information there is currently approximately 77 acres of identified salt marshes in St. Joseph Sound including 32 acres along the eastern shoreline of Honeymoon Island. The eastern shoreline of Honeymoon Island is a low energy shoreline with significant tidal inundation and represents the only significant salt marsh habitat along the coastal barrier islands within the CHSJS other than a small area on Three Rooker Bar. Based on historical land use estimates provided in the State of the Resource report, St. Joseph Sound historically contained equivalent acreage of salt marshes; however, the marshes were located along the mainland shoreline and no marsh existed on Honeymoon Island. Over time, the mainland salt marshes have been displaced and salt marshes have recruited to Honeymoon Island. Therefore, protection of Honeymoon Island salt marshes is vital to maintain historical acreages within this segment.

Multiple factors interact to determine the formation, structure, and ecological function of salt marshes including; climate, hydrology, and physical factors (USFWS 2007). Climatic factors (e.g., temperature and rainfall) hydrologic factors (e.g., tidal inundation and wave energy), and physical factors (e.g., elevation, slope, sediment and soil composition, and surface water and soil salinity) all contribute to success of salt marshes. Honeymoon Island is managed as a state park. The presence of salt marsh habitat in this area means that natural ecological processes are working to recruit emergent vegetation that stabilizes existing shorelines and provides important habitat for many biotic communities. Efforts should be made to ensure that this habitat has every opportunity to succeed. Several strategies are listed below to ensure this habitat remain viable on Honeymoon Island.

### **STRATEGY:**

*Action 1: Remove exotic species that compete with native salt marshes on Honeymoon Island.*

*Action 2: Protect adjacent areas to allow for expansion of natural vegetation.*

*Action 3: Foster active stewardship by engaging local communities.*

*Action 4: Continue to support effective management through a process based on sound science, monitoring, and assessment.*

**EXPECTED BENEFITS:** Protecting native vegetation will enhance wildlife habitat, and stabilize the eastern shoreline of Honeymoon Island.

**ASSOCIATED REGULATIONS:** Appropriate permits are required for any excavation.

## **BH8: IMPLEMENT RESTORATION OF SALT BARRENS, AND SALT MARSHES TO THE EXTENT POSSIBLE TO RESTORE THE BALANCE AMONG THE MOST IMPACTED WETLAND HABITATS.**

### BACKGROUND:

Saltwater marshes and salterns historically made up a significant portion of the coastal vegetative communities in the St. Joseph Sound, but less than four and three percent of the coastal vegetation in Clearwater Harbor North and South, respectively. While current proportions of these habitats are not dissimilar to historic proportions, salt marshes and salterns occur rarely if at all in Clearwater Harbor North or South. Therefore, targeting Clearwater Harbor North and South for even small restoration projects would increase the extent of this habitat and result in a net increase in wetlands.

While the value of salt marshes to fish and wildlife, as well as protecting against coastal erosion, is well-documented, salterns are frequently overlooked in coastal communities. Salterns are flat expanses of firm sand characterized by salt tolerant perennials such as saltwort (*B. maritime*), glasswort (*Salicornia virginica*), and sea purslane (*Sesuvium portulacastrum*). Salterns occur landward of mangroves and salt marshes, but waterward of the coastal forested hammocks. Salterns function in the storage and release of salt and orthophosphate, transitional sites for plant succession, and habitat for fish and wildlife (Hoffman and Dawes, 1997) and therefore any management decisions for protection or enhancement should include the saltern as a component of tidal marsh communities.

### STRATEGY:

*Action 1: Identify areas where historic salt marshes were present.*

*Action 2: Identify current land use of those areas.*

*Action 3: Identify those areas where opportunities exist for restoration.*

*Action 4: Identify those areas where restoration is most likely to succeed.*

*Action 5: Investigate opportunities for restoration of salt marshes or barrens under either Water & Navigation permitting or local land development codes. If private property adjacent to the sound is undergoing development (docks, marina, condos, etc) they may or could be required to restore/enhance/create marshes next to the project usually as a compensatory measure for some other impact.*

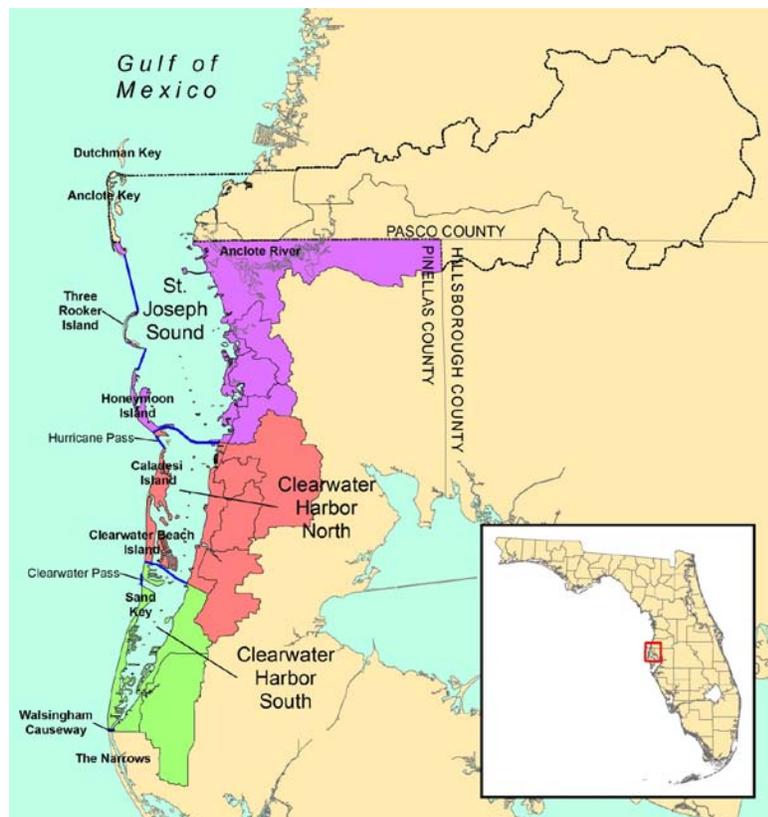
**EXPECTED BENEFITS:** Restored and/or purchased salt barrens, saltbarrens, and/or salt marshes will provide spawning and nursery habitat for several marine species, while the value to the public includes recreation, flood attenuation, and water quality benefits.

**ASSOCIATED REGULATIONS:** ERP, 404 permits.

## WATERSHED HABITATS ACTION PLANS

While bay habitats remain largely as they were circa 1942, natural resource habitats in the watershed of the CHSJS have been dramatically altered. For example, mangrove losses represent the smallest loss among the estuarine wetlands and yet 57, 67, and 98% of historic mangroves have been destroyed or displaced in St. Joseph Sound, Clearwater Harbor North, and Clearwater Harbor South, respectively. Even more dramatic habitat alterations have occurred to native uplands, forested freshwater wetlands (swamps), and freshwater marshes. An estimated 85% of native uplands have been converted, primarily to residential and urban land uses. Nearly 63% of forested freshwater wetlands have likewise been lost.

Protection targets should be regarded as a minimum and the goals of the CCMP should be, in particular, restoration of wetland habitats to the extent practical. In the case that acres of wetlands cannot reasonably be restored to the historic extents, one potential restoration target might be to restore those lost or degraded historic wetlands that are currently in agriculture or rangeland within the CCMP. In total, these areas add up to 706 acres in St. Joseph Sound and 222 acres in Clearwater Harbor. Flanagan and Richardson (2010) identified historic wetland habitats that had been converted to agriculture as good candidate sites for wetland restoration and water quality improvement due to their underlying geomorphology. Based on these dramatic losses combined with the limited open land left in the watershed for restoration of these habitats, the strategy for protecting and restoring these habitats is multi-faceted as outlined below with specific action plans.



Geographic boundaries for the three watersheds of the CHSJS.

## **WH1: ACHIEVE A NET INCREASE IN WETLANDS CONSISTENT WITH EPA'S STRATEGIC PLAN FOR 2011-2015.**

### **BACKGROUND:**

While it has been deemed untenable to expect restoration of forested wetlands to their historical extent (circa 1942), certainly there are several areas in public ownership that may provide opportunities to deliver a net increase in wetlands in the CCMP area, consistent with the EPA strategic plan. These areas are mapped and described in an appendix to the State of the Resource Report titled "Potential Forested Freshwater Wetland Restoration Sites for the CHSJS CCMP". Based on several screening criteria (including public land on which historical wetlands are now absent or degraded), several potential sites have already been identified including nine sites, totaling about 294 acres of historical freshwater wetlands in St. Joseph Sound, approximately four acres of historical freshwater wetlands in Clearwater Harbor North, and eight sites in Clearwater Harbor South totaling about 369 acres of historical freshwater wetlands that may be suitable for restoration.

### **STRATEGY:**

*Action 1: Use Geographic Information System (GIS) to identify and prioritize potential forested freshwater wetland restoration sites based on historical land use.*

*Action 2: Develop exclusionary criteria to remove those historic wetlands that are now on developed lands.*

*Action 3: Develop a priority ranking matrix to rank potential restoration sites based on proximity to other wetlands or Strategic Habitat Conservation Areas (SHCA).*

*Action 4: Identify costs, water quality improvement potential, reduction in erosion and habitat improvement benefits associated with each potential site.*

*Action 5: Identify a final rank sheet from which to pursue funding opportunities.*

**EXPECTED BENEFITS:** Increasing the extent of forested freshwater wetlands will, like other wetland restorations, provide flood attenuation and water quality improvements. Wetlands provide habitat for many more species than uplands because many upland species are wetland dependent, e.g., amphibians and birds, and are often wildlife corridors.

**ASSOCIATED REGULATIONS:** ERP and 404 permits, as well as applicable local permitting requirements.

## **WH2: DEVELOP INCENTIVES TO ENCOURAGE WETLAND RESTORATION ON PRIVATE LANDS.**

### **BACKGROUND:**

To increase the extent of forested freshwater wetlands further, private lands should be considered. While this may be a serious challenge in Clearwater Harbor North and South, there are areas in the St. Joseph Sound watershed where agricultural areas may offer opportunities for purchase and restoration. Education by sustaining, promoting and delivering voluntary wetland restoration programs to private landowners, sharing expert knowledge on restoration techniques, and reducing barriers to improve state property tax for wetland conservation, may also provide opportunities for private land owners to assist in a goal of a net increase in freshwater forested wetlands in the CCMP area. While Pinellas County may be able to develop incentive programs for partnering with private landowners to promote wetland and native lands stewardship and preservation, there are other programs available to the County and private land owners.

For example, the primary program for inland wetland restoration has been the Wetland Reserve Program (WRP). The Wetlands Reserve Program (WRP) is a voluntary program to restore and protect wetlands on private property (<http://www.wi.nrcs.usda.gov/programs/wrp.html>). It is an opportunity for landowners to receive financial incentives to restore wetlands that have been drained for agriculture. Landowners who choose to participate in WRP may sell a conservation easement or enter into a cost-share restoration agreement with USDA to restore and protect wetlands. The landowner voluntarily limits future use of the land, yet retains private ownership. The landowner and NRCS develop a plan for the restoration and maintenance of the wetland. The program offers landowners three options: permanent easements, 30-year easements, and restoration cost-share agreements of a minimum 10- year duration.

The Conservation Reserve Program (<http://www.wi.nrcs.usda.gov/programs/crp.html>) is a voluntary program for agricultural landowners. Through CRP, annual rental payments and cost-share assistance is available to establish long-term, resource conserving covers on eligible farmland. The Commodity Credit Corporation (CCC) makes annual rental payments based on the agriculture rental value of the land, and it provides cost-share assistance for up to 50 percent of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years.

The Wetland Program Development Grants (WPDGs), initiated in 1990, provide eligible applicants an opportunity to conduct projects that promote the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution ([http://water.epa.gov/grants\\_funding/wetlands/grantguidelines/index.cfm](http://water.epa.gov/grants_funding/wetlands/grantguidelines/index.cfm)). While WPDGs can continue to be used by recipients to build and refine any element of a comprehensive wetland program, priority is given to funding projects that address the three priority areas identified by EPA: Developing a comprehensive monitoring and assessment program; improving the effectiveness of compensatory mitigation; and refining the protection of vulnerable wetlands and aquatic resources. States, Tribes, local governments (S/T/LGs), interstate associations, intertribal consortia, and national non-profit, non-governmental organizations are eligible to apply.

