

Committing To Our Future

Volume 1

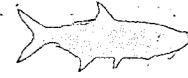
*A Draft Comprehensive Conservation and Management Plan
for the Greater Charlotte Harbor Watershed*



- *Peace River & Watershed • Myakka River & Watershed*
- *Coastal Venice/Lemon Bay/Gasparilla Sound/Cape Haze*
- *Charlotte Harbor Proper • Pine Island Sound/Matlacha Pass*
- *Estero Bay & Watershed • Tidal Caloosahatchee River & Watershed*

November 1999





Comments

Specific comments on text or action plans may be noted in the margins of this document.

Specific questions:

Do you agree with the goals for harbor and watershed restoration presented in the "Introduction" chapter? What goals would you change or add?

Which specific actions do you consider the highest priority? (Indicate your top five choices using the assigned codes.)

What specific changes or additions would you recommend to accomplish harbor and watershed restoration goals?

How can we improve the format, readability, and design of this plan?

Thank you!

Committing To Our Future

Volume 1

A Draft Comprehensive Conservation and Management Plan for the Greater Charlotte Harbor Watershed

The draft action plans and text in this document are provided for review by the Greater Charlotte Harbor Watershed community. *Committing To Our Future* was produced by the Charlotte Harbor National Estuary Program, and recommendations by reviewers will be considered for incorporation into the final plan, to be published and available to citizens in the summer 2000. We welcome your comments and inquiries and encourage your use of the section titled "Comments, please" that appears at the beginning of the book.

November 1999

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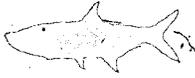


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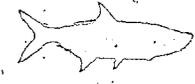
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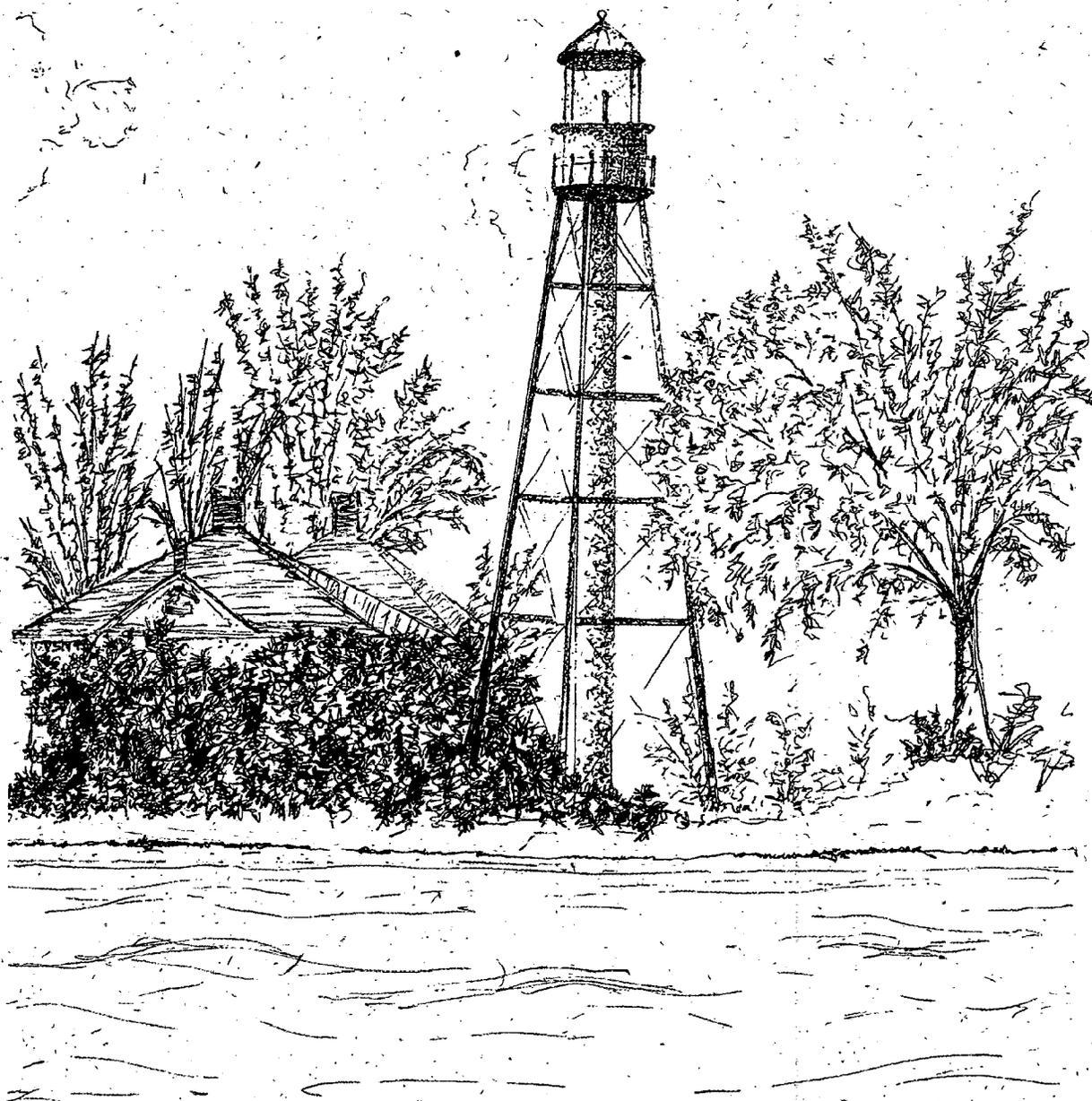
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Sanibel lighthouse.



PREFACE

This document, the *Comprehensive Conservation and Management Plan for the Greater Charlotte Harbor-Watershed*, is the product of years of work by many talented and dedicated people. The members of the Citizens', Technical, Management, and Policy Committees donated their expertise and their spirit to this effort. This plan could not have been accomplished without them. With their confidence and commitment, we will make a difference in the future of this region. The commitment of so many local people to the long-term future of this watershed is both impressive and inspiring.

Many people and organizations have supported this effort from its infancy. We owe a debt of gratitude to Wayne Daltry and Dr. Ernest Estevez for shepherding the effort, along with many others, to nominate Charlotte Harbor as a National Estuary Program. We thank the late Governor Lawton Chiles and current Governor Jeb Bush for their leadership and unflinching support for our efforts.

Many people deserve credit for taking us down such a long path so quickly and with so few resources. Despite our region's size and diversity, we have completed this draft plan in three years time and under budget. It is only with the many local governments, basin boards, agencies, and organizations, who contributed their technical and financial support, that we have completed our mission. The participation of both inland and coastal organizations has been extraordinary and this plan reflects their involvement.

Through the volunteer efforts of our committee members and local citizens we have stretched our funding to accomplish all of our aims. Our past and present committee chairs provide a special measure of leadership and insight to the process. Our appreciation goes to Citizens' Advisory Committee Chair Molly Krival and Vice Chair Robert Croft; Technical Advisory Committee Co-Chairs James Sampson and Michael Perry and Past Chair Thomas Fraser and Past Vice Chair Judy Ott; Management Committee Chair Wesley "Bo" Crum and Vice Chair David Burr; and Policy Committee Chair Thomas Welborn as well as Past Chairs Margaret Highsmith, Peter Ware, and Stallings Howell.



I would also like to express special thanks to the program staff including Melissa Upton, Patti Armbruster, David Moldal, and Jock Robertson for their dedication and professionalism that kept us on track. To the many dedicated staff of the Environmental Protection Agency-Region 4, who set us on the path to success, we thank you. Particularly, J. Hudson Slay, Robert Howard, and John H. Hankinson who provided extra moral, technical, and financial support along the way.

This plan is not only a starting point, it is also a time to take stock in what we have accomplished. To everyone who contributed their time and energy, your efforts are realized in this plan. And to the residents and visitors of the Greater Charlotte Harbor Watershed who are learning about our issues for the first time, we hope you will join us in our efforts to protect the health of this special region. Here is our commitment to the future....

*Tiffany Lutterman, Director
Charlotte Harbor National Estuary Program*





INTRODUCTION

"Future generations will enjoy and appreciate the land and sea connection of the Charlotte Harbor watershed...that marvelous array of connected habitats of pine flatwoods, scrub, hardwood hammocks, fresh and saltwater marshes, mangrove forest, barrier island beaches, and estuaries, where fresh water from rivers and streams plays with the salty ocean tides." - Carla Kappmeyer, CAC member



Artwork by Shelly Castle

The Greater Charlotte Harbor Watershed is a special place. Three large rivers, the Myakka, Peace, and Caloosahatchee, flow westward to the Gulf of Mexico. These rivers start as lakes, creeks, and groundwater that combine and meander until they become substantial rivers. The rivers flow through cities and towns, cattle pastures and citrus groves, pine flatwoods and cypress swamps. When these rivers meet the salty water of the Gulf of Mexico, they form estuaries which are one of the most productive natural systems on earth. Coastal bays such as Lemon Bay and Estero Bay are influenced by smaller streams and are spectacular havens for fish and wildlife.

As more people discover the beauty of this region and the demands for land and water intensify, the special qualities of the region are threatened. The human needs for land, water, food, and fertilizer can take precedence over the quality of water and wildlife habitat. Urban communities struggle to balance housing, transportation, and commercial growth while maintaining the quality of life that drew people and businesses to their communities in the first place. Rural communities are challenged by changing markets for their products while managing the pressures of regulation, international competition, and the encroachment of suburbs from nearby urban areas.

Action is needed to balance the demands on urban and rural communities and their natural resources.



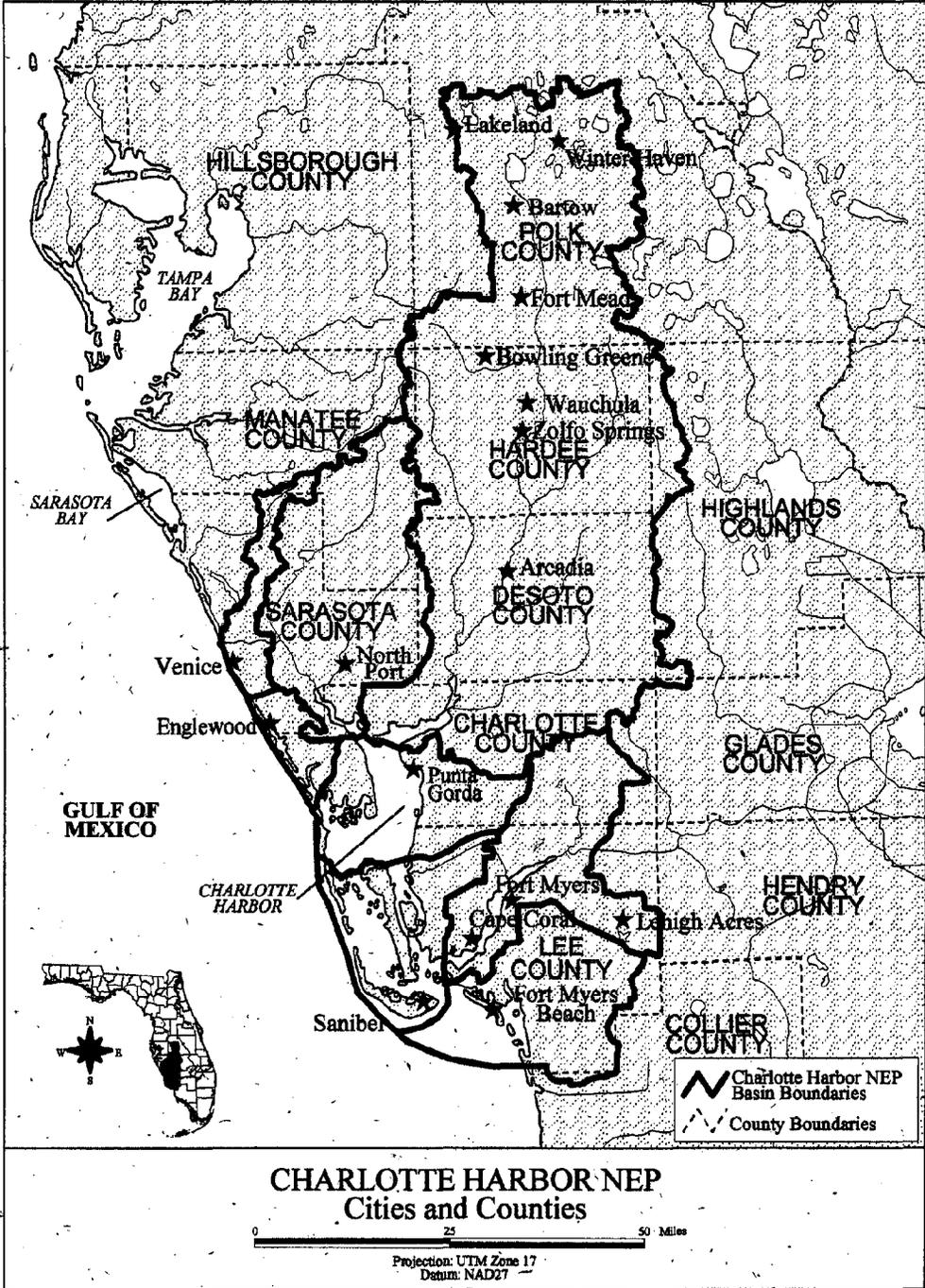
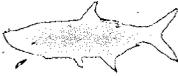
Action is needed to balance important natural characteristics and human needs. Without careful management and protection, the basic nature of the region could be spoiled. Fortunately, we know the pitfalls of overstressing our natural and municipal communities. We can measure the connections between the quality of the environment and the health of the local economy. We know the real costs of fixing problems are much greater than preventing difficulties from occurring.

This *Comprehensive Conservation and Management Plan* (CCMP) details the actions needed to protect and improve our watershed as we try to balance human needs with the natural systems. Our plan is ambitious in scope and timeframe. For the goals to be realized, our region's citizens, governments, and industry will need to work together. The plan's objectives are specific so we can measure our progress. The timelines are short to encourage immediate attention and action. Many of the actions will require multiple groups and agencies to work together, combine resources, and overcome institutional boundaries. All of these challenges are surmountable because we are unified in our mission -- to keep the Greater Charlotte Harbor Watershed a special place for ourselves and our children's children.

SPECIAL PLACES AND SPECIAL PEOPLE

This management plan was written by literally hundreds of people. Citizen volunteers, scientists and engineers, resource managers, and elected officials have contributed countless hours, essential knowledge, and informed opinions. Over a three-year period, the plan was written in locations throughout the watershed like Bartow and Boca Grande, Venice and Myakka City, Haines City and Sanibel, Punta Gorda and Wauchula.

The scale of participation with this management plan reflects the size of the study area. Although Charlotte Harbor itself only covers 270 square miles, the Greater Charlotte Harbor Watershed extends over an area of 4,400 square miles. At its northern end, the Peace River basin begins in Polk County near Lakeland and travels over 100 miles to the harbor. The Myakka River basin starts in eastern Manatee County until it winds and meanders to meet the northeastern side of Charlotte Harbor. Along the coast, Charlotte Harbor affects the watersheds of Venice and Lemon Bay. To the south, Pine Island Sound and Matlacha Pass connect Charlotte Harbor to the tidal Caloosahatchee and to Estero Bay in Lee County (Map 1).



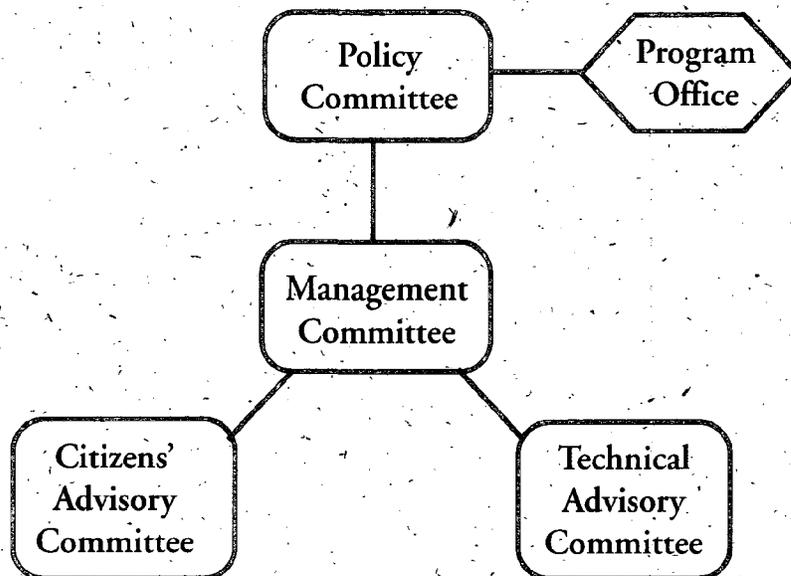
Map 1: Cities and counties in the Greater Charlotte Harbor Watershed.



Our study area includes all or part of eight counties and many cities and towns. The area's extent also broadens the number of organizations who manage, regulate, and govern its uses and resources. Two water management districts—Southwest Florida and South Florida Water Management Districts—have jurisdiction over water supply and flood control in the study area. Regional and emergency planning are conducted by three regional planning councils. Environmental regulation, park management, enforcement, and aquatic preserve management are performed by two districts of the Florida Department of Environmental Protection.

In 1995, Governor Lawton Chiles nominated Charlotte Harbor as an "estuary of national significance." As a result of this nomination, Charlotte Harbor was accepted into the National Estuary Program, one of only 27 other watersheds in the United States. The mission of the Charlotte Harbor National Estuary Program is to bring together all of the local organizations, both public and private, into a "management conference" to write a *Comprehensive Conservation and Management Plan* for the watershed. Now that the management plan is completed, the management conference will work together to implement that plan and achieve its goals.

Committee Structure of the Program's Management Conference





The *management conference* consists of four committees and the program office. Each of the four committees serves a specific purpose and brings together a diverse representation of expertise, interests, and opinions. The four committees of the management conference are the following: Citizens' Advisory Committee (CAC), Technical Advisory Committee (TAC), Management Committee, and Policy Committee. The program office performs the administrative functions of the program and supports the activities of all the committees. The *management conference* will continue to be active during the implementation of this management plan.

Through the participation of hundreds of people, the Charlotte Harbor National Estuary Program held its kick-off ceremony in September 1996 and began a three-year process of writing a regional management plan. Local problems were identified, goals were established, information was collected, and special projects were funded. Local governments, basin boards, and public agencies funded programs to develop monitoring programs, make scientific information more accessible, and encourage local environmental education programs.

Hundreds of citizen volunteers continue to work on "getting the word out" to their communities, take water quality samples, plant seagrasses at restoration sites, and give presentations to schools and civic organizations. They tour phosphate mines, travel the rivers, visit restoration sites, and voice their concerns and visions of the future. All of these institutions together with the many homeowner associations, school districts, not-for-profits, universities, and research facilities affect the condition of our environment. Our awareness of these problems and our ability to correct them is dependent on the effectiveness and the dedication of our communities and these institutions.

This management plan addresses the natural resource issues in the entire study area. Some of our problems are regional and will require breaking down institutional barriers to address them. Some problems are local - specific sites that require special attention from the local community. In every case, we gain from focusing our efforts where they will be most effective and by sharing solutions because the entire region benefits from the results.



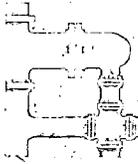
Photo by Brett Gilmore

Senator Bob Graham gives a speech during the kickoff ceremony for the Charlotte Harbor National Estuary Program. Also in this picture from left to right are Tiffany Lutterman, Gary Oden, Ralph Cantral, Dr. Kumar Mahadevan, and Congressman Porter Goss.



NATURE OF THE PROBLEM

One of the *management conference's* early achievements was to identify the region's *priority problems*. These problems, summarized below, vary geographically in extent and severity but they are common regional issues:



Hydrologic Alterations: Adverse changes to amounts, locations, and timing of freshwater flows, the hydrologic function of floodplain systems, and natural river flows.



Water Quality Degradation: Including but not limited to pollution from agricultural and urban runoff, point source discharges, septic tank system loadings, atmospheric deposition, and groundwater.



Fish and Wildlife Habitat Loss: Degradation and elimination of headwater streams and other habitats caused by development, conversion of natural shorelines, cumulative impacts of docks and boats, invasion of exotic species, and cumulative and future impacts.



The issues or problems described above can also be viewed as symptoms or consequences of more basic processes. **Land uses and land use management**, for examples, affect the time it takes rainwater to travel to a water body like a river, nutrient concentrations and loading rates, and wildlife habitat. Given the rate and scale of land use decisions in the study area, a continuing program effort will be needed in the general subject area of land use management. Also, we must address the problem of incomplete information on particular topics. Certain topics in certain geographic areas may be important but lack definitive data.





This management plan focuses on these three regional problems and the related land use issues. The management conference also developed specific objectives, called *quantifiable objectives*, for each of the three *priority problems*. The committees then created action strategies called *priority actions* to identify the specific activities needed to achieve the *quantifiable objectives*. As a first step for action, projects will be conducted by more than 40 organizations to initiate implementation of this management plan. Those actions are detailed in Volume 2 of this document.

PROGRAM GOALS

The *management conference* also developed program goals to guide the management plan to a specific regional vision. The figure below details the program goals. The related *quantifiable objectives* for the management plan which address both the program goals and *priority problems* are presented in the chapter called "Quantifiable Objectives." The following goals were created by our committees at the beginning of the Charlotte Harbor National Estuary Program. Their goals institute a long-term vision of the region's resources. All of these goals are achievable with local commitment and participation in the implementation of this management plan.

Goals of the Charlotte Harbor National Estuary Program

1. Improve the environmental integrity of the Charlotte Harbor study area.
2. Preserve, restore and enhance seagrass beds, coastal wetlands, barrier beaches, and functionally related uplands.
3. Reduce point and non-point sources of pollution to attain desired uses of the estuary.
4. Provide the proper fresh water inflow to the estuary to ensure a balanced and productive ecosystem.
5. Develop and implement a strategy for public participation and education.
6. Develop and implement a formal Charlotte Harbor management plan with a specified structure and process for achieving goals for the estuary.





COAST INTO THE FUTURE

This management plan is a call for action from our citizens, our governments, and our industries. Everyone who works and plays in the Greater Charlotte Harbor Watershed is called to help in the implementation of this management plan. There is much to be accomplished. Tourism-based industries can work to minimize visitor impact on the natural resources and teach an appreciation for our unique environment.

Residents can decrease water use on their lawns and in their homes to reduce the stress on our limited freshwater resources. Homeowners can also decrease stormwater pollution by minimizing use of and properly disposing of chemicals, fertilizers, and household waste. Boaters can act to avoid damaging seagrass beds, harming manatees, and other fragile living resources. Agriculture can decrease its water use and utilize re-use water for irrigation. Local governments can implement effective growth management to control the impacts of septic systems, sewage plant discharges, and habitat destruction.

This plan represents our commitment to the future. The implementation of this plan will determine our legacy to future generations. We are determined to create our own future by working together and acknowledging the challenges we face. The dedication and participation of so many people to create this plan is an important first step. Many of our choices are not easy, but they have lasting effects. We hope that you and your children will help us keep the Greater Charlotte Harbor Watershed a special place to live, work, and visit.



Artwork by Victor McGuire

Old church on Boca Grande.





MANAGEMENT CONFERENCE MEMBERS

"I was impressed by the large number of individuals and organizations that have been and are working to protect the long term health of Charlotte Harbor and its connected systems." - Jim Sampson, TAC member

CONSENSUS FOR ACTION

Four committees comprise the management conference of the Charlotte Harbor National Estuary Program. Each serves a specialized role but all support the program goals and activities. Almost 200 people participate on one or more committees. They have dedicated thousands of volunteer hours to building consensus for the actions in this management plan. The committees and their members are described in the following sections.



Photo by Melissa Upton

Citizens' Advisory Committee members meet at the J.N. "Ding" Darling National Wildlife Refuge, Sanibel Island.



POLICY COMMITTEE

The Policy Committee establishes general policy for the Charlotte Harbor NEP and has ultimate authority in program administration. The Policy Committee appoints members to other committees and approves budgets. This committee is the bridge between the *management conference* and local governments of the region. In fact, all but four of the 24 members of the Policy Committee represent city, county, or regional governing bodies in Southwest Florida. The following Policy Committee members reflect the citizenry of the Greater Charlotte Harbor Watershed:

Ms. Margaret Highsmith, Former Co-Chair
Florida Department of Environmental Protection

Mr. Tom Welborn, Co-Chair
U.S. Environmental Protection Agency, Region 4

Hon. A.C. "Cal" Adams
City of Bartow

Hon. John Albion
Southwest Florida Regional Planning Council

Mr. Jim Beaver
Florida Fish and Wildlife Conservation Commission

Hon. Steve Brown
City of Sanibel

Hon. Adam Cummings
Charlotte County Commission

Hon. T. Felton Garner
DeSoto County Commission

Hon. Patricia Glass
Manatee County Commission

Hon. Bill Gorvine
City of Punta Gorda

Hon. Ray Judah
Lee County Commission

Mr. Medard Kocczynski
City of Venice

Mr. Joe Kowalski
City of Arcadia

Ms. Molly Krival
Citizens' Advisory Committee Chair

Mr. Douglas Leonard
Central Florida Regional Planning Council

Hon. Paul Monroe
City of Cape Coral

Hon. John Mulholland
Town of Fort Myers Beach

Mr. Gary Oden
Hardee County

Mr. Donald Ross
South Florida Water Management District

Secretary Steven Seibert
Florida Department of Community Affairs

Mr. Jeff Spence
Polk County

Hon. Shannon Staub
Sarasota County Commission

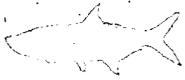
Mr. Robert Tewis
City of Fort Myers

Ms. Trudi Williams
South Florida Water Management District



A Policy Committee meeting being conducted in the City of Venice.

Photo by Melissa Upton



Past Policy Committee Members.

Mr. Jim Allen
Southwest Florida Water Management District

Mr. Joe E. Davis
Southwest Florida Management District

Hon. Joseph Fink
City of North Port

Mr. William Hammond
South Florida Water Management District

Mr. Stallings Howell
U.S. Environmental Protection Agency

Hon. Wallace Kain
City of Sanibel

Mr. John Kremiski
City of Fort Myers

Hon. Dawn MacGibbon
City of Punta Gorda

Secretary James Murley
Florida Department of Community Affairs

Hon. Nick Timmerman
Hardee County

Hon. Jack O'Neil
Sarasota County Commission

Hon. Raymond Pilon
Sarasota County Commission

Hon. Bill Richards
City of Punta Gorda

Hon. Robert Shedd
City of Punta Gorda

Hon. Frank "Bubba" Smith
City of Bartow

Hon. Amy E. Stein
Manatee County Commission

Mr. Peter Ware
Florida Department of Environmental Protection

Mr. Edward Wotizki
Southwest Florida Water Management District

MANAGEMENT COMMITTEE

The Management Committee serves as a bridge between the Citizens' Advisory Committee and the Technical Advisory Committee, and Policy Committee. The Management Committee also provides strong institutional support for the Charlotte Harbor NEP by staffing, funding, or otherwise facilitating projects. This committee reviews work plans, contracts and proposals, work schedules and products. It also ensures that program milestones and objectives are accomplished. Each member of the Policy Committee has one or more appointed representatives on the Management Committee. These currently include:



Photo by Melissa Upton

A Management Committee meeting being conducted in Myakka City.



MANAGEMENT COMMITTEE

- | | |
|---|---|
| Wesley "Bo" Crum, Chairman
<i>U.S. Environmental Protection Agency, Region 4</i> | Andreas Mager
<i>National Marine Fisheries Service</i> |
| David Burr, Vice Chairman
<i>Southwest Florida Regional Planning Council</i> | Chip Merriam
<i>South Florida Water Management District</i> |
| Karen Burnett
<i>Sarasota County Resource Management Division</i> | Col. Joe Miller
<i>U.S. Army Corps of Engineers</i> |
| Alton Cheatham
<i>Charlotte County Soil and Water Conservation District</i> | Ken Murray
<i>USDA/Natural Resources Conservation Service</i> |
| Pat Collins
<i>City of Venice</i> | Misty Nabers
<i>Gasparilla Island Conservation & Improvement Association</i> |
| June Fisher
<i>DeSoto County</i> | Roland Ottolini
<i>Lee County Natural Resources</i> |
| Mark Hammond
<i>Southwest Florida Water Management District</i> | Eduardo Patino
<i>United States Geological Survey</i> |
| Louis Hinds
<i>U.S. Fish & Wildlife Service</i> | Michael Peiry
<i>Technical Advisory Committee, Co-Chair</i> |
| Christina Hummel
<i>Polk County Planning Department</i> | Jim Quinn
<i>Florida Department of Community Affairs</i> |
| Charlie Hunsicker
<i>Manatee County</i> | Robert Repenning
<i>Florida Department of Environmental Protection</i> |
| Robert Kollinger
<i>Polk County Natural Resources and Drainage Division</i> | James Sampson
<i>Technical Advisory Committee, Co-Chair</i> |
| Molly Kriyal
<i>Citizens' Advisory Committee Chair</i> | William Smith
<i>Florida Fish & Wildlife Conservation Commission</i> |
| Rufus Lazzell
<i>City of Punta Gorda</i> | Brian Sott
<i>Central Florida Regional Planning Council</i> |
| Patrick Lehman
<i>Peace River/Manasota Regional Water Supply Authority</i> | Ronald Stowers
<i>Hardee County Zoning Office</i> |
| Chuck Listowski
<i>West Coast Inland Navigation District</i> | Robert Tewis
<i>City of Fort Myers</i> |
| Robert Loffin
<i>City of Sanibel</i> | Stephen Thompson
<i>Florida Department of Environmental Protection</i> |
| | Charles Walter
<i>Charlotte County Public Works</i> |



The Budget Subcommittee meets at the Charlotte Harbor Environmental Center's Alligator Creek Site in Punta Gorda.