STRATEGY:

*Action 1: Establish a group to represent private land owners interested in restoring wetland functions for fish and wildlife habitat, water supply, erosion protection, and water quality.*

*Action 2: Work with the group to develop and establish goals for restoring wetlands on private lands.*

*Action 3: Identify lands for restoration, enhancement, or identify program consistent with the priorities of a funding source that will provide opportunities to restore wetlands on private lands.*

*Action 4: Identify potential partnerships for expertise and funding to accomplish wetlands restoration on private lands.*

*Action 5: Identify funding opportunities.*

EXPECTED BENEFITS: In addition to the benefits listed above, private lands offer the added benefit of opportunities to connect public lands and reduce habitat fragmentation in the watershed.

ASSOCIATED REGULATIONS: ERP and 404 permitting, as well as appropriate local permits for any activities in a wetland.

### **WH3: PROTECT NATIVE UPLANDS IN EXISTING MANAGED LANDS.**

#### **BACKGROUND:**

Much of the historic native upland acreage in the CHSJS has been lost to development. While wetlands generally contain a greater number of species, uplands serve as buffers for wetlands and many species found in uplands are wetland dependent (e.g., amphibians, reptiles, and birds). While wetlands are legally protected at the local, regional, state, and national level, uplands are not protected to the same extent. Therefore, development of uplands for residential and agricultural use can lead to the loss of the value for which wetlands were protected, including water quantity and quality, nutrient cycling, and wildlife habitat.

Local Government Comprehensive Planning and Land Development Regulation Act, often referred to as the Growth Management Act, Chapter 163, Sections 163.3161 through 163.3217, Florida Statutes, requires each local government in Florida to adopt a comprehensive land use plan for the lands within its jurisdiction and provides a broad mandate authorizing local governments to protect upland habitats. This mandate is reflected in the Pinellas County Comprehensive Plan chapters discussing natural, historic, and cultural resources, recreation, future land use, and capital improvements. These chapters establish the County's commitment to land acquisition, land management, and identifying additional environmentally sensitive lands for conservation purposes.

Pinellas County supports funding for restoration and purchase of environmentally sensitive land through the Penny for Pinellas Program through the 2011-2016 Capital Improvement Program. The last renewal of the Penny for Pinellas on March 13, 2007 extended the program for a third decade, 2010-2020. Per State statute, the Penny for Pinellas can only be used for capital projects and cannot be used for operating and maintenance purposes such as maintaining parks or funding social service programs. This funding source is shared between the County and the 24 municipalities through an inter-local agreement.

#### **STRATEGY:**

*Action 1: Continue to promote community "adoptions" of uplands in managed areas to increase awareness and control of non-native invasive plant and animal species in these areas.*

*Action 2: Continue funding lands acquisition through "Penny for Pinellas".*

*Action 3: Identify future lands for acquisition and management.*

*Action 4: Implement additional local government strategies for upland habitat protection, such as biodiversity or habitat conservation plans authorized under Section 10 of the Endangered Species Act, and/or ecological design standards and guidelines for land development.*

**EXPECTED BENEFITS:** Aquifer recharge, nutrient cycling, wetland buffers.

**ASSOCIATED REGULATIONS:** Habitat Management and Landscape Permit (Contact: P.C. Building and Development Review Services) required for the removal of any vegetation in wetlands, natural areas or designated conservation easements.

## **WH4: CONSIDER APPLICATION OF STREAM RESTORATION TECHNIQUES TO IMPROVE TRIBUTARY HABITATS.**

### **BACKGROUND:**

Stream restoration has been a proven way to reduce coastal erosion, increase attenuation of nutrients and improve ecological function in impacted systems. Stream restoration methods vary according to many factors including available area, local land contours, soil types and more. While a variety of methods exist, the Rosgen method (Rosgen 2007) of stream restoration uses a system that classifies rivers and streams, and prescribes restoration remedies according to several qualities, including water flow, channel characteristics and sediment load, and takes into account how human activity affects the landscape. There are four basic approaches to the Rosgen method: establish bank-full stage at the historical floodplain elevation; create a new floodplain and stream pattern with the stream bed remaining at the present elevation; widen the floodplain at the existing bank-full elevation, and stabilize existing stream banks in place. Restoration projects that include tributaries should focus on identifying the restoration technique most likely to result in restoration success. Given the County's historic flooding issues, an overarching concern of any potential restoration is the consideration of its impact on flooding issues. Identification of the appropriate restoration methods provides assurances that restoration activities will have a greater opportunity for success.

### **STRATEGY.**

*Action 1: Define specific restoration objectives for each watershed.*

*Action 2: Identify individual sites on public lands that offer restoration opportunities.*

*Action 3: Identify available funding opportunities and include in evaluation of priorities.*

*Action 4: Consider passive restoration recommendations based on land use change and zoning, in lieu of mechanical restoration.*

*Action 5: If non-structural methods are inadequate for meeting objectives, consider the Rosgen stream stabilization approach, as well as actions described for previous restoration efforts (i.e. education, access restrictions, exotic plant species control).*

*Action 6: Identify any and all potential impacts to flooding as a result of restoration.*

**EXPECTED BENEFITS:** Stream restoration can increase ecological function and contribute to improved connections between uplands and wetlands. Restoration can also improve instream habitat for fish and wildlife, and help attenuate nutrients. Restoration generally provides multiple benefits including reducing sediment erosion which is a major re-occurring issue within the tidal tributaries of the CHSJS.

**ASSOCIATED REGULATIONS:** ERP and 404 permitting, as well as relevant local permitting will be required for any activities in wetlands.



## **WH5: PROTECT EXISTING ENVIRONMENTALLY SENSITIVE AREAS IN MANAGED LANDS.**

### **BACKGROUND:**

Environmentally Sensitive Lands are those lands that contain naturally occurring and relatively unaltered flora, fauna or geologic conditions that might be preserved through acquisition. The program principally aims to preserve habitat for endangered and threatened species or species of special concern. Within the CHSJS, environmentally sensitive lands include Anclote River, Howard Park, Mariners Point, Ozona Preserve, Sand Key Park, Wall Springs Park and Walsingham Park. With the exception of some areas in the northeastern portion of the county, managed lands in the CCMP are almost exclusively surrounded by urban areas. Caladesi and Honeymoon Island State Parks are large and not subject to direct urbanization impacts, but require management to control non-native invasive species and disturbances due to visitors. Monitoring in these managed areas is important so that managers can intervene if undesirable trends in habitat and/or water quality are observed.

Conservation of environmentally sensitive lands helps maintain ecosystem function in a densely populated, urban environment. Preserving green space also provides aesthetic appeal and offers recreational opportunities that lead to healthier communities. Natural buffers protect our rivers from polluted stormwater as well as allowing for retreat of natural communities as the coast experiences sea level rise.

### **STRATEGY:**

*Action 1: Identify sensitive habitats in managed areas and establish buffers along or adjacent to the habitats.*

*Action 2: Include signs to educate visitors as to importance of the sensitive habitats and restrict adverse impacts to the habitats.*

*Action 3: Monitor habitat to evaluate trends that may be applicable to other parts of the managed area.*

**EXPECTED BENEFITS:** Improved protection of sensitive areas and a means of evaluating trends in habitat quality.

**ASSOCIATED REGULATIONS:** Signs in aquatic preserves require approval by state and local agencies.

## **WH6: CONTINUE EXOTIC (NON-NATIVE) AND INVASIVE SPECIES CONTROLS AND MONITORING IN MANAGED AND PUBLIC LANDS.**

There are approximately 125 exotic and invasive species in Florida (FDEP, 2011) that are tracked and listed by the [Florida Exotic Pest Plant Council \(FLEPPC\)](#). The most troublesome species include Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casuarina sp.*), Chinese tallow (*Sapium sebiferum*), cogon grass (*Imperata cylindrical*), air-potato (*Dioscorea bulbifera*), Japanese climbing fern (*Lygodium japonicum*), old world climbing fern (*Lygodium microphyllum*), and the aquatic, invasive hydrilla (*Hydrilla verticillata*). Melaleuca (*Melaleuca quinquenervia*), formerly a high priority exotic species, is now successfully controlled on public lands. All of these species are present in the CHSJS CCMP area.

Invasive exotic species are recognized as major factors in degradation of the environment. Without control, these species have the potential to impede and even prevent restoration efforts (Doren et al., 2009). Methods for control vary widely among these species, making control even more difficult. While melaleuca is now largely removed from public lands, it remains difficult to control on private lands and illustrates how difficult control of these species is.

### STRATEGY

*ACTION 1: Maintain funding to continue control of non-native invasive plant species on public lands.*

*Action 2: Expand existing education regarding impacts of these species to include private lands.*

*Action 3: Ensure that any restoration efforts funded with public money include provisions for exotic and invasive species removal and control.*

*Action 4: Encourage municipalities to adopt land development codes such that if a property undergoes development, removal of exotics from the parcel or from parcels under contiguous ownership could be required.*

*Action 5: Promote Florida-Friendly Landscaping™*

**Expected Benefits:** Control of non-native invasive plant species will increase native species diversity and make native vegetation communities available to native wildlife.

**ASSOCIATED REGULATIONS:** Habitat Management and Landscape Permit (Contact: P.C. Building and Development Review Services) is required for the removal of any vegetation in a wetlands, natural areas or designated Conservation Easements.

## WATER QUALITY ACTION PLANS

For the purposes of the CCMP, a water quality goal for the estuary was established to ensure that water quality conditions in the estuary are protective of two critical indicators of estuarine health – seagrasses and dissolved oxygen. Because seagrasses are currently stable or improving throughout the CHSJS estuary it was concluded that recent water quality conditions in the estuary are sufficient to maintain full aquatic life uses in the estuary. Therefore, a reference period approach was used to establish management targets and thresholds used to monitor water quality in the estuarine open bay waters of the CCMP.

While the estuary is currently healthy, some of the tidal tributaries to the estuary have instream water quality conditions that do not meet state standards. These tributaries have had substantial physical alterations to the stream channel as well as the surrounding watershed which have altered natural hydrology and native vegetation.

Central to the protection of water quality is an effective monitoring program. Currently, Pinellas County has a rigorous water quality monitoring program design for both the estuarine waters of the CHSJS and the tributaries to the estuary. The water quality targets and thresholds have been established to protect existing conditions in the estuary using a reference period approach and a reference period of 2003 through 2009. These thresholds are not to be considered as end of pipe criteria for point source discharges within the CCMP for regulatory purposes. Further, a single excursion of the threshold value does not necessarily mean that there has been significant degradation of water quality. The analyses of section 5.2 of the State of the Resource report (Janicki Environmental, 2011) suggests that there have been times when estuarine water quality values for chlorophyll *a*, TN, TP, and light transmittance have historically exceeded the proposed threshold values and yet the estuarine waters were meeting full aquatic life uses according to FDEP. However, in keeping with the spirit of EPA's anti-degradation policy given the special nature of these estuarine waters, the CHSJS water quality threshold values were chosen as the appropriate management level criteria for these segments.

The management strategies defined by the water quality action plans are designed to implement best management practices in an effort to control pollutant loadings to the CHSJS and provide a mechanism from which to track changes in water quality over time for compliance with established thresholds.

## **WQ1: CONTINUE PINELLAS COUNTY'S AMBIENT MONITORING THROUGHOUT THE CHSJS.**

### **BACKGROUND:**

The established water quality targets and thresholds were developed as management criteria and are proposed to be used to evaluate water quality with respect to not allowing for degradation of water quality from that observed over recent time period (i.e., 2003-2009) when the open bay estuarine segments were fully meeting their designated uses. Within this context, an excursion is defined as when an annual geometric average for a particular constituent that exceeded the threshold value. The annual geometric mean should be derived strictly from water quality sampling conducted according to Pinellas County's probabilistic water quality sampling design in designated strata "W1", "W2" , and "W3" corresponding to St. Joseph Sound, Clearwater Harbor North, and Clearwater Harbor South, respectively. Based on these considerations, it is imperative that the water quality monitoring program be maintained in its current design in order to properly assess future changes in estuarine water quality.

### **STRATEGY:**

- Action 1: Continue sentinel monitoring for water quality parameters indicative of health of the CHSJS estuary.*
- Action 2: Secure the funding necessary to maintain Pinellas County's ambient water quality monitoring design.*
- Action 3: Promote the special nature of the CHSJS estuaries and need for protection to local, state and federal regulatory agencies.*

**EXPECTED BENEFITS:** Sentinel monitoring for providing information on estuarine condition, trends over time, occurrence of harmful Algal blooms, baseline information for comparison in case of catastrophic events (e.g., oil spills, hurricanes, etc.)

**ASSOCIATED REGULATIONS:** Future regulatory criteria related to numeric nutrient criteria and other attempts to define assimilative capacity of the system should be tailored to the site specific nature of this estuary. Proposed criteria that do not reflect the site specific nature of this estuary may result in falsely concluding that this estuary is impaired when in fact it is not. Further, the choice of minimum detection limit used in assessing these waterbodies will effect compliance assessments and should be considered.

## **WQ2: MAINTAIN NUTRIENT LOADINGS TO SUPPORT SEAGRASS PROTECTION AND FULL AQUATIC LIFE USES IN THE ESTUARY.**

### **BACKGROUND:**

Estuarine biological processes respond in a system specific manner to both the concentration of nutrients in the water and to the mass of nutrients delivered to the estuary. The differences in response to loads or concentrations include factors such as dilution, water residence times, and the complex interactions between the mass delivered and nutrient assimilation and recycling from biological processes. Both concentrations and loadings are an integral part of the Florida Department of Environmental Protection's (FDEP) Total Maximum Daily Loads (TMDL) program that attempts to define the assimilative capacity of water bodies it deems impaired due to excessive nutrient pollution.

The analysis conducted for this CCMP has suggested that nutrient loadings to the estuary have been sufficiently low so as not to cause adverse effects within the estuary. Threshold values have been proposed as management level criteria for assessing changes in nutrient loadings to the estuary over time relative to the identified reference period when estuarine water quality conditions supported expansion of seagrass acreage. However, tributary water quality conditions have resulted in FDEP impaired status. Therefore, nutrient loading reductions will be targeted for the watersheds of these tributaries and an overall strategy is required to optimize the allocation of resources to accomplish nutrient reduction goals.

### **STRATEGY:**

*Action 1: Support and enforce Pinellas County's fertilizer ordinance*

*Action 2: Encourage expansion of reclaimed water use*

*Action 3: Encourage LID practices and flow attenuation*

**EXPECTED BENEFITS:** Pollutant Load Reductions

**ASSOCIATED REGULATIONS:** Meeting NPDES requirements

## WQ3: CONTINUE ADVANCED WASTEWATER MANAGEMENT THROUGH OPTIMIZING RECLAIMED WATER OPPORTUNITIES.

### BACKGROUND:

There are currently 4 large municipal water reclamation facilities within the study. These are the William H. Dunn plant located in the Klosterman Bayou watershed, the Marshall Street plant located in the Stevenson Creek watershed, the City of Tarpon Springs' wastewater treatment facility located in the Anclote River watershed, and the City of Dunedin's wastewater treatment plant. All of these facilities utilize Advanced Wastewater Treatment (AWT) techniques and meet or exceed all surface water discharge requirements.

Through cooperative funding agreements with the Southwest Florida Water Management District, these facilities have been expanding their capacity to provide reclaimed water for non potable uses. The District requires that any expansion achieve at least a 50% connection rate as well as a 50% offset commitment of potable sources (Andrade and Scott. 2002).

The Marshall Street Plant provides reclaimed water to much of Clearwater Beach as well as Coachman Park and the neighborhoods of Island Estates, and Harbor Oaks. The City of Clearwater has developed a Reclaimed Water Master Plan that includes a schedule for phased future extensions of this system. Future extensions are based on several factors, including; lawn irrigation usage; proximity to existing sources, and infrastructure cost. The City of Tarpon Springs is currently in the process of acquiring funds to develop a master plan for their facility as well. Therefore, a goal for this action plan is to increase the utilization of available reclaimed water sources within the CCMP and optimize the delivery of services.

### STRATEGY:

*Action 1: Identify reuse as substitute for potable for irrigation potable consumption for irrigation purposes throughout the study area.*

*Action 2: Expand additional areas for expansion the Irrigation Source Survey to assess need in areas outside city jurisdiction.*

*Action 3: Identify best locations for expansion of reclaimed water where attenuation of nutrients is greatest within the watershed.*

*Action 4: Investigate feasibility of the reuse water generators to provide wholesale water to adjacent municipalities.*

EXPECTED BENEFITS: Pollutant load reductions

ASSOCIATED REGULATIONS: Consistency with the Total Maximum Daily Load program for impaired waters.

## **WQ4: CONTINUE TO IMPROVE STORMWATER MANAGEMENT STRATEGIES THROUGH THE USE OF LOW IMPACT DEVELOPMENT AND OTHER BEST MANAGEMENT PRACTICES.**

### **BACKGROUND:**

Anthropogenic alterations of natural watershed hydrology can have a significant effect on the ecology of the estuary (Wolanski 2007). Extensive alterations to hydrologic features within the CHSJS have changed how freshwater is delivered to the receiving water. Channelization of historical coastal streams and destruction of historical wetlands has increased peak flow rates and velocities, and reduced opportunities for pollutant removal and groundwater recharge. Higher peak flows and reduced attenuation have also increased the potential for channel and coastal erosion.

Best Management Practices (BMPs) is a term used to describe the use of both structural (e.g. retention ponds) and non-structural practices (e.g. minimizing use of chemical fertilizers and pesticides) as pollution control techniques. Low Impact Development (LID) is a technique to incorporate pollution control measures directly into the design or re-design of development features. Rain gardens, green roofs, cisterns, and pervious pavements are all LID practices used to attenuate stormwater, filter pollutants, and minimize impacts to land features as a result of development. Together these practices can be both environmental beneficial and cost effective in minimizing stormwater pollution and associated issues as well as achieving compliance with regulatory issues associated with stormwater management.

### **STRATEGY:**

*Action 1: Support and enforce Pinellas County's fertilizer ordinance.*

*Action 2: Encourage expansion of reclaimed water use.*

*Action 3: Incorporate LID principles in Pinellas County's Land Development Code update.*

*Action 4: Encourage LID practices and flow attenuation.*

*Action 5: Promote channel stabilization projects with local government entities.*

*Action 6: Encourage local governments to adopt buffer zones adjacent to streams.*

.

**EXPECTED BENEFITS:** Pollutant load reductions, hydrologic attenuation, cost savings.

**ASSOCIATED REGULATIONS:** ERP permitting will be required on a project-specific basis.

## ESTUARINE FAUNA ACTION PLANS

Estuarine ecosystem productivity is the transfer of energy up the trophic food web to the many estuarine fauna that attract human interest. Fish, dolphin, manatee, sea turtles, and birds rely on estuarine productivity at lower trophic levels to support healthy populations. Therefore, in an effort to protect the more charismatic species that are symbolic of human's interactions with nature, protection and management goals are needed for the entire ecosystem. The CCMP is designed to direct management at the ecosystem level to ensure that the estuarine fauna most associated with the economic value of the CHSJS are sustained.

Not all estuarine fauna require direct management intervention to succeed in the CHSJS. For many species, sustaining appropriate water quality conditions and seagrass habitats in the CHSJS estuary will provide sufficient protection provided that adverse human impacts do not increase. However, other species are more susceptible to discrete events that may result in large impacts to their populations. For example, a tropical storm or hurricane could conceivably destroy a large portion of a mangrove forest that is critical nesting habitat for several bird species within the CCMP. Natural and anthropogenic erosional forces could substantially reduce shoreline areas required for nesting shorebirds. Therefore, birds are a particularly susceptible fauna in the CHSJS and efforts should be made to support the Audubon's recommended management actions outlined in the CHSJS State of the Resource Report. Colony protection, population estimates, public education, predator control, and reducing human disturbances to nesting colonies are prime among these recommendations.

For other species, public education is likely to be the most effective management strategy that the CCMP can employ to protect and conserve these species. For dolphins and manatee, limiting negative human interactions is of prime concern. Boat collisions, harassment and fishing line accumulation are the principal negative anthropogenic effects on these populations. Cold stress and red tide mortality are the principal negative natural stressors for these populations. For fishes, controlling fishing pressure and protecting important estuarine fish habitat in the CHSJS estuary is the principal goal. The FWC sets recreational limits for many fish species and monitors populations of important commercial fish stocks. Supporting the FWC management goals and objectives, protecting fish habitats and public education are principal management goals of the CCMP.

Scallop populations historically extended throughout the CHSJS but are only recently returning to this area. FWC maintains a scallop monitoring program in the northern portion of the CHSJS estuary; however, an annual scallop count, similar to that conducted in Tampa Bay may be a good way to educate the public, build environmental awareness and help resource managers estimate trends in scallop populations.

## **EF1: SUPPORT AUDUBON'S MANAGEMENT RECOMMENDATIONS FOR THE PROPER STEWARDSHIP OF BIRD POPULATIONS IN THE CHSJS.**

### **BACKGROUND:**

Audubon of Florida has recognized the CHSJS area as highly valuable for its avifauna by inclusion of the CHSJS in their designated Important Bird Areas (IBAs) of Florida. A unique assemblage of colonial waterbirds and shorebirds use the CHSJS. Located on the Atlantic Flyway, these waterways, beaches, and shorelines are extremely important stopover and over-wintering sites for birds that nest further north, some as far as the Arctic tundra, but retreat south in the winter to find their fish, shellfish, insect, and invertebrate prey. At least twenty-five bird species, including several taxonomic groups of colonial waterbirds and territorial birds, breed in CHSJS coastal habitats. Eleven of these species are federally or state-listed as "endangered", "threatened", or as "species of special concern" and many birds that occur in the region are listed on non-regulatory management lists. In 2009, 5,331 pairs (all species combined) nested on islands in the system. This count does not include colonies of Least Terns and Black Skimmers that nested on scattered beaches and rooftops in this region of Pinellas County.

Bird habitats in CHSJS include forested areas (patches of mangroves, coastal hammocks, or pine flatwoods remaining on barrier islands, some natural mangrove islands, and mangroves and coastal hammock communities on some islands created when the Intracoastal Waterway was dredged); beaches on barrier islands; and coastal marshes. The dominant types of nesting habitats within the CHSJS include arboreal (tree), beach, and coastal marshes. Many species of colonial waterbirds use arboreal habitats for nesting including: Brown Pelican, Double-crested Cormorant, the herons and egrets, White Ibis, and Roseate Spoonbill. Colonies of birds nesting in trees generally occur only on small islands that have no resident mammalian predators and are off-shore, separated by open water and deep channels with tidal currents that discourage mammals from swimming to them. Colonial waterbirds will not nest on islands if mammalian predators are present. Three of the larger barrier islands (Honeymoon Island, Caladesi Island, and the northern section of Clearwater Beach) still have relatively undisturbed mangrove forests, coastal hammock communities, salt marshes, beaches, and pine flatwoods. Conversely, most of Clearwater Beach and Sand Key are highly developed and the beach-front communities of condominiums, hotels, and residences on Clearwater Beach, Belleair Shores, Belleair Beach, and Indian Rocks Beach have displaced most native vegetation and shallow water shorelines.

Management and conservation activities conducted by Audubon's FCIS, the Florida Park Service, Florida Department of Environmental Protection Pinellas Aquatic Preserves, Pinellas County, and the cities of Clearwater, Belleair Beach, and Indian Rocks Beach, other cooperating agencies, and regional volunteers (Tampa Bay Regional Planning Council's Agency on Bay Management, Clearwater Audubon Society, Suncoast Chapter of the Florida Native Plant Society, Keep Pinellas Beautiful, and boating groups, among others) are addressing some management needs but more work needs to be undertaken.