Photo by Joy Duperault



CITIZENS' ADVISORY COMMITTEE

The Citizens' Advisory Committee (CAC) represents public concerns and transfers information back to their local communities. The CAC provides a mechanism for citizens to advise the Charlotte Harbor NEP, as well as distributing relevant information to the public. It works closely with staff to reinforce and maintain public support for the NEP, develop public participation strategies, and provide input on public education programs. This committee also helps develop public workshops, provides a forum for public comment, and directs public concerns to the Technical Advisory Committee and the Management Committee. The CAC chair is a voting member of the Management Committee. CAC members include:

Molly Krival, Chair <i>J.N. "Ding" Darling Wildlife Society</i>	Carla Kappmeyer-Sherwin <i>Florida Department of Environmental Protection</i>
Bob Croft, Vice Chair <i>Charlotte County Citizen</i>	Wilma Katz <i>Lemon Bay Conservancy</i>
Ralph Allen <i>Kingfisher Fleet</i>	Joseph Lee <i>South Gulf Cove Homeowners Assoc.</i>
Roger Blackmore <i>Charlotte County Citizen</i>	Daniel Leonard <i>Shellfish Farmer Board of Directors</i>
Anna Bowditch <i>Charlotte Harbor Advisory Council</i>	Lloyd Lueptow <i>Charlotte County Citizen</i>
John Brenneman <i>Polk County Extension Service</i>	Steve Minnis <i>Southwest Florida Water Management District</i>
Terry Cain <i>Fort Myers Marine Task Force</i>	Misty Nabers <i>Gasparilla Island Conservation & Improvement Assoc.</i>
Beth Casey <i>Florida Power & Light</i>	Kayton Nedza <i>Hardee County Outdoor Classroom</i>
Ed Chance <i>Peace River/Manasota Regional Water Supply Authority</i>	Andy Neuhofer <i>Farm Bureau/Agriculture & Natural Resources Advisory Committee</i>
Joyce Chase <i>DeSoto County Citizens Against Pollution</i>	Barbara Oxford <i>Peace River Valley Citrus Growers Assoc.</i>
Joy Duperault <i>Charlotte Harbor Environmental Center</i>	Laraine Pollock <i>Environmental Confederation of Southwest Florida</i>
Joe Fleming <i>Harbor Heights Waterways</i>	Bill Protheroe <i>South Gulf Cove Homeowners Assoc.</i>
Ken Harrison <i>DeSoto County</i>	Louise Raterman <i>The Pinecone</i>
Chauncey Goss <i>Gasparilla Island Conservation & Improvement Assoc.</i>	Beverly Sidenstick <i>League of Women Voters</i>
Ellen Hawkinson <i>Peace River Audubon Society</i>	Robert Slayton <i>Sanibel-Captiva Audubon Society</i>
Ernest Helms <i>U.S. Agri-Chemicals Corp.</i>	Camilla Spicer <i>4H and Boy Scouts of America</i>
Ed Highy <i>Polk County ICAP</i>	Sain Stone <i>Peace River/Manasota Regional Water Supply Auth.</i>
Terry Hixon <i>Charlotte County Citizen</i>	Lee Thurner <i>IMC-Agrico Company</i>
Richard Huxtable <i>Edge of the Wild</i>	Bernie Tibble <i>Florida Power and Light</i>
Nat Italiano <i>Charlotte Harbor Advisory Council</i>	Susan Toth <i>4-H</i>
	Diana Youmans <i>Hardee County, IMC Agrico</i>





TECHNICAL ADVISORY COMMITTEE

The Technical Advisory Committee (TAC) provides technical support to the NEP. During the planning and interpretive stages of the NEP program, the TAC identified scientific problems facing the Greater Charlotte Harbor Watershed. The TAC helps develop work plans, develops requests for proposals, and reviews the responding proposals. It also assists with information management and coordinates agency research. A designated TAC co-chair is a voting member of the Management Committee. TAC members include:

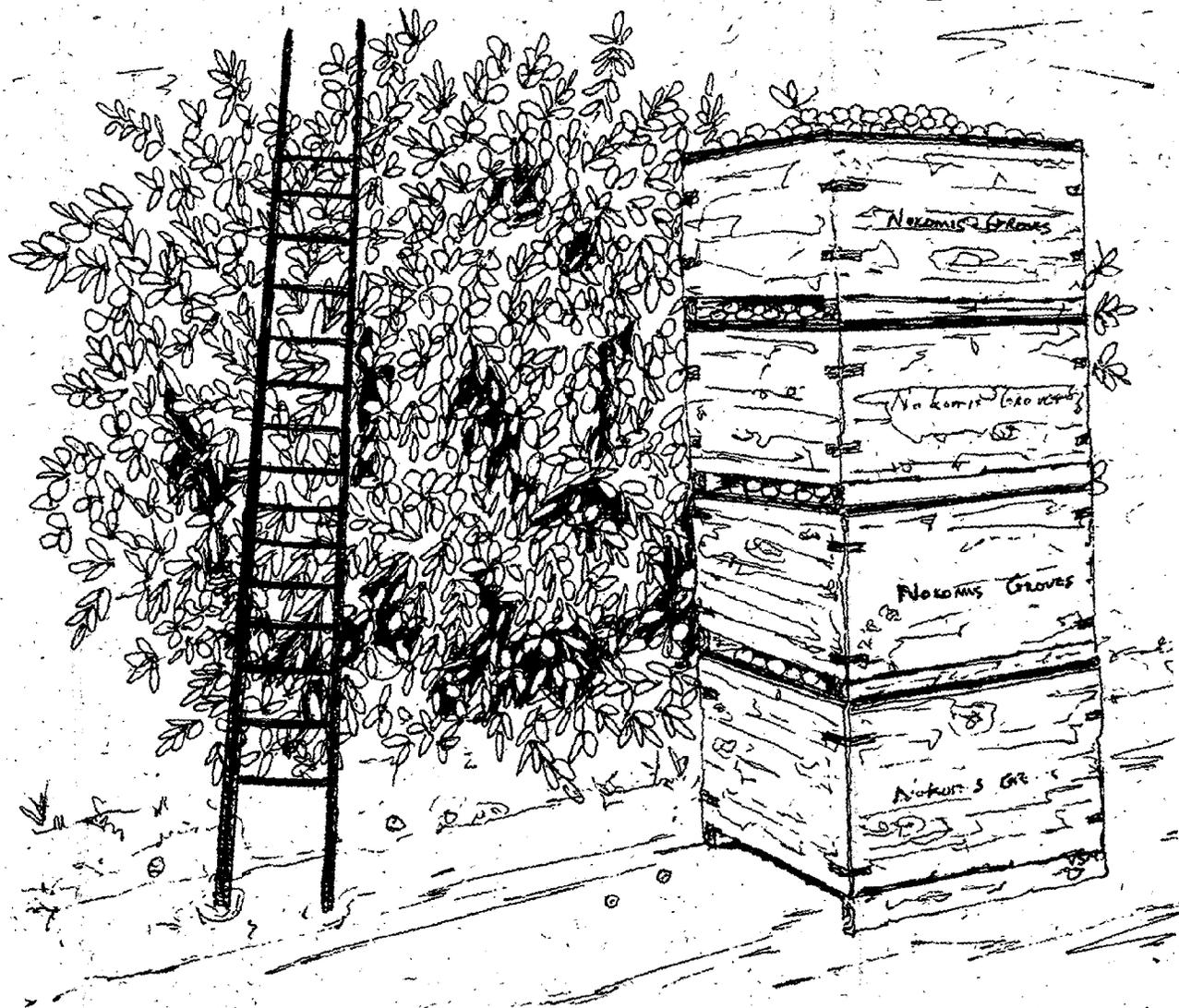
- | | |
|--|--|
| Mike Perry, Co-chair
<i>Southwest Florida Water Management District</i> | Allison "Chip" Clough
<i>U.S. Army Corps of Engineers</i> |
| Jim Sampson, Co-chair
<i>CF Industries, Inc.</i> | Jorge Coppen
<i>U.S. Fish and Wildlife Service</i> |
| Steve Adams
<i>City of Punta Gorda</i> | LeRoy Crockett
<i>Natural Resource Conservation Service</i> |
| Tomna Barnes
<i>South Florida Water Management District</i> | Jim Culter
<i>Mote Marine Laboratory</i> |
| Chris Becker
<i>Florida Department of Environmental Protection/
Florida Parks Service</i> | David Dale
<i>National Marine Fisheries Service</i> |
| Jim Beever
<i>Florida Fish and Wildlife Conservation
Commission</i> | Kelly Dixon
<i>Mote Marine Laboratory</i> |
| Margaret Bishop
<i>South Florida Water Management District</i> | John Durkin
<i>Orange Co of Florida, Inc.</i> |
| Gregory Blanchard
<i>Manatee County Environmental Management
Department</i> | Win Everham
<i>Florida Gulf Coast University</i> |
| Steve Boutelle
<i>Lee County Natural Resources Management
Division</i> | Sharon Fitzgerald
<i>U.S. Geological Survey</i> |
| Robert Brown
<i>Manatee County Environmental Management
Department</i> | Thomas Fraser
<i>W. Dexter Bender & Assoc.</i> |
| Bill Byle
<i>Charlotte County National Resources Department</i> | Pat Fricano
<i>Florida Department of Environmental Protection</i> |
| Matthew Cain
<i>Bromwell & Carrier Inc.</i> | Layne Hamilton
<i>U.S. Fish & Wildlife Service</i> |
| John Capece
<i>University of Florida, IFAS</i> | Brett Harrington
<i>City of North Port</i> |
| John Cassani
<i>Environmental Confederation of Southwest Florida</i> | Dan Haunert
<i>South Florida Water Management District</i> |
| David W. Ceilley
<i>Sanibel-Captiva Conservation Foundation</i> | Linda Hawk
<i>South Florida Water Management District</i> |
| Alton Cheatham
<i>Charlotte Harbor Environmental Center</i> | Glenn Heath
<i>Southwest Florida Regional Planning Council</i> |
| Daniel Clark
<i>City of Sanibel</i> | Peggy Hellenbach
<i>Department of Environmental Protection</i> |
| | Michael Heyl
<i>Camp, Dresser, and McKee, Inc.</i> |
| | Kendal Hicks
<i>Natural Resource Conservation Service</i> |
| | Lou Hinds
<i>U.S. Fish & Wildlife Service</i> |





TECHNICAL ADVISORY COMMITTEE (CONTINUED)

- Anthony Janicki
Janicki Environmental, Inc.
- Connie Jaryvis
City of Cape Coral
- Keith Kibbey
Lee County Environmental Laboratory
- Joe King
Polk County Natural Resources & Drainage
- Erick Lindblad
Sanibel-Captiva Conservation Foundation
- Dianne McCommons Beck
Florida Department of Environmental Protection
- Jono Miller
New College of USF/Myakka River Coordination Council
- Mike Milligan
Center for Systematics and Taxonomy
- Ralph Montgomery
Consultant
- Gerold Morrison
Department of Environmental Protection
- Sandra Newell
Sarasota County
- Richard Novak
Florida Sea Grant Extension Program
- Warren Olds
U.S. Fish and Wildlife Service
- Judy Ott
Department of Environmental Protection
- Shailesh Patel
Bromwell & Carrier Inc.
- L.A. Pellicer
Lee County Natural Resources
- Shelly Redovan
Lee County Mosquito Control District
- Steven Richardson
Florida Institute of Phosphate Research
- Jacque Rippe
South Florida Water Management District
- Bobbie Rodgers
Charlotte Harbor Environmental Center
- Deborah Scerno
Florida Department of Environmental Protection
- Peter Sheng
University of Florida/Coastal and Oceanographic Engineering
- Karen Shudes
Florida Department of Environmental Protection
- Ron Silver
U.S. Army Corps of Engineers
- Michael Simonik
The Conservancy of Southwest Florida
- James R.E. Smith
Charlotte County Citizen
- Jeff Spence
Polk County Natural Resources and Drainage
- Heather Stafford
Department of Environmental Protection
- Fran Stallings
Save the Manatee Club
- Helen Stallkamp
City of Cape Coral
- Jim Stilwell
City of Punta Gorda
- Sam Stone
Peace River/Manasota Regional Water Supply Authority
- Steve Susick
U.S. Agri-Chemicals Corp.
- Stephen Thompson
Florida Department of Environmental Protection
- Jim Thomson
Charlotte County Mosquito Control
- Dave Tomasko
Southwest Florida Water Management District
- Bob Vincent
Charlotte County Health Department
- Charles Walter
Charlotte County Public Works Department
- Albert Walton
Florida Department of Environmental Protection
- Greg Williams
IMC-Agrico Company
- Dick Workman
Coastplan, Inc.
- Kelly Young
Florida Department of Environmental Protection



Citrus grove

Artwork by Victor McGuire



STATE OF THE WATERSHED

"A valuable lesson for a person who has only lived on barrier islands, such as myself, was giving a face and a voice to the other people in the watershed of the Charlotte Harbor National Estuary Program study area. The Charlotte Harbor National Estuary Program has made it possible to truly feel connected to the other seven counties and for the committee members to express desires for their areas in the common cause of conserving habitats and natural resources for future generations to enjoy."

- Terry Cain, CAC member

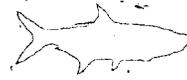
NATURAL GEOGRAPHY LINKS INLAND AREAS WITH THE COAST

Inland areas with freshwater lakes and rivers combine with coastal areas to make up the Greater Charlotte Harbor Watershed ecosystem. The watershed extends approximately 130 miles, from the northern headwaters of the Peace River in Polk County to southern Estero Bay in Lee County. The Greater Charlotte Harbor region is divided into seven sub-basins by hydrological, ecological, and management distinctions. In each of these sub-basins, rainfall collects in wetlands, runs to streams and rivers through a rich variety of plant and animal habitat, soils, and surficial geology.



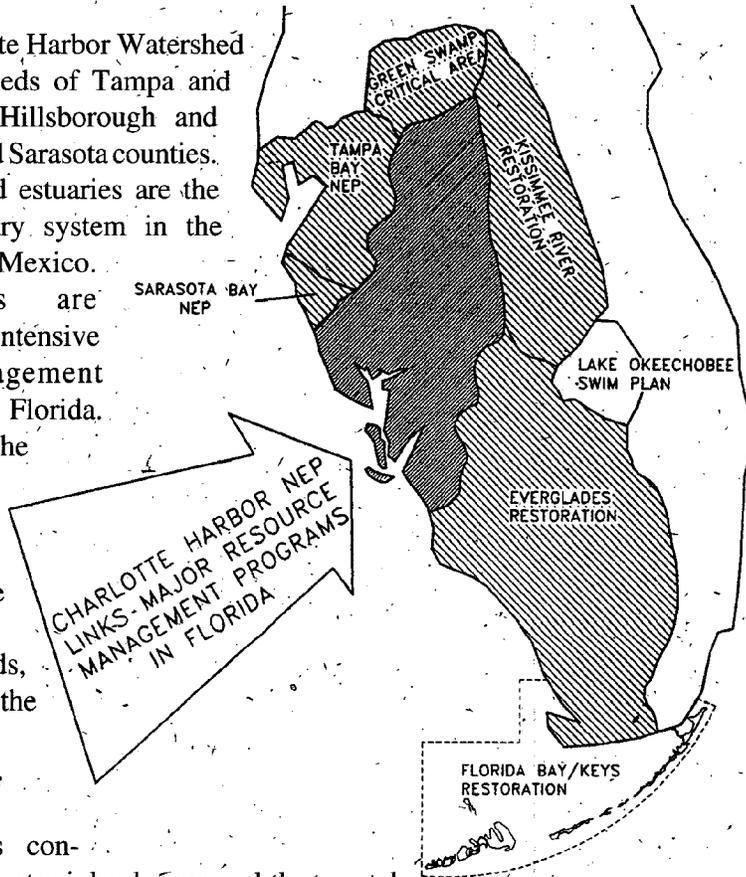
Photo by NASA

A satellite image depicts the Greater Charlotte Harbor Watershed.



The Charlotte Harbor estuary has a unique fresh water source. Unlike other estuaries in southwest Florida that are mostly influenced by the Gulf of Mexico, Charlotte Harbor's large rivers, such as the Peace, give it special characteristics. Large fluctuations of river flows between wet and dry seasons strongly affect the water's salinity and dissolved oxygen. In contrast, adjoining waters in Tampa and Sarasota Bays are more influenced by the Gulf and are usually well-mixed.

The Greater Charlotte Harbor Watershed adjoins the watersheds of Tampa and Sarasota Bays in Hillsborough and western Manatee and Sarasota counties. The three combined estuaries are the fourth-largest estuary system in the entire Gulf of Mexico. These estuaries are complemented by intensive ecosystem management initiatives in South Florida. Initiatives include the efforts to solve some of the problems with Lake Okeechobee, the Everglades, the Ten Thousand Islands, Florida Bay, and the Florida Keys.



Difficult resource management issues confront both the freshwater inland areas and the coastal estuary region. Inland, groundwater levels have declined significantly, phosphate mining is moving into new areas, and some lakes and rivers suffer from chronic water quality problems. More intensive agriculture, mining, and residential development are replacing native upland habitats and grazing lands. On the southwest Florida coast, projected increases in visitors, residents, and urban development are staggering. Both upstream pollution as well as the increasing water consumption and intensive use of boats, cars, and roads threaten coastal habitats.

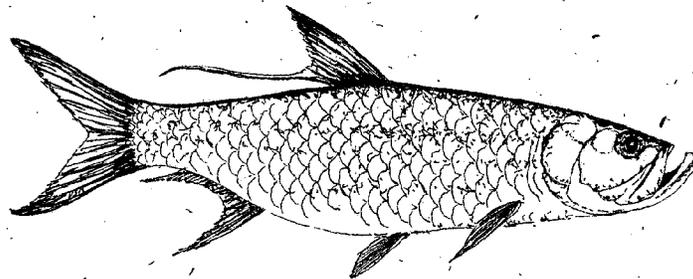
For additional information, see *The Story of the Greater Charlotte Harbor Watershed*.





Political geography links government in the watershed. The Greater Charlotte Harbor Watershed has distinct demographic, cultural, and political features. Locally, the watershed includes 15 municipalities in all or most of Polk, Hardee, DeSoto, Charlotte, and Lee Counties; eastern Manatee and Sarasota Counties; and the narrow western edge of Highlands County. Regionally, these local governments are linked by three regional planning councils, two water management districts, and numerous district divisions of state agencies. Nationally, eight federal agencies and six private science or resource management groups are also active in this region. Many of these agencies have multiple roles in managing natural resources in the Greater Charlotte Harbor Watershed.

The economic geography of the watershed covers a diverse region of important rural and urban communities and a unique environment worth protecting. Fishing, agriculture, mining, tourism, retirement, and construction compose the economic base. The economy has diversified and strengthened because people have moved here to enjoy the natural environment. The region, especially coastal counties, has grown at a faster rate since 1950 than the state and the nation. Highways link inland rural communities with jobs and services in more populous urban communities on the interstate freeway system.



Tarpon

Artwork by Victor McGuire



Challenges To Resource Management

The large size of the study area creates challenges for managers and citizens alike. The watershed has both rural and urban characteristics, freshwater and marine ecosystems, tourism and agricultural based economies, and diverse local issues and priorities. This diversity creates a need for improved regional management as well as public education about the interconnections among the benefits we treasure.

The complexity of the Greater Charlotte Harbor Watershed does not lend itself to simple management solutions. Since the watershed is large, it is often difficult to determine how changes are caused by natural conditions versus human impacts. When a basin undergoes rapid changes such as the construction of canals, the expansion of urban development, and the intensification of agriculture simultaneously, it can be troublesome to link environmental problems to a single activity. Understanding how human activities effect water quality, hydrology, and habitat requires intensive monitoring and analysis over the long-term. In our diverse region with a constantly growing population, not enough consistent information exists to make perfect decisions. In these circumstances, both resource managers and the public have to make the best judgements possible even though opinions about the best course of action may differ.



Photo by David Moldal

Great blue heron

Declines in wildlife, water quality, and water flows are usually caused by a combination of effects called *cumulative impacts*. All of us contribute to cumulative impacts when we drive our cars, flush our toilets, and build a new house. The challenge to resource management in southwest Florida is to ensure that the cumulative effects are not so large that the natural systems and the benefits they provide are beyond repair. When the quality of natural resources is diminished, the area's economy can also be adversely affected. Understanding how natural resources and the economy are related is also a challenge to resource management.

For more information, see the *Strategic Regional Policy Plan 1995 and 1997*, *Base Program Analysis*, and *The Story of the Greater Charlotte Harbor Watershed*.





THE REGIONAL ECONOMY

Measuring the economic value of the environment and its quality is a difficult assessment. Although the value is rarely considered, the economic value associated with the current uses of our resources, such as tarpon fishing in the Peace River, or "non-use" values, such as the wetlands naturally providing treatment of stormwater are important to the regional economy. A functional environment provides clean drinking water for our homes, soil and fertilizer for our crops, and wading birds to compliment a canoe trip through the mangroves. However, none of these resources are limitless, although they are often treated as such.

Tourists demand clean beaches, or they will seek substitute destinations with their vacation dollars. Likewise, residents are entitled to a healthy community, yet have a stewardship responsibility to ensure its health. Tourists and residents are drawn to southwest Florida because of many natural amenities. The strength of our economy rests on the quality of our environment, and nearly every household and occupation is in some way affected by the health of the ecosystem. Conversion of natural landscapes has a cost in addition to that of permits, blueprints, materials, and labor. Natural ecosystems directly or indirectly support a multitude of jobs, provide essential services for our communities, and make this a place to enjoy.

Agriculture and phosphate mining dominate the inland counties of DeSoto, Hardee, and Polk Counties, while tourism as well as residential and commercial development plays the dominant role in the coastal economy. Although the outputs of goods, services, and revenues from all sectors of the economy are constantly changing, it is useful to understand the economic value associated with the current activities, amenities, and non-use satisfaction levels dependent on natural resources.

Economic activities that are affected by environmental quality range from recreational fishing to construction. The natural habitats, water quality, and freshwater flows maintain the amenities and natural resources necessary to sustain fishing, tourism, recreation, and the businesses that sustain these activities. To make mining a profitable venture, surface water in adequate quantities must be present; for agriculture, water for irrigation and livestock must meet certain quality standards. Thus, the quality and economic output of the activities is dependent on the extent and quality of the natural resources.



Estimating the Value of Natural Resources

All residents benefit economically from the unique natural resources of the Greater Charlotte Harbor Watershed. The multi-billion dollar agriculture industry, championship fishing, and tourism are directly related to the quality of the environment. Natural resources provide jobs and industry earnings as well as other public and private benefits such as recharging groundwater aquifers and providing essential fish and wildlife habitat.

Assessments of natural resource value must make certain assumptions and use estimates. These assumptions make the results imprecise and may overestimate some economic values. Nonetheless, the methods provide a very useful estimate of natural resources values. Economists used two methods to estimate the total economic value of Greater Charlotte Harbor Watershed natural resources--*consumer surplus* and *total income*.

Consumer surplus may be thought of as consumer "profit." Although this money does not actually change hands, it represents the value of human satisfaction from using the resource. For example, if a family on vacation rented kayaks at a wildlife refuge for \$100, but had been willing to pay up to \$120, they would receive a \$20 benefit in *consumer surplus*.

Total income cannot be added to consumer surplus, it simply reflects value differently. It includes income from direct, indirect, and induced wages. Any business that relies on natural resources to make money also usually requires goods and services from other businesses. Typically, this support includes food, transportation, utilities, office supplies, and professional services. These related goods and services also produce an income, and additional benefits such as jobs.

The combined income of a business and the related sales it generates from other companies is the *total income* that a particular business generates in the region's economy. For example, the same family on vacation that rented kayaks also likely spent money for gas, meals, and hotel lodgings. In this case, *total income* attempts to account for the additional expenditures required to use the resource.





The Economic Value of the Greater Charlotte Harbor Watershed

The Greater Charlotte Harbor Watershed supports 124,000 full-time and part-time jobs and \$6.8 billion in total sales annually. Based on this level of economic activity, the watershed also provides about \$1.8 billion per year in net value to recreation users, and produces about \$3.2 billion per year total income to the area. Table 1 summarizes consumer surplus and total income derived from natural resources in the watershed. This one-year estimate is based on the best information available for 1994 through 1996. In addition to these billions of dollars in annual benefits, we receive uncounted benefits such as clean air to breathe or the scenic beauty of a river, values difficult to quantify, yet still tied to the quality of the environment.

Table 1: Annual Consumer Surplus and Annual Total Income in the Greater Charlotte Harbor Watershed

Resource Activity/Amenity	Consumer Surplus	Total Direct, Indirect, and Induced Income
Tourism & Recreational Industries	(in Other Recreational Activities)	\$2,196,941,059
Commercial Fishing	*	\$22,635,667
Recreational Fishing	\$107,228,991	(in Tourism)
Other Recreational Activities**	\$809,448,482	(in Tourism)
Agriculture	*	\$671,580,307
Mining	*	\$270,250,299
Non-use value of wetland areas in the Charlotte Harbor NEP study area	\$884,028,344	not applicable
TOTAL	\$1,800,705,816	\$3,161,407,332

* not provided due to information disclosure constraints.

** e.g. boating; swimming and other water sports; nature observation.

Source: Charlotte Harbor NEP, *Estimated Economic Value of Resources*, Hazen and Sawyer, 1998, p. ES-5.



What happens to these counted and uncounted economic benefits if our natural resources are damaged? Certainly the number of wildlife will decline, and so will other natural benefits such as purifying and recharging our drinking water supply. While temporary jobs in mining or construction may be created, resulting declines in environmental quality may destroy more permanent jobs in agriculture and business, and impose higher pollution costs.

Economic and natural resource decisions are connected. When considering land use changes, should we only look at initial project payoffs, or on the other hand, consider both the short and long-term costs and benefits? For example, building roads and causeways not only increases access to public lakes, trails, and beaches, but also increases the value of adjacent private lands for more intensive use. Therefore, the cost of such new facilities should include the natural benefits lost not only from the right-of-ways, but also from the adjacent lands opened up for urban development. Do we consider these total costs when planning future trade-offs?

Economic assessment helps us to understand the basic linkage between our natural and economic geography. Natural resources are commonly taken for granted, or simply discounted when assessed with more traditional methods of economic valuation. By considering the economic value of natural resources, we may avoid passing on the costs of our present natural resource alterations to our children and grandchildren.

The Charlotte Harbor NEP conducted a study to measure economic value associated with natural resources. These natural resources include fish and wildlife, natural ecosystems, water, minerals, fisheries, and productive soils.

The significant activities and amenities include:

<i>Agriculture</i>	<i>Recreational fishing</i>
<i>Mining</i>	<i>Water sports and boating</i>
<i>Tourism</i>	<i>Recreation industries</i>
<i>Nature observation</i>	<i>Commercial fishing</i>
<i>Wetland benefits</i>	

For more information see *Our Southwest Florida Natural Resources and Economy, 1999* and *Estimated Economic Value of Resources, 1998*.



FRESHWATER CREEKS AND RIVERS

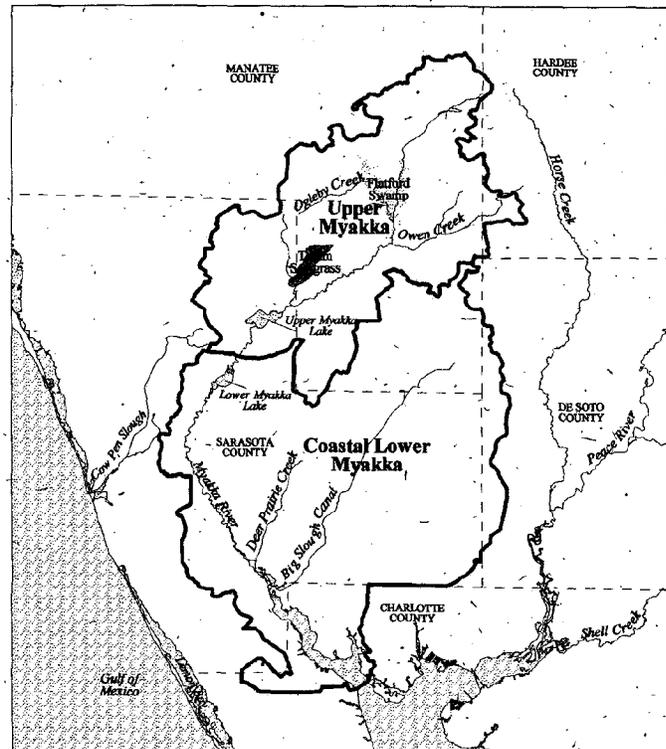
Freshwater resources are worth protecting. As freshwater resources decline and demand for water grows, inland resources increase in value. These waters are particularly important to inland economies, but their quality affects the entire Greater Charlotte Harbor Watershed. Agricultural land uses, including ranching, are one of the three traditional components of the state-wide economic base. These freshwater-based uses and the coastal communities they supply with food and other products are linked by the rivers and economics.

Freshwater resources define the quality of residential life in both coastal and inland communities. These resources support agriculture, fishing, mining, and recreation/tourism uses valued annually in billions of dollars. Three sub-basins contain our major surface freshwater supplies - the upper watersheds of the Myakka, Peace, and Caloosahatchee Rivers.

The Myakka River

The Myakka Watershed has the largest contiguous wetland landscape of the three sub-basins. (Map 2). The river begins its southerly flow from headwaters in Manatee and Hardee counties. After following a narrow floodplain forest corridor, the river slows and enters a series of lakes in Myakka River State Park, the largest state park in Florida. Deer Prairie Creek and Big Slough feed the river as it widens and enters Charlotte Harbor.

Cattle ranching dominates the majority of the basin, especially upstream of Myakka River State Park. To satisfy the need for range and pastureland, much of the watershed was drained



LOCATION
Myakka River Basin

0 1 2 3 4 5 Miles



Map 2: Myakka River Basin.

For more information on freshwater resources, see Charlotte Harbor NEP, *The Story of the Greater Charlotte Harbor Watershed*, 1998.



and diverted. These alterations enabled some of the drained area to be used for row crops and citrus groves. Other parts of the upper and central portions of the Myakka watershed have been acquired for state management and protection.