The following actions which should be continued or added to ongoing activities for the protection of the birds of the CHSJS estuary include: population estimates; colony protection; public education; predator control; cooperation among law enforcement agencies; habitat management; fishing line accumulation; coordination with public agencies, and protecting nesting islands from erosion.

STRATEGY:

*Action 1: Facilitate coordination among public agencies in the management of bird nesting habitats.*

*Action 2: Facilitate continued bird population estimates for birds inhabiting the CHSJS.*

*Action 3: Maintain and enhance predator control measures in bird nesting habitats.*

*Action 4: Promote public education of adverse effects of human interactions with nesting bird populations.*

*Action 5: Promote public education with regards to adverse effects of fishing line accumulation.*

EXPECTED BENEFITS: Protection of sensitive bird nesting and foraging habitats.

ASSOCIATED REGULATIONS: None.

## **EF2: LEVERAGE EXISTING RESOURCES TO SUPPORT SCIENTIFIC FISHERIES RESEARCH TO FACILITATE PROPER STEWARDSHIP OF FISHERIES RESOURCES IN THE CHSJS.**

### **BACKGROUND:**

The limited availability of fisheries data for the CHSJS Estuary precludes establishing quantitative targets for fisheries populations. However, there are specific actions that can be taken to facilitate the proper stewardship of fisheries resources in the CHSJS by leveraging existing resources and supporting scientific fisheries research. Currently, the Clearwater Marine Aquarium and the Florida Wildlife Research Institute have a presence in the area. The Clearwater Marine Aquarium conducts daily tours of the estuary and will deploy trawl nets to collect fish for education purposes. Data are collected with each tow, speciating and enumerating the catch. The Florida Wildlife Research Institute has a routine monitoring program for scallop recruitment in the northern portion of the St. Joseph Sound estuary and is currently sampling the nearshore waters around Anclote Key to estimate the recruitment populations of economically valuable fishery species that utilize the estuary as juvenile nursery grounds.

### **STRATEGY:**

*Action 1: Leverage existing fishery research efforts to provide a more quantitative estimate of the relative abundance of species over various habitat types within the study area.*

*Action 2: Promote public education to reduce anthropogenic stressors on fish habitat.*

*Action 3: Facilitate existing creel surveys to obtain accurate information on angler pressure.*

*Action 4: Support research into the utilization of the estuarine segments by the bay scallop.*

*Action 5: Initiate a Bay Scallop Search in the CHSJS to correspond with other Southwest Florida scallop search programs.*

*Action 5: Protect the current extent of seagrasses and shoreline habitat (i.e., fish habitat).*

**EXPECTED BENEFITS:** Maintain and enhance CHSJS fisheries resources.

**ASSOCIATED REGULATIONS:** None

### **EF3: PROMOTE PUBLIC EDUCATION CAMPAIGNS TO FACILITATE THE PROPER STEWARDSHIP OF MANATEE, SEA TURTLE, AND DOLPHIN HABITATS WITHIN THE ESTUARY.**

#### **BACKGROUND:**

While there are only limited data available for analysis, a characterization of the ecology of these species, natural and anthropogenic stressors, and management issues was provided in the State of the Resource Report (Janicki Environmental, 2011) to aid in the development of action plans for these species. Much of the existing information on marine mammals and sea turtles in the Clearwater Harbor-St. Joseph Sound system comes from research programs at the Florida Fish and Wildlife Conservation Commission (FWC), Mote Marine Laboratory, and the National Marine Fisheries Service (NMFS), though collaborative efforts between these and various other agencies have provided information as well. In Florida, state-wide programs exist to monitor and assess the status of marine mammal and sea turtle populations and to conduct research on the biology and ecology of these species. This information is useful for the management of these natural resources and can be applied to populations that use the estuarine and coastal habitats of Clearwater Harbor and St. Joseph Sound. Principal to the protection of these species is to protect critical habitats, and to educate the public regarding the potential negative consequences of human interaction with these animals. The specific actions for these charismatic megafauna are listed below.

#### **STRATEGY:**

*Action 1: Public education regarding the human interactions with these animals among the boating and fishing community will continue to be an important part of the management strategy for these species and should be emphasized as part of the CCMP.*

*Action 2: Facilitate future research into causes of sea turtle, dolphin and manatee strandings in the study area to document potential causes that may be influenced by anthropogenic activities.*

*Action 3: Protecting crucial habitats of sea turtle, dolphin and manatee within the estuaries.*

**EXPECTED BENEFITS:** Increased public participation and awareness of environmental issues.

**ASSOCIATED REGULATIONS:** None.

## **EF4: INVESTIGATE THE EFFICACY OF AN ANNUAL SCALLOP SEARCH PROGRAM IN THE CHSJS.**

### **BACKGROUND:**

The bay scallop, *Argopecten irradians*, population has declined dramatically in southwest Florida, so much so that harvesting scallops south to the Hernando/Pasco county line is now forbidden. Scallops are a valuable food source for both humans and wildlife (e.g., stone crabs), and increasing the local population would be a benefit to the estuarine system. Scallops provide water quality benefits by filtering water as they feed, and also serve as water quality sentinel's, as they are very sensitive to changes in water chemistry.

Florida Fish and Wildlife Conservation Commission's (FWC) Molluscan Fisheries Program has monitored the status of the bay scallop population in St. Joseph Sound since 1994 and has tracked recruitment by scallop spat since 1997. However, the FWC monitoring sites are all in the Anclote Anchorage near Anclote Key. No scallop data are available for middle and southern St. Joseph Sound, or Clearwater Harbor. With funding and resources limited, it would be difficult for FWC to expand their monitoring program to the extent necessary to obtain valid data for the entire CHSJS area.

Instituting a volunteer-staffed annual scallop inventory would present an opportunity for citizens to assist in a resource monitoring program for the bay scallop. The search would be modeled after the "Great Bay Scallop Search" that is held in Tampa Bay each year, led by Tampa Bay Watch and the Tampa Bay Estuary Program. Volunteer boaters and snorkelers scour the seagrass beds searching for live scallops hidden among the blades of seagrass. Data obtained would be provided to FWC for use in their studies. Additionally, a scallop search gives community volunteers an opportunity to learn about the estuary's natural resources.

### **STRATEGY:**

*Action 1: Ensure that initiation of a scallop search program will not be counterproductive to the efforts of FWRI and their scallop monitoring program.*

*Action 2: Identify potential lead entities for event coordination, logistics, and funding.*

*Action 3: Enlist scientific experts to select locations to sample and to develop sampling plan.*

*Action 4: Develop instructional material for volunteers.*

*Action 5: Develop methods and format for reporting results.*

**EXPECTED BENEFITS:** Track distribution and abundance of bay scallop in CHSJS.

**ASSOCIATED REGULATIONS:** None.

## SEDIMENT MANAGEMENT ACTION PLANS

Erosion is a physical process that, in nature, keeps stream channels dynamic and balanced. However, in a highly urbanized environment such as most of the CHSJS CCMP area, hydrologic conditions may cause excess erosion with subsequent adverse impacts to both freshwater and estuarine resources, as well as increased flooding potential. Although erosion management efforts have addressed individual water bodies in the CCMP area (Stevenson Creek, Curlew Creek and others), a holistic sediment management plan will prove beneficial for the watershed, the receiving waters, and associated natural resources.

Sediment transport, or erosion, is caused by the movement of soil and rock particles by water. Factors that affect the rate of erosion include channel slope, shape, and alignment, channel bed particle characteristics (density, grain size, organic content, etc.), and relative size of the contributing drainage basin. Some of these relationships are illustrated in Figure 11. Alterations to natural surface water features, known as hydromodification, are usually conducted for the purpose of moving stormwater runoff off the landscape as quickly as feasible. This is usually accomplished through any of the following actions:

- Channelizing and straightening naturally meandering streams
- Filling stream floodplains
- Creating regular geometric channel cross sections and installing control structures
- Clearing vegetation from the channel
- Hardening and smoothing the channel with concrete, rip rap, gabions, etc.
- Replacing open channel streams with culverts

The above alterations are often accompanied by changes to the surrounding drainage area that promotes higher rates of stormwater runoff. These changes can include loss of natural vegetation including tree canopy, loss of on-site depressional storage, and increases in pavement and other impervious surfaces.

Without proper stormwater management, a surface water system that has been subjected to the above alterations will subsequently generate higher water flow rates and velocities during runoff events. Because the rate of erosion is intimately tied to flow velocity, higher flows result in higher rates of sediment transport.

Many of the surface water features in the CHSJS CCMP area have undergone the transformation from natural coastal stream systems to urban drainage networks. Additionally, the CCMP area contains areas with significant relief such as the Clearwater and Belleair bluffs. These features contribute to high rates of erosion and subsequent deposition in the watershed and estuary. Adverse impacts that may result from excess sedimentation include:

- Causing property damage by undermining structures (foundations, bridge pilings, etc.) in the watershed
- Destruction of desirable habitat in stream channels
- Increasing flooding potential by the reduction in channel flow capacity through deposition

- Impacting natural resources in the estuary such as seagrass beds and benthic communities through physical smothering or reduction in water clarity
- Reducing circulation and nearshore flushing in the estuary and downstream channel reaches
- Spreading contaminants
- Creating hazards to navigation
- Degrading aesthetic values through accumulation of muck

## **SM1: PROMOTE BEST MANAGEMENT MAINTENANCE OF STREAM AND DITCH CHANNELS.**

### **BACKGROUND:**

One of the natural functions of streams is to transport sediment downstream. Under unaltered conditions stormwater flows to the stream follow seasonal patterns and the movement of sediment is balanced by the periodic flushing action after rain storms. However in altered systems such as urban streams or streams that have been channelized for drainage purposes the disturbed banks are prime habitat for aggressive invasive vegetation. These nuisance plants grow rapidly and can clog channels, and are also a source of excessive detritus when the plants die or shed leaves and flowers. During the dry season, there is little or no flow in these channels because the urban landscape does not promote natural levels of base flow when it does not rain for extended periods. This allows the vegetative material to decay and form a thick organic muck layer in the channel. At the beginning of the rainy season this accumulated material that is rich in excess nutrients and biochemical oxygen demand (BOD) is suddenly flushed downstream in large quantities and can have detrimental effects in receiving waters.

Local government maintenance crews routinely perform maintenance dredging in stream and ditch channels by hand or machine. However, the maintenance schedule is often fairly random or in response to a flooding complaint. By coordinating the dredging schedule on a seasonal basis, much of the accumulated organic material could be removed from the channels prior to its delivery downstream.

### **STRATEGY:**

*Action 1: Identify stream and ditch reaches most susceptible to organic sediment accumulation. These areas include channels with banks overgrown with nuisance vegetation, or with overhanging trees that drop leaves and branches. Also, ditches in residential neighborhoods may be used as disposal areas for yard waste. These areas would be mapped and geo-referenced to allow easy location by work crews.*

*Action 2: Arrange for seasonal mobilization. Schedule work crew availability and equipment readiness to allow a concentrated effort during the later part of the dry season, in April, May, and early June. This would result in dredging the channels when they have the most organic sediment.*

**EXPECTED BENEFITS:** The more efficient removal of organic sediment would result in reduced nutrient and BOD loading to receiving waters.

**ASSOCIATED REGULATIONS:** No extra regulatory needs are anticipated.

## **SM2: FACILITATE DEVELOPMENT AND IMPLEMENTATION OF WATERSHED MANAGEMENT PLANS IN THE CCMP AREA.**

### **BACKGROUND:**

There are currently watershed management or restoration plans for Stevens Creek and Cedar Creek in the CHSJS area. These plans include recommended actions to address issues in the basins including sediment management issues. Some of the recommended actions have been completed as part of a holistic approach to managing the watershed's resources. In contrast, Bee Branch, Curlew Creek, and McKay Creek do not have watershed plans. These water bodies are all subject to significant erosion or sedimentation issues and each has capital projects completed or scheduled to address these issues. Isolated projects include construction of an in-line sediment sump in McKay Creek, channel stabilization efforts in Bee Branch, and various channel improvements in Curlew Creek. However if a comprehensive plan were developed the sediment issues could be addressed in context of an overall protection and restoration approach.

### **STRATEGY:**

*Action 1: Bee Branch, Curlew Creek, and McKay Creek are the highest priority water bodies with respect to addressing sediment management. McKay Creek has a watershed management plan scheduled for development starting in 2012. A timeline for development of the other two streams should be established.*

*Action 2: Identify budget and funding sources for implementing plans and recommended capital projects. Funding should include continuing maintenance, as many worthy projects receive funding for construction but not maintenance over the years.*

*Action 3: Make sure that sediment management issues get adequate attention in the plan. Water quality, flooding, and habitat are usually the top priorities in watershed management plans, however sediment can affect all three issues and should be a focus of recommendations.*

**EXPECTED BENEFITS:** Plan development would identify problem areas in a watershed and focus management attention on correcting the problems. Benefits could include reduced erosion and the threat of property damage, restoration of habitats that may be damaged by excess sediment deposition, and improved water quality.

**ASSOCIATED REGULATIONS:** Each project to be implemented would go through the regulatory process during the design phase after the plan was completed. In the case of multiple projects being recommended, it may be desirable to obtain a Conceptual Permit to facilitate construction permitting after design.

## DREDGING AND DREDGE MATERIAL ACTION PLANS

Shoreline erosion and a low beach profile caused by storms, wave action, and currents are a serious concern along Pinellas County barrier island beaches. Pinellas County, like many Florida counties, employs a federal shore protection project (SPP) to protect shorelines by placing fill material along the shorelines as beach nourishment and re-nourishment programs. Beach quality fill has historically been obtained from inlet borrow areas and the Egmont Channel Shoal for nourishment of Pinellas County beaches. Nine offshore borrow areas have been identified for future use to alleviate the transport expense of material from Egmont Channel. Restoration projects go further than simple sand placement and may include rebuilding dunes, planting vegetation, and other enhancements to approximate the natural ecosystem (Pinellas County 2009). Re-nourishment projects in the CCMP include Honeymoon Island and Sand Key barrier islands, as well as several sandy beaches. Pinellas County beaches were awarded ASBPA's Best Restored Beach in America award in 2006 for achieving this goal (Elko 2005).

The Pinellas County SPP is administered by the Jacksonville District U.S. Army Corps of Engineers (USACE). The typical construction cost sharing for the project is 60 percent federal (Army Corps), 20 percent state (FDEP) and 20 percent local (Pinellas County tourist development funds). With 825 miles of sandy shoreline, Florida has the largest number of federally funded beach re-nourishment projects. The Pinellas County SPPs are permitted by FDEP after rigorous analysis of the environmental effects of each project with regard to surrounding islands, seagrasses, sea turtles, and nearshore hard bottom or other habitats. In the past, the USEPA (1996) had concluded that impacts on valuable hard bottom and soft bottom benthic communities in borrow areas were not effectively addressed by some Florida dredge projects. Pinellas County is required to prevent and/or mitigate for these potential adverse impacts.

## **DM1: CONTINUED BEST MANAGEMENT PRACTICES (BMPs) ASSOCIATED WITH MAINTENANCE DREDGING AND MATERIALS MANAGEMENT.**

Dredging and spoil management BMPs were developed by FDEP (2008) to address avoidance of dredging impacts to hard bottom habitats in the Florida Keys. A total of 27 separate BMPs were developed that address the need for adequate baseline information to evaluate potential impacts prior to activities, mitigation for potential impacts, buffer zones and travel corridors to avoid impacts, water quality controls, fish and wildlife protection (e.g., sea turtles, manatees, seagrasses), and monitoring. All the BMPs appear applicable to Pinellas County and should be reviewed for appropriateness and possible inclusion in a similar document for the County. Disposal of dredged materials that are inappropriate for beach nourishment is evaluated on a case by case basis and requires approval by the permitting process, including approval the EPA, USACE, FDEP, SWFWMD, and the County. A regional sediment management strategy that uses beach quality sand from upland dredged material management areas and the maintenance dredging of navigation projects should continue to be incorporated into the maintenance of the beach restoration projects.

### STRATEGY

*Action 1: Develop a dredged material management BMP document to address potential impacts of dredging on hard bottom and other habitats.*

*Action 2: Develop baseline mapping data for hard bottom habitats and other habitats of interest for use in evaluating future dredging activities.*

*Action 3: Develop a long-term, coordinated dredging and dredged materials management plan for the CCMP area to address ongoing and future renourishment projects.*

*Action 4: Identify additional areas for beneficial use of dredged materials.*

**EXPECTED BENEFITS:** Planning will identify bay habitats to be protected as well as a means of minimizing impacts of dredging on bay habitats. For example, a \$35 million project to widen eroded beaches between Clearwater Pass and North Redington Beach was planned for 2011, but issues over an offshore reef stalled the project until next year, leaving millions of dollars for the project at risk of re-appropriation. Mapping and planning would reduce the uncertainty of many projects.

**ASSOCIATED REGULATIONS:** Continue to obtain all permits for beach renourishment and maintenance.

## PUBLIC EDUCATION ACTION PLANS

Our nation's future relies on a well-educated public to be stewards of the environment that sustains us, our families and communities, and future generations. It is environmental education which can best help us as individuals make the complex conceptual connections between economic prosperity, benefits to society, environmental health, and our own well being. Ultimately, the collective wisdom of our citizens, gained through education, will be the most compelling and most successful strategy for environmental management (National Environmental Education Advisory Council 2000). However, studies consistently reveal that the U.S. public suffers from an environmental literacy gap that appears to be increasing rather than decreasing. For example, two-thirds of the public fail even a basic environmental quiz (NEETF 2001) and 88 percent of the public fail a basic energy quiz (NEETF 2002).

To address these issues at the local level, Pinellas County has developed an extensive environmental education program to inform residents about the importance of environmental stewardship. The County hosts partnerships with non-profit citizen organizations, educational institutions, and local school districts among other entities. For example, Pinellas County partners with the School District to promote environmental stewardship to local students. Enterprise Village provides opportunities for students to learn about the importance of water conservation and social responsibility for resources, while County employees may attend classes to lecture students about environmental issues that can affect them. The Learning in Florida's Environment (LIFE) Honeymoon Island State Park Program is a partnership between the Pinellas County and Dunedin Highland Middle School in Pinellas County. This LIFE Program is the subject of an 18 month project on coastal environmental education funded by the Gulf of Mexico Program, and the Gulf of Mexico Alliance, a regional initiative to protect the Gulf of Mexico. The program targets eighth grade students for field experiences with FDEP staff, volunteers and participating teachers to illustrate important concepts and principles in Life and Environmental Science. The County also has a partnership with the non-profit organization Friends of the Brooker Creek Preserve, which supports the Preserve through volunteer programs, fundraising, and education. Pinellas County also works extensively with the non-profit Keep Pinellas Beautiful in hosting beach cleanups and other volunteer based environmental activities. Clearwater Marine Aquarium also has numerous educational programs that promote environmental awareness.

Pinellas County also educates residents using signs and kiosks in many of its parks and environmental lands to inform residents of non-native invasive plant and animal species, seagrasses, mangroves, sand dunes and other habitats. County-operated boat ramps have information kiosks describing manatee protection, educational signs and collection bins for fishing line.

**PE1: CONTINUE TO PROMOTE TO EDUCATE THE PUBLIC ON ENVIRONMENTAL STEWARDSHIP THROUGH COMMUNITY OUTREACH AND EDUCATION, PARTNERSHIPS, AND THE USE OF PINELLAS COUNTY WATER ATLAS.**

**BACKGROUND:**

Pinellas County has been proactive in promoting environmental stewardship as evidenced by the numerous successful programs implemented in recent years. Several Pinellas County departments develop brochures and videos available to the public through County offices, special events, civic meetings, and on Pinellas County's television station, PCC-TV. In 2007, Pinellas County began the development of a Water Atlas, in conjunction with the University of South Florida. The Water Atlas compiles data from several data sources, including SWFWMD, FDEP, and USGS, into one location for interested parties to access it as necessary. The site also includes teacher education resources, as well as information on climate change and restoration projects. While the Water Atlas is one mechanism to effectively reach out to citizens using electronic media, other opportunities should be investigated as well. Below is a list of recommended actions the County can take as funding is available to promote environmental awareness within the CHSJS.

**STRATEGY:**

- Action 1: Promote the Pinellas County Water Atlas as a means of providing resources to teachers, advocates, and scientists.*
- Action 2: Encourage County participation in Florida Coastal Cleanup program through local schools and businesses. Develop brochures that educate the public about water quality, boating, non-native invasive species, and habitat loss in the CCMP area.*
- Action 3: Develop a SoundWatch program as a means of including the community and individuals to participate in observing, recording, and compiling incidents of violations that affect seagrasses, mangroves, sand dunes, and other sensitive habitats, and reporting incidents to local enforcement agencies. Reports contain observations of vessel incidents as well as overall activity summaries.*
- Action 4: Consider issuance of a CHSJS license plate similar to the Tampa Bay Estuary Program plate to enhance recognition of the CHSJS as a unique area worthy of special protection.*
- Action 5: Investigate fundraising and soliciting sponsorship opportunities as potential additional sources of funding for the promotion of environmental awareness within the CHSJS.*

**EXPECTED BENEFITS:** As a result of expanding, improving, and introducing education programs, environmental stewardship is expected to improve and an educated public will be more willing to assist in the preservation and restoration of natural habitats.

**ASSOCIATED REGULATIONS:** None anticipated.

## **PE2: ESTABLISH AN ADOPT-A-STREAM PROGRAM.**

### **BACKGROUND:**

The purpose of this Action Plan is to encourage the establishment of an Adopt-A-Stream program for the CHSJS CCMP area. Freshwater streams have long been recognized as an important element of the hydrologic system in both rural and urban settings. Improving ecosystem function of streams can provide numerous benefits including:

- Providing appropriate freshwater inflows and sediment loads to receiving waters
- Reducing flood damage to property
- Improving water quality
- Providing aquatic, benthic, and floodplain habitat for fish, birds, and other wildlife
- Increasing recreational and aesthetic opportunities
- Increasing property values

Governmental agencies have traditionally been the leaders charged with protecting and managing our streams, as with other natural resources. This is not likely to change. However, with the continuing and growing constraints on the level of effort that can be allocated to stream management by public entities, volunteer involvement is increasingly important as a means of ensuring that our streams are protected. Additional support could include non-profit organizations like Keep Pinellas Beautiful (KPB) who partner with Pinellas County on various county-wide cleanup events with volunteers, students, and residents.

One approach to increasing public involvement is to institute an Adopt-A-Stream program, which is an excellent public outreach tool to involve citizens of all ages and abilities. These volunteer programs encourage participants, under the guidance and oversight of a leading entity, to "adopt" a stream or creek to conduct studies, clean ups, monitoring and data collection, and other actions. Through these activities, the adopting group becomes in a sense the caretaker of that stream. Potential governmental participants that would provide guidance and support for volunteers in the CHSJS CCMP area include Pinellas County, municipalities, SWFWMD, TBEP, Extension Service, and Florida Yards & Neighborhoods. These groups would designate individuals to participate and form a technical organization and leadership committee.

Adopt-A-Stream programs can be tailored to a specific water body, to allow participation at any level from a group or organization. Setting a program of volunteer activities is flexible and can be as unique as the streams themselves. Adopting a stream is appropriate for a wide range of volunteer groups including but not limited to:

- Neighborhood organizations
- Civic associations
- Boy Scouts, Girl Scouts, and other youth organizations
- Church groups
- Schools and universities
- Businesses

Adopt-A-Stream programs can be time-consuming and demanding but should begin with a simple survey using community volunteers with lead entity organization and oversight for data collection.