In the lower portion of the Myakka basin, urban development is gradually displacing agriculture. Former grazing lands along the banks of the lower Myakka River are now being converted to urban uses, mostly homes. Some construction is finally occurring on the vast inventory of lands that were platted in the 1960s. At that time, these plats displaced agriculture in western Port Charlotte and in the City of North Port. The Myakka River now becomes even more important to these areas, supplying their drinking water as well as habitat for fish and wildlife.



Photo left: Oak tree on the Myakka River.

Photo by David Moldal

Photo right: Tree die-off at Flatford Swamp in the Myakka River Watershed.



Photo by David Tomasko



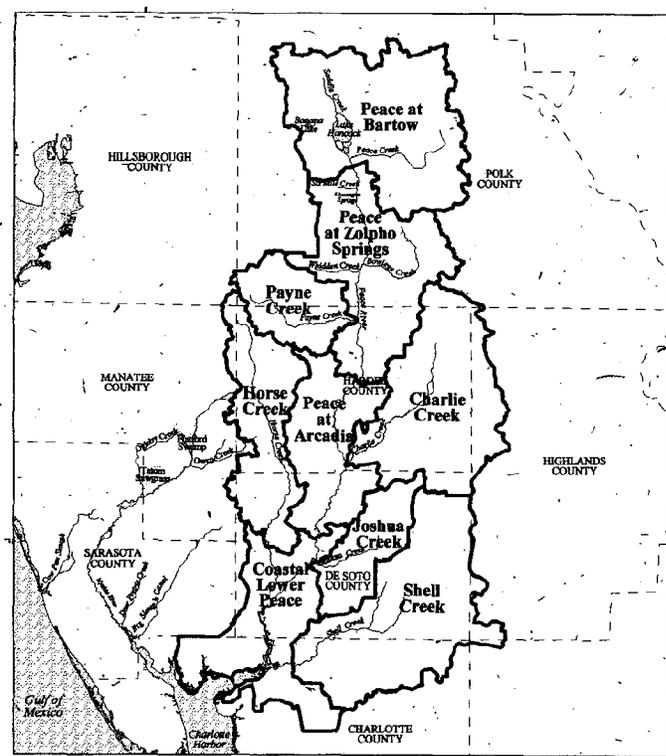


The Peace River

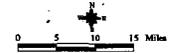
At 2,300 square miles, the Peace River basin is the largest and most diverse in the Greater Charlotte Harbor Watershed (Map 3). The river originates at the Green Swamp in central Polk County, draining a series of wetlands and lakes. The rate of flow is directly proportional to groundwater levels. Underground and overland flows follow natural and altered paths through canals, flood control structures, former phosphate mines, wetlands, and Lake Hancock. South of Lake Hancock, canals and tributaries combine to define the main channel of the Peace River that eventually flows over 100 miles southwest to Charlotte Harbor.

For almost a century, phosphate mines have been a major land use in the Polk County headwaters of the Peace River, greatly altering the hydrology, and natural flora and fauna of the landscape. Since adoption of a State trust fund in 1977, a portion of old mined areas are being voluntarily reclaimed. Citrus, cattle ranching, and row crop farming also occurs in Polk County, but even more commonly, downstream in Hardee, DeSoto, and Highlands Counties.

The Peace River is the major freshwater contributor to Charlotte Harbor. It is a major source of drinking water for about 90,000 people in Charlotte, DeSoto, and also Sarasota Counties. When the effects of mining and agriculture have combined with municipal water uses and decreased rainfall, freshwater flows have declined, threatening the ecology of the river system and Charlotte Harbor. Reduced flows are most apparent upstream, although declines have also been recorded in the Peace River as far downstream as Arcadia.



LOCATION
Peace River Basin



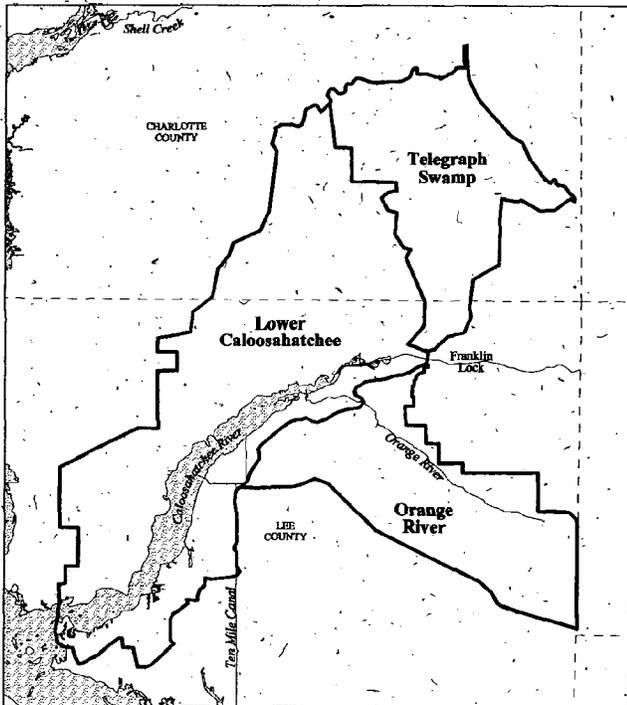
Map 3: Peace River Basin.



The Caloosahatchee River

Before this century, the Caloosahatchee River originated as overland flow from Lake Okeechobee through marshlands and swamp forest. Since then, the U.S. Army Corps of Engineers has gradually converted the upper river into a canal connecting the lake and controlled by discharge structures and locks. Today, Franklin Lock in Lee County separates the freshwater of the river from the salt water of the estuary. It also marks the beginning of the 30 mile tidal basin of the Caloosahatchee River—starting at the lock and continuing to the Gulf of Mexico (Map 4).

Twentieth century transportation, drainage, irrigation, and waste disposal have been hard on the Caloosahatchee River and its watershed. Channels straightened, shorelines hardened, oyster reefs dredged; the river has been assaulted by raw sewage, stormwater runoff, great counter-seasonal freshwater releases, pesticide spills, thermal effluent, and exotic nuisance species.



LOCATION
 Tidal Caloosahatchee River Basin



Dominated by the human uses in the surrounding cities of Cape Coral and Fort Myers, the estuary still provides critical habitat that requires careful management. Despite the accumulated damages, seagrasses still flourish when river conditions are suitable. Boaters delight upon seeing manatees, and anglers speak of remarkable catches of snook or redfish from secret fishing holes. Agribusiness has converted many uplands and wetlands east of Franklin Lock to intensive agricultural uses. Conversion includes numerous drainage and irrigation canals where crop demands regulate river water flows into or out of the adjacent canals. The citrus industry has expanded significantly into the upper sub-basin during the past decade and depends highly on controlling soil water levels. In addition to the upstream channel, small creeks and tributaries contribute significant freshwater to the

Map 4: Tidal Caloosahatchee Basin.

sub-basin. Considerable freshwater urban runoff also enters the river and estuary from the extensive Lee County network of navigation and drainage channels.





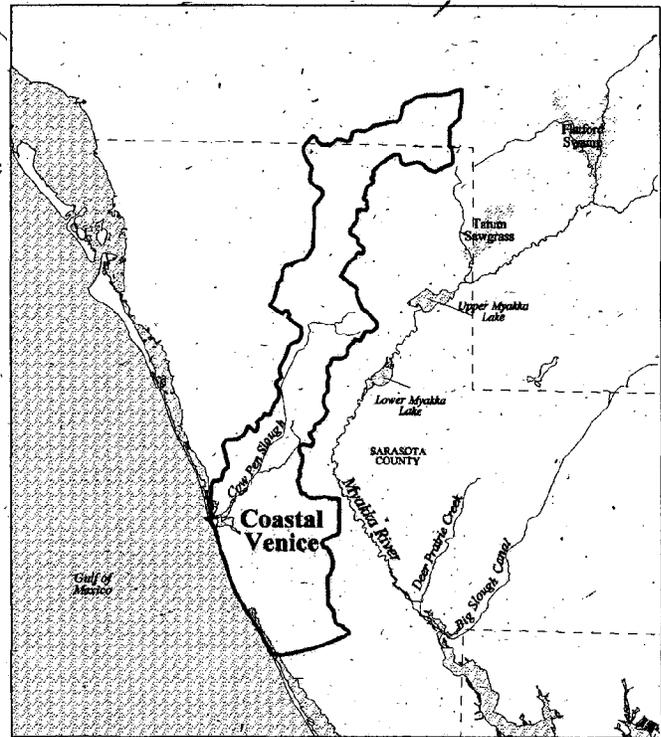
COASTAL ENVIRONMENTS

Estuaries are among the most productive environments on earth. When the freshwater creeks and rivers meet the salty waters of the Gulf of Mexico, they create a unique and productive estuarine environment. Plants, animals, and people take advantage of the places we call estuaries. Many species of freshwater and marine animals rely on the estuary and spend a portion of their life cycle in this environment. A series of distinct but related bays and estuaries make up the coastal environment of southwest Florida. Together they form one of the largest systems in the state and the west coast of Florida's most productive estuarine area.

Estuarine environments require careful management. The estuaries in the Greater Charlotte Harbor Watershed are unique resources heavily influenced by freshwater systems and intense use. Restoration and maintenance of high environmental quality should sustain the coastal economic base for tourism, fishing, recreation, and residential quality of life.

Coastal Venice and Lemon Bay

A series of bays, beaches, barrier inlands, and mangroves dominates the Coastal Venice to Cape Haze estuarine area. The barrier islands separate the waterway running from Venice Inlet through Lemon Bay from the open waters of the Gulf of Mexico and Charlotte Harbor. Gasparilla Sound, a broad open waterbody, forms the exception to this pattern of lagoons. Southward, Gasparilla Sound merges into Charlotte Harbor proper (Maps 5 and 6).



LOCATION
Coastal Venice Basin

0 1 2 3 4 5 Miles



Map 5: Coastal Venice Basin.

For more information, see *Base Programs Analysis, Volume 1, 1998.*



This part of the study area has some important resource management challenges:

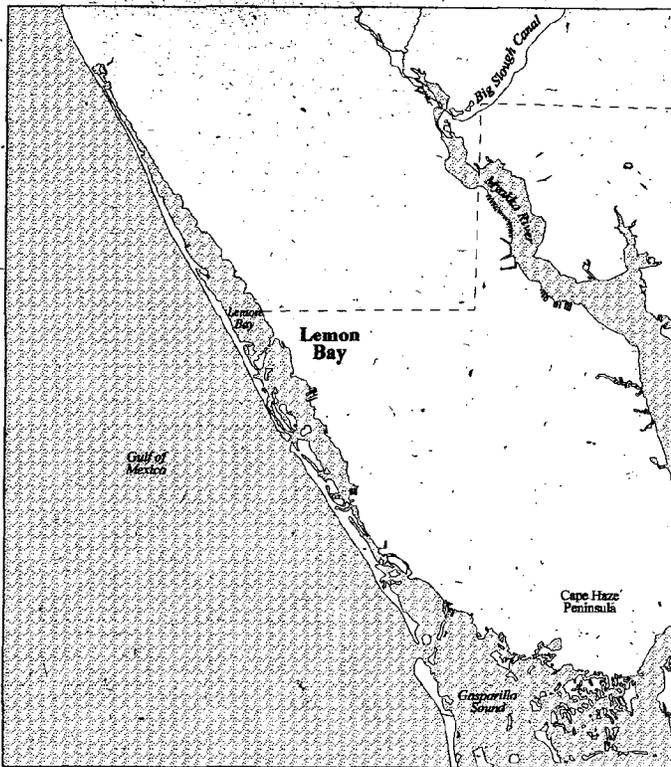
- ◆ the effect of boat traffic and dredging on the Intracoastal Waterway;
- ◆ retaining mangrove areas and protecting seagrass beds;
- ◆ large areas of undeveloped platted lots;
- ◆ the effects of septic systems and stormwater runoff from development on water quality;
- ◆ dynamically unstable tidal inlets; and
- ◆ removal of nuisance exotic vegetation.

All of these factors influence the neighborhoods and habitats in this coastal area.

Charlotte Harbor, Myakka and Peace Estuaries

Charlotte Harbor proper lies primarily in Charlotte County and connects to the Gulf of Mexico through Boca Grande Pass (Map 7). Although the harbor has an area of about 270 square miles, much of it is very shallow. Areas of deep harbor water extend up into the lower Myakka and Peace rivers. Sandy shelves make up the harbor "walls" including Cape Haze on the west, and Punta Gorda/Cape Coral on the east. These east and west walls are covered by seagrass beds--essential habitat for young fish and other wildlife.

The tides from the Gulf of Mexico effect water levels far up the Myakka and Peace rivers. Although saltwater migrates up the rivers during low river flow periods, typical high flows in summer freshen the rivers and lower harbor salinity. Thus, the harbor changes dramatically with the seasons.



LOCATION
 Lemon Bay Basin



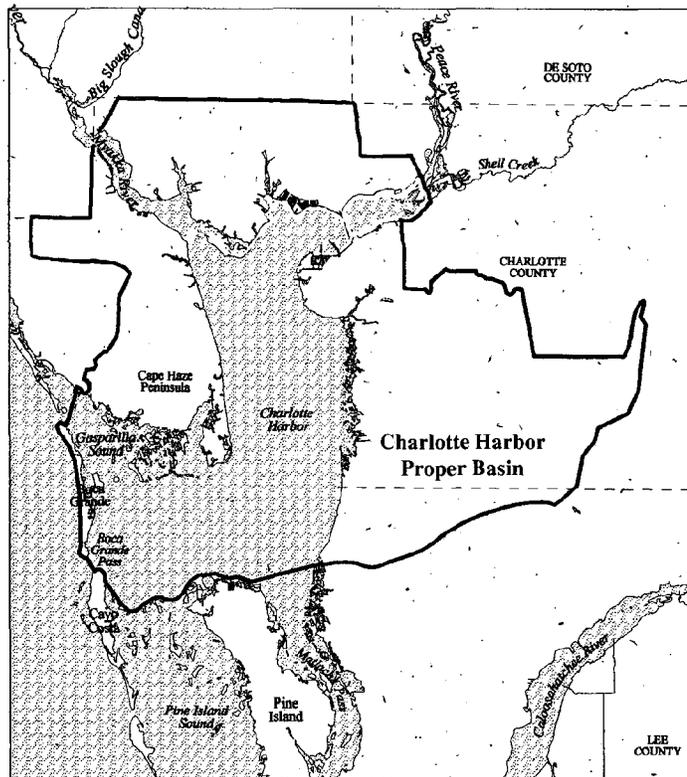
Map 6: Lemon Bay Basin.

For more information, see *Synthesis of Existing Information, 1999*.





The public owns many of the wetlands, mangrove forests, and salt marshes surrounding the harbor. Very large buffer areas, part of the Charlotte Harbor Buffer Preserve, and mangrove islands are also publically owned. However, much of the former ranch land and natural habitat have been displaced by platted lots and suburban development. As people continue to move to the communities around Charlotte Harbor, the impacts of man-made canals, septic systems, mangrove trimming, and loss of upland habitats require more careful management. One excellent example is the recent decision by Charlotte County to provide central sewers in South Gulf Cove.



The 270 square mile Charlotte Harbor estuary is characterized by:

- ◆ Freshwater inflow from three major rivers and several smaller streams mixing with sea waters of the Gulf;
- ◆ Semi-tropical plants and animals specifically adapted to this habitat;
- ◆ Semi-enclosed bodies of water, open to the Gulf of Mexico through several tidal inlets; and
- ◆ Freshwater dilution of sea water ranging from zero to 100 percent, depending on season, location, and depth in the harbor.



LOCATION
Charlotte Harbor Proper Basin



Map 7: Charlotte Harbor Proper Basin.



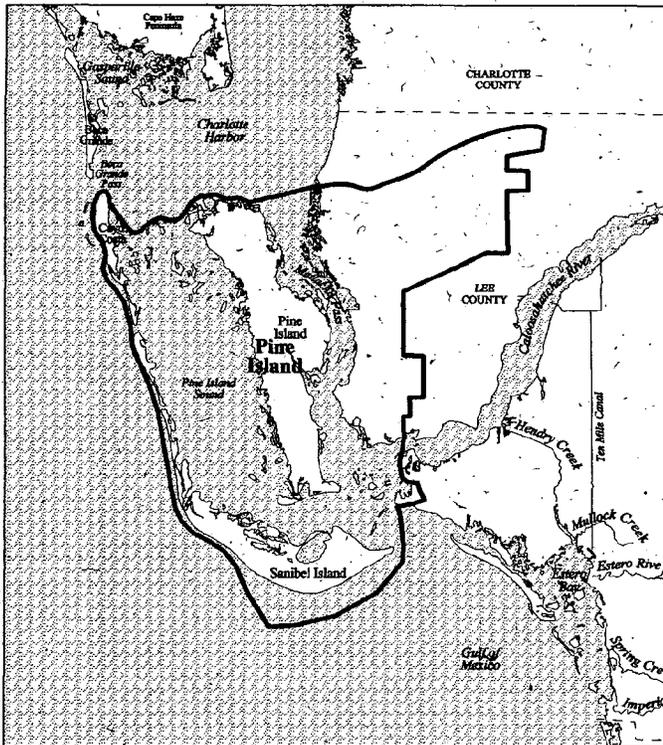
Pine Island Sound and Matlacha Pass

Two large estuaries, Pine Island Sound and Matlacha Pass, lie immediately south of Charlotte Harbor proper (Map 8). Pine Island separates the two estuaries and provides them with limited freshwater from numerous small creeks and wetland areas. Direct rainfall and runoff from western Cape Coral provide the major portion of freshwater to Pine Island Sound and Matlacha Pass. The Cape Coral interceptor waterways directly influence the quantity and quality of the freshwater inflow.

Both estuaries have extensive seagrass beds that provide essential habitat for young fish. Periodically, during large releases from the Caloosahatchee River, outflow can discharge freshwater through San Carlos Bay into southern Pine Island Sound. Dredging and altered timing and volumes of freshwater discharges from the Caloosahatchee River system has harmed these estuaries. Seagrasses, oyster beds, and other plants and animals are vulnerable to salinity changes, sediments, and pollutants that occur during dramatic changes in freshwater inflows. A better understanding of these impacts and improved management of freshwater releases is necessary to protect these coastal habitats.

Estero Bay and Watershed

Just south of the Caloosahatchee River mouth, Matanzas Pass to San Carlos Bay forms the northern boundary of the Estero Bay estuary (Map 9). Protected on the west by a barrier island chain including the Town of Fort Myers Beach and Bonita Beach, the estuary stretches southeast to the mouth of the Imperial River at the county boundary. Extensive seagrass beds support young fish and crabs in the shallow bays, and mangroves support large bird rookeries on the bay's numerous islands.



LOCATION
 Pine Island Basin

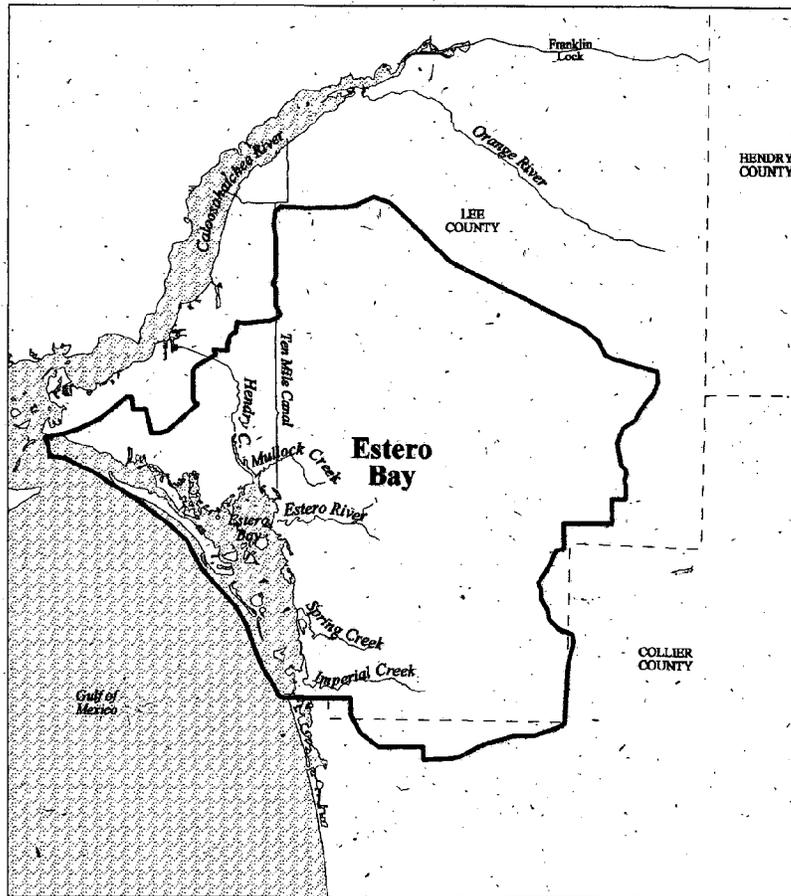


Map 8: Pine Island Basin.

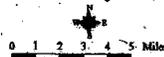




A 15 square mile area of the Estero Bay Watershed is designated as a state aquatic preserve. The state also protects tributaries in the Estero Bay watershed by the designation "Outstanding Florida Waters." The 300 square mile Estero basin is currently subject to significant growth and development, including several large residential projects and Florida Gulf Coast University.



LOCATION
Estero Bay Basin



Map 9: Estero Bay Basin.

For more information, see *The Story of The Greater Charlotte Harbor Watershed*, 1998.



ECONOMIC ACTIVITIES IN THE WATERSHED

Phosphate Mining Is A Unique Regional Activity

The phosphate industry is a significant factor in resource management within the Charlotte Harbor NEP watershed. The "Bone Valley" phosphate deposit of more than 500,000 acres lie principally within the Peace River basin. This deposit is a unique resource within North and South America. Mineable reserves within the Bone Valley deposit are projected to last at least an additional 30 years. The deposit provides approximately 75 percent of the nation's phosphate supply and about 25 percent of the world supply. Approximately 240,000 acres have been mined in Polk, Hillsborough, Hardee, and Manatee counties. Previous mining in Polk County accounts for more than 197,000 acres of the total mined area. Additional mines are under consideration for Hardee, DeSoto, and Manatee Counties.

This industry, in an important segment of the economy within the central and northern portions of the NEP watershed. The Florida phosphate industry employs more than 8,000 people with a total payroll of more than \$423 million. The industry contributed more than \$120 million in sales, property, gross severance, and other taxes in 1996. The first \$10 million collected in severance tax each year is directed to the Conservation and Recreation Lands (CARL) Trust Fund. The State of Florida uses this money to purchase environmentally sensitive lands. Since 1979 the CARL program has received more than \$432 million from the phosphate industry severance tax.

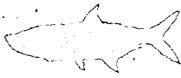


Photo by David Moldal

Draglines are used to strip mine phosphate deposits in the region known as the "Bone Valley."

A significant majority of these funds have been spent on the acquisition of environmentally sensitive lands elsewhere in Florida.

The mining and reclamation process significantly change the land form of large areas within the NEP watershed. The hydrology of significant areas of the watershed has also been impacted. The visual impact of mining, especially prior to reclamation,



mation, is significant. Real and perceived environmental impacts due to mining and chemical processing are of significant public concern. The nature of that concern contributes toward differing perspectives of the industry held by citizens of the upper basin and of the area surrounding Charlotte Harbor.



Photo by Melissa Upton

The mining process significantly changes the land form of large areas within the Charlotte Harbor NEP watershed.

Agriculture

Agriculture is the area's economic anchor, second only to tourism in Florida and the Charlotte Harbor region. Curiously, as Florida loses record levels of wetlands and native uplands to farmland, the state also leads the nation in farmland lost to development. Former ranches and farms in coastal counties are especially vulnerable to wholesale transformation into bedroom communities.

Citrus is the main agricultural product. Freezes in the 1980s in northern Florida accelerated the establishment of citrus groves in southwest Florida, notably Lee County. More than a dozen citrus varieties are grown, although most acreage goes into juice oranges. In 1995, a total of 283,000 acres of land in the study area was dedicated to citrus -- one third of all Florida citrus acreage.

Beef cattle follow citrus in economic importance. Four counties count among Florida's top 10 beef producers: Polk, Hardee, DeSoto, and Manatee. Hardee County leads the region in dairy production, with 8,000 cows in 1996, and Polk County is Florida's second-largest egg producer. Other crops are characteristic of the region. Hardee County is the self-proclaimed cucumber capital of America. Tropical fruit production on Pine Island is a growing land use. Tomato acreage has grown rapidly in this decade, joining strawberries, watermelon, and peppers as dominant field crops.

Agriculture faces challenges on all fronts throughout our region. Land clearing, leveling, and drainage improvements transform habitats. Florida's greatest water demands are for agriculture, but overpumping of aquifers has caused large decreases



of the groundwater pressure. Groundwater pumped to the surface for irrigation escapes fields, adding to stream flows and changing the natural water chemistry of Myakka and Peace River tributaries. Fertilizers and pesticides find their way to surface and ground waters, creating calls for tighter farmland regulation.

Additionally, farmers face growing economic challenges. The federal tax code can compel families to sell farms in order to pay estate taxes. Despite green belt exemptions, property taxes have escalated as nearby rural lands are developed. Citrus falls unpicked as crop prices fluctuate unpredictably. Preserving the economic viability of ranches and family farms, while at the same time providing for the region's ecological integrity, is one of our greatest challenges.



Photo by Joy Duperault

The main agricultural activity in the Myakka River watershed is cattle ranching.

Cow/Calf Ranching

Ranches occupy vast areas of the Greater Charlotte Harbor Watershed. These ranches are predominantly cow/calf ranches rather than dairies. Calves born throughout the basin are shipped to midwestern and plains states where they can be fed abundant and inexpensive corn. Ranching is a relatively benign land use. Fences interfere little with movements of native wildlife. Natural landscapes are opened up without completely removing wetlands or forested areas. Much of the Peace and Myakka rivers' natural shoreline beauty results from ranchers' decisions to keep cattle from wetter areas. Ranchers also use prescribed burns to manage grasslands and native habitats. Runoff from ranch land tends to have few contaminants other than coliform bacteria and nitrogen. Earlier practices of unchecked pesticide use at cattle "dipping stations" are now avoided.

Economic pressures endanger future ranching. Development potential has raised the tax base of some ranches to critical levels, and some ranch families may be forced to divide land in order to pay estate taxes. Others will lease and convert ranch land to citrus or tomato producers that often degrade land, soils, and water. The rural quality of the region depends on the maintenance of our ranching heritage.





Photo by Melissa Upton

Shrimp trawlers at Fort Myers Beach.

Commercial and Sport Fisheries

Recreational fishing in freshwater creeks, rivers, and lakes is a popular pastime in inland counties such as Polk, Highlands, Hardee and DeSoto. Snook are caught as far upstream as Fort Meade, while freshwater fish such as largemouth bass, croppie, gar, and the exotic species tilapia are also highly prized gamefish throughout the study area. Charlotte Harbor is highly significant to Florida as a nursery ground for marine and estuarine species. Up to 90 percent of commercial and 70 percent of recreational species landed in Florida spend all or part of their lives in estuaries.

The main fishery species of commercial and recreational value in the study area include the following: black mullet, spotted sea trout, red drum, black drum, king whiting, flounder, blue crab, pink shrimp, stone crab, hard clam, snook, tarpon, grouper, sea bass, snapper, Florida pompano, bluefish, sand sea trout, Spanish and king mackerel, sheepshead, and several species of sharks.

The bountiful waters off Charlotte Harbor provide some of the best saltwater sportfishing in the world. Snook, tarpon, redfish, and spotted seatrout are just a few gamefish found here. About one-third of all tourists come to Florida to fish; as a result, the Charlotte Harbor region derives substantial economic benefits from the maintenance of a healthy estuarine and coastal sport fishery. It is difficult to establish a precise monetary value because of the industry's close relationship to tourism facilities and service, but Florida Department of Environmental Protection data indicate that 21 percent of our population engages in recreational fishing and total angling in the region exceeds \$1.1 billion annually.



Shellfish Harvesting

Most than 275 species of shellfish are found throughout the waters of the Charlotte Harbor estuaries. In the ancient past, the Calusa Indians of southwest Florida gathered enormous amounts of shellfish digging canals and constructing immense shell mounds. These shell mounds still dot the coastal landscape of the Charlotte Harbor NEP, and some are protected as "State Archaeological Sites."

In the more recent past, oysters, clams, and scallops were harvested commercially and rec-reationally throughout Lemon Bay, Gasparilla Sound, Charlotte Harbor, and Pine Island Sound. The height of the shellfish industry in the Charlotte Harbor area occurred during the 1940s. However, since this time, the commercial harvest of shellfish has been declining with the disappearance of the scallop fishery in Pine Island Sound in the early 1960s.



Artwork by Merald Clark, Florida Museum of Natural History

Calusa Indians digging the "Great Canal" at Pineland on Pine Island.

Shellfish are a reliable measure of the environmental health of an estuary. Because shellfish feed by filtering estuary water, they assimilate and concentrate materials carried in the water. In clean water free from bacteria, red tide, and other pollutants, the shellfish can be safely eaten year round. In areas of the estuaries affected seasonally by red tide or nearby urban areas, shellfish may not be safe to consume. Therefore, shellfish must be monitored regularly to protect public health. Currently, about one-third of Pine Island Sound is approved for shellfish harvesting year-round. Many areas in Lemon Bay, Gasparilla Sound, and the Myakka River are conditionally approved for seasonal harvest when bacteria and red tide levels are at safe levels. Pine Island Sound and Estero Bay are closed to shellfish harvesting throughout the year due to measured or probable bacterial contamination. The importance of healthy waters for safe shellfisheries has taken on a new significance in Charlotte Harbor with the introduction of clam farming in Gasparilla and Pine Island Sounds. Areas of the submerged estuary bottom lands are leased to individuals by the state for growing clams. Clams require proper salinity, oxygen, and nutrients to grow at a reasonable rate and good water quality to be safe to eat.