Levels of involvement could range from occasional visual surveys and litter pick-ups to monthly water quality testing to one-time habitat restoration projects. The objective of the program is not only to improve the quality of the stream but to increase local interest in maintaining and improving the water quality and aesthetics of all local waterbodies. Potential volunteer activities might include:

- Trash and litter cleanups
- Water quality, flow, and sediment monitoring
- Habitat and wildlife surveys
- Benthic invertebrate sampling
- Stream habitat restoration and erosion control projects
- Invasive and nuisance plant removal
- Newsletter and publicize events publication
- Informational material development and distribution (e.g., Stream Report Card)
- Stream walk, workshop, and other outreach activity sponsorship.
- Storm drain markings and related pollution prevention educational materials

The effectiveness of Adopt-A-Stream programs can be enhanced by public-private partnerships. Through cooperation between the government leads and businesses, local utilities, or other public agencies, modest program funding can be leveraged to accomplish significant results that are beneficial to all involved, as well as the general public.

STRATEGY:

*Action 1: Identify lead entity and cooperating governmental groups.*

*Action 2: Identify funding source since any oversight will require time and expense of lead entity.*

*Action 3: Develop goals and objectives for program.*

*Action 4: Establish organization structure, schedule, and program content.*

*Action 5: Obtain commitments for sustained funding and logistical support.*

*Action 6: Identify stream reaches that are appropriate for/in need of adoption.*

*Action 7: Identify and contact likely participant volunteer groups.*

*Action 8: Identify specific activities for volunteers. Activities can be different for each stream and group.*

*Action 9: Develop instructions and protocol, especially safety procedures, for volunteer activities.*

EXPECTED BENEFITS: Increased knowledge base of local streams based on volunteer activities and data collection. Enhanced public awareness through educational outreach programs.

ASSOCIATED REGULATIONS: None anticipated

## **PE3: QUANTIFY THE ECONOMIC VALUE OF CHSJS NATURAL RESOURCES.**

### **BACKGROUND:**

The CHSJS has many valuable natural resources including; extensive seagrass meadows, mangrove forests, abundant recreational fisheries, inland streams and wetlands, critical nesting bird habitats, a scenic open water estuary. These resources, in terms of their ecosystem services and replacement costs, are rarely considered in cost/ benefit analyses of public use projects. The purpose of this Action Plan is to emphasize the need to be able to express the value of the CHSJS natural resources in monetary terms that can be conveyed to the community and the local and state legislative delegations such that more appropriate cost/benefit considerations can be applied to decision making processes regarding the alteration or preservation of these precious natural resources.

In economic terms, natural resources have two types of value. The first type of value in the ecosystem services that the resource provides. For example, protecting stream floodplains provides flood protection for nearby properties and provides valuable foraging habitat for migratory birds. If the floodplains were filled and developed, additional costs would be incurred both by the local government to provide enhanced stormwater management facilities, by land owners who may have to purchase flood insurance or to protect their property from flood waters and in the reduced ecological function as a result of reduced habitat availability. Another example is protecting seagrasses. Seagrass meadows provide habitat, refuge and foraging areas for numerous species, including fishes of recreational and commercial importance. Seagrasses are prime habitat targets for recreational fishing interests that provide significant contributions to the local economy. The multiple ecosystem services provided by seagrass beds is one of the primary reasons that seagrasses are keystone considerations for natural resource management plans including the CHSJS CCMP.

The second type of natural resource value is defined by its replacement cost. Habitat restoration and creation projects are not uncommon, expensive, and only partially successful in attempting to replace or enhance lost ecological functions caused by physical or hydrological alteration to natural systems. While this type of value is more easily quantified, that quantification must be based on an accurate assessment of the natural resource it is attempting to replace.

Environmental economics is a relatively new discipline and there is a relatively small body of knowledge to draw upon. Quantifying the value of natural resources provides a valuable tool in helping to focus decision-makers' efforts and to allocate appropriate levels of effort to the protection and management of various resources. Although there are numerous examples of valuing natural resources, the unique characteristics of Florida's, and the CHSJS in particular, ecological features limit the application of environmental economic assumptions made in other geographic regions. One local effort was completed for the Charlotte Harbor Estuary Program (CHNEP: Johns et al., 1998) which is regionally similar in terms of ecological and demographic features. The approach used for that work is used as a basis for this Action Plan. Two compendiums of other examples of Florida-based natural resource valuation include Sea Grant (20002) and NOAA (1999).

Several activities and amenities that are dependent on natural resources were identified in the CHNEP study. Those that are applicable to the CHSJS CCMP area include:

- Tourism
- Recreational fishing

- Commercial fishing
- Swimming, boating, and other water sports
- Nature observation
- Non-use values for wetlands (e.g. increased property value)
- Flood control

Johns et al. (1998) estimated the total economic value (“...the sum of producer surplus and consumer surplus received from the production of goods and services provided by the natural resources”) of the natural resources of Charlotte Harbor and its watershed. The above terms were defined by Johns et al. (1998) as follows:

- Total economic value – “...the maximum amount of money that society, or a subset of society, would be willing to pay to use (and/or preserve) the resource.”
- Producer surplus – “...total revenue minus production costs [labor and capital costs] and the value of the natural resources when placed in their best alternative service.”
- Consumer surplus – “... the maximum amount of money a consumer would be willing to pay for the benefit above the price actually paid.” This represents the value, in monetary terms, of the human well-being associated with the current use of the resource.

The methods used to estimate these values are very data-intensive and require numerous assumptions. Johns et al. (1998) detail data sources and how the information was used, which allows the methodology to be replicated for the CHSJS CCMP area. Information that would be required includes but is not limited to the following:

- Local and state resident population
- Number of tourist visiting the area and length of stay
- Number of resident and tourist days spent in various recreational activities (visiting beach, fishing, boating, hiking, bird watching, etc.)
- Amount of money that households (local and state-wide) would be willing to pay to preserve a resource
- Income within the CHSJS CCMP area for a variety of industries including tourism (hotels, restaurants and bars, gas stations, fishing supply stores, fishing guides, gift shops, amusement, etc.) and commercial fishing (finfish, shellfish)
- Personal income and employment in the tourism and recreation industry in the CHSJS CCMP area
- Amount of money spent daily by tourists in various activities

Some of the sources of information used by Johns et al. (1998) included:

- Florida Department of Environmental Protection (FDEP)
- Florida Fish and Wildlife Conservation Commission (FWC)
- National Oceanic and Atmospheric Administration (NOAA)
- University of Florida Bureau of Economic and Business Research
- Florida Tourism Industry Marketing Corporation
- Citations from various journals (Water Resources Research, Journal of Leisure Research, Journal of Environmental Economics and Management, etc.)

- Other environmental economic studies

The second relevant resource value, replacement cost, is more straightforward but by no means simplistic. Two examples are the costs to construct a wetland habitat or restore a stream channel. Major costs involved with these activities would include scientific investigation, engineering design, land acquisition, construction, and operation and maintenance. This type of work is commonly accomplished for mitigation projects (e.g., urban development, mining, etc.) or habitat enhancement (e.g. SWFWMD SWIM work). Of the potential costs above, land acquisition is often by far the most expensive item. Thus, replacement costs of this type can vary significantly depending on site ownership (public or private).

It should be noted that the restoration of other resources (e.g. fisheries) can be much more complicated. The steps needed to restore a depleted fish species may require significant political activity (limiting season, setting limits, enforcement, etc.) as well as habitat restoration or water quality improvement. The section below presents a step-wise approach to estimating the value of CHSJS CCMP area natural resources.

STRATEGY: To develop estimates of total economic value and replacement costs for CHSJS natural resources

*Action 1: Establish a qualified team of economists, scientists, and resource managers.*

*Action 2: Define the natural resources relevant for valuation.*

*Action 3: Determine the appropriate methodology to use for estimating resource values.*

*Action 4: Obtain required information.*

*Action 5: Conduct assessment.*

*Action 6: Synthesize results into a brief summary document that can be distributed to decision-makers and present the significance of the findings.*

*Action 7: Promote the findings in newsletters and electronic media outlets to raise community awareness.*

EXPECTED BENEFITS: Increased appreciation of the value of CHSJS CCMP natural resources.  
Provides a tool to help focus resource management decisions.

ASSOCIATED REGULATIONS: None.

## PROJECTS AND THE ACTION PLAN DATABASE

Part of the development of the CCMP involved collecting information on past, current and future projects directed toward a net ecosystem benefit within the CHSJS. These projects include: water quality improvement; sediment control, habitat restoration, point and non-point source load reductions and public education. A database of these projects has been compiled to summarize planned or already-completed actions. This database is designed to be a central repository of information that can be used to quickly and efficiently understand where and when projects have been completed in the CHSJS. The database is designed to be routinely updated as funding for projects is secured and projects are initiated and completed. In this sense the database is a living documentation of projects that will serve the CCMP well as a compilation of projects throughout the CCMP area.

A total of 64 projects are listed in the database. Many of the listed projects have been cooperatively funded by the Southwest Florida Water Management District (SWFWMD) and local municipalities or Pinellas County. Projects addressing nonpoint source water quality and pollutant loading are currently best represented in the database with 26 individual projects listed. Pinellas County was lead entity for 16 of the projects, the cities of Clearwater, Dunedin, and Tarpon Springs each had two or three, and SWFWMD was the lead entity on two projects. Several of the nonpoint source projects had water quality, sediment management, and habitat restoration components. Typical designs include a stormwater treatment pond for pollutant (nutrients, suspended solids, biochemical oxygen demand) load reduction with integral created wetlands. Channel restoration to reduce erosion was also common. Some of the projects were limited in scale with the intent of serving only a small neighborhood but some projects included regional benefits. Larger nonpoint source projects (with lead entity listed) included:

- Dunedin Isles Stormwater Improvements (Pinellas County) – A new stormwater treatment pond was constructed and an existing pond enlarged adjacent to the Dunedin Country Club. A stormwater filtration unit was also installed.
- Glen Oaks (City of Clearwater) – This was a recommended project of the Stevenson Creek Watershed Management Plan (City of Clearwater, 2001). The regional stormwater facility includes five stormwater management areas for water quality treatment and flood protection and over four acres of created wetlands.
- Lake Bellevue Expansion (City of Clearwater) - This project was also a recommendation of the Stevenson Creek Watershed Management Plan. It will enhance stormwater treatment by expanding the storage and treatment capacity of an existing lake.

Nine projects were developed to provide local habitat restoration. Pinellas County was lead entity for four projects, City of Clearwater for three, and the Cities of Dunedin and Tarpon Springs had one each. The habitat benefits of some projects were associated with the creation of stormwater treatment ponds with wetlands. Other projects were focused solely on habitat improvement including:

- Hammock Park Restoration (Pinellas County) – Part of Hammock Park in the City of Dunedin will be restored and re-hydrated by re-routing stormwater conveyances. Channel restoration will reduce erosion and downstream sediment loading.

- Shoreline Restoration (City of Tarpon Springs) – This project will install rip rap along shorelines in Whitcomb and Kreamer Bayous. The rip rap will provide substrate for vegetation and reduce erosion potential.
- Bayview Drive Shoreline Restoration (Pinellas County) – Approximately 2,800 linear feet of undeveloped shoreline will be restored with rip rap and vegetation.

Wastewater treatment projects included 13 improvements to the City of Clearwater's Marshall St. Advanced Wastewater Treatment Facility. A variety of plant and site upgrades combine for a total budget of approximately \$20 million.

Sanitary sewer projects included three extensions of existing sewer service lines. The largest project was in the City of Tarpon Springs and included removing 126 septic tanks and providing sanitary sewer service.

Only nonpoint source treatment has more projects than those for reclaimed water. The 19 reclaimed water projects had a combined budget of about \$70 million. The City of Clearwater was the lead entity for the majority of the projects (15). Pinellas County and SWFWMD also have projects.

Sediment management is represented by one project – maintenance dredging of the mouth of the Anclote River. The City of Tarpon Springs is the lead local entity. It should be noted that several other projects include sediment management considerations such as the shoreline restoration, habitat, and nonpoint source treatment projects.

The one project for public education, the Pinellas County Water Atlas, was led by Pinellas County. The Water Atlas is a tool for the general public as well as environmental professionals to quickly acquire information about the County's surface water resources.

## DATA AND INFORMATION GAPS

During the development of the CHSJS CCMP a significant amount of data and information was identified, obtained, and synthesized. The data proved invaluable for assessing conditions in the study area and helping to develop a management strategy for local natural resources. However, not all searches for relevant data and information were successful. This chapter discusses data and information gaps, and lists some of the items that have potential usefulness in the management of the CHSJS system.