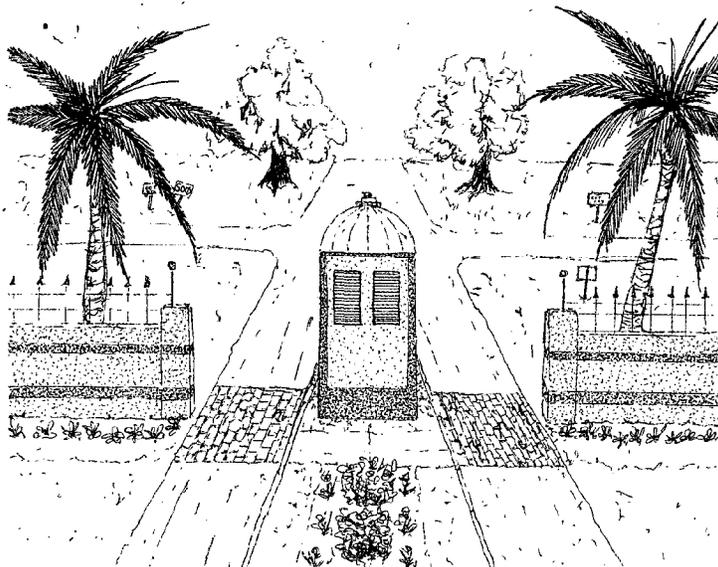




Residential Land Uses

The land-sale development that began in the 1950s dramatically and permanently changed the character and use of the land. Pastures and cropland were drained and cleared, and coastal lowlands were dredged and filled to create developable homesites by the tens of thousands. The land was subdivided, canals were dug, and streets were paved. However, in most of these developments very few houses were built. Even though some of this land was platted and sold 20 years ago, today a large percentage of it remains sparsely populated. The existing residential centers such as Fort Myers, Fort Myers Beach, Cape Coral, Port Charlotte, Punta Gorda, Englewood, Venice, and Sanibel have expanded and grown, but these areas are small compared to the near-empty land-sales developments.

The thousands of acres of land subdivided in the 1950s and 1960s have permanently cast the form of future development. The platting of these extensive tracts of land removed thousands of acres from agricultural and other productive uses years in advance of when the land would actually be needed for housing. Agricultural land is under considerable development pressure near existing urban centers, particularly south and east of Fort Myers. There, flower and vegetable cropland is being rapidly displaced by urban land uses. Since so much land has already been converted, it may be preferable to encourage new development to in-fill platted areas before covering additional high-quality habitat areas.



Gated community

Artwork by Victor McGuire



Tourism

Tourism plays a major economic role in all of Florida. Many residents initially came to the area on business or on vacation, and then decided to make Florida home. Surveys indicate that beaches remain the top attraction for both domestic and international visitors. In central Florida, tourists are attracted to Cypress Gardens, Bok Tower and its botanical gardens, and major league baseball training sites. On a regional basis for central Florida, tourism is considered the "third industry," behind citrus and phosphate mining. Tourists and winter visitors are drawn to certain natural resource attractions in the inland parts of the study area such as Winter Haven's Chain of Lakes, the Peace River, and the Highlands Hammock State Park. Canoeing and freshwater fishing are common attractions in central Florida lakes, canals, and rivers.

In coastal southwest Florida, tourism has been an important element of the economy since the 19th century. In 1993, approximately 1.7 million tourists visited coastal southwest Florida. Seasonal residents spend extended periods of time enjoying the temperate winter climate and warm Gulf waters. Longer visits are also common by international travelers from places such as Canada and Germany. The coastal area also attracts vacationing tourists and business travelers for shorter periods of time. The total coastal population, therefore, increases by more than 30 percent above the permanent population because of seasonal, business, and vacationing tourists. In 1993, total tourism expenditures were more than \$1.1 billion in Sarasota, Charlotte, and Lee Counties, with vacationing tourism dollars contributing 53 percent of total tourism spending. Coastal residents and tourists alike enjoy renowned boating and fishing, a moderate climate, shelling and bird-watching, and spring baseball training.



White, sandy beaches like this one on Sanibel Island are found throughout the coastline of the Charlotte Harbor NEP study area and are a major attraction for both national and international tourists.

Photo by Melissa Upton





Land Use and Environmental Management

"Living on a canal has made me aware of the fragility of water. The fertilizers we use can really be devastating. The NEP has given me a chance to learn about, explore and discuss the water quality in our area. The phosphate mines were especially interesting. Although I knew they existed, I did not know of the great effort in the last 20 years that went into making them add to instead of detract from the environment." - Joe Lee, CAC member

Land use changes are constantly occurring in the Greater Charlotte Harbor Watershed. The Charlotte Harbor NEP reviewed land use planning efforts as part of an evaluation of the region's environmental management. This analysis included information about specific local issues, and about how government and private groups make land use decisions. The following activities and land use decisions affect environmental management:

- ◆ Residential land sales since the 1950s dramatically and permanently changed land use patterns. Lowlands were dredged and filled, and pastures and crop land were drained and cleared to create almost a million outlying homesites in the three coastal counties. Most of these platted lots and streets still lie empty and overgrown, but continued road-building near the urban centers of Venice, Englewood, Punta Gorda, Bartow, Fort Myers, Bonita Springs and Sanibel is opening up even more agricultural lands and natural habitat for urban development.
- ◆ Tourist surveys indicate that water and beaches remain the top attraction for visitors. The total coastal population in Charlotte, Lee, and Sarasota Counties now increases by over 30% above permanent residents for seasonal, business, and vacationing visitors. Many of these visitors decide to buy a residence in Florida, adding more population and pressure on land and water resources.

For more information, see *The Story of The Greater Charlotte Harbor Watershed*, 1998.



- ◆ Strip mines remove and process phosphate rock in Polk, Hardee, and Manatee Counties. DeSoto County anticipates mining activities in the near future. Although early operations caused both air and water pollution, regulation has reduced pollution and conserved water. However, mining operations still disrupt water quality, wildlife habitats, and change the way water is stored in the system.
- ◆ Compared to more intensive land uses, runoff from cattle ranching carries relatively few contaminants other than coliform bacteria and nitrogen compared to more intensive land uses. But land clearing, leveling, and draining for crops can have more serious effects. Citrus and row crop farming can transform habitats, deplete aquifers, and pollute surface and ground water with fertilizers and pesticides.



Photo by Melissa Upton

Mound Key, located in Estero Bay, was the home of Carlos, King of the Calusa, and scholars believe it was the ceremonial center of the vast Calusa empire in southwest Florida when the Spanish arrived in 1513. The island is now protected as a "State Archaeological Site."

The Pick Preserve is made up of 26 acres of land that is contiguous with the 264-acre Florida State Botanical Site on Sanibel Island. Purchased in 1995 by the Sanibel-Captiva Conservation Foundation, the Pick Preserve is located along Sanibel-Captiva Road; opposite the Sanibel Elementary School and J.N. "Ding" Darling National Wildlife Refuge.



Photo by David Moldal





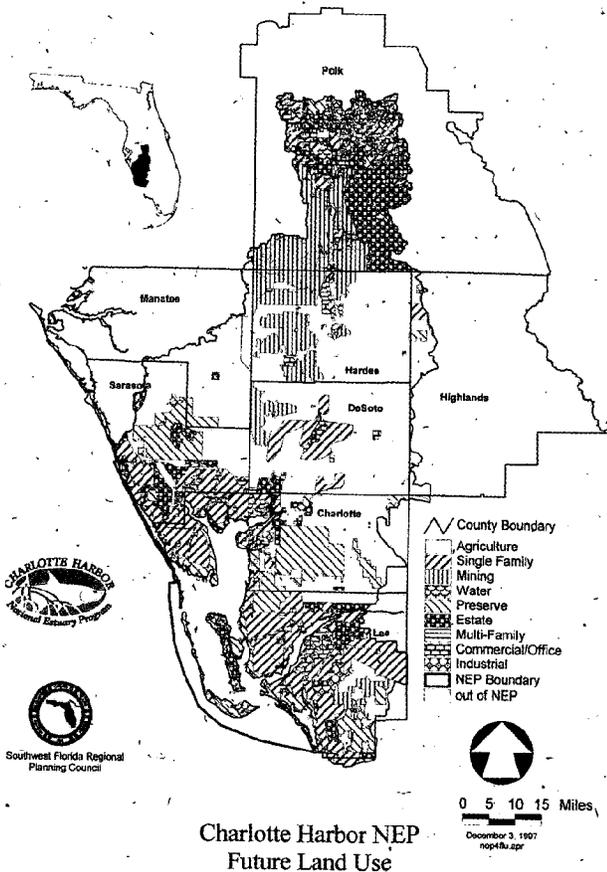
WHO MAKES THESE LAND USE DECISIONS?

However unintentionally, some land use decisions can degrade the value of the environment and our quality of life. Many different private organizations and public agencies make these decisions - some through multiple roles and programs.

Florida law delegates most land use authority to local governments, with state and regional supervision. City and county plans, regulations, taxes, and public facilities create a framework for private land use decisions. About three-fourths of the applicable policies in all city and county comprehensive plans within the watershed implement the relevant goals of this *Comprehensive Conservation and Management Plan*. Most gaps in local policies concern point source pollution and freshwater inflows that are usually regulated by regional and state agencies.

In Florida, local governments have primary responsibility for land use and planning.

Growth requires improved management of urban and rural resources. Local government comprehensive plans reflect the population growth forecasted by the year 2010 (Table 2). Despite growing urbanization, rangeland and pasture will continue to dominate the Greater Charlotte Harbor Watershed (Map 10). However, intensive agriculture and phosphate mining are expected to increase, and improved environmental performance will be required of all farming and mining activities to prevent large-scale water quality and quantity degradation.



Map 10: Charlotte Harbor NEP Future Land Use.

Source: *Base Program Analysis Volume 1*, Charlotte Harbor NEP, 1998, p. 11.



Not surprisingly, most local plans assume that a majority of the new residents will continue to choose traditional single family housing or multi-family apartment/condominiums. Together with supporting commerce, office, and industrial development, the plans project that these urban uses will take over a fifth of the region's land area by the year 2010. At the same time, area devoted to natural preserves and water resources are not projected to grow at the same pace.

Urban development can cause water quality and quantity problems, as well as loss of natural habitat. Improved environmental management of this development will be required. Land use and management, for example, affect the timing of rainwater traveling to a water body, subsequent nutrient concentrations and loading rates, and habitat availability. The following sections describe current issues of the region's water quality, hydrologic alterations, and habitat loss with regard to predicted growth and development.

POPULATION ESTIMATES & FORECASTS					
County	Year				
	1960*	1980*	2000**	2020**	% Change
Charlotte	12,600	58,500	142,400	210,700	1,572%
DeSoto	11,700	19,000	30,000	38,300	227%
Hardee	12,400	20,400	23,200	25,200	102%
Lee	54,500	205,300	421,800	594,300	990%
Polk	195,100	321,700	480,500	615,000	215%
Sarasota	76,900	202,300	325,900	419,100	445%
SUBTOTAL	363,200	827,200	1,423,800	1,902,600	424%
Florida	4,951,600	9,747,000	15,233,000	20,066,000	305%
United States	180,700,000	227,700,000	274,634,000	322,742,000	79%

* Countywide, Florida, and U.S. estimates, from the U.S. Census.
 ** Countywide forecasts from the University of Florida, Bureau of Economic and Business Research, and Florida and U.S. forecasts from U.S. Dept. of Commerce.

Table 2: Population Estimates and Forecasts.



WATER QUALITY BACKGROUND

Nutrients

The amount of nutrients entering a waterbody has important effects on water quality. Plants and animals that live in lakes, rivers, and estuaries use these nutrients, especially nitrogen and phosphorus, to grow and survive. However, when excessive amounts of nutrients enter the water, negative impacts can occur. Excessive nutrients may cause algal blooms that turn the water green and block sunlight for aquatic plants. When the nutrients are used up, the algae dies in large quantities, and the bacteria that consume the algae deplete the oxygen in the water. Low oxygen, in turn, can kill fish and other animals that cannot escape the low oxygen zone. Low levels of oxygen in the water are sometimes called "hypoxia."

Nutrients cycle through water, plants, animals, and soils. Problems occur when people add additional nutrients to the water in great excess to nature's contribution. Nutrients can come from a large number of sources and are therefore one of our leading threats to water quality. Below are some examples of sources of nutrients.

Sewage Treatment Plants/Domestic Point Sources: When sewage treatment plants process residential and commercial waste, they remove most of the nutrients from the water. However, most of the water discharged from sewage treatment plants still contain some nutrients. These discharges are point sources of nutrients to the lakes, estuaries, and streams where they are located.

Industrial Sources: Many types of industrial facilities discharge water used in their manufacturing processes. These discharges are regulated and, therefore, must meet state standards. Industries such as citrus processing, phosphate beneficiation, and animal feed lots are sources of nutrients although they are limited to the state standards for their discharges.

Atmospheric Deposition: The air around us contains nutrients also. Nutrients are released into the air from local sources such as car engines and power plants. Distant sources such as fires in Mexico and out-of-state industries can also serve as nutrient sources. Nutrients from the air can fall directly onto the land as rain or as tiny dry particles. They are then carried to a nearby water body during a rain event. It is estimated that atmospheric deposition is the source of 20% of the total nitrogen and 8% of the total phosphorus loads to our waterbodies.

For more information, see *The Story of The Greater Charlotte Harbor Watershed*, 1998.



Non-point sources: This term is used for the many places where nutrients come from when they are carried by rainwater to a storm drain, creek, or canal, and into our lakes, rivers, and estuaries. These sources are many and have the largest impact on the amount of nutrients in the water. Sources include fertilizers from residential lawns, agricultural operations, litter and oil on roads, and animal waste from livestock. It is important to note that *everyone* contributes to these sources and it is the most difficult category of sources to control.

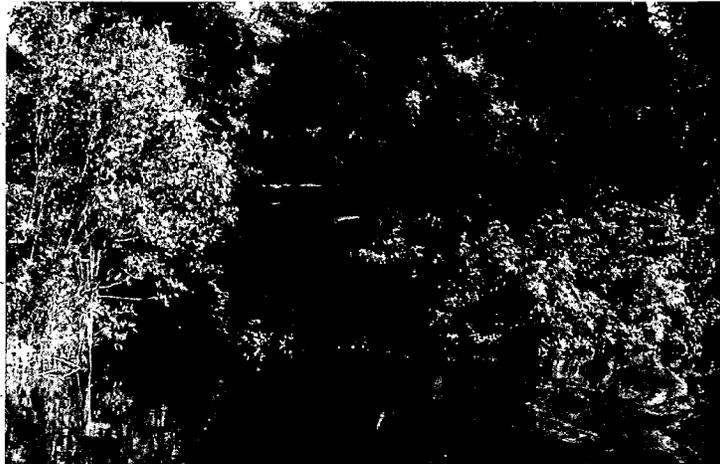


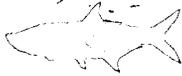
Photo by David Moldal

The spread of exotic vegetation and water pollution sources are a threat to the Estero River watershed.

Septic Tank Systems: Septic tank systems are common in the region. These tanks process household waste in areas where central sewage treatment is not available. Proper placement and maintenance of these systems are critical to their effective use. When these systems malfunction, even one household can be a large local source of nutrients and bacteria. The nutrients can have adverse effects on water quality and the bacteria can cause disease in animals, including humans.

Groundwater: Water that has been stored in the ground and then travels to the surface contains nutrients. Groundwater sources of nutrients are estimated to be small, but may be important to streams and rivers with large springs or areas where people are pumping groundwater and then discharging it to local waterbodies. Since the region's water table is high, there is much interaction between surface water and groundwater. Therefore, surface and groundwater quantity and quality are strongly related.





Bacteria

Bacteria in the water affect our ability to use the water for drinking, swimming, and shellfishing. The state's water standards establish bacteria limits for different types of uses. The highest standards are for shellfishing areas. Shellfish such as clams and oysters can concentrate bacteria in their bodies. When they are eaten raw, these bacteria can cause serious illness or even death. Therefore, only the waters that are regularly monitored and show very low levels of bacteria are open for shellfish collection. Other, less stringent standards, apply for drinking water and for water recreation such as swimming and fishing.

Bacteria can come from a variety of sources but those of most concern come from fecal waste of animals and people. Sources of fecal bacteria include malfunctioning septic tank systems, leaking sanitary sewers, concentrated animal feedlots, and untreated waste from wastewater plant overflows. Other sources such as urban pet waste and stormwater are significant sources, especially after a heavy rainfall. For this reason, many shellfish areas are closed immediately after a large rain event.

Dissolved Oxygen

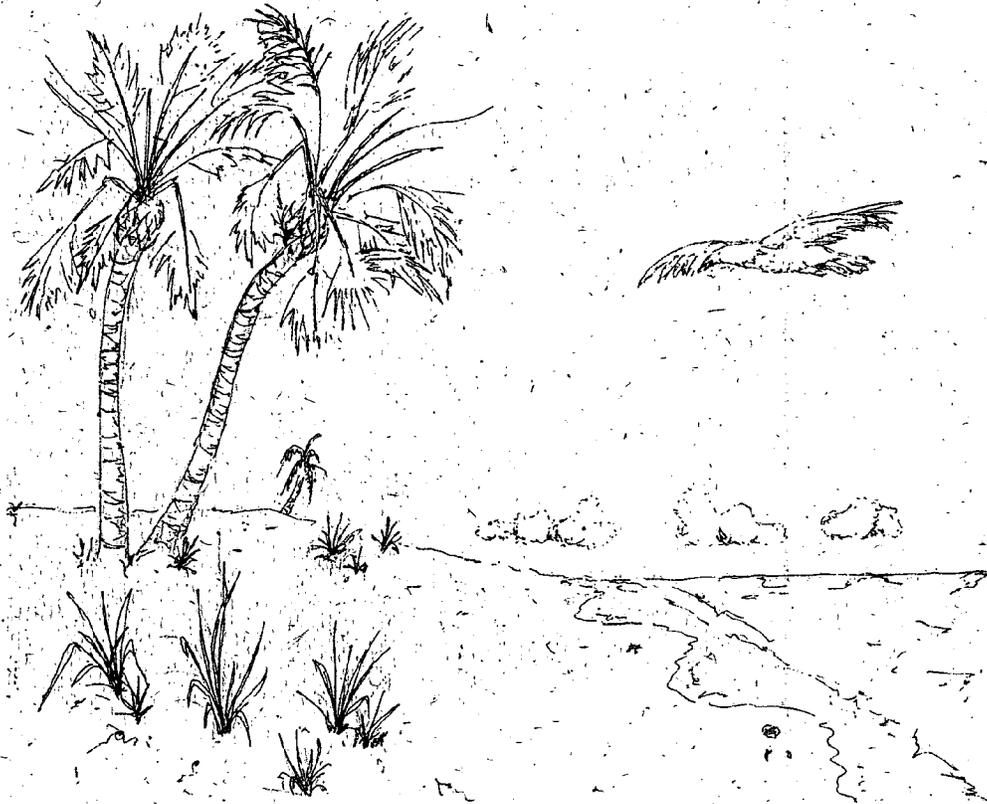
When dissolved oxygen is low in the water, fish and other aquatic animals cannot respire and may die. The factors that control oxygen levels are complex and change not only throughout the year but also during a single day. Sources of oxygen include plant photosynthesis and surface mixing from wind. Uses of oxygen include decomposition, sediment oxygen demand, and plant and animal respiration.

Human impacts on water quality can affect the amount of oxygen available for aquatic animals. Excess nutrients can cause algal blooms. When the algae die, their decomposition can use up most of the water's oxygen. During the rainy season, large amounts of freshwater can flow over the top of saltier (and heavier) water, creating a freshwater cap that reduces the movement of oxygen to deeper water. Nutrients and bacteria in bottom sediments can combine to create a demand for oxygen that limits the oxygen available in the water column. Also, sediments and particles in the water can limit sunlight that, in turn, lowers the amount of oxygen-producing photosynthesis that occurs in plants.



Toxics

The sources of toxics are numerous and are expensive to monitor. Toxics include heavy metals like lead and mercury. Pesticides and chemicals that are unhealthy for plants and animals, including people, are also considered toxics. Toxics can be released into the air from power plants, manufacturing facilities, or autos. They can be deposited on land and water through the use of pesticides, illegal dumping, and accidental spills. After a rain, stormwater carries oil, heavy metals, lawn chemicals, and waste into rivers and estuaries. Some toxic chemicals can be stored in the sediments of lakes and estuaries allowing their ill-effects to continue for extended periods of time.



Beach scene

Artwork by Victor McGuire





HYDROLOGIC ALTERATIONS BACKGROUND

Aquatic plants and animals are adapted to certain types of environments. Some species prefer the salty water of the Gulf of Mexico. Others thrive in the dynamic environment of the estuary, where salinity changes throughout the day and throughout the year. Some plants and animals can only survive in a freshwater environment, where the salty ocean waters never invade.

When people modify the level of the water table, dam rivers, or divert freshwater flows, the amount, timing, and placement of fresh and salty water can change dramatically. These changes can significantly alter the types and abundance of plants and animals that can survive and reproduce. Therefore, many of man's hydrologic alterations to the landscape over the past 200 years have been detrimental to the natural environment around us.

Changes in Total Flows

Over time, people have changed the total amount of freshwater that reaches the estuaries and the Gulf of Mexico. For some fish and plants, these changes have significant impacts on their ability to colonize, grow, and reproduce. Here are some examples of human impacts on total freshwater flows in southwest Florida:

Reduced Groundwater Levels: When too much groundwater is pumped from underground, the level of the aquifers can drop significantly. In southwest Florida, groundwater is an important contributor to creeks and rivers. In the upper Peace basin, many springs have gone dry because of the drop in aquifer levels. These springs, once sources of freshwater, no longer contribute to the Peace River flows. Similar effects can occur when water tables drop in other basins, decreasing the amount of groundwater contribution to rivers and estuaries.

Dams, Locks, and Weirs: Water control structures are very effective at their job—to hold back fresh water. Often, these structures store water for important dry season uses such as irrigation, water supply, and navigation. Their net effect to the receiving waters, however, is to decrease the amount of freshwater downstream while it is diverted for other uses.

Channelization and Canals: Straightening rivers and streams as well as connecting new areas through canals and pipes can increase the amount of freshwater in a river and estuary. If these changes are substantial, they also can have serious adverse impacts on plants and animals. Many species require a minimum level of salt



or can only endure freshwater conditions for a limited period of time. A good example of connection and channelization is the straightening of the Caloosahatchee River and connecting Lake Okeechobee to the river head.

Table 3: Examples of Hydrologic Alterations in the Greater Charlotte Harbor Watershed

Examples of Hydrologic Alterations in Watersheds of the Charlotte Harbor NEP				
	<i>Decreased Flow</i>	<i>Increased Flow</i>	<i>Altered Timing</i>	<i>Altered Location</i>
<i>Myakka Basin</i>	Peak flow transfer to coastal basin via Blackburn Canal	Big Sough Channelization	Drainage of Tatum Sawgrass	Clay Gulley Cutoff; Vanderripe Slough levee
<i>Peace Basin</i>	Loss of Kissengen Springs and sinkholes		Green Swamp and Lake Hancock regulation	Charlotte County drainage/canal systems
<i>Caloosahatchee Basin</i>	Reduction of dry season flows to tide	Agricultural tailwater runoff	Drainage of Lake Okeechobee	Sanibel Causeway
<i>Coastal Systems*</i>	Sanibel Causeway	Myakka River discharge to Venice	Salinity barriers (Coral Creek)	Drainage culverts, interceptor waterways
<i>*Estero, Lemon Bays; Pine Island, Gasparilla Sounds; Matlacha Pass.</i>				

Source: *Story of the Greater Charlotte Harbor Watershed*, Charlotte Harbor NEP 1997.

Altered Timing of Water Flows

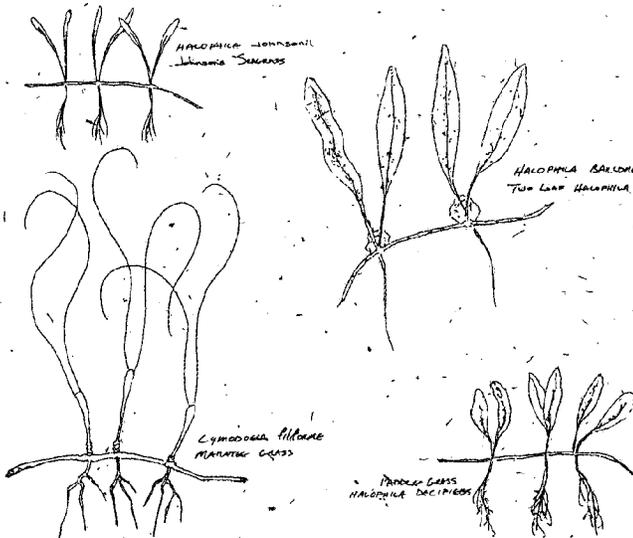
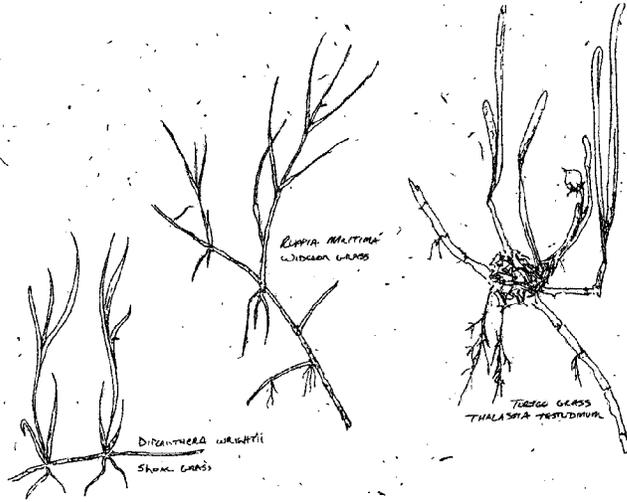
The timing of the arrival of freshwater to estuarine areas is also important to plants and animals. Their life cycles are often triggered or conditional to the salinity of the water. Therefore, man-made changes such as dams, locks, canals, and channels change not just the water *quantity* but the also the *timing* of freshwater flows. These changes, particularly when they are large and contrary to the usual seasonal conditions, can be very detrimental to plants and animals in the estuary.





Altered Location of Water Flows

Placement of freshwater sources also has strong impacts on aquatic life. Sources of freshwater keep the water relatively salt free and can push back saltier water from entering an area during high tide. When traditionally freshwater places become salty, the plants and animals that live there usually cannot survive. Similar situations occur in salt water areas, where plants and animals are not adapted to a freshwater environment. If large amounts of freshwater are suddenly directed into a marine (salty) system, the existing wildlife cannot remain for an extended period of time. Particularly in estuarine areas, small changes in freshwater sources can have significant impacts. Drainage systems and canal systems are common examples of changing the location of freshwater flows. These changes must be minimized to maintain the biological conditions.



Seagrasses

Artwork by Victor McGuire



FISH AND WILDLIFE HABITAT LOSS BACKGROUND

Florida's growing population and development are replacing natural habitat. Without the proper habitat, plant communities and wildlife disappear. Florida remains one of North America's most important reserves of biological diversity. Occupying an important transitional zone between tropical and temperate climates, Florida contains over 1,300 fish and wildlife species, and about 3,500 plant species. Preserving this *biodiversity* in the Greater Charlotte Harbor Watershed requires protection and restoration of regional fish and wildlife habitat. High rates of land conversion and habitat modification create a critical need for regional wildlife habitat planning in the watershed.

When development breaks up natural lands, habitat fragmentation results. The remaining isolated landscapes are often too small to support breeding pairs of animals and preclude intermixing of breeding populations. Also, the margins of these fragmented natural lands create "edge habitat" that alters species composition and can increase human impacts.

Half Of Original Wetlands Converted To Human Uses

Florida has lost about half its original wetland habitat - mostly to agriculture, but also to coastline development. Land drained by connector ditches for farming accounts for the largest loss of freshwater wetlands. More recently, wetland conversions to farmland or open water have accelerated, especially in smaller unregulated wetlands. Often, dredge and fill permits are issued that allow wetlands to be converted into permanent ponds for stormwater treatment systems.

Mining activities have also impacted wetlands. Prior to 1975, phosphate companies strip-mined but never restored many wetlands. This happened especially along tributaries of the Peace River in Polk County. Now, due to regulation, the phosphate industry is required to construct and replace wetlands that are destroyed.

Urban and rural development also destroy wetlands. However, spurred largely by citizen initiatives, local and state governments and private conservation organizations acquire extensive wetlands including coastal and barrier island tracts. Public or private holdings now preserve extensive portions of the mangrove coast from Placida to Estero Bay. Extensive public "buffer uplands" administered by the state aquatic preserve system further protect saltwater wetlands around Charlotte Harbor proper.





Mangroves Maintain Vital Fish And Wildlife Habitat

Mangrove forests form a distinctive broad margin around the estuary's bays and lagoons. They cover several thousand acres and may extend inland several miles from open waters. Mangroves perform vital, irreplaceable roles in providing food for species such as striped mullet and pink shrimp, habitat for birds and wildlife, and buffering inland areas from storm surges.

Over the years, dredge-and-fill operations have reduced much mangrove habitat. In addition to direct loss, urban and agricultural runoff changes water flows to interfere with the beneficial functions performed by mangrove systems. The high cost of developing mangrove habitat is ultimately paid by taxpayers in terms of flood damage, shoreline erosion, and water quality corrections. Despite increased regulation, cutting and trimming continues to threaten mangroves.

Seagrass Beds Also Perform Vital Roles

Seagrasses play several vital roles in the estuary. These plants "clean" the water by trapping suspended sediments. They provide food directly to manatees and sea turtles, and indirectly support sport and commercial fisheries by supplying habitat for fish. Spotted sea trout, for example, live out their entire lives with seagrass beds. Seagrasses provide habitat for a wide variety of sea life, giving the beds a high recreation value for shelling and snorkeling.

Commercial and recreational activities can damage or destroy seagrass. Filling for land development or dredge spoil disposal causes some losses as do changes in freshwater inflow or the closure of passes between barrier islands. Losses of seagrasses near their lowest depths indicate reduced water clarity, but specific causes have not yet been found. Shallow-draft boats able to move across the seagrass sometimes cause scars that may take years to heal. Recently, boaters, guides, anglers, and government agencies have begun educational efforts to reduce the losses caused by propellers of boats and other watercraft.