Data and information gaps can be generally classified in three categories. The first includes information that does not exist and cannot be obtained, for example a record of nutrient concentrations in the estuary that extends back to the 1950s. There is no way to close this type of data gap. The second category includes information for which there is no current effort being made to collect the information. Most natural resource managers have a “wish list” of data that are not currently being collected but would be valuable to have. However, constraints - budgetary chief among them – limit the amount of monitoring that a program can support. The third type of information gap is created when the information does exist but is not accessible. Examples include schedules of stormwater management system maintenance that are not compiled or recorded in a central location. This type of gap is the easiest to close but requires that someone knows where the information is and has the resources to organize it in a way that becomes accessible. The action plan database facilitates closing this type of information gap.

From the management perspective, the value of information is based on the ability to make decisions from it. Because of limitations on resources available to obtain and analyze data, managers must choose which data are most useful to effectively steward the natural resources which they are managing. The following paragraphs include data and information gaps identified in the development of the CCMP that would facilitate effective management of its natural resources.

- ELECTRONIC DATABASE LISTING SPATIAL LOCATION OF EXISTING STORMWATER PIPES AND NODES THROUGHOUT THE CCMP.

The National Pollution Discharge Elimination System (NPDES) governs permitting requirements for the distribution and treatment of stormwater runoff. Most local governments have engineering drawings of stormwater conveyances within their jurisdiction; however, current electronic information on these drainage networks is limited. It would be beneficial to have a comprehensive coverage of stormwater pipes, vaults, ponds and nodes accessible as part of the CCMP.

- ELECTRONIC DATABASE OF MAINTENANCE ACTIVITIES ON STORMWATER MANAGEMENT FACILITIES.

County and municipal maintenance crews constantly maintain stormwater ditches and pipes – cutting back vegetation, clearing accumulated sediment, cleaning inlets of debris and many other activities. Keeping a consolidated database of these actions would help managers identify problem areas and subsequently target remedial actions to reduce the need for frequent maintenance. For example, one piece of information that would prove very useful is data on the volume (cubic feet) of sediment that is removed from ditch and creek channels during a given maintenance session.

➤ CURRENT COUNTY-WIDE DRAINAGE MASTER PLAN AND DIGITAL STORMWATER FACILITY ATLAS

The County's stormwater management plan is dated and needs more detailed and GIS-based maps of drainage areas and stormwater management facilities. This information is very important for water quality and quantity studies, as well as capital improvement planning.

➤ FLOW DATA FOR MCKAY CREEK

No stream flow (discharge) data for McKay Creek were identified. Streamflow information is critical information for the design of water quality and quantity structures, wetlands, or other water management facilities. A stream gage should be installed to collect flow data for use in the McKay Creek Watershed Management Plan study scheduled for 2012. The channel invert elevation is above five feet NGVD, and thus out of the normal tide range at 8<sup>th</sup> Avenue so that is a potential location for the gage. While some instantaneous flow measurements exist as baseline information, more rigorous discharge data would be helpful.

➤ QUANTIFIED ESTIMATE OF THE EFFECT OF IMPLEMENTATION OF THE COUNTY'S FERTILIZER ORDINANCE ON NUTRIENT LOADINGS TO THE ESTUARY.

The summer of 2011 (i.e., June through September), was the first season when a new local ordinance prohibiting the sale of any fertilizer containing nitrogen or phosphorus in Pinellas County. Additionally, fertilizer sold between October and May shall contain at least 50% slow release nitrogen and shall not contain phosphorus. A quantification of nutrient load reduction to the CHSJS due to the fertilizer ban would be a valuable addition to the CCMP and to the Action Plan Database as potential credit against TMDL allocations.

➤ SCALLOP DATA FOR THE SOUTHERN PORTION OF THE CCMP

No scallop data exist for nearshore areas south of Anclote Anchorage. The current FWC scallop monitoring program could be extended south from Anclote Anchorage to include more or all of the CCMP area. Also, initiating a volunteer-staffed scallop search could provide valuable information.

➤ FISHERIES DATA

Very limited fisheries data exist for CHSJS. The CHSJS is a very popular fishing area and near the large Pinellas urban center which puts high pressure on the resource. The current FWC FIM fisheries monitoring program could be expanded to include the southern portions of the CHSJS and provide valuable information regarding fish abundance and distribution. Consideration should be given to coordination with Clearwater Marine Aquarium to leverage current resources.

➤ OYSTER ABUNDANCE AND DISTRIBUTION DATA

Oyster bars are known to exist in St. Joseph Sound and are a valuable resource, including as food for shore birds (oystercatcher and others) but little information exists on existing or historical oyster beds within the CCMP. An annual or biannual oyster survey program should be initiated to quantify the distribution and abundance of oysters in the CHSJS estuaries.

➤ INVENTORY OF HARD BOTTOM HABITATS

The CHSJS estuary is known to contain some hard bottom habitat. This habitat adds diversity to the estuary and serves a unique role by providing structure, relief and habitat for many estuarine species. However, the extent of hard bottom in the CHSJS is not well documented. Recently acquired LIDAR data collected by SWFWMD may be adequate to assess the areal extent of hard bottom habitat within the CHSJS for future study and protection.

➤ COORDINATION WITH PASCO COUNTY REGARDING ANCLOTE RIVER ISSUES

Most of the Anclote River is in Pasco County, while the mouth of the river is in Pinellas County. The Anclote River watershed in Pasco County is an area that has experienced significant urbanization during the past 20 years, and land use activities that affect water quality and quantity in the upper river have a direct impact on downstream river reaches and the St. Joseph Sound estuary. Given that the Anclote River has an MFL established and will be subject to future regulatory criteria, information sharing between Pinellas and Pasco Counties will be an important component of effective management strategies for both entities. A mechanism for frequent and meaningful communication between the two jurisdictions should be established so that a framework is in place to address these natural resource management issues as they arise.

## IMPLEMENTATION AND MONITORING

The successful implementation of the action plans is a necessary element of meeting the specific goals for the protection, enhancement, and restoration of the CHSJS area's natural resources that include seagrasses, wetland and upland habitats, fish and wildlife, and water and sediment quality. The action plans detail the Actions necessary to achieve the goals and objectives of the CCMP. However, implementation will require the coordination and cooperation of several municipal governments, and local citizens groups. This chapter describes the implementation process and the County's role in CCMP implementation.

Although specific activities are detailed in the action plans, responsible entities should remain flexible in their approach to putting the action plans into practice, as opportunities present themselves. The estuarine resources of the CCMP appear to be, by in large, stable and healthy despite significant alterations to the watershed. Therefore, a protection strategy is generally employed within the estuary to maintain recent water quality conditions when the estuarine waters have been meeting their designated uses and providing adequate environment for the health and success of estuarine faunal assemblages. This allows local resource managers some flexibility in how to address localized issues within the estuary as well as more pervasive issues related to natural resource protection and restoration within the watershed. Restoration activities in the watershed will have benefits both within the localized area and in downstream estuarine waters. However, it is the coordination of these activities that will lead to the most cost effective, efficient and productive net benefit to the CHSJS and this is the role of the CCMP.

Every effort should be taken to ensure that as individual watershed management plans (e.g., the City of Clearwater's Stevenson Creek WMP and the upcoming County McKay Creek WMP) and site-specific restoration plans (e.g., the City of Dunedin's Cedar Creek Restoration Plan), and updates to existing management plans for public lands (e.g., Pinellas County Aquatic Preserve and Anclote Key Preserve State Park Management Plans), recognize the CHSJS CCMP goals and objectives and work within the framework established by the CCMP to integrate individual actions within the CHSJS. Additionally, similar to plans such as SWFWMD's Comprehensive Watershed Management Plan (CWMP) for the Pinellas-Anclote River basin and County and municipal comprehensive plans, the CHSJS CCMP should be recognized as an effective framework from which these plans can address issues relevant to the CHSJS. By ensuring that the goals of all these management efforts are compatible, a synergy can be created to effectively approach future natural resource management challenges.

Integral to implementation of the CCMP is approval from the Pinellas County Board of County Commissioners (BOCC). In approving the CCMP, the BOCC is accepting the goals and objectives of the CCMP and agreeing to a framework for complete specific management actions, as resources allow. After BOCC approval, participating stakeholders should present the CCMP to their respective boards and decision-makers for ratification. Although non-binding, the agreement will signify a willingness to local municipalities to participate in the CCMP process.

Upon approval by participating entities, a group of County and stakeholder representatives will be formed to guide and oversee action plan implementation, and will focus on the realization of the CCMP goals. The CCMP team members will also serve as liaisons for their respective decision-makers and will provide periodic updates of action plan status, as well as encourage continued

participation in the program. The CCMP team will also be responsible for monitoring the success or failure of the action plans, as discussed below.

#### MONITORING AND REPORTING STATUS OF MEETING CCMP GOALS

- Monitor progress in implementing action plans and achieving goals for the CHSJS
- Revise action plans and goals as necessary as conditions change
- Prepare periodic (annual or otherwise) progress report for stakeholders and the public

#### ASSIST IN ACTION PLAN IMPLEMENTATION

- Seek timely implementation of priority actions
- Pursue grants and other funding sources
- Direct or coordinate technical investigations and other efforts to assist implementation
- Provide support to other resource management groups
- Assist in conflict resolution if mediation is needed

#### PUBLIC OUTREACH AND EDUCATION

- Encourage community outreach and involvement activities, including educational opportunities and volunteer activities

#### DATA MANAGEMENT

- Improve access to data and information, on the Internet and otherwise

The CHSJS CCMP is foremost a Pinellas County document, and thus the County will likely be the lead entity for organizing and managing the CCMP. The County may enter into inter-local agreements or other contracts with local stakeholders. Alternately, a stakeholder may elect to complete an action plan individually without cooperative assistance, or may join another stakeholder, for example an adjoining municipality to complete an action plan together, but without County participation. Public-private cooperative efforts will be especially effective as examples of community-based involvement. Potential stakeholders include governmental agencies and departments at all levels, public and private utilities, businesses, special interest groups, and individual citizens. The active participation of stakeholders will greatly increase the opportunities for success in plan implementation.

Within a specified time frame after agreeing to contribute resources to the CCMP program, each stakeholder should submit an action plan to the CCMP team detailing how it anticipates participating to meet program goals. Stakeholders may utilize a variety of strategies to help reach the goals. Stakeholder action plans should include descriptions of proposed activities, how that project helps achieve the goals, an implementation schedule, and a cost and financing plan.

The action plans could potentially be based on on-going watershed initiatives begun prior to the adoption of the CHSJS CCMP (e.g., Stevenson Creek WMP), provided that the existing plans are consistent with the CHSJS CCMP's objectives. Implementing management activities for specific waterbodies can be an effective tool for implementing the CCMP.

Once the CCMP action plans have been approved, the action plan elements may be incorporated into local rules and policies. Comprehensive plans may be updated to include CCMP goals, and local development standards can be revised to afford protection to priority resources. Potential

provisions may include altering development setbacks, limiting impervious surfaces, incorporating low impact development designs, and enhanced surface and ground water management.

## MONITORING

Monitoring of the CHSJS natural resources is central to the success of resource management efforts. Tracking the results of monitoring activities can help identify successful or ineffective management activities, allowing resource managers to focus their efforts where necessary. Effective monitoring programs are critical to resource protection programs for several reasons. Scientifically defensible monitoring programs are critical to adaptive management. The monitoring data provide sentinel information on ecosystem response that can serve as an early warning system of potential degradation to resource managers and decision makers. This CCMP has provided threshold values to inform decision makers when time for action may be necessary. Monitoring also serves as compliance criteria for many permitting related activities.

Another important aspect of a monitoring program is to make data and inference available and understandable to resource managers, decision-makers, and the general public. Increased awareness of trends in environmental conditions often leads to the increased likelihood of cooperation of local governments and higher levels of volunteer efforts. It is anticipated that one of the main duties of the CCMP stakeholder team will be to review results of various monitoring efforts to gauge progress in meeting CCMP goals. The monitoring plan approach presented here will be subject to revision based on the team's review and assessment. Changes to the monitoring plan may change as environmental conditions change in the watershed and estuaries, or as levels of available resources to conduct monitoring vary.