Little Of Coastal Strand Habitat Remains

In southwest Florida, little of the original coastal strand ecosystem remains. This plant community can be found in long narrow bands of well-drained sandy soils affected by salt spray along the Gulf and estuaries. Vegetation includes low growing grasses, sea grape, prickly pear cactus, stunted cabbage palm, and live oak.





While residential and urban development converted most of the original coastal strand community, large adjacent sections do remain. These include the undeveloped barrier islands in Lee County, particularly Cayo Costa, and also the Stump Pass area of Charlotte County. Coastal strands provide invaluable habitat to sea turtles, shorebirds, and amphibians.

Urban and Agricultural Uses Replacing Pine Flatwoods

Until the 1920s, south Florida landscape was mostly pine flatwoods. One or more pine species grows on these nearly level lands accompanied by understory wax myrtle and saw palmetto. The pines were then intensively logged off for a period extending through World War II, until the resource was commercially exhausted. By 1987, pine flatwoods had dropped to sixth place in area coverage behind grasslands, cypress swamp, dry prairies, freshwater marsh, and urban areas.

Throughout the Greater Charlotte Harbor Watershed, improved pasture, citrus, vegetable farms, and urban development have commonly replaced pine flatwoods. Displaced animal inhabitants include pileated woodpecker, American kestrel, sandhill crane, black bear, panthers, indigo snake, and gopher tortoise.

Oak Scrub and Scrubby Flatwoods Depleted

Both these ecosystems provide animal habitat similar to pine flatwoods. Various species of oak as well as saw palmetto, rosemary, and staggers bush dominate oak scrub habitat. Ground cover is generally sparse and is dominated by grasses, herbs, and ground lichens. Occuring along coastal shorelines, ridges, and tributaries, and rivers such as the Caloosahatchee, it has been vulnerable to urban development.

The Greater Charlotte Harbor Watershed also includes scrubby flatwoods. Similar to sand pine scrub, the south Florida slash pine or longleaf pine generally dominates this community. Typical understory consists of wiregrass and herbs. Remaining stands of scrubby flatwood have been severely depleted by selective or clear-cutting of the pines. Due to the flatwood's rapidly percolating soils and high elevations, citrus groves and residential development commonly displace this habitat.

Based on historical estimates, slightly over one percent of oak scrub communities remain, and only 10 percent of scrubby flatwoods. Flatwoods, although providing critical habitat, are quickly disappearing from the landscape.

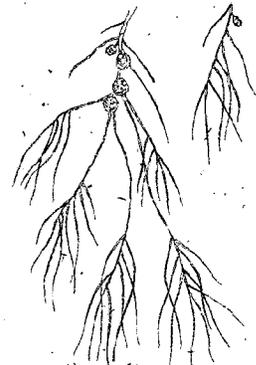




Many Exotic Plants Invade and Destroy Habitat

Many non-native plant species now invade and displace natural habitat in the Greater Charlotte Harbor Watershed. The list of "out-of-control" species includes:

Australian Pine: Pine-like trees introduced a century ago for windbreaks and erosion control along coast lines; toppled by winds; displaces coastal vegetation, and spreads easily.



Australian pine

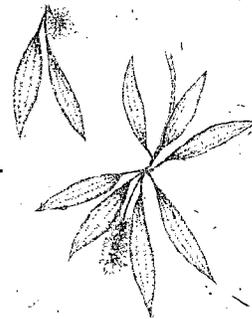
Brazilian Pepper: Holly look-alike brought to Manatee and Charlotte counties in the 1920s; irritant sap; forms dense stands; displaces wildlife and native plants; encroaches into wetlands; easily spread by wildlife.



Brazilian pepper

Punk Tree or Melaleuca: Fast growing, white-barked tree intended for windbreaks and draining of wetlands. Forms dense thickets displacing wildlife. Very common throughout southwest Florida, the Everglades, and is spreading northward. The eradication effort is a constant battle.

Hydrilla: Aquatic plant that entered Tampa, in 1950s; grows dense strands of whorled leaves that chokes waterways and depletes oxygen. Displaces native plants and fish. Control efforts making steady progress.



Melaleuca

Artwork by Victor McGuire

Water hyacinth: Large floating plant with dark green leaves and lavender flowers. Introduced in the 1800s; slows water flow and boats; depletes oxygen. Increasingly managed and can assist hydrilla control.

Air potato: Introduced through agriculture in 1905; covers native trees, shading out understory vegetation. Eliminates habitat for birds and other wildlife.

Cogon grass: Unsuccessfully introduced in 1911 for cattle forage and soil stabilization; can increase fire intensity. Invades sandhill and pine flatwoods, agricultural forests, roadsides, phosphate mining lands, and altered pinelands. Takes over large areas, crowding out native species.



WHY THE BIG CONCERN OVER FISH AND WILDLIFE HABITAT LOSS?

Vital habitat exists on both public and private lands. How these lands are managed affects both fish and wildlife populations. One may find it difficult to appraise their loss to urban and rural development without appreciating their historical coverage and location. As these ecosystems shrink, people lose the benefits and values they provide. These include:

- ❖ habitat for wildlife and plant species, including endangered, threatened, and species of special concern;
- ❖ water resource functions, including ground water recharge and water quality purification from filtration; and,
- ❖ aesthetic and scientific values.

Increasing development pressures in the Greater Charlotte Harbor Watershed require us to protect critical habitats on public lands and to support private owners whose lands provide additional habitat. Aquatic habitats require protection from pollution and the pressure of increasing boating and marine activities.



Photo courtesy of Mote Marine Laboratory

Seagrasses provide critical habitat for invertebrates and fishes in the estuary. As plants, they also provide much-needed oxygen to sea water.

WATERSHED MANAGEMENT

"The key to estuary management is understanding how an estuary's component watersheds affect its overall health, and then addressing those concerns by involving all the stakeholders in the project area. This holistic, participatory approach, which was so aptly demonstrated in the Charlotte Harbor NEP process, should be a model for all ecosystem protection and restoration activities worldwide." - Pat Fricano, TAC member

A network of existing public and private organizations in addition to citizen volunteers creates the Charlotte Harbor National Estuary Program (NEP). These organizations manage resources in different capacities including issuing permits, conducting research, monitoring water quality, and educating the public about natural resources. Our large study area and the interconnected jurisdictions of our public and private institutions have created both management opportunities as well as critical gaps in our complex legal and organizational framework. This chapter briefly summarizes the management connections that have been made to successfully address problems as well as the continuing management challenges that need to be resolved.

This management plan is designed to focus efforts on the region's most important issues and to encourage the many local organizations to work together to solve problems. This section, therefore, identifies the organizations in the region who are working to manage our resources. Once identified, the role that each organization is determined by their mission, jurisdiction, legal authority, and budget. This chapter summarizes the environmental organizations in the study area, their areas of management, and their current expenditures. With this information we can build on our existing management infrastructure and work together for implementation of this management plan.

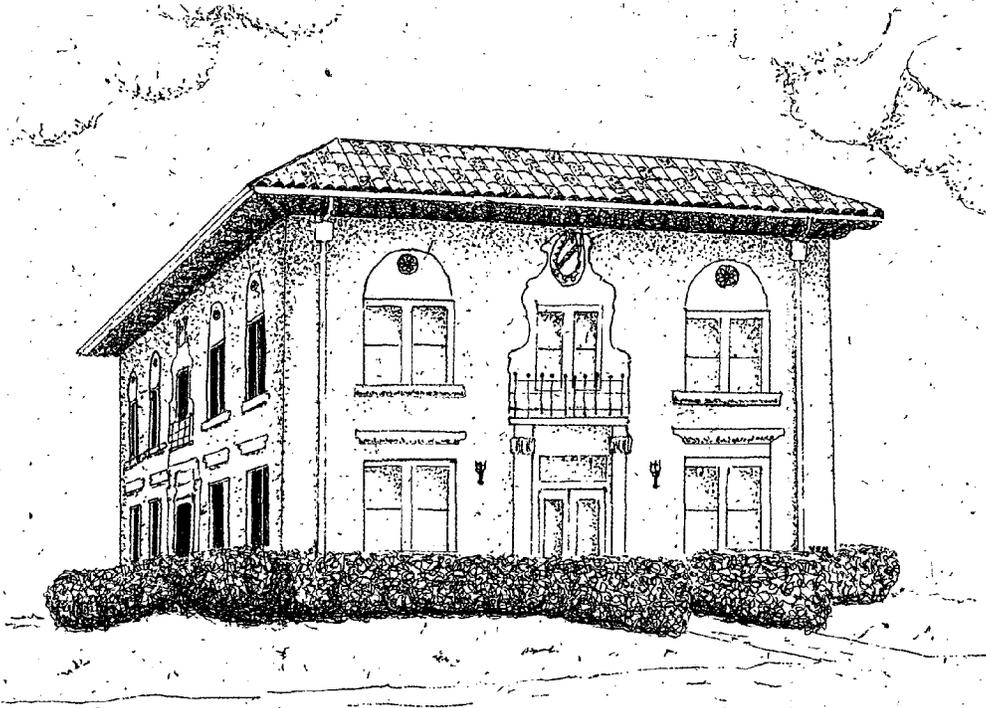
For more details, *Base Program Analysis, Volume 1.*



THE REGION'S ORGANIZATIONAL NETWORK

A large array of public agencies and private organizations work to protect and manage natural resources within the Charlotte Harbor Watershed. Most of these organizations have several roles in natural resource management. The types of organizations include the following:

- ◆ 23 local governments;
- ◆ three regional planning councils;
- ◆ two water management districts;
- ◆ 26 divisions of nine state agencies;
- ◆ seven special districts;
- ◆ eight federal agencies; and
- ◆ six private science or resource management groups.



Arcadia City Hall

Artwork by Victor McGuire



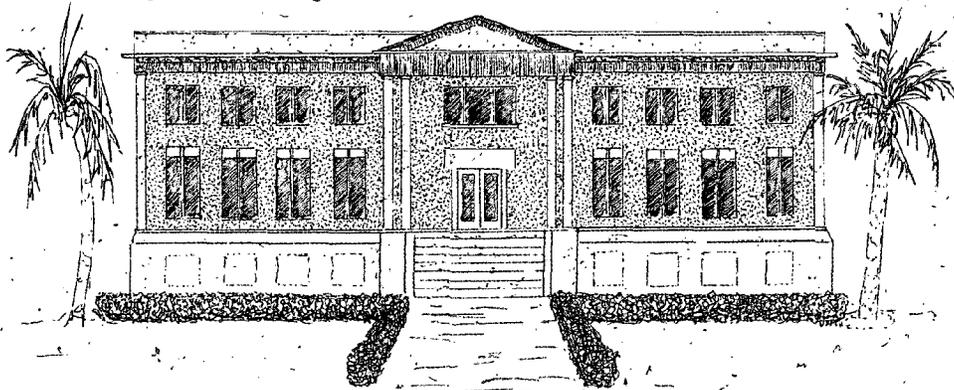


Local Governments

Local governments manage natural resources through their considerable authority for zoning, land use, transportation planning, and local ordinances. In the NEP study area there are eight counties and 15 cities and towns.

Each local government has their own board, ordinances, comprehensive plan, and zoning. The implementation and enforcement of these authorities are critical components of effective environmental management, particularly since local governments have the most authority among government entities over land use issues.

County Governments	Cities and Towns
Charlotte County	Arcadia
DeSoto County	Bowling Green
Hardee County	Bartow
Highlands County	Fort Meade
Lee County	Cape Coral
Manatee County	Fort Myers Beach
Polk County	Fort Myers
Sarasota County	Zolfo Springs
	Lakeland
	North Port
	Punta Gorda
	Sanibel
	Venice
	Wauchula
	Winter Haven



Hardee County Courthouse

Artwork by Victor McGuire



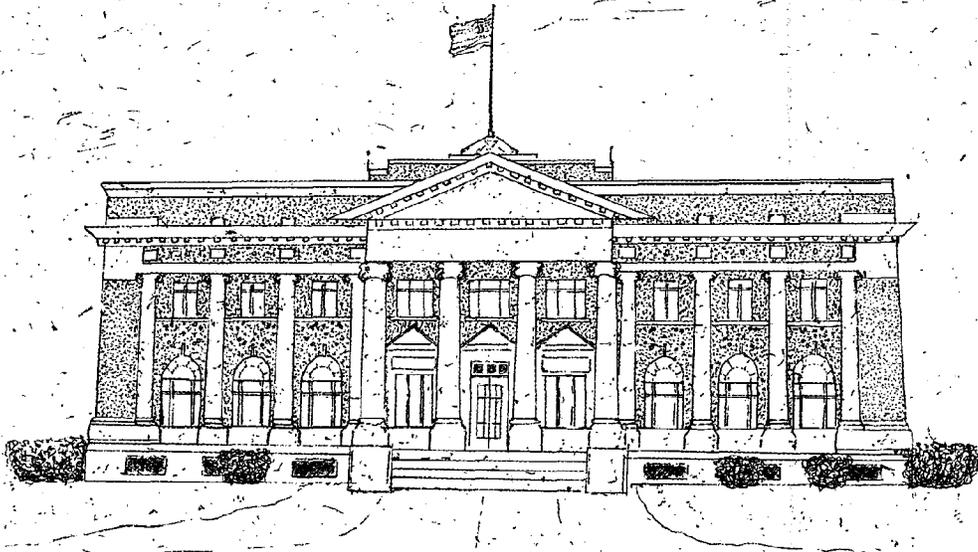
Regional Organizations

Regional organizations include regional planning councils, water management districts and water supply authorities. The three regional planning councils in the study area use their strategic regional policy plans to review and coordinate local plans and large developments of regional impact (DRIs). The regional planning councils within the Charlotte Harbor NEP study area include:

- ◆ *Central Florida Regional Planning Council;*
- ◆ *Southwest Florida Regional Planning Council; and*
- ◆ *Tampa Bay Regional Planning Council.*

Regional planning councils also include programs such as emergency preparedness, transportation, and natural resource protection. Agreements among the three councils ensure that issues and policies are coordinated in the Charlotte Harbor NEP.

Two regional water management district's jurisdictions divide the Charlotte Harbor NEP watershed. The *Southwest Florida Water Management District* and the *South Florida Water Management District* make up part of a state-wide system of water management districts created by the State Legislature. The water management district's responsibilities include water supply, flood protection, natural systems, and water quality.



DeSoto County Courthouse

Artwork by Victor McGuire

Four counties in the Charlotte Harbor NEP created the *Peace River/Manasota Regional Water Supply Authority*. Manatee, Sarasota, Charlotte and DeSoto County representatives direct the design, construction, operation, and maintenance of facilities to ensure adequate water supplies for citizens within their four-county area. The Peace River water plant and reservoir provide the major municipal water supply for those areas.

State Government

State agencies play important roles in the region's management. Policies in the State Comprehensive Plan form a framework for all Florida's budgeting, planning, and regulation programs in the watershed. The state agencies with major roles in natural resource management include:

- ◆ *Board of Trustees of the Internal Improvement Trust Fund;*
- ◆ *The Florida Land and Water Adjudicatory Commission;*
- ◆ *Attorney General;*
- ◆ *Forestry Division of Agriculture;*
- ◆ *Education Commissioner and Department;*
- ◆ *Department of Community Affairs (DCA);*
- ◆ *The Florida Fish and Wildlife Conservation Commission (formerly the Florida Game and Fresh Water Fish Commission);*
- ◆ *Department of Environmental Protection (DEP);*
- ◆ *Department of Health (DOH);*
- ◆ *Department of Transportation (DOT);*
- ◆ *Florida State Office of Trade and Tourism Development; and*
- ◆ *South and Southwest Florida Water Management Districts.*

State agencies report to the Governor and cabinet and are administered through a series of district and central offices. State permit, enforcement, and planning functions play important roles not often covered by local or federal efforts.



Federal Government

The states, in our U.S. Constitution, delegate broad responsibilities for our national resources to the federal government. Over the last century, Congress has adopted policies and created agencies to administer these policies. These federal agencies do not directly approve land uses—except for special uses such as nuclear power plants. However, federal taxes, grants and loans, and economic policy can increase or decrease activities that directly affect land use. Federal agencies with major roles in natural resource management include:

- ◆ *Environmental Protection Agency (EPA);*
- ◆ *Department of Agriculture (DOA);*
- ◆ *Department of Commerce (DOC);*
- ◆ *National Oceanic and Atmospheric Administration (NOAA);*
- ◆ *Department of Defense (DOD), including the Army Corps of Engineers (ACOE);*
- ◆ *Department of Housing and Urban Development (HUD);*
- ◆ *Department of the Interior (DOI);*
- ◆ *U.S. Fish and Wildlife Service (USFWS);*
- ◆ *U.S. Geological Survey (USGS);*
- ◆ *Department of Transportation (DOT); and*
- ◆ *Federal Emergency Management Agency (FEMA).*

Federal agencies provide a consistent framework for environmental laws and management. These agencies conduct research, review and issue permits, and apply engineering expertise which is ultimately put to use at the state and local levels. Most federal agencies have local or regional offices that are charged with specific project and regulatory responsibilities. Although policy consistency between regions is sometimes an issue, the presence of regional offices enhances local expertise and accessibility for local organizations.





Private Organizations

In addition to the local, regional, state, and federal agencies, private groups and non-profit organizations are important contributors to environmental management. These groups often target their efforts towards needs where government is weak or absent. Private groups are very effective at education, outreach, and “whistle blowing” when programs and enforcement are lacking. Some of the private organizations include: Charlotte Harbor Environmental Center, Mote Marine Laboratory, Audubon Society, Sierra Club, Environmental Confederation of Southwest Florida, Sanibel-Captiva Conservation Foundation, Lakes Action/Education Drive, and the Gasparilla Island Conservation and Improvement Association.

Each organization confronts management challenges in an attempt to protect the web of life that makes up the ecosystem. How can these organizations better understand system-wide problems and the need to work closely together to effectively manage the area’s resources? One way to start is to evaluate the management *connections* and *gaps* among these organizations.



Photo by Melissa Upton

Cedar Point Environmental Park consists of 88 acres crossed by five marked hiking trails through southwest Florida pine flatwoods, oak scrub, salt flats, and the mangrove fringe of Lemon Bay. In 1994 the Charlotte Harbor Environmental Center, a private, not-for-profit organization, was appointed to manage and protect the natural resources of Cedar Point. The park is a site for public education and passive recreation.





MANAGEMENT CONNECTIONS AND GAPS

At the federal level, the U.S. Constitution fails to provide any specific responsibility for maintaining environmental quality. Through time, Congress and the courts have defined the *general welfare* provisions of the U.S. Constitution to include environmental conservation and protection policies. The executive branch contains the agencies responsible for initiating programs to implement these federal environmental policies. The U.S. Environmental Protection Agency (EPA) is often the lead federal agency on natural resource issues. However, Table 4 illustrates that seven federal agencies, in addition to EPA, share six distinct management functions resulting in 27 different programs within the Greater Charlotte Harbor Watershed.

Table 4: Federal Agency Management Roles

Agency	Roles					
	Regulatory	Review	Planning	Research	Funding	Ownership
Environmental Protection Agency	X	X	X	X	X	
Department of Agriculture	X			X	X	
Department of Commerce		X	X	X	X	
Defense/Army/Corps of Engineers	X		X		X	X
Housing and Urban Development			X		X	
Department of the Interior	X	X	X	X	X	X
Department of Transportation	X				X	
Federal Emergency Management Agency	X		X	X	X	

Source: Charlotte Harbor NEP, *Base Programs Analysis*, Volume 1, 1998.

It should be noted that although one agency may play a role in several management areas, the level of funding dedicated to the different functions may vary significantly. Also, as congressional funding changes and new initiatives are started, the agencies' priorities may change.



At the state level, Florida programs represent an even more complex allocation of natural resource management roles. Water management districts, the Florida Fish and Wildlife Conservation Commission, and local governments receive authority from the State Constitution. Ten other state agencies receive authority from specific Florida Statutes. Together they share six management functions resulting in 35 additional program areas as illustrated in Table 5.

Table 5: State Agency Management Roles

Roles						
Agency	Regulatory	Review	Planning	Research	Funding	Ownership
Board of Trustees of the Internal Improvement Trust Fund		X	X			X
Florida Land and Water Adjudicatory Commission	X					
Attorney General		X				
Department of Agriculture Forestry Division	X	X	X	X		X
Commissioner and Department of Education				X	X	X
Department of Community Affairs	X	X	X		X	
Department of Environmental Protection	X	X	X	X	X	X
Department of Health	X	X		X		
Department of Transportation	X	X	X		X	X
Fish and Wildlife Conservation Commission	X	X	X	X		X
South Florida Water Management District	X	X	X	X	X	X
Southwest Florida Water Management District	X	X	X	X	X	X

Source: Charlotte Harbor NEP, *Base Programs Analysis*, Volume 1, 1998.

Levels of funding and priorities within state agencies can change over time as they do on the federal level. However, the information in the table indicates each agency's main goals and authorities.



LAYERS OF MANAGEMENT CREATE PROBLEMS & OPPORTUNITIES

With this overlapping framework of federal and state organizations, both problems and opportunities are inevitable. Within each *priority problem* category of hydrologic alterations, water quality degradation, and fish and wildlife habitat loss, there are good management connections as well as management gaps. During the planning phase, the Charlotte Harbor NEP identified the best examples of management connections in the hope that our management successes will serve as examples for further cooperation. The management gaps are described to highlight our management weaknesses and to correct our shortfalls. The following sections describe the management connections and gaps for each of the three *priority problem* areas.

Our Region's Hydrologic Management Connections

Management connections for hydrologic conditions such as restoring groundwater levels and maintaining ecologically balanced river flows are important. Water resources do not usually follow jurisdictional lines of local, regional, and state governments. Since the resources are affected by management at all levels of government, effective management approaches are important to the long-term health of water flows and levels.

Authority to Coordinate Land and Water Decisions: The cumulative impact of many small land and water decisions can remain hidden until after problems with hydrologic alterations arise. However, the review process for Developments of Regional Impact (DRIs) and power plant sitings provide good examples of reviews that consider regional effects, not just site-specific considerations.

General Resource Assessment, Protection, and Use: Although surface and groundwater data are not complete, land acquisition programs such as *Save Our Rivers* consider freshwater conditions to prioritize land parcels with the most water protection benefits.

Use Permitting, Planning, and Public Benefit Test: Water use permits must meet the strong legal test of *public benefit*. As agencies fill information gaps, public benefit may be expanded to consider long-term regional impacts when issuing water use permits.

A "Post = Pre" Public Policy: The guiding rule for drainage permits requires storm water management *after* development to equal or improve conditions *before* development.



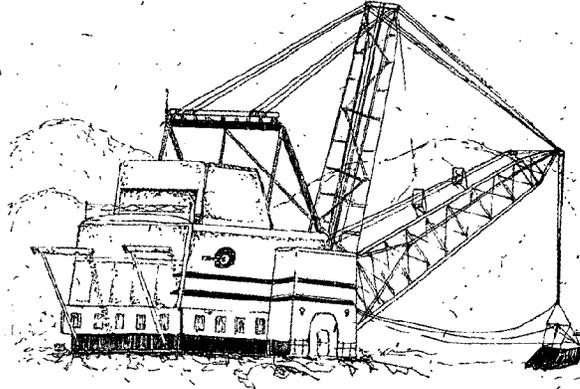
Evaluation and Prediction

Models: Models can incorporate much of the available hydrologic information. While not readily available yet, such modeling can be developed and used cooperatively among agencies and developers.

Restoration and Mitigation:

Hydrologically-oriented permit programs have helped re-establish hydrologic flows in parts of the watershed such as the upper Peace River.

New or renewed permits require damage reduction and mitigation.



Dragline used in phosphate mining

Artwork by Victor McGuire

Our Region's Hydrologic Management Gaps

When addressing hydrologic alteration problems, the challenge in the Greater Charlotte Harbor Watershed is to identify mistakes that can be reversed, especially in extensive undeveloped platted lands. Past mistakes include: over-drainage, direct sewer and stormwater discharges, and development in low-lying floodplains. Listed below are examples of gaps in our management of hydrologic problems.

Reactive Water Management: Public policy has not been effective in keeping development out of flood-prone areas.

Fresh and Salt Water Management: Overpumping freshwater aquifers has allowed contamination by salty groundwater. Improved management focuses on new development, but little is known about the effects of the timing and volume of discharges of water from our rivers to the estuaries.

Inadequate Measurable Objectives: The debate continues over conflicting water management policies and minimum freshwater flows in the three rivers in the study area. Incomplete science cannot accurately predict the results of management actions.



Inadequate Monitoring: Comprehensive, systematic, and statistically reliable resource monitoring is not currently performed. The *Compendium of Existing Monitoring Programs* should help guide solutions, but better-comprehensive monitoring is needed.

Inadequate Enforcement and Penalties: Small staff sizes and increasing responsibilities limit inspections and deter legal enforcement procedures. Conversely, the limited penalties seem too small to deter violations.

Our Region's Management Connections in Water Quality

A general level of regulatory authority has been established at the federal, state, and local government level to prevent or eliminate water pollution in the Greater Charlotte Harbor Watershed. Some of the management connections include the categories listed below.



Photo by David Moldal

Volunteers test water samples early in the morning.

Authority to Prevent or Eliminate Pollution: Institutional structures presently exist to regulate land, water, or air uses known to cause pollution. Reporting requirements keep information on hazardous materials and uses relatively current.

Sampling Data and Predictive Models: Where reliable data sets have been gathered, different pollution treatment techniques can be modeled and effects predicted. The example of Tampa Bay's improvements justify this monitoring and conservation.

Water Use Permitting: Water management districts require water withdrawal or use to a) be reasonable-beneficial; b) not interfere with existing-water uses; c) be consistent with the public interest; and d) use conservation measures.

Best Management Practices: Impacts to land, water, and air resources may be reduced through simple alterations in land form or effective resource engineering such as aerobic septic systems to minimize negative impacts.





Our Region's Management Gaps in Water Quality

Water quality degradation issues intertwine with those of hydrology. Water quality modeling, monitoring, and enforcement in the Greater Charlotte Harbor Watershed remain as gaps to be closed.

What is the "Best" Level of Nutrients?: Too much nutrients such as nitrogen and phosphorous can kill aquatic life and foul the water. Best management practices to minimize nutrient flows from new development are not well known.

Competing Funding Demands: Funding for water quality management competes with other public policies. For example, some proposals to monitor water quality for public health threats at Fort Myers area beaches were turned down.

Voluntary Prevention vs. Mandatory Correction: Failure to use best management practices will degrade area-wide water quality. It is undecided what degradation level justifies a shift from voluntary prevention to enforceable regulation.

Lack of Intergovernmental Support of Common Goals: State environmental agencies have not supported local governments pursuing common goals - such as Punta Gorda expanding mandatory sewer hookups and Lee County denying extensive wetland filling.

Our Region's Management Connections in Habitat

Among the priority problems in the Greater Charlotte Harbor Watershed, habitat protection may be the most intensely discussed. While most water and waterways are considered public property to be managed for the public, most habitat exists on private property. Even on public lands, sometimes the appropriate uses and priorities for land acquisition are debated. The best habitat management incorporates effective management of public lands along with good management on private lands.

Basic Research and Understanding - The Florida Fish and Wildlife Conservation Commission has distributed maps of likely species presence on both public and private lands. With this tool, the general public, private conservation groups, and regulatory agencies have a better idea what wildlife may exist in specific areas.

Land Acquisition, Restoration, and Other Mitigation: Over the last 25 years government and private programs purchased or acquired large land holdings. These programs have also encouraged land banking and tested habitat restoration programs.



Jeopardy: Habitat information and public support to promote enforcement actions to protect a listed species in “jeopardy” of harm or danger led to acceptable private and public mitigation and prevention programs.

Our Region’s Management Gaps in Habitat

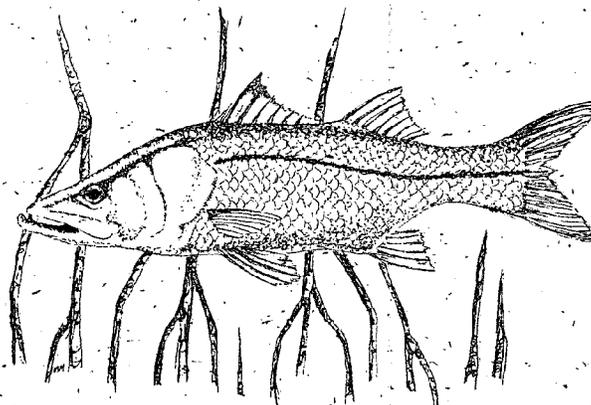
Any land development or alteration, such as water management or transportation changes the habitat value for wildlife. Only recently has the impact on wildlife been part of review and permitting processes. Even now, developers and regulatory officials may not understand public policy on the value of fish and wildlife habitat - creating many gaps in preventing habitat loss.

Gaps in Habitat Issues: When land is not owned by government, private owners, by right, do not have to manage their property as potential wildlife habitat. The purpose of most requirements for landscaping or trees is aesthetics or to provide shade, not habitat.

Separation of Plants from Animals: In ecosystem habitats, animal and plant populations operate in an integrated “web of life.” Yet, the state manages animals through one agency focused on restoring species, and manages plants through another agency focused on commercial marketability or scarcity of plants.

Habitat Preservation in “Penny Packets”: Most habitat management occurs through land and water permitting agencies that review permits based on property boundaries, not ecosystem boundaries, and developers propose land use for small, defined areas that seldom cover entire habitat communities.

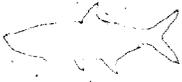
Conflicting Public Policy for Baseline Species Habitat Protection: Habitat identified by state agencies for high priority protection of baseline species may include areas necessary to meet the economic assumptions of the community or region.



Snook in the mangroves

Artwork by Victor McGuire





MANAGEMENT CONNECTIONS POINT THE WAY TO FIXING GAPS

As our population grows and changes, so will our management techniques and gaps. Some resource management and land use programs have been linked, but despite these efforts, other programs do not work in harmony. The result is loss of effectiveness and efficiency in natural resource protection. The public understands the purpose of resource management systems, and this understanding provides the critical motivation tension necessary for reform and improvement in the Greater Charlotte Harbor Watershed.

This management plan and the continuation of the NEP *management conference* will promote management connections and the filling of management gaps. Regular meetings of the committees of the *management conference* will promote communications among both agencies and interest groups. The meetings and information materials generated through the Charlotte Harbor NEP are also helpful for calling attention to new research, studies, and data that become available. Continued participation from the private groups as well as federal, state, regional, and local agencies will be important to the continued value of the NEP's activities.



Photo by Patti Armbruster

Committee members work on the *priority actions* for the *Comprehensive Conservation and Management Plan* at the retreat near Haines City.



EXPENDITURES FOR MANAGEMENT

Even when the ideal management framework is in place, funding is necessary to carry out the projects and enforcement needed for successful management. As part of the analysis of management connections and gaps, a review was conducted of the funding that is currently dedicated to environmental management. The analysis divided each organization's environmental funding and staff into six general categories:

1. **Land Use:** Managing the benefits and impacts of population growth, economic development, agriculture, forestry, and beaches.
2. **Water Quality:** Managing water quality conditions in fresh, estuarine, or marine waters.
3. **Hydrology:** Addressing issues in water supply (including agricultural uses), flood plain management, water table management, and retaining or draining wetlands.
4. **Habitat:** Managing land as well as fresh/salt water resources for yield and sustainability of species.
5. **Research:** Developing information resources for other agencies to use in any of the above efforts.
6. **Grants:** Funding from grant agencies for any of the above efforts.

All agencies in the Greater Charlotte Harbor Watershed provided information from fiscal year 1998-99 on mail-back survey forms and in follow-up phone calls. State and federal agencies usually provided a *best guess* since their service areas seldom coincided with watershed boundaries (see Figure 1).

The analysis of natural resource funding indicates significant staffing and expenditure levels within the Greater Charlotte Harbor Watershed. However, staffing levels are usually not correlated with any specific watershed, reflecting differences in agency jurisdictions versus watershed boundaries. Issues involving day-to-day management receive significant local support, with connections to regional, state, and federal agencies. Hydrology and land use issues appear to consume most day-to-day management resources. Reactive, or incident-driven issues receive less manage-

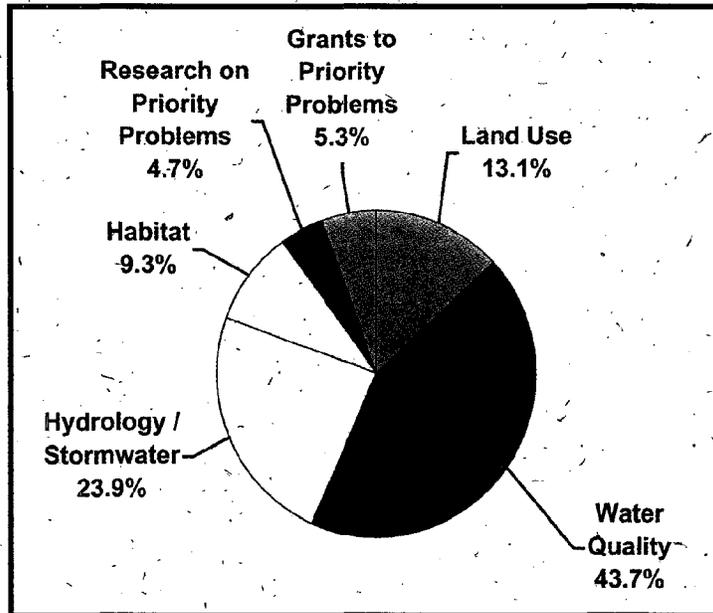
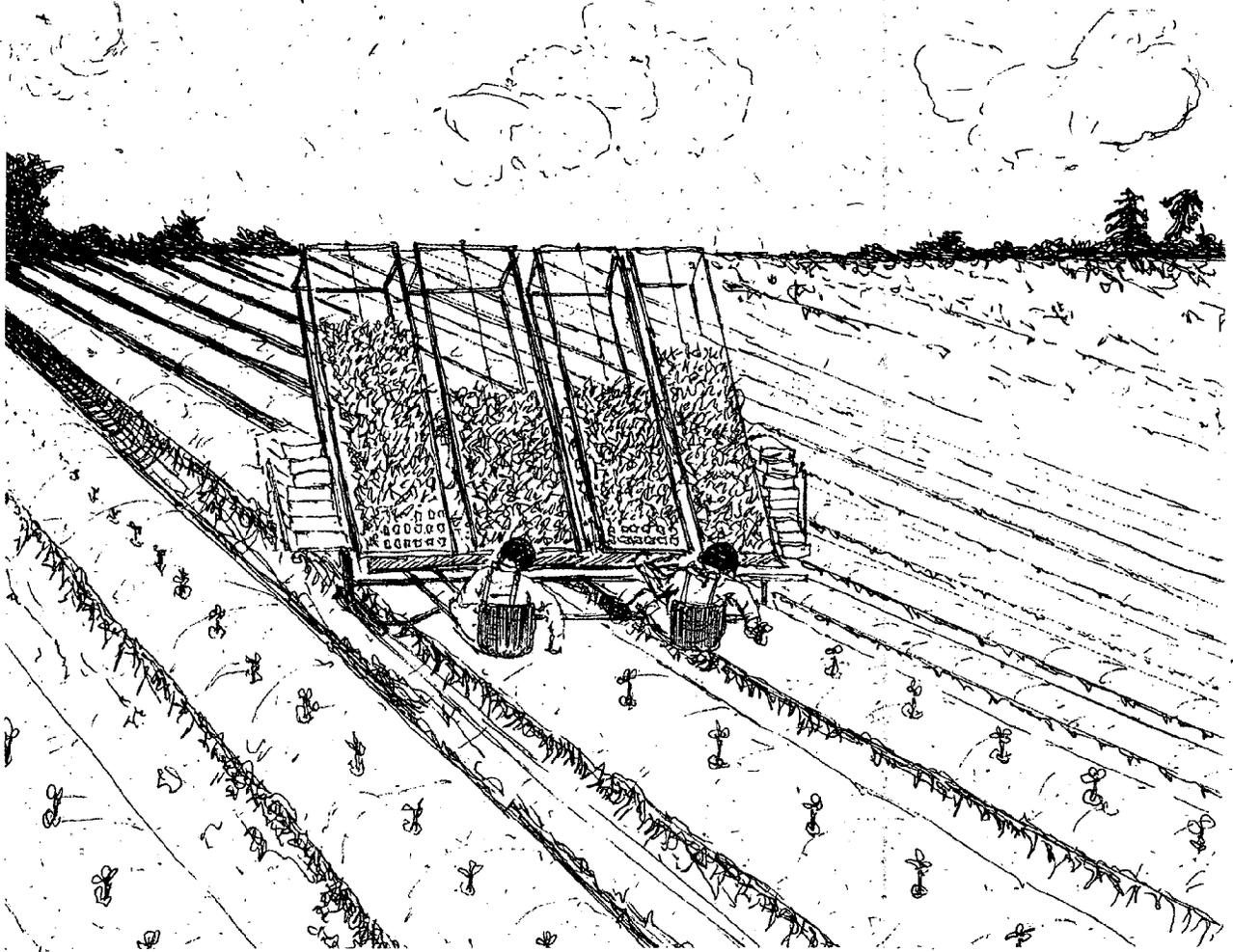


Figure 1: Fiscal Year 98-99, relative program budgets for resource management programs in the Greater Charlotte Harbor Watershed.

ment attention at local levels, but more general support from regional, state, and federal levels. Finally, general staffing levels indicate a lack of on-going research activities within the watershed.

The many projects in *Volume II* of this document are included as preliminary efforts to implement this management plan. Many of these projects incorporate multiple organizations, a variety of funding sources, and focus on natural resources rather than only jurisdictions. These examples need to be used to encourage more cooperation and targeted funding. Achievement of the *quantifiable objectives* will require all of the organizations discussed here to do their part and, in some cases, change the way that they address management problems. Their commitment to this management plan will dictate the ultimate success of our efforts and the condition of the watershed for future generations.

For details see *Base Programs Analysis, Volume 2*, Charlotte Harbor NEP.



Farm workers

Artwork by Victor McGuire



EARLY ACTIONS FOR WATERSHED CONSERVATION

"As much as Sanibel does to restore and preserve the island as a sanctuary for wildlife, we cannot dodge the effects of deteriorating conditions in the rest of the Charlotte Harbor watershed." - Molly Krival, CAC member

Over three years, the Charlotte Harbor National Estuary Program funded technical and educational early action demonstration projects. These innovative projects, selected on a competitive basis, were designed to provide immediate benefits to the watershed's natural resources, to enhance our overall technical knowledge of the greater watershed, and strengthen community awareness of and participation in environmental issues. The selected projects reflected the diversity of resource issues and information needs within the greater watershed. All projects were located in the program's study area and addressed at least one of the three priority problems or facilitated public education of environmental issues. The grants addressed a specific technical question, a new management technique, or managed a known problem, and contribute to the development of the *Comprehensive Conservation and Management Plan*.

Demonstration project objectives varied across three broad categories: habitat restoration, environmental education, and ecosystem monitoring and research. Examples included the removal of invasive exotic vegetation and construction of interpretive nature trails on public lands, hosting hands-on teacher's workshops focusing on estuarine water quality, wildlife, and ecology, and the characterization of total pollutant sources and estimation of pollutant loadings to an impaired residential lake in Polk County.

Grants were administered by the sponsoring organization and the program office, and funded directly and indirectly by the U.S. Environmental Protection Agency, the Southwest Florida Water Management District, as well as the cities, counties, and agencies who provided program matching funds. Invaluable contributions of technical expertise and volunteer hours were the key ingredients in project success. Direct program funding support exceeded \$383,000, with total project value in excess of \$1.1 million, not including numerous professional and volunteer hours. At least a 25% match was required for grant requests over three thousand dollars. Overall, the Charlotte Harbor National Estuary Program approved funding for thirty-seven demonstration projects throughout the greater study area.



HABITAT RESTORATION

<i>PROJECT NAME</i>	<i>PROJECT PARTNER</i>	<i>OTHER CONTRIBUTORS</i>
Punta Gorda Nature Park	City of Punta Gorda	Southwest Florida Water Management District
Myakka Wild and Scenic River Exotic Removal	Florida Department of Environmental Protection - Parks Service	Friends of the Myakka
Three Lakes Back to Nature Restoration	Florida Department of Environmental Protection	Charlotte Harbor Environmental Center
Edison Community College Oak Hammock Restoration	Florida Native Plant Society	
Pick Preserve Nature Trail and Teaching Center	Sanibel-Captiva Conservation Foundation	
Punta Gorda Waterfront Juvenile Fisheries Habitat	Charlotte Harbor Reef Association	Reef Ball Association; Krehling Industries, Inc.
A Pond Boardwalk at Winkler Point	Florida Department of Environmental Protection	
Dry Prairie Restoration	Florida Department of Environmental Protection - Parks Service	



Photo by Jim Stilwell

A public boardwalk and nature trail overlooks a tidal creek and re-introduced native vegetation at the Punta Gorda Nature Park.



HABITAT RESTORATION

Eager volunteers along the banks of the Myakka River during exotic vegetation removal and habitat restoration activities.



Photo by David Moldal



Photo by David Moldal

Project manager and Florida Department of Environmental Protection biologist Chris Becker displays an air potato seed during exotic vegetation removal along the Myakka River.



Photo by Heather Stafford

Hard working volunteers clear the exotic pest plant Melalueca in preparation of building the Winkler Point Natural Trail near Estero Bay.



HABITAT RESTORATION

Restoration ecologist David Ceilley from the Sanibel-Captiva Conservation Foundation outlines the location of the teaching shelter for the Pick Preserve Nature Trail on land recently cleared of exotic vegetation.



Photo by David Moldal



David Tomasko and Forest Turbiville of the Southwest Florida Water Management District survey the mosquito ditch connection to the residential canal during construction of the Punta Gorda Nature Park.

Photo by David Moldal

Project manager Jim Stilwell of the City of Punta Gorda removes *Melaleuca* during development of the Punta Gorda Nature Park.

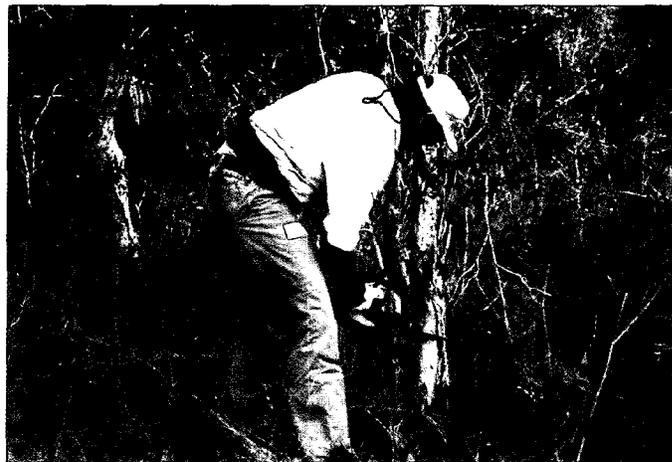


Photo by David Moldal





HABITAT RESTORATION

Linda Wilson, Jim Beever, Lisa Beever, and Monica Dorken after a productive day removing exotic vegetation and planting native flora within a hardwood hammock at Edison Community College.



Photo by David Moldal



Project manager and park biologist Belinda Perry examines roller-chopped saw palmetto as part of the Myakka River State Park Dry Prairie Restoration Project.

Photo by David Moldal

Re-graded railroad bed within the Myakka River State Park restores the sheet flow of water in a native prairie ecosystem.



Photo by David Moldal



HABITAT RESTORATION



Photo by David Moldal

Project manager Jerry Jensen (center) directs the pouring of concrete during the construction of reef balls in Punta Gorda.



Photo by David Moldal

Rich Dorken walks a boardwalk at the newly constructed nature trail on Florida Department of Environmental Protection's Three Lakes restoration site.



Photo by David Moldal

Reef balls of various shapes and sizes will be submerged beneath private docks. The structures create fish habitat as part of the Punta Gorda Waterfront Juvenile Fisheries project.



ENVIRONMENTAL EDUCATION

<i>PROJECT NAME</i>	<i>PROJECT PARTNER</i>	<i>OTHER CONTRIBUTORS</i>
The Myakka Connectivity Project	The Myakka Conservancy	Sarasota County; Southwest Florida Water Management District; Florida Power and Light; Myakka River Resources; Sarasota Community Foundation
Keep the Estuary Clean	Hardee County School Board	Hardee County School District
Florida Yards and Neighborhoods Program	Charlotte Harbor Environmental Center, Inc.	University of Florida Cooperative Extension Service
History of the Upper Peace River Watershed	Fort Meade High School	
Estuaries for Our Kids Sake	Myakka River Elementary School	
Keeping the Peace	Port Charlotte Middle School	
Treasures of the Sea	Town of Fort Myers Beach	
Upper Peace River Education Strategy	Charlotte Harbor Environmental Center	
Boater's Guide to Charlotte Harbor	Florida Sea Grant	Charlotte County; West Coast Inland Navigation District
Knowing Our Ecosystems	4-H Shark's Club of Charlotte County	Charlotte County Cooperative Extension Service
Estuary Awareness and Education	Florida Atlantic University	Florida Center for Environmental Studies
A Study of the Old Mill Pond	Fort Meade High School	
Seagrass Workshop Project for Teachers	Lemon Bay High School	
Lake Hancock Monitoring and Education	George Jenkins High School	
Seagrass Education in Lemon Bay	Charlotte Harbor Environmental Center	



ENVIRONMENTAL EDUCATION

*Port Charlotte Middle School
7th graders enjoy a field trip on
the Peace River.*



Photo by Melissa Upton



*Myakka River Elementary
School students learn about the
estuaries in the coastal areas near
Placida.*

Photo courtesy of Wendy Graham

*Myakka River Elementary
School students study plants
and animals at Cedar Point
Environmental center in
Englewood.*



Photo courtesy of Wendy Graham





ENVIRONMENTAL EDUCATION



Landowner and rancher Buster Longino discusses land management and preservation options with fellow workshop participants during the Myakka Connectivity project.

Photo by Tiffany Lutterman

Photo right: Nick Nichols, of Environmental System Analysts, Inc., presents the Myakka Connectivity Report to landowners in the Myakka River basin.



Photo by Tiffany Lutterman

Photo below: Chauncey Goss, former Director of the Gasparilla Island Conservation and Improvement Association and CAC member, chairs a session at the Charlotte Harbor Public Conference and Technical Symposium in 1997.

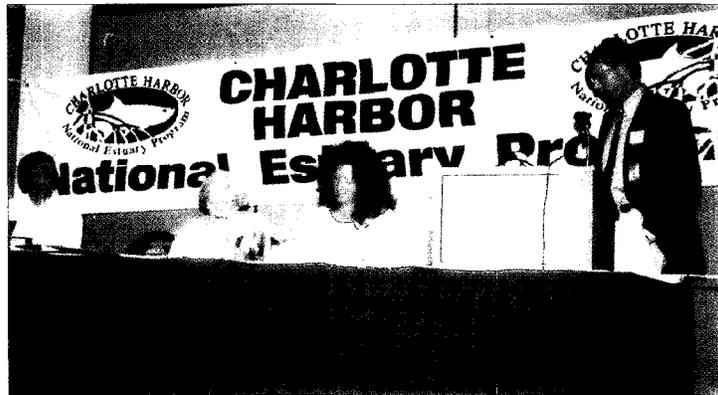


Photo by Melissa Upton



ENVIRONMENTAL EDUCATION

Naturalist Valerie Troxell of Charlotte Harbor Environmental Center identifies a fish living in the seagrass of Lemon Bay.



Photo by David Moldal



Photo by Valerie Troxell

Merv and Joy Bilbrey, in historic Punta Gorda, are proud owners of the 100th certified 'Florida Yard' in Charlotte County.

Participants investigate estuarine plant and animal life during the Charlotte Harbor Environmental Center's seagrass education project in Lemon Bay.



Photo by David Moldal



ENVIRONMENTAL EDUCATION

Photo right: 'Treasures of the Sea' tours allow people to learn more about the beach ecosystem and wildlife.



Photo by Saul Taffet

Photo middle: The 'Treasures of the Sea' group meets for their walking tour at the Connecticut Street beach access point on Fort Myers Beach.



Photo by Helen Caldwell



Another 'Florida Yard' is inspected for certification as part of the Charlotte Harbor Environmental Center's Florida Yards and Neighborhoods Program.

Photo by Valerie Troxell



Early Actions for Watershed Conservation

ECOSYSTEM MONITORING AND RESEARCH

<i>PROJECT NAME</i>	<i>PROJECT PARTNER</i>	<i>OTHER CONTRIBUTORS</i>
Peace/Myakka River Water Quality Monitoring Project	Charlotte Harbor Environmental Center	Southwest Florida Water Management District; Peace River/Manasota Regional Water Supply Authority; Florida Department of Environmental Protection
Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Project	Department of Environmental Protection	Charlotte Harbor Environmental Center, Inc.
Causes of Light Attenuation with Respect to Seagrasses in Lower Charlotte Harbor	Mote Marine Laboratory	Southwest Florida Water Management District
Matlacha Pass Benthic Survey	Center for Systematics and Taxonomy	
The Charlotte Harbor Symposium	Mote Marine Laboratory	South and Southwest Florida Water Management Districts; Central and Southwest Florida Regional Planning Councils
Lake Mariana Improvement Project	Polk County Natural Resources and Drainage	
Tidal Caloosahatchee River Benthic Survey	Center for Systematics and Taxonomy	
Rapid Bioassessment Program for Estero Bay	Florida Gulf Coast University	



ECOSYSTEM MONITORING AND RESEARCH

Florida Gulf Coast University researcher Win Everham records water quality, wildlife, and habitat data during development of the Estero Bay rapid bioassessment protocol.



Photo by John Cassani

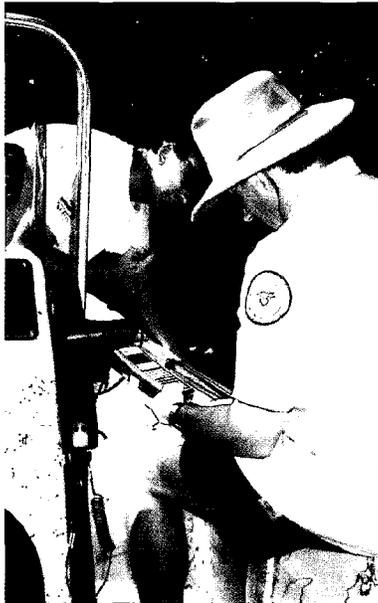


Photo by David Moldal

Researchers David Ceilley and John Cassani measure dissolved oxygen, salinity, and other water quality parameters at a monitoring station on the Estero River.

Researchers John Cassani and Greg Tolley assess water quality in the Estero River during the development of the Estero Bay rapid bioassessment protocol.



Photo by David Moldal



ECOSYSTEM MONITORING AND RESEARCH



Cathy Valenti measures dissolved oxygen in the early morning hours as part of the Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network.

Photo by David Moldal



Photo by David Moldal

Collecting a water sample at the Matlacha Pass station as part of the Volunteer Water Quality Monitoring Network.



Photo courtesy of Mote Marine Laboratory

Kellie Dixon, a scientist at Mote Marine Laboratory, was one of the researchers involved with the seagrass study.





ECOSYSTEM MONITORING AND RESEARCH



Photo by David Moldal

Resource Manager Hong Nguyen inspects a stormwater quality sampling device as part of the Lake Mariana Improvement Project in Polk County.

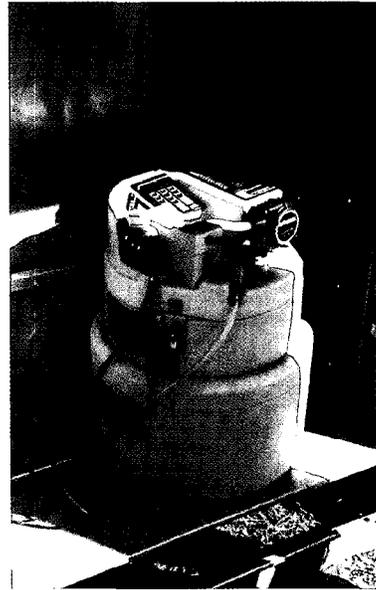


Photo by David Moldal

Automated stormwater sampling equipment collecting water samples as a component of the Lake Mariana Improvement Project in Polk County.

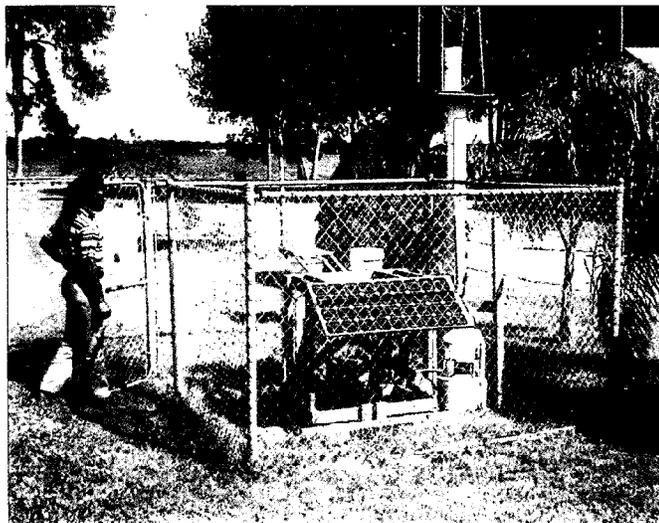


Photo by David Moldal

Resource Manager Corey Franklin inspects an atmospheric deposition monitoring and stormwater sampling station to characterize total pollutant loading to Lake Mariana.



ECOSYSTEM MONITORING AND RESEARCH



Photo by David Moldal



Photo by Joy Duperault

Southwest Florida Water Management District staff collect water samples as part of the Peace/Myakka Water Quality Monitoring Project.

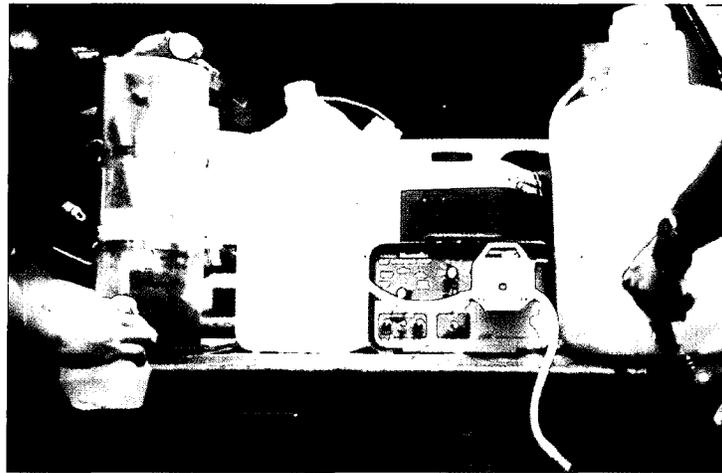


Photo by David Moldal

Southwest Florida Water Management District staff prepare a water sample for transport to the laboratory.

For detailed project information, please see the booklet "Early Action Demonstration Projects in the Charlotte Harbor Watershed."



QUANTIFIABLE OBJECTIVES

"It would be good if we could preserve, for future generations, some sense of the natural beauty that attracted us to the Charlotte Harbor region" - Glenn Heath, TAC member

A series of practical and technically defensible *quantifiable objectives* have been developed to address each of the three Charlotte Harbor NEP *priority problems* and the *program goals*. The development of appropriate *quantifiable objectives* supports the goals for preservation, restoration, and enhancement of the natural resources of the Charlotte Harbor NEP study area. The *quantifiable objectives* evolved through an extended series of workshops during which issues, goals, and priority problems were discussed. Public comment on local environmental priorities was used to define these measures. Ballots and rankings by committee members led to the formation and refinement of each of the proposed *quantifiable objectives*.

The identification of *quantifiable objectives* is a critical step in the NEP process. Without specific *quantifiable objectives* it would be difficult, if not impossible, to gauge the future success or failure of subsequent management activities initiated throughout the Charlotte Harbor NEP study area. Each *quantifiable objective* is technically sound, defensible, objective, and able to be assessed utilizing either existing or future monitoring programs. In addition, the *quantifiable objectives* address the specific major resource issue(s) that have been identified within the Charlotte Harbor NEP study area. The development of *quantifiable objectives* adds to both the technical foundation of the CCMP, as well as establishes the direction of future management actions.

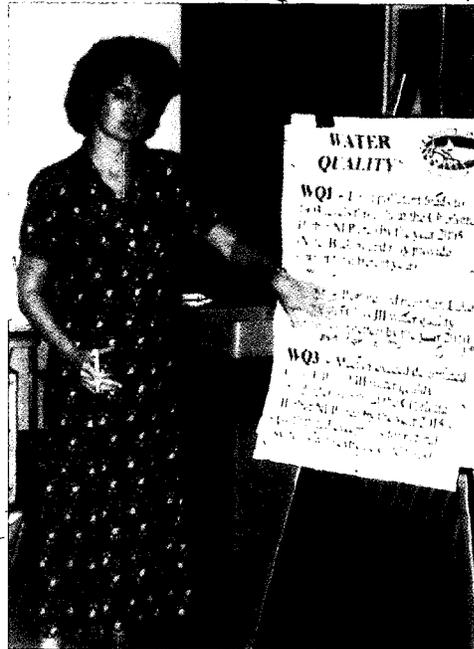
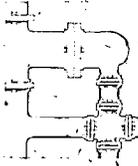
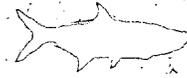


Photo by Melissa Upton

Pam Latham moderates a discussion of *quantifiable objectives* at a workshop in Fort Myers.



HYDROLOGIC ALTERATIONS QUANTIFIABLE OBJECTIVES

The following four *quantifiable objectives* were established to address specific problems associated with hydrologic alterations (HA) that have occurred within the Charlotte Harbor NEP study area.

HA-1: *Establish values for minimum seasonal flows beginning with the Myakka River at State Road 72 and for Big Slough; the Peace River at Bartow, Zolfo Springs, and Arcadia; and for the tributaries Horse Creek, Joshua Creek, Shell Creek, and the lower Peace River/upper estuary by the year 2005. Achieve these minimum seasonal flows by the year 2020.*

HA-2: *Identify, establish, and maintain a more natural seasonal variation (annual hydrograph) in freshwater flows by the year 2010 for:*

1. *Caloosahatchee River;*
2. *Upper Peace River and its tributaries from Tenoroc to Zolfo Springs; and*
3. *the Upper Myakka River (with special attention to Flatford Swamp).*

HA-3: *Restore, enhance, and improve where practical historic subbasin boundaries and natural hydrology for basins within the Charlotte Harbor NEP study area, with special attention to Outstanding Florida Waters, Class I waterbodies, and tributaries to Estero Bay by the year 2020.*

Citizen and Technical Advisory Committee members edit the quantifiable objectives at a workshop in Port Charlotte.