The overall monitoring approach described herein is to incorporate existing monitoring programs to the fullest extent practicable, and propose additional or altered monitoring efforts only where priority resources of the CHSJS system are not currently adequately assessed to indicate whether or not CCMP goals and targets are being met. There are several existing monitoring programs that provide useful information, as discussed below. Using on-going monitoring programs is beneficial not only for its cost-effectiveness, but because a period of record of important data is available to gauge the significance of future changes. Current monitoring programs in the CHSJS include:

### WATER QUALITY

Pinellas County initiated a water quality monitoring program 1991 that includes both open water and land based sites. Open water monitoring stations were fixed (sampled at the same location each time) until 2002. In 2003, the County implemented a probabilistic site selection program for all of its open waters. This new design provides for a more statistically significant assessment of water quality status and trends to assess the effectiveness of management actions.

The coastal waters of Pinellas County were delineated into strata for the random site selection program. St. Joseph sound, Clearwater Harbor North, and Clearwater Harbor South are designated as strata W1, W2, and W3, respectively. Land based sites include all of the watershed basins in the CHSJS CCMP area. Water quality samples are collected at fixed station locations for a suite of parameters that includes nutrients, dissolved oxygen, chlorophyll a, turbidity, and color.

## SEDIMENT QUALITY AND BENTHIC COMMUNITIES

Sediment quality and the associated benthic macroinvertebrate community in Clearwater Harbor and St. Joseph Sound were sampled by the Environmental Protection Commission of Hillsborough County (EPCHC) during September 2009. Sample sites were randomly selected from St. Joseph Sound (15 sites), Clearwater Harbor North (8 sites), and Clearwater Harbor South (7 sites). However, no on-going sediment quality/benthic monitoring program currently exists for the CHSJS area. The baseline characterization of sediment quality and benthic community structure can be replicated at long term (e.g., 5 year) intervals as funding becomes available to assess sediment quality in the estuary

## SEAGRASSES

Seagrasses are among the most valuable estuarine resources in the CHSJS CCMP area as discussed throughout this document. Seagrass extent in St. Joseph Sound and Clearwater Harbor has been estimated by SWFWMD for the recent years 1999, 2001, 2004, 2006, 2008 and 2010. Additionally, seagrass monitoring transects data have been collected by Pinellas County since 1998. These monitoring programs are critical to future management of the CHSJS since seagrasses are a key indicator used to evaluate the health of the CHSJS estuary. Full support should be given to the continuation of these monitoring programs to track trends in the extent seagrasses over time such that water quality trends can continue to be related to ecosystem responses for a keystone indicator of estuarine health.

## NATURAL LANDS

SWFWMD updates their aerial photography-based land use coverage every three to five years. It is proposed to utilize these data to monitor the extent and trends in land use and land cover including uplands, freshwater wetlands, and emergent estuarine wetlands.

## ESTUARINE FISHES

Several one-time fish surveys were conducted in northern St. Joseph Sound during the 1970s and early 1980s. More recently, the Florida Fish and Wildlife Conservation Commission's (FWC) Fisheries Independent Monitoring Program (FIMP) conducted a one-year study (2004-2005) on the Anclote River to evaluate the response of the fish and invertebrate community to variations in freshwater inflow. Most recently, the fish and invertebrate community was characterized for the shoreline and nearshore seagrass habitats of St. Joseph Sound in waters ranging from 1.0-3.4 m in depth. Since June 2005, staff from the Clearwater Marine Aquarium has collected trawl samples from Clearwater Harbor as part of their Education and Outreach program providing ecological tours of the project area. The study area includes sixty fixed locations throughout Clearwater Harbor from which two samples, on average, are collected every day with the locations rotated among the sixty stations.

Although these surveys established a baseline of fisheries data for portions of St. Joseph Sound and Clearwater Harbor, there is no on-going comprehensive monitoring program for fisheries in the CHSJS CCMP area; however, it may be possible to leverage existing efforts between the CMA and FWC to obtain a more quantitative fisheries monitoring program throughout the CHSJS estuary without much additional effort.

Florida Fish and Wildlife Conservation Commission's (FWC) Molluscan Fisheries Program has monitored the status of the Bay Scallop population in St. Joseph Sound since 1994 and has tracked recruitment by scallop spat since 1997. However, the sampling sites are confined to the Anclote Anchorage area and only include the northern extent of St. Joseph Sound. The CCMP should support continued monitoring of scallop populations in the Anclote Anchorage and investigate the feasibility of additional monitoring efforts in Clearwater Harbor (North and South).

#### BIRDS

Audubon of Florida has recognized the CHSJS area as highly valuable for its avifauna by inclusion of two of its regions, "Clearwater Harbor-St. Joseph Sound" and the "Gulf Islands GEOPark", in the Important Bird Areas (IBAs) of Florida. Sites in these areas extend from northern St. Joseph Sound to Clearwater Harbor South. Besides active management of the areas Audubon monitors bird populations annually, including resident and migratory individuals, and nesting colonies. Sites in the CHSJS are included in the Audubon annual Christmas bird count as well. It is anticipated that the data generated by Audubon will be sufficient to track the status of these resources, but the CCMP should support this monitoring effort as well as the goals and objectives outlined for the protection of CHSJS bird populations.

The collection of environmental data through various monitoring programs is not an end unto itself. Once compiled, the data must be evaluated and interpreted to identify any trends, and to determine if the trends are within the range of natural variability or if they indicate some significant shift in the ecological balance of the system. The targets and thresholds established as part of this CCMP were developed to identify when significant deviations from expected conditions have occurred to provide an early warning system of potential degradation. With little effort, routine monitoring data can be evaluated and results coalesced to provide an indication to natural resource managers and decision makers on the state of the CHSJS resource and the success of management efforts in Conserving the Natural Heritage of the CHSJS for future generations.

## LITERATURE CITED

- Andrade, A.J. and K.F. Scott. 2002. Effective Use of Reclaimed Water Demonstrated To Offset Water Demand. Southwest Florida Water Management District. Brooksville, FL.
- Brussard Peter F, Reed Michael J and Tracy C Richard 1998 Ecosystem Management: What is it really? Landscape and Urban Planning 40: 9-20.
- Doren, R.F., Richards, J.H., Volin, J.C., 2009. A conceptual ecological model to facilitate understanding the role of invasive species in large-scale ecosystem restoration. Ecological Indicators 9, 651–658.
- Elko, N.A., 2005. Management of a Beach Nourishment Project during the 2004 Hurricane Season. Shore and Beach, 73, 49-54.
- Ellison, A. 2000. Mangrove Restoration: do we know enough? Restoration Ecology 8(3):219-229.
- FDEP (Florida Department of Environmental Protection, Bureau of beaches and Coastal Systems). 2008. Strategic Beach Management Plan for the Southwest Gulf Coast Region. 54 pages.
- FDEP. 2008. Best Management Practices (BMPs) for Construction, Dredge and Fill and Other Activities Adjacent to Coral Reefs. Prepared by Atkins (formerly PBS&J) for the Southeast Florida Coral Reef Initiative and Florida Department of Environmental Protection (FDEP) and the Maritime Industry and Coastal Construction Impacts Focus Team. [http://www.dep.state.fl.us/coastal/programs/coral/reports/MICCI/MICCI\\_6\\_BMP\\_Manual.pdf](http://www.dep.state.fl.us/coastal/programs/coral/reports/MICCI/MICCI_6_BMP_Manual.pdf)
- FFWCC (Florida Fish and Wildlife Conservation Commission) Florida Marine Research Institute. 2003. Conserving Florida's Seagrass Resources: Developing a Coordinated Statewide Management Program. St. Petersburg, FL 33701-5095.
- Flanagan, N., and C.J. Richardson. 2010. A multi-scale approach to prioritize wetland restoration for watershed-level water quality improvement. Wetlands Ecology and Management 18:695–706
- Florida Sea Grant. 2002. Florida Coastal Environmental Resources – A Guide to Economic Valuation and Impact Analysis. D. Letson and J.W. Milon (Ed.). Gainesville, FL.
- Hoffman, B.A. and C.J. Dawes. 1997. Vegetational and abiotic analysis of the salterns of mangals and marshes of the west coast of Florida. Journal of Coastal Research 13(1): 147-154.
- Janicki Environmental, Inc. 2011. State of the Resource Report for Clearwater Harbor and Saint Joseph Sound. Prepared for Pinellas County Department of Environment and Infrastructure. Clearwater, FL.
- Johns, G.M., L. McDonald, and D. Sayers. 1988. Estimated Economic Value of Resources. Prepared by Hazen and Sawyer, P.C. Prepared for the Charlotte Harbor National Estuary Program. Ft. Myers, FL.

- Lackey, R.T. 1998. Seven pillars of ecosystem management. *Landscape and Urban Planning* 40: 21-30
- Montague, C.L. and R.G. Weigert. 1990. Salt marshes, PP 481-516 in *Ecosystems of Florida*. R.L. Myers and J.J. Ewel, eds. University of Central Florida Press, Orlando. 765 pp.
- National Environmental Education Advisory Council. 2000. Report to Congress, September 2000.
- National Oceanic and Atmospheric Administration (NOAA). 1999. Annotated Bibliography of Florida Environmental Resource Valuation Case Studies. September 27, 1999. Washington, D.C.
- NEETF (National Environmental Education and Training Foundation). 2001. *The National Report Card on Environmental Attitudes, Knowledge, and Behavior*, Roper Starch Worldwide.
- NEETF (National Environmental Education and Training Foundation). 2002. America's Low "Energy IQ:" A Risk to Our Energy Future, Roper ASW.
- NOAA. 2011. Habitat Conservation/Restoration Center.  
<http://www.habitat.noaa.gov/restoration/techniques/livingshorelines.html>
- Pinellas County Planning Department. 2008. Pinellas County Comprehensive Plan. Clearwater, FL.
- Pinellas County. 2009. Field Trip Guidebook for the American Shore and Beach Preservation Association (ASBPA) 2009 National Coastal Conference. St. Pete Beach, FL.
- Rosgen, D. L. 2007. The natural channel design method for river restoration.  
[http://www.wildlandhydrology.com/assets/FINAL The Natural Chann River Restoration pape ASCE 2006.pdf](http://www.wildlandhydrology.com/assets/FINAL%20The%20Natural%20Chann%20River%20Restoration%20pape%20ASCE%202006.pdf)).
- Stephenson and Geiger. 2010. Bay Scallop Project 2009 Annual Report. Florida Wildlife Research Institute. St. Petersburg, Florida.  
Web address: [www.floridamarine.org](http://www.floridamarine.org)
- Tampa Bay Estuary Program 1996. Charting the Course: A Comprehensive Conservation and Management Plan for Tampa Bay. St. Petersburg, Florida. Tampa Bay Estuary Program.  
[http://www.tbep.org/tbep/charting\\_the\\_course.html](http://www.tbep.org/tbep/charting_the_course.html)
- Twilley, R.R., V.H. Rivera-Monroy, E. Medina, A. Nyman, J. Foret, T. Mallach, and L. Botero. 2000. Patterns of forest development in mangroves along the San Juan River estuary, Venezuela. *Forest Ecology and Management*.
- USFWS. 2007. South Florida Multi-Species Recovery Plan. U.S. Fish and Wildlife Service. Vero Beach, FL.

VIMS (Virginia Institute of Marine Science). 2010. Living Shoreline Design Guidelines for Shore Protection in Virginia's Estuarine Environments. College of William & Mary Gloucester Point, Virginia. <http://www.deq.virginia.gov/export/sites/default/coastal/documents/task94-01-08.pdf>

Wolanski, E. (2007). *Estuarine Ecohydrology*. Linacre House, Jordan Hill, Oxford OX28DP, UK: Elsevier.

Szaro, R., Sexton, W.T., and Malone C.R. 1998. The emergence of ecosystem management as a tool for meeting people's needs and sustaining ecosystems. *Landscape and Urban Planning* 40: 1-7

This page intentionally left blank