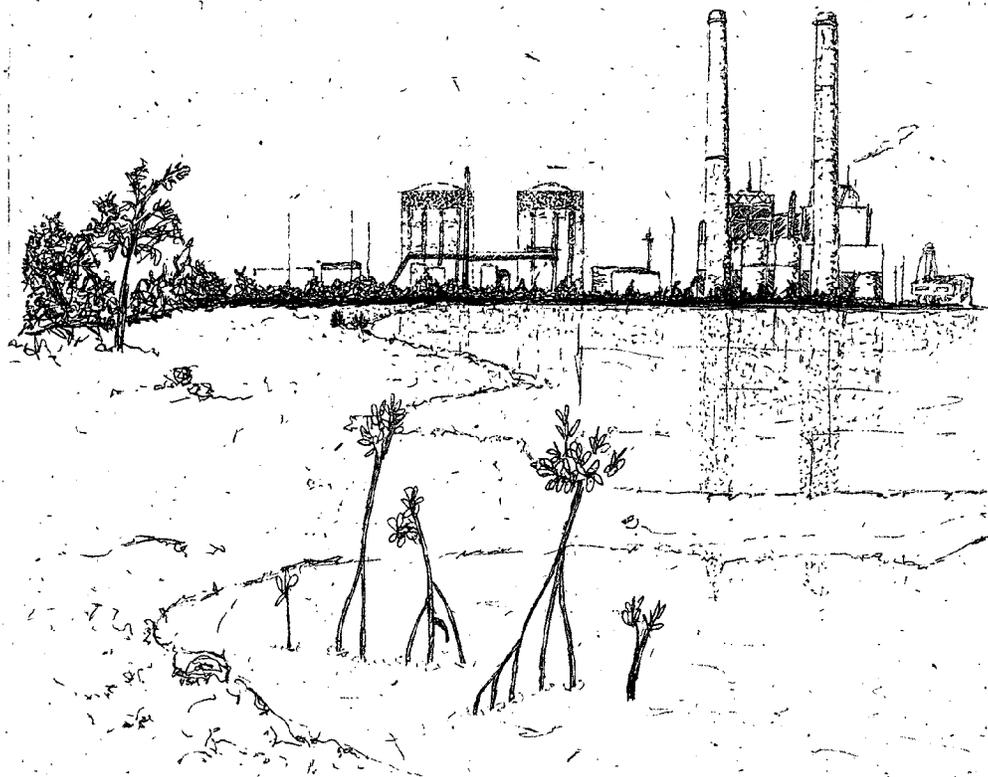


Photo by David Moldal



HA-4: *Enhance and improve by the year 2020 to more natural hydrologic conditions waterbodies affected by artificially created structures throughout the Charlotte Harbor NEP study area beginning with:*

1. *the Sanibel Causeway;*
2. *Myakka River;*
 - 1) *the weir below Upper Myakka Lake;*
 - 2) *the crossing below Lower Myakka Lake;*
 - 3) *Down's Dam;*
3. *the causeway between Lover's Key State Recreation Area and Bonita Beach;*
4. *the water control structure on the south end of Lake Hancock;*
5. *the structure on Coral Creek; and*
6. *the Gator Slough canal collector system (Lee and Charlotte Counties).*



Industry along an estuary

Artwork by Victor McGuire



WATER QUALITY DEGRADATION QUANTIFIABLE OBJECTIVES

The following seven *quantifiable objectives* were established to address specific problems associated with water quality (WQ) degradation.

WQ-1: *Identify those waterbodies that do not meet their designated water quality standards, and develop a plan during the year 2000 to meet those standards.*

WQ-2: *Develop Total Maximum Daily Loads (TMDLs) for the basins in the Charlotte Harbor NEP study area by the year 2005.*

WQ-3: *Identify specific actions and develop timetables for achieving TMDLs by the year 2010.*

WQ-4: *Achieve water quality that will meet shellfish harvesting standards throughout the Class II waters of the Charlotte Harbor NEP study area by the year 2015.*

WQ-5: *Restore and maintain Lake Hancock to Class III water quality standards (or better) and improve the Trophic State Index (TSI) value for the water exiting the lake from "poor" to "good" by the year 2010.*

WQ-6: *Meet or exceed designated water quality standards throughout basins of the Charlotte Harbor NEP study area by the year 2015 with possible exceptions for natural and/or site-specific conditions.*

WQ-7: *Identify waterbodies in the Charlotte Harbor NEP study area that should be designated as Outstanding Florida Waters and support the establishment of that designation during the year 2000.*





FISH & WILDLIFE HABITAT LOSS QUANTIFIABLE OBJECTIVES

The following four *Quantifiable Objectives* were established to address regional problems associated with fish and wildlife (FW) habitat loss.

- FW-1:** *Achieve a 25% increase in conservation, preservation, and stewardship lands within the boundaries of the Charlotte Harbor NEP study area by the year 2018. The increase will be based upon 1998 acreages of existing conservation, preservation, and stewardship lands.*
- FW-2:** *Meet the stated objectives for the target extent, location, and quality of the following habitats in the Charlotte Harbor NEP study area:*
- a) *native submerged aquatic vegetation should be maintained and restored at a total extent and quality no less than caused by natural variation;*
 - b) *maintain the existing extent and location within range of natural variability of intertidal un-vegetated habitats (especially mud flats and salt terns) and improve the habitat quality;*
 - c) *manage natural mangrove habitats to their historic extent (1980) to enhance and improve their ecological functions and, where feasible, restore mangrove habitats in urban areas;*
 - d) *restore and maintain saltwater marsh habitats where feasible (e.g. public lands or undeveloped areas) and prevent loss or conversion of existing salt marsh habitats;*
 - e) *restore, maintain, and manage freshwater wetland systems in current extents and to a quality capable of maintaining all natural functions within the range or natural variability;*
 - f) *restore, manage, and improve the habitat quality of oyster bars in the Charlotte Harbor NEP area based on the existing historic data; and-*
 - g) *protect, enhance, restore native upland communities vital to the ecological function of the Charlotte Harbor NEP study area.*

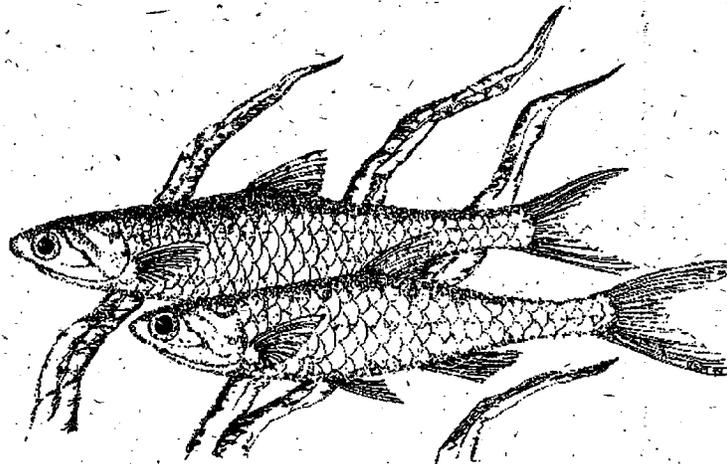


Quantifiable Objectives

FW-3: Reduce propeller damage to seagrass beds, identified from the 1992-1993 baseline data, within the Charlotte Harbor NEP area by the year 2010. Reduce all severely scarred areas to light scarring and reduce 70% or more of the moderately scarred areas to light scarring.

FW-4: On conservation, preservation, stewardship, and other public lands achieve controllable levels of invasive exotic plants as defined by the Florida Exotic Pest Plant Council by the year 2020. Encourage and support the removal and management of invasive exotic plants on private lands.

These *quantifiable objectives* were used to develop the priority actions for this management plan, which are discussed in the next chapter. All of these objectives are measurable and have an ambitious timeline to provide incentive for action. Over time, our progress will be measured against these *quantifiable objectives*.



Bay anchovies

Artwork by Victor McGuire

For more information, refer to the "Framework for Action" by the Charlotte Harbor NEP.





PRIORITY ACTIONS AND RELATED PROJECTS

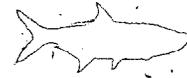
"Because of the intensity of the program over the three years of work--all of the meetings, workshops, demonstration projects, and activities-- my eyes were opened to the needs of the entire watershed. I was transported from my very coastal perspective (perhaps on the wings of the osprey in the poster!) to a new awareness of the people and communities who love the harbor from its origins upriver. This is so important for the future, for our capacity to work together as we manage and protect our natural systems."

- Joy Duperrault, CAC member

Priority actions define the necessary management activities to attain the *quantifiable objectives*. Most of the *quantifiable objectives* are broad aims that require many individual tasks to be accomplished. Therefore, the *priority actions* detail these tasks and key information about how they might be carried out. The priority actions included in this chapter were written by the *management conference* through a series of workshops and retreats. The actions are grouped into the three *priority problem* areas: hydrologic alterations (HA), water quality degradation (WQ), and fish and wildlife habitat loss (FW). Each *priority action* describes the key elements of management action including:

Priority Action Statement - The *priority action* begins with a brief statement of the action.

Background - This section provides background information about the *priority action*, how it will satisfy its *quantifiable objective*, and the rationale for its implementation. The background may include a history of the *priority problem*, a description of how the *priority action* will fit with past or ongoing management activities, and how the *priority action* will achieve the objectives.



Quantifiable Objective - In this segment, the *quantifiable objectives* to which the *priority action* is related are listed. Many of the *priority actions* address more than one *quantifiable objective*.

Areas for Implementation - This category describes where the *priority action* will be implemented. The locations (watersheds, jurisdictions, or specific locations) within the study area where the *priority action* will be most applicable are identified. The location also helps identify the most appropriate responsible agencies and organizations.

Strategy - A strategy for implementing the *priority action* is detailed. Some of the strategies are complex with many components; others are fairly simple.

Potential Responsible Agencies & Organizations - A listing of the potential parties for implementing each *priority action* is included. These groups could include government agencies (local, regional, state, or federal), not-for profit groups, private organizations, industry, or other private interests. Each listed organization may play a role in only one part of the strategy or region.

Expected Benefits - The expected benefits derived from each *priority action* are explicitly stated. In addition, an acknowledgment of potential drawbacks are also included. All possible outcomes and the implications of each *priority action* need to be understood by those who may become responsible for their implementation. Identifying potential drawbacks will minimize both future conflicts and failures.

Monitoring Response - A means of monitoring the success of each *priority action* is identified allow a future gauge of the action's effectiveness and benefits.

Preliminary Implementation Projects - A list of the related implementation projects (detailed in *Volume 2*) and their key agency are listed.

Our success in carrying out each of these priority actions will be measured and tracked. To achieve complete implementation of these actions, more projects, in addition to the ones listed, will be needed. Therefore, the region's management activities will require consistent measurement and evaluation as the benefits are realized and projects are completed. All of the *priority actions* describe timely, needed management actions to fulfill the goals of the *Comprehensive Conservation and Management Plan*.





HA-A: Establish and implement minimum flows for tributaries as detailed in the *quantifiable objective*. Determine maximum cumulative withdrawals.

Background

The state legislature has required the water management districts to establish minimum flows and levels for all surface waters. The water management districts should make this a priority activity for surface waters including those that have undergone significant hydrologic alteration or may be impacted by proposed projects.

Quantifiable Objective - HA-1

Areas for Implementation -

- 1) the Myakka River and Big Slough at State Road 72;
- 2) the Peace River at: a) Bartow, b) Zolfo Springs, and c) Arcadia;
- 3) the Peace River tributaries: a) Horse Creek and b) Joshua Creek; and
- 4) the Caloosahatchee River.

Strategy

- 1) Develop a priority for the establishment of minimum flows based on:
 - ❖ existing documented impacts; and
 - ❖ the potential for hydrologic impacts that might be associated with proposed projects.
- 2) Conduct the necessary research to establish minimum flows on a basin-wide approach for the preceding areas. Evaluate flows in conjunction with both environmental and water supply needs - through the following methods:
 - ❖ Develop better surface water/groundwater model parameters (discharge, seepage, and water level data) through analysis and processing of field data and statistical techniques for the Peace and Myakka River basins; and
 - ❖ Expand the groundwater and surface water monitoring networks to monitor groundwater levels and surface water stages at selected wells in the Peace and Myakka Rivers basins.
- 3) Detail the maximum amount of cumulative withdrawals possible based upon the minimum flows established, for the tributaries and rivers in the Peace and Myakka River watersheds.



- 4) Encourage the proper treatment and discharge and/or re-use of waste water effluent instead of deep-well injection to help maintain minimum flows.

Potential Responsible Agencies & Organizations

Florida Department of Environmental Protection
Southwest Florida Water Management District
U.S. Geological Survey

Expected Benefits

Established protective criteria for surface waters to prevent future overuse and allow for long-term planning of regional needs and sources, as well as maintain and recharge surficial aquifers.

Monitoring Response

Measure rainfall and flow data for major watersheds within the Charlotte Harbor NEP.

Preliminary Implementation Projects

City of Punta Gorda

Punta Gorda Aquifer Storage and Recovery Project

Peace River / Manasota Regional Water Supply Authority

Peace River Regional Water Supply Facility Water Use Permit
Renewal Project

Polk County

Polk County Extension Water School

South Florida Water Management District

Caloosahatchee Water Management Plan

Southwest Florida Water Management District

1998 Minimum Flows And Levels (MFL) Priority List And
Schedule

Southern Water Use Caution Area (SWUCA)

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program
Coastal Nonpoint Program

U.S. Geological Survey

Groundwater and Surface Water Monitoring Network
Stormwater Runoff Effects on Tributary Flows into Estero Bay
Support of Planning Model Development in the Caloosahatchee
River Basin

HA-B: Identify gaps in flow data based on ecosystem needs and projected needs for water withdrawals due to population growth, development, agriculture, and mining. Implement data collection to address these gaps.

Background

To document changes in surface water flows and patterns due to hydrologic alterations, it is important that accurate, long-term data bases be developed for all basins and watersheds within the Charlotte Harbor NEP study area. While many areas within the NEP have extensive historical flow records, other areas lack this historic record. Accurate data will also be needed to assess the effectiveness of the Action Plans.

Quantifiable Objective - HA-1, HA-2

Areas for Implementation - Watersheds within the Charlotte Harbor NEP study area currently without sufficient accurate measurements of rainfall and gauged surface flows.

Strategy

- 1) Identify basins and sub-basins where there is insufficient watershed flow data to accurately assess seasonal and long-term changes in water resources.
- 2) Determine the minimum number and appropriate locations of needed gauges.
- 3) Install appropriate monitoring gauges.
- 4) Integrate with stormwater utility programs.
- 5) Collect information and analyze effects that stormwater runoff has on flow characteristics of tributaries (already being planned for Estero Bay tributaries).
- 6) Monitor surface water stages and monitor groundwater levels in the Peace and Myakka basins.
- 7) Fill in data gaps on flow and salinity patterns to support the development and implementation of hydrodynamic models as planned in Charlotte and Lee Counties and as needed in Sarasota and Charlotte Counties.
- 8) Expand the "Continuous Surface Water Level Monitoring" to monitor surface water levels into the South Florida Water Management District region.



- 9) Encourage the development and implementation of local government "Stormwater Management Plans" to improve the timing of water flows reaching natural waterbodies.
- 10) The Charlotte Harbor NEP and its partners should participate in the feasibility study and implementation activities for the Central and South Florida Restudy, the Caloosahatchee Water Management Plan, and the Lower West Coast Water Supply Plan as those efforts will be measuring and managing flows in the Caloosahatchee River.

Potential Responsible Agencies & Organizations

Charlotte Harbor National Estuary Program
County and Municipal Governments
U.S. Army Corps of Engineers
U.S. Geological Service
Water Supply Authorities
Water Management Districts

Expected Benefits

Action will provide accurate, long-term information on amounts and variability of surface water resources and provide a basis for planning. Identifying gaps in flow data will provide a scientific basis for the establishment of minimum flows and assess future changes related to projected development and consumptive uses.

Monitoring Response

As specified in the action above.

Preliminary Implementation Projects

Charlotte County

Charlotte County Stormwater Master Plan
Development Review Process

City of Punta Gorda

Punta Gorda Aquifer Storage and Recovery Project

City of Venice

Venice Stormwater Management

Florida Department of Environmental Protection

Charlotte Harbor Estuaries Volunteer Water Quality Monitoring
Network (CHEVWQMN)
Mandatory Phosphate Reclamation & Permitting (Regulatory)
Non-Mandatory Phosphate Reclamation (Grants Program)
Saddle Creek Restoration and Alternative Mitigation



Lee County

Hydrologic Data Network

Polk County

Polk County Volunteer Rainfall Monitoring Program

Polk County Extension Water School

Sarasota County

Myakka River Floodplain Study

South Florida Water Management District

Caloosahatchee Water Management Plan

Lower West Coast Water Supply Plan

Southwest Florida Water Management District

Continuous Surface Water Level Monitoring Using the Southwest Florida Water Management District's Supervisory Control and Data Acquisition (SCADA) System

U. S. Army Corps of Engineers

Central and Southern Flood Control Restudy

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

U.S. Geological Survey

Flow and Salinity Patterns at Selected Points Within Estuaries of the Charlotte Harbor NEP Study Area

Groundwater and Surface Water Monitoring Networks

Stormwater Runoff Effects on Tributary Flows Into Estero Bay

Support of Planning Model Development in the Caloosahatchee River Basin



HA-C: Evaluate the interaction between groundwater and surface water and how they contribute to overall river flows.

Background

There is general agreement that in many areas of the Charlotte Harbor NEP long-term changes in surface water flows have resulted from hydrologic alterations in groundwater levels. The importance of these interactions and magnitude of such potential alterations need to be documented throughout the NEP study area.

Quantifiable Objective - HA-1, HA-2, HA-3

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Determine the goals to be derived from scientific investigations of the interactions of groundwaters and surface waters in areas: a) currently thought to have significant anthropogenic impacts; b) areas thought to have the highest potential for future impacts.
- 2) Design long-term studies to assess the relative magnitudes of human and natural variability.
- 3) Implement long-term monitoring programs.
- 4) Using the MIKE-SHE surface water/groundwater model as an example, perform similar analyses to the Estero Bay basin and portions of the study area in the Southwest Florida Water Management District.
- 5) Conduct local monitoring and modeling of surface/ground water relationships necessary to provide historical data to the permit review process.

Potential Responsible Agencies & Organizations

U.S. Geological Survey
Water Management Districts

Expected benefits

Accurate knowledge of the interactions and relationship between groundwater and surface water resources and the magnitude of changes caused by growth.

Monitoring Response

As detailed in the strategy above.





Preliminary Implementation Projects

City of Sanibel

Sanibel Island Surface Water Management Plan

Florida Department of Environmental Protection

Mandatory Phosphate Reclamation & Permitting (Regulatory)

Non-Mandatory Phosphate Reclamation (Grants Program)

Saddle Creek Restoration and Alternative Mitigation

Lee County

Hydrologic Data Network

Polk County

Polk County Extension Water School

Polk County Volunteer Rainfall Monitoring Program

South Florida Water Management District

MIKE-SHE for Modeling Surface and Groundwater Interactions

Southwest Florida Water Management District

Continuous Surface Water Level Monitoring Using the Southwest Florida Water Management District's Supervisory Control and Data Acquisition (SCADA) System

Ongoing Efforts to Restore the Hydrology of the Upper Myakka River Watershed

Southern Water Use Caution Area (SWUCA)

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

U.S. Geological Survey

Delineation of Saltwater Intrusion in Lee and Collier Counties

Real-Time Ground Water Monitoring Sub-Network

Support of Planning Model Development in the Caloosahatchee River Basin



HA-D: Encourage efficient use and reuse of water:

Background

The issue of sufficient freshwater supplies will increase as a result of the projected development in southwest Florida. As a result, the efficient use and reuse of water should be made a key planning element at the local, regional, and state levels.

Quantifiable Objective - HA-1, HA-2

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Encourage Best Management Practices (BMPs) for use of surface and groundwaters by urban, agricultural, and industrial users.
- 2) Develop economic incentives to encourage water re-use programs wherever possible.
- 3) Encourage advanced wastewater treatment and re-use and/or return rather than deep well injection.
- 4) Encourage progressive rate structures to facilitate the efficient use of water.
- 5) Enhance existing education programs designed to inform and promote public awareness as to the importance of efficient water use.
- 6) Investigate unincorporated areas that may benefit from water and sewer, identify options for providing such services, and study the feasibility of setting up such services in areas where services are not already supplied.
- 7) Use rebates or other incentives to encourage the retrofitting of pre-1992 irrigation systems with a sensor to interrupt irrigation when rain or moisture is present.

Potential Responsible Agencies & Organizations

Institute of Food and Agricultural Sciences (IFAS)/Cooperative Extension Service
County and Municipal Governments
Florida Department of Environmental Protection
Public and Private Utilities
Water Management Districts



Expected Benefits

Reduced demands on all surface and groundwater resources for projected growth.

Monitoring Response

Development of accurate methods to track both consumption and re-use of water resources.

Preliminary Implementation Projects

Charlotte County

Encourage Efficient Use and Reuse of Water
Environmental Information Center (EIC)

Charlotte Harbor Environmental Center, Inc.

Reclaimed Water Education in Charlotte County

City of Cape Coral

Cape Coral Dual Water System

City of Punta Gorda

City of Punta Gorda Irrigation Sensor Rebate Program

City of Venice

Venice Wastewater Reuse

Florida Department of Environmental Protection

Mandatory Phosphate Reclamation & Permitting (Regulatory)

Non-Mandatory Phosphate Reclamation (Grants Program)

Public Education Programs

Saddle Creek Restoration and Alternative Mitigation

Team Permitting - Net Ecosystem Benefit Planning and Permitting
Process

Hardee County

Hardee County Water and Sewer Study

Manatee County Planning Department

Natural Resources Conservation Service

Conservation Financial Assistance

Conservation Technical Assistance

Peace River / Manasota Regional Water Supply Authority

Peace River Water Authority Water Conservation Public Outreach
and Education Program

Polk County

Polk County Extension Water School

Sarasota County

Identify Reuse Customers



South Florida Water Management District

Alternative Water Supply Funding Program
Caloosahatchee Water Management Plan

Southwest Florida Water Management District

Ongoing Efforts to Restore the Hydrology of the Upper Myakka
River Watershed
Southwest Florida Water Management District's Reuse Program

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

U.S. Geological Survey

Delineation of Saltwater Intrusion in Lee and Collier Counties
Effects of Pumpage and Seasonal Stresses on the Saltwater
Interface in the Lower Tamiami Aquifer near Bonita
Springs, Florida
Real-Time Ground-Water Monitoring Sub-Network
Support of Planning Model Development in the Caloosahatchee
River Basin



HA-E: Discourage deep-well injection of wastewater effluent in favor of advanced wastewater treatment of surface water discharges that are compatible with the water quality of the receiving waters, and encourage appropriate reuse alternatives.

Background

The issue of freshwater supplies will continue to increase as a result of the projected development in southwest Florida. As a result, the efficient use and reuse of water should be made a key planning element at the local, regional, and state levels. Deep-well injection was seen as short-sighted and a last-resort alternative in comparison to advanced wastewater treatment to appropriate water quality standards compatible with the water quality requirements of the receiving waters and/or appropriate reuse alternatives.

Quantifiable Objective - HA-1, HA-2.

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

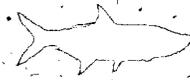
- 1) Develop interagency task force (Water Management Districts, Florida Department of Environmental Protection, U.S. Environmental Protection Agency, etc.) to review conflicts in current permitting requirements.
- 2) Establish site-specific criteria for nutrient discharges to receiving waters based both on their characteristics and on Total Daily Maximum Daily Loads (TMDLs).
- 3) Provide economic incentives to utilities to re-use and/or return appropriately treated wastewater to surface waters.

Potential Responsible Agencies & Organizations

Institute of Food and Agricultural Sciences (IFAS)/Cooperative Extension Service
County and Municipal Governments
Public and Private Utilities
Water Management Districts

Expected benefits

Reduced demands on all surface and groundwater resources to provide for projected growth.



Monitoring Response

Site specific monitoring programs to assess and correct any problems associated with changes in nutrient loadings.

Preliminary Implementation Projects

Charlotte County

Encourage Efficient Use and Reuse of Water

City of Cape Coral

Cape Coral Dual Water System

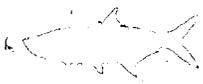
Southwest Florida Water Management District

Southwest Florida Water Management District's Reuse Program

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program





HA-F: Re-establish, where practical, surface flows from sub-basins that do not currently contribute to their historic hydrologic connections.

Background

There are regions, especially within the upper Peace River basin, where surface flows no longer contribute to the flows in their historic watersheds. In some areas, such hydrologic alterations have accounted for significant changes in both the amount and seasonal characteristics of flows of the major tributaries within these subbasins.

Quantifiable Objective - HA-1, HA-2, HA-3, HA-4

Areas for Implementation - The initial emphasis should center on the upper Peace River basin

Strategy

- 1) Assess and document changes in historic basins caused by past and current alterations, including mining, ditching, channelizing, damming, and other structural changes.
- 2) Inventory stormwater systems and facilities.
- 3) Promote projects that address freshwater runoff problems from canal systems.
- 4) Evaluate plans to establish more natural surface water flows from historic sub-basins.
- 5) Encourage coordination between stormwater utilities and transportation planning and projects.
- 6) Determine mechanisms to fund restoration projects (including property taxes to purchase environmentally sensitive lands to place in public trust in order to preserve natural hydrology).
- 7) Rank projects and implement, as funds become available.
- 8) Utilize the state's "Section 319—non-point source program" to implement appropriate projects.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department of Environmental Protection
Mining Industry
Southwest Florida Water Management District

Expected benefits

Restore more natural surface water flows in the upper Peace River basin.

Monitoring Response

Measure improvements in water quantity and quality changes.



Preliminary Implementation Projects

Central Florida Regional Planning Council

Lake Hancock Restoration Project

Charlotte County

Hydrologic Restoration of Charlotte Harbor Flatwoods (Zemel Road Southwest Parcel)

Charlotte Harbor Environmental Center, Inc.

Feasibility Study of Lemon Lake Restoration at Amberjack Slough
Partial Restoration Of Huckaby Creek, Phase I

City of Venice

Hydroperiod Restoration

Florida Department of Environmental Protection

Greater Charlotte Harbor Ecosystem Management Area Initiative
Mandatory Phosphate Reclamation & Permitting (Regulatory)
Non-Mandatory Phosphate Reclamation (Grants Program)
Saddle Creek Restoration and Alternative Mitigation
Six Mile Creek Watershed Restoration
Team Permitting - Net Ecosystem Benefit Planning and Permitting Process

Lee County

Stormwater System Inventory
Lee County Conservation Land Acquisition and Stewardship Committee (CLASAC)

Polk County

Eagle Lake/Millsite Regional Drainage Project
Lake Parker/Saddle Creek - Regional Drainage Project
Peace Creek Canal/Wahneta - Regional Drainage System Enhancement
Polk County Aquatic Weed-Control Program

Sarasota County

T. Mabry Carlton, Jr. Memorial Reserve Water Use Permit Monitoring Program

South Florida Water Management District

Caloosahatchee Water Management Plan

Southwest Florida Water Management District

Surface Water Improvement And Management (SWIM) Program

U.S. Environmental Protection Agency

Coastal Nonpoint Program
Clean Water Act Section 320 National Estuary Program
Nonpoint Source Program

U.S. Geological Survey

Storm-Water Runoff Effects on Tributary Flows Into Estero Bay
Support of Planning Model Development in the Caloosahatchee River Basin



HA-G: Plug abandoned groundwater wells to improve groundwater quality, increase water levels, and promote water conservation.

Background

There are a number of abandoned agriculture wells within the Charlotte Harbor NEP study area. Some of these wells although once capped are now free flowing, while the casings of other wells have failed providing direct connections to groundwater layers of different quality. The water management districts have conducted programs to deal with these problems. However, a greater emphasis should be given to these programs, and standards for future well abandonments should be strengthened.

Quantifiable Objective - HA-1, HA-2, HA-3

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Develop and /or support programs to identify and plug abandoned groundwater wells.
- 2) Expand the Quality of Water Improvement Program (QWIP) into the South Florida Water Management District portion of the study area.
- 3) Support coordination among counties, cities, and water management districts to identify leaking wells and examine strategies for groundwater recovery.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Water Management Districts

Expected Benefits

Reduced loss of groundwater resources through direct loss and mixing of lower grade waters.

Monitoring Response

As detailed in the strategy above.

Preliminary Implementation Projects

City of Venice

Venice Well Plugging

Southwest Florida Water Management District

Quality of Water Improvement Program (QWIP)

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



HA-H: Where possible (practical), restore groundwater levels to historic seasonal mean levels.

Background

There are areas within the Charlotte Harbor NEP where groundwater levels have severely declined due to the historic overuse of groundwater for mining, agricultural, and public supplies. In specific areas this overuse has resulted in declines in both wetland habitats, as well as surface water flows that are seasonally dependent on groundwater contributions. Efforts should be made to restore groundwater levels to the greatest extent practical to mitigate for these past hydrologic impacts.

Quantifiable Objective - HA-1, HA-2, HA-3

Areas for Implementation - Initial primary emphasis would be in the upper Peace River basin

Strategy

- 1) Identify and document areas of greatest long-term changes in ground water levels.
- 2) Identify potential causes and relative contributions.
- 3) Determine potential for restoration of groundwater levels and the relative effectiveness of proposed actions.
- 4) Implement long-term restoration plan.
- 5) Encourage alternative water sources in place of groundwater with drawal.
- 6) Encourage conservation and preservation of groundwater recharge areas.

Potential Responsible Agencies & Organizations

Agricultural Industry
County and Municipal Governments
County and Municipal Departments of Education
Mining Industry
U.S. Army Corps of Engineers
Water Management Districts

Expected benefits

Restoration of wetlands and increased surface water flows in specific areas.





Monitoring Response

Measure groundwater levels and surface water flows.

Preliminary Implementation Projects

Charlotte County

Hydrologic Restoration of Charlotte Harbor Flatwoods (Zemel Road Southwest Parcel)

Florida Department of Environmental Protection

Greater Charlotte Harbor Ecosystem Management Area Initiative
Mandatory Phosphate Reclamation & Permitting (Regulatory)
Non-Mandatory Phosphate Reclamation (Grants Program)
Saddle Creek Restoration and Alternative Mitigation

Lee County

Hydrologic Data Network

Manatee County

Manatee Government Access TV (MGATV) Public Service Announcements

Polk County

Polk County Extension Water School

Sarasota County

T. Mabry Carlton, Jr. Memorial Reserve Water Use Permit Monitoring Program

Southwest Florida Water Management District

Southern Water Use Caution Area (SWUCA)

U.S. Army Corps of Engineers

Central and Southern Flood Control Restudy

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

U.S. Geological Survey

Effects of Pumpage and Seasonal Stresses on the Saltwater Interface in the Lower Real-Time Ground-Water Monitoring Sub-Network in the Tamiami Aquifer near Bonita Springs, Florida



HA-I/HA-J/HA-K: Create and implement an overall public information program including: 1) public service announcements and videos; 2) portable displays; and 3) educational materials to educate the public about water resource issues, water conservation, and water use. Explain the importance of maintaining minimum freshwater flows in tributaries and to the estuarine complex.

Background

An important function of the NEP should be to coordinate a working group to promote the development and distribution of public service announcements. Education materials should emphasize the importance of maintaining minimum freshwater flows, with regards to riverine habitats as well as sustaining estuarine production. Additional water resource issues and the need for water conservation and reuse should be based on the Charlotte County Metropolitan Planning Organization build-out scenario process. Portable displays should be created that could be placed in public areas, including schools, churches, county administrative buildings, malls, etc.

Quantifiable Objective - HA-1, HA-2, HA-3, HA-4

Areas for Implementation - entire Charlotte Harbor NEP study area

Strategy

- 1) Coordinate survey research by the working group to identify:
 - ❖ public perceptions of freshwater flows, water resource issues, and water conservation;
 - ❖ areas where the public is generally interested; and
 - ❖ those areas where specific knowledge is generally limited concerning the issues surrounding water use and the importance of maintaining adequate freshwater flows in riverine and estuarine systems.
- 2) Based on these results, develop the above methods to increase the ready availability of unbiased information and level of current knowledge utilizing appropriate build-out models for urban service areas and platted lands throughout the NEP watershed. The methods should highlight the NEP's efforts to establish, enhance, and maintain minimum seasonal flows in each of the major basins, and water resource issues. The methods should clearly indicate the benefits to the public that will result from such efforts and how they can help or participate.



- 3) Identify a focal point within each of the NEP basins to be responsible for identifying target groups and carrying out the program.
- 4) Make sure that local and state governmental representatives are supplied information, and involved in the program.
- 5) Utilize the county Master Gardeners programs and the Florida Yards & Neighborhoods programs to promote public awareness of water resource issues.
- 6) Make use of existing public service announcements and government access television channels to promote public education.
- 7) Develop both a comprehensive video and a speaker's presentation that can be presented to interested public groups and schools.
- 8) Utilize appropriate existing educational materials developed for Senior High School 4-H students by the state university system.

Potential Responsible Agencies & Organizations

Charlotte Harbor National Estuary Program
County and Municipal Governments
Florida Fish and Wildlife Conservation Commission
Florida Coastal Management Program
Florida Department of Environmental Protection
Florida Gulf Coast University Industry
Local School Districts
Metropolitan Planning Organizations
Regional Planning Councils
Regional Water Supply Authorities
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency
University of Florida Sea Grant
Water Management Districts

Expected Benefits

Increased public awareness of issues and benefits to be derived from restoring and maintaining adequate surface water flows.

Monitoring Response

Measure the effectiveness of promotion and public education programs by a "before and after" constructed survey.



Preliminary Implementation Projects

Charlotte County

- Charlotte County's Speaker Bureau Program
- East Spring Lake
- Environmental Information Center (EIC)

Charlotte Harbor Environmental Center, Inc.

- Water Use Education
- Freshwater Flow Education
- Freshwater Flow Exhibits

City of Venice

- City of Venice Public Information and Education

Florida Department of Environmental Protection

- Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN)
- Charlotte Harbor State Buffer Preserve Public Education
- Mandatory Phosphate Reclamation & Permitting (Regulatory)
- Non-Mandatory Phosphate Reclamation (Grants Program)
- Saddle Creek Restoration and Alternative Mitigation
- Coastal Management Workshops

Peace River / Manasota Regional Water Supply Authority

- Peace River Water Authority Water Conservation Public Outreach and Education Program

Sanibel-Captiva Conservation Foundation, Inc.

- Captiva Cruises Partnerships
- Resident Environmental Orientation
- Realtors' Environmental Orientation
- Realtor Education Workshop

Sarasota County

- Resource Conservation Program

Southwest Florida Water Management District

- Communications Program

U.S. Environmental Protection Agency

- Clean Water Act Section 320 National Estuary Program





HA-L: Implement the recommendations of the South Lee County Plan.

Background

The South Florida Water Management District has completed (1998) a thorough review of the hydrologic alterations of surface water flows that have occurred in the Estero Bay Watershed. This report contains a series of recommendations to both prevent future similar changes in surface flow patterns, as well as projects to mitigate some of the historic alterations and diversions which have occurred.

Quantifiable Objective - HA-2, HA-3

Areas for Implementation - Southern Lee County

Strategy

- 1) Prioritize recommendations within the South Lee County Plan based on both need, and degree to which substantial benefits can reasonably be expected for defensible costs.
- 2) Implement selected elements within the plan and assess resulting benefits.

Potential Responsible Agencies & Organizations

Florida Department of Environmental Protection
Florida Department of Transportation
Lee County
South Florida Water Management District
U.S. Army Corps of Engineers

Expected Benefits

Improvement and mitigation of historic hydrologic alterations to the Estero Bay Watershed.

Monitoring Response

Establish network of gauging stations to determine patterns and movement of surface waters.



Preliminary Implementation Projects

Lee County

Hydrologic Data Network

Kehl Canal Weir

Lee County Conservation Land Acquisition and Stewardship

Committee (CLASAC)

Stormwater System Inventory

U. S. Army Corps of Engineers

Central and Southern Flood Control Restudy

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Nonpoint Source Program





HA-M: Prevent and/or reduce, to the greatest extent possible, future hydrologic impacts of transportation projects within the Charlotte Harbor NEP and mitigate for past problems whenever possible.

Background

Historically, many transportation projects within the Charlotte Harbor NEP study area have either blocked and/or diverted the patterns of surface water flows. By comparison, the current design criteria used during planning and construction of local, state, and federal transportation projects generally account for and prevent these previous problems. As transportation needs increase in response to the rapid rate of growth in southwest Florida, every effort should be made to mitigate for past hydrologic alterations as existing facilities are expanded and/or upgraded.

Quantifiable Objective - HA-3

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Make mitigation of any potential hydrologic alterations a key criterion for evaluation during any new roadway construction projects.
- 2) Support mitigation of hydrologic alterations and impacts to water quality as part of future roadway improvement projects.
- 3) Create a stormwater master plan in areas where road drainage significantly affects water flows.
- 4) Utilize appropriate Metropolitan Planning Organization and Regional Planning Council build-out models for urban service area and platted lands throughout the NEP watershed.
- 5) Utilize the state's "Section 319—non-point source program" to address problems created by past-transportation projects.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department of Environmental Protection
Florida Department of Transportation
Metropolitan Planning Organizations
Regional Planning Councils
U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
Water Management Districts



Expected benefits

A re-evaluation of the methods used in assessing past and future hydrologic alterations that have or could result from roadways and other transportation projects within the Charlotte Harbor NEP.

Monitoring Response

Assess and hydrologic impacts due to transportation projects.

Preliminary Implementation Projects

Charlotte County

- Development Review Process
- Land Use and Transportation Buildout Scenario
- Long Range Transportation Plan
- Myakka River Master Plan

Charlotte Harbor Environmental Center, Inc.

- Charlotte County Mitigation Sites

Florida Department of Environmental Protection

- Greater Charlotte Harbor Ecosystem Management Area Initiative

Lee County

- Stormwater System Inventory

National Marine Fisheries Service

- Fisheries Habitat Conservation Program

Polk County

- Environmental Lands Acquisition Program In Polk County
- Protection of Wetlands, Floodplain, and Land Preservation

Southwest Florida Water Management District

- Management of Transportation Project Impacts

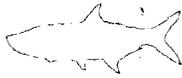
U. S. Army Corps of Engineers

- Central and Southern Flood Control Restudy

U.S. Environmental Protection Agency

- Clean Water Act Section 320 National Estuary Program
- Coastal Nonpoint Program
- Nonpoint Source Program





HA-N: Ensure Charlotte Harbor NEP's continued representation and involvement in the reconnaissance and feasibility phases of the U.S. Army Corps of Engineers' comprehensive restudy of the Central and South Florida Flood Control Project.

Background

The U.S. Army Corps of Engineers is currently in the process of undertaking a major restudy of its works and related issues in South Florida. It would be appropriate for the NEP staff and members to be represented on the advisory group for the reconnaissance study.

Quantifiable Objective - HA-2, HA-3

Areas for Implementation - Lee County

Strategy

- 1) Provide that members of the review committees for the U.S. Army Corps of Engineers Central and South Florida restudy are aware of the concerns and proposed Actions Plans in the *Comprehensive Conservation and Management Plan*.
- 2) Include NEP members on the Restudy Committees to review and evaluate results.

Potential Responsible Agencies & Organizations

Charlotte Harbor National Estuary Program
U.S. Environmental Protection Agency
U.S. Army Corps of Engineers

Expected Benefits

Provision for representatives of the Charlotte Harbor NEP to be part of this process.

Preliminary Implementation Projects

U. S. Army Corps of Engineers

Central and Southern Flood Control Restudy

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

U.S. Geological Survey

Flow and Salinity Patterns at Selected Points Within Estuaries of the Charlotte Harbor NEP Study Area



HA-O: Support implementation of three-dimensional model studies to determine potential hydrologic benefits of proposed alternative alterations of the Sanibel Causeway during any reconstruction program.

Background

It has been proposed that the bridges to Sanibel be replaced. As part of this replacement, there have been suggestions that the causeways that were constructed as part of the roadway when the current bridges were built either be removed or modified. The primary reason for removing the causeways would be to restore the patterns of circulation in San Carlos Bay and nearby waters to the conditions that existed before the causeways were constructed. The use of a three dimensional (3-D) model would help assess both the alterations caused by the existing causeways and any proposed modifications.

Quantifiable Objective - HA-4

Areas for Implementation - Southern Pine Island Sound, San Carlos Bay, Estero Bay

Strategy

Implement a three-dimensional model to determine the impacts of the Sanibel causeway on the circulation and ecology of San Carlos Bay and nearby waters. In the bridge re-design, the circulation effects and the model's analysis will be considered.

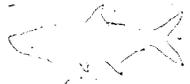
Potential Responsible Agencies & Organizations

- City of Sanibel
- Florida Department of Environmental Protection
- Lee County
- South Florida Water Management District
- U.S. Environmental Protection Agency
- U.S. Coast Guard
- U.S. Marine Fisheries Service
- U.S. Army Corps of Engineers

Expected Benefits

Improvement of previous hydrologic alterations that results from replacement of the causeway. Accurate assessment of the potential for new significant unexpected impacts caused by any proposed changes.





Monitoring Response

Monitor changes in flows during construction to verify model results.

Preliminary Implementation Projects

South Florida Water Management District

Three-dimensional Circulation Model

U. S. Army Corps of Engineers

Central and Southern Flood Control Restudy

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Coastal Nonpoint Program



HA-P: Evaluate potential alternatives to modification and/or removal of the structure at the southern end of Lake Hancock.

Background

Thick layers of unconsolidated nutrient-rich "muck" lie on the bottom of Lake Hancock. Also, nutrient levels within the surface waters of the lake are often extremely high and water quality (based on a Trophic State Index) is usually "poor." The waters leaving Lake Hancock can result in degraded water quality and algal bloom in the upper Peace River. It has been suggested that construction of a "filtration marsh system" to reduce pollutant loads leaving Lake Hancock would help improve water quality in these areas of the Peace River. Another potential mechanism to increase the area of natural marsh in the lake system would be to drop lake levels by either removal or control of the structure at the southern end of the lake.

Quantifiable Objective - HA-1

Areas for Implementation - Upper Peace River basin

Strategy

- 1) Support the Lake Hancock Advisory Group or similar working group to determine alternatives for modification or removal of structure at the southern end of Lake Hancock to restore the natural hydrology of the Lake Hancock system.
- 2) Pursue additional funding opportunities for water quality restoration.

Potential Responsible Agencies & Organizations

Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
Polk County
Southwest Florida Water Management District
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

Expected Benefits

Reduction of large periodic discharges of highly polluted waters from the lake into the upper Peace River.



Monitoring Response

Monitor flows and water quality in the upper Peace River.

Preliminary Implementation Projects

Florida Department of Environmental Protection

Mandatory Phosphate Reclamation & Permitting (Regulatory)

Non-Mandatory Phosphate Reclamation (Grants Program)

Saddle Creek Restoration and Alternative Mitigation

Polk County

Lake Hancock Advisory Group

Southwest Florida Water Management District

Lake Hancock Water and Nutrient Budget and Lake Hancock

Water Quality Improvement Project

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Coastal Nonpoint Program



HA-Q: Restore hydrologic surface features of the Peace Creek flood plain.

Background

Peace Creek is little more than a channelized surface water system, with major hydrologic alterations of most of its historic flood plain. As one of the most altered areas within the upper Peace River basin, it deserves special attention for restoration.

Quantifiable Objective - HA-1, HA-2, HA-3

Areas for Implementation - Upper Peace River basin, between Bartow and Lake Wales

Strategy

- 1) Acquire flood plain property bordering Peace Creek either through fee simple, or less-than-fee acquisition process.
- 2) Restore sheet flow and some semblance of a natural marsh system in the flood plain by de-channelizing Peace Creek.
- 3) Utilize the state's "Section 319—Non-point source pollution control program" for funding of specific projects.

Potential Responsible Agencies & Organizations

Florida Department of Environmental Protection
Polk County
Southwest Florida Water Management District
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency

Expected Benefits

Restoration of a more natural seasonal variation in freshwater flow to the upper Peace River. Flood attenuation and storage. Water quality improvement due to removal of cattle and subsequent nutrient filtration by recreated marsh system.

Monitoring Response

Measure seasonal flows and water quality.





Preliminary Implementation Projects

Florida Department of Environmental Protection

Greater Charlotte Harbor Ecosystem Management Area Initiative
Six Mile Creek Watershed Restoration

Polk County

Peace Creek Canal/Wahneta - Regional Drainage System
Enhancement

Southwest Florida Water Management District

Surface Water Improvement And Management (SWIM) Program

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program
Coastal Nonpoint Program
Nonpoint Source Program



WQ-A: Establish a shellfish-monitoring network to ensure sampling of 100% of Class II waters in the Charlotte Harbor NEP study area.

Background

There has been a documented historical decline in the areal extent of oyster beds throughout many areas of the Charlotte Harbor NEP. Currently the state's shellfish monitoring program does not include all areas designated as Class II waters.

Quantifiable Objective - WQ-1, WQ-4

Areas for Implementation - Oyster and clam beds

Strategy

Implement comprehensive area-wide program for both the bacteriological testing of water, as well as regular tissue analysis for potential health related potential pollutants.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department of Environmental Protection
Not-for-Profit Conservation Organizations

Expected benefits

Accurate assessment of potential shell fish areas, including both natural and commercial lease areas. Aid in the identification of potential areas for the construction of artificial beds.

Monitoring Response

As detailed in the strategy above.

Preliminary Implementation Projects

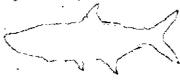
The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

Florida Department of Environmental Protection

Florida Department of Environmental Protection (FDEP)
Southwest District Point Source Discharge Permitting Program





Lee County

Lee County Estuarine Monitoring Program

Polk County

Lake Mariana Water Quality Improvements

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Volunteer Scientific Research Team, Inc.

Marine Research and Education



WQ-B: Promote general public awareness and education on water quality issues and demonstration projects.

Background

General public has limited knowledge of the goals and work of the NEP. There is a need to develop greater awareness of benefits that can accrue from individual actions.

Quantifiable Objective - WQ-1, WQ-4, WQ-5, WQ-6, WQ-7

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Stencils at stormwater drains.
- 2) Signs at road/canal crossings.
- 3) Develop school curriculum and guest speaker programs.
- 4) Recycling programs.
- 5) New resident education package.
- 6) Support and enhance local and regional Florida Yards and Neighborhood programs.
- 7) Information material for local developers, engineering firms and contractors.
- 8) Expand training for coordination of volunteer water quality sampling programs.
- 9) Work with media in getting water quality information to the public.
- 10) Increase public awareness of potential sources of pollution, and potential agencies responsible for enforcement.
- 11) Implement "River Keeper" program in conjunction with volunteer and educational programs.
- 12) Support pollution prevention (P2) programs to educate business and industry.
- 13) Utilize existing videos for public education such as "Stormwater-A Mixed Blessing," "Floodplain Facts-A Buyer's Guide," and "A Developer's Guide to Stormwater Management".
- 14) Hold public education workshops on specific topics.





Potential Responsible Agencies & Organizations

Chambers of Commerce
County and Municipal Governments
Departments of Education
Florida Department of Environmental Protection
Institute of Food and Agricultural Sciences (IFAS)/Cooperative Extension Service
Not-for-Profit Conservation Organizations
Water Management Districts

Expected benefits

Provision of mechanisms for greater public awareness.

Preliminary Implementation Projects

The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

Charlotte County

Environmental Information Center (EIC)
Greater Port Charlotte Canal Water Quality Enhancement
Charlotte County Master Stormwater Plan
South Gulf Cove Water Quality Enhancement
Support Horse Creek Outstanding Florida Water Designation
U.S. 41 Water Quality Improvement
Video: Stormwater Runoff... A Mixed Blessing

Charlotte Harbor Environmental Center, Inc.

Coordination of Water Quality Monitoring Program in Charlotte Harbor, Peace River and Myakka River
Water Quality Education

City of Cape Coral

Stormwater Utility Program (SWUP)/Utility Expansion Plan (UEP)

City of Fort Myers

Storm Water Management Program (SWMP) Surface Water Management Master Plan

City of Lakeland

Lake Hollingsworth Sediment Removal Project And Lake Parker Southwest Outfall Retrofit

City of Venice

City of Venice Public Information and Education



Florida Department of Environmental Protection

- Aquatic Preserve Management Maps
- Biological Assessment and Monitoring of Streams: Stream Condition Index and Biorecon
- Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN)
- Charlotte Harbor State Buffer Preserve Public Education
- Citizen Support Organization (CSO) The Friends Of The Charlotte Harbor Aquatic Preserves, Inc.
- Citizen Support Organization (CSO), Estero Bay Buddies
- Clean Marina Program (CMP) Assessment
- Coastal Management Workshops
- Environmentally Responsible Marinas and Boat Maintenance Practices
- Evaluation of Biological/Physical Impacts of Anchorages
- Florida Department of Environmental Protection Lakes Bioassessment Program
- Lake Howard Water Quality and Habitat Restoration Project
- Mandatory Phosphate Reclamation & Permitting (Regulatory)
- Non-Mandatory Phosphate Reclamation (Grants Program)
- Public Education Programs
- Reclaimed Water Use Development
- Saddle Creek Restoration and Alternative Mitigation
- Southwest Florida Anchorages Monitoring

Green Partners

- Green Partners - A Partnership of Polk County Businesses

Lakes Education/ Action Drive (LE/AD)

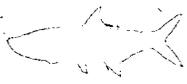
- Public Education on Polk County Lakes

Lee County

- National Pollutant Discharge Elimination System (NPDES) Implementation
- Small Quality Hazardous Waste Generator Program

Polk County

- Crooked Lake Water Quality Enhancement (Seminole Ave. Stormwater Detention Pond)
- Environmental Landscape Management Education Program
- Farm*A*Syst/Home*A*Syst
- Garden Grove Pines Stormwater Retrofit Project
- Jan Phyl Village Stormwater Retrofit Project
- Lake Hancock Advisory Group



Lakewatch

Polk County Ambient Surface Water Monitoring Program

Polk County Extension Water School

Polk County Stormwater Management Plan Implementation

Stormwater Videos For Public Education

Sanibel-Captiva Conservation Foundation, Inc.

Captiva Cruises Partnership

Habitat Management and Ecology Program: Prescribed Burning,

Wetland and Upland Enhancement, Monitoring, and

Applied Research of Native Flora and Fauna

Realtor Education Workshops

Realtors' Environmental Orientation

Resident Environmental Orientation

Sarasota County

Resource Conservation Program

Southwest Florida Regional Planning Council

Managing Selected Anchorages and Harbors - Southwest Florida

Southwest Florida Water Management District

Communications Program

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Coastal Nonpoint Program

Nonpoint Source Program

Volunteer Scientific Research Team, Inc.

Marine Research and Education



WQ-C/WQ-D: Identify gaps in water quality data needed to calibrate the appropriate models used to determine Total Maximum Daily Load (TMDL) limits. Coordinate monitoring programs and implement programs to fill data gaps for TMDLs.

Background

The Florida Department of Environmental Protection is currently in the process of beginning to establish Total Maximum Daily Load (TMDL) for water bodies within the state which have been identified as not meeting current water quality standards. It was the consensus of the Charlotte Harbor NEP working groups that within the NEP study area, this effort be expanded to address entire subbasins and/or watersheds. It is expected that in many areas identified for the determination of TMDLs there may be insufficient water quality data to accurately calibrate models.

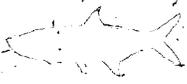
Quantifiable Objective - WQ-1, WQ-2, WQ-3

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Determine bodies of water and segments of riverine systems for which the determination of total maximum daily loads (TMDLs) needs to be accomplished, consulting with the Florida Department of Environmental Protection Watershed Management Program.
- 2) Coordinate the locations and analytes for TMDLs within the Charlotte Harbor NEP.
- 3) Assess previously collected data and determine gaps with the Florida Department of Environmental Protection Watershed Management Program.
- 4) Establish a joint agency working-group to identify the information gaps and data needed specifically for TMDLs.
- 5) Develop monitoring programs to address gaps in data needed to develop accurate TMDLs with the Florida Department of Environmental Protection Watershed Management Program.
- 6) Collect accurate and reliable data appropriate to the establishment of TMDLs for all water bodies and river segments within the Charlotte Harbor NEP.
- 7) Establish a procedure for data to be stored in a common database (e.g. STORET).
- 8) Analyze data and establish appropriate TMDLs.





Potential Responsible Agencies & Organizations

- Florida Department of Environmental Protection/Watershed Management Program (principal partner)
- County and Municipal Governments
- Not-for-Profit Conservation Organizations
- Industry
- Stormwater Utilities
- Water Management Districts

Expected Benefits

Assistance in determining appropriate background information for the establishment of Total Maximum Daily Loads (TMDLs). Provision of accurate estimated loads and assess associated negative impacts.

Monitoring Response

Monitoring programs should be tailored to each identified priority water body.

Preliminary Implementation Projects

The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

Charlotte County

Greater Port Charlotte Canal Water Quality Enhancement

Charlotte Harbor Environmental Center, Inc.

Coordination of Water Quality Monitoring Program in Charlotte Harbor, Peace River and Myakka River
Volunteer Water Quality Monitoring Network

Florida Center for Environmental Studies

Water Quality Sampling in the Caloosahatchee River and Estuary

Florida Department of Environmental Protection

Biological Assessment and Monitoring of Streams: Stream Condition Index and Biorecon

Caloosahatchee River Total Maximum Daily Load (TMDL) Study

Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN)

Domestic Wastewater (DW) and Industrial Wastewater (IW) Permitting Programs

Evaluation of Biological/Physical Impacts of Anchorages

Florida Department of Environmental Protection (FDEP)

Southwest District Point Source Discharge Permitting Program



Integrated Water Resources Monitoring (IWRM) Network Basin Assessment and Total Maximum Daily Load (TMDL) Development

Natural Resources Monitoring Programs at Estero Bay Aquatic and State Buffer Preserve (EBS&SBP)

Surface Water Ambient Monitoring Program (SWAMP)

Watershed Management Program Watershed Approach

Florida Center for Environmental Studies

Water Quality Sampling in the Caloosahatchee River and Estuary

Lee County

Lee County Ambient Surface Water Monitoring Program

Lee County Estuarine Monitoring Program

National Pollutant Discharge Elimination System (NPDES) Implementation

Peace River / Manasota Regional Water Supply Authority

Peace River Hydrobiological Monitoring Program (HBMP)

Peace River Water Quality Monitoring Project

Polk County

Crooked Lake Water Quality Enhancement (Seminole Ave. Stormwater Detention Pond)

Garden Grove Pines Stormwater Retrofit Project

Jan Phyl Village Stormwater Retrofit Project

Lake Mariana Water Quality Improvements

Lakewatch

Polk County Ambient Surface Water Monitoring Program

Polk County Stormwater Management Plan Implementation

Sarasota County

Sarasota County Ambient Water Quality Monitoring Program

Southwest Florida Water Management District

Further Refinement of a Pollutant Load Reduction Goal for Charlotte Harbor

Ongoing Water Quality Monitoring Program in Charlotte Harbor

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Investigation of Atmospheric Deposition of Nutrients

Water Quality Modeling and Total Maximum Daily Load Development



WQ-E/WQ-M: Install or retrofit Best Management Practices (BMPs) as necessary to maintain or improve water quality.

Background

Once the assimilative capacity of waterbodies within the Charlotte Harbor NEP study area have been established, the point and non-point sources pollutants should be identified. Then effective programs to reduce and/or maintain loading levels within the assimilative capacity of each surface water system should be identified. Where septic systems pose a significant potential threat of pollution to ground and surface waters and where central sewer systems are impractical, composting toilet systems may present a viable alternative.

Quantifiable Objective - WQ-1, WQ-2, WQ-3, WQ-4, WQ-5, WQ-6

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Inventory existing programs, including stormwater systems.
- 2) Evaluate and rank potential expansions of current programs.
- 3) Implementation.
- 4) Utilize federal funding sources such as the state's "Section 319-Non point source control program" when appropriate.
- 5) Implement incentives for composting toilets in appropriate areas.

Potential Responsible Agencies & Organizations

County and Municipal Governments

Florida Department of Health

Florida Department of Environmental Protection

Industry

Institute for Food and Agricultural Science/Cooperative Extension Service

Not-for-Profit Conservation Organizations

Natural Resource Conservation Service

U.S. Environmental Protection Agency

U.S. Department of Agriculture

Water Management Districts



Expected Benefits

Reduction of pollutant loads to meet established goals. In the case of increased use of composting toilets, the reduction of water consumption and reduction of nutrients loads from wastewater treatment facilities.

Monitoring Response

Monitoring programs should be established to assess success of implemented management practices.

Preliminary Implementation Projects

Charlotte Harbor Environmental Center, Inc.

Composting Toilet Implementation and Education

City of Cape Coral

Stormwater Utility Program (SWUP)/Utility Expansion Plan (UEP)

City of Fort Myers

Storm Water Management Program (SWMP) Surface Water Management Master Plan

City of Lakeland

Lake Hollingsworth Sediment Removal Project And Lake Parker Southwest Outfall Retrofit
Lake Parker Southwest Outfall Retrofit

City of Punta Gorda

City of Punta Gorda – Burnt Store Isles Stormwater Treatment Retrofit

City of Winter Haven

Multiple Stormwater Quality Improvement Projects

Florida Department of Environmental Protection

Domestic Wastewater (DW) and Industrial Wastewater (IW) Permitting Programs

Industrial Wastewater Compliance/Enforcement; Domestic Wastewater Compliance/Enforcement

Mandatory Phosphate Reclamation & Permitting (Regulatory)

Non-Mandatory Phosphate Reclamation (Grants Program)

Saddle Creek Restoration and Alternative Mitigation

Lake Howard Water Quality and Habitat Restoration Project

Green Partners

Green Partners - A Partnership of Polk County Businesses





Lee County

- Lakes Park Flow-Way/Filter Marsh
- National Pollutant Discharge Elimination System (NPDES) Implementation
- Stormwater System Inventory
- Lee County Ambient Surface Water Monitoring Program
- Lee County Conservation Land Acquisition and Stewardship Committee (CLASAC)

Manatee County

- Application of Innovative Wastewater Treatment Systems at Emerson Point Conservation Park

Natural Resources Conservation Service

- Conservation Financial Assistance
- Conservation Technical Assistance

Polk County

- Environmental Landscape Management Education Program
- Polk County Extension Water School
- Lake Mariana Water Quality Improvements
- Farm*A*Syst/Home*A*Syst
- Crooked Lake Water Quality Enhancement (Seminole Ave. Stormwater Detention Pond)
- Garden Grove Pines Stormwater Retrofit Project
- Lake Hancock Advisory Group
- Jan Phyl Village Stormwater Retrofit Project
- Polk County Stormwater Management Plan Implementation

Sarasota County

- Sarasota County Ambient Water Quality Monitoring Program

Southwest Florida Water Management District

- Management of Transportation Project Impacts
- Ongoing Efforts to Restore the Hydrology of the Upper Myakka River Watershed

U.S. Environmental Protection Agency

- Clean Water Act Section 320 National Estuary Program
- Coastal Nonpoint Program
- Nonpoint Source Program



WQ-F: Assess the cumulative impact of the density of septic tank systems and where appropriate take effective corrective action.

Background

There are potential pollutant impacts from high and moderately dense urban areas relying on septic systems to both ground and receiving surface waters.

Quantifiable Objective - WQ-1, WQ-2, WQ-3, WQ-4.

Areas for Implementation - Entire Charlotte Harbor study area

Strategy

- 1) Conduct appropriate groundwater and surface water studies necessary to determine the cumulative impacts of high densities of septic tanks.
- 2) Identify the appropriate indicator organism to identify septic system discharges.
- 3) Make appropriate changes in state laws and local septic tank ordinances to mitigate impacts to the greatest practical extent.
- 4) Require, every other year, inspection of all septic systems where impacts to groundwater/surface waters have been shown. Counties should be encouraged to include such language within their updated comprehensive plans.
- 5) Enhance enforcement to ensure appropriate repairs are made when necessary.
- 6) Establish homeowner education programs.
- 7) Utilize the state's "Section 319—Non-point source control program" for funding of projects, where appropriate.

Potential Responsible Agencies & Organizations

County and Municipal Governments

Florida Department of Health

Florida Department of Environmental Protection

Institute for Food and Agricultural Science/Cooperative Extension Service

Not-for-Profit Conservation Organizations

U.S. Environmental Protection Agency

Expected Benefits

Reduction of pollutant loads to meet established goals.



Monitoring Response

Monitoring programs should be established to assess the potential of septic tank pollution to groundwaters and surface waters.

Preliminary Implementation Projects

The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

Charlotte Harbor Environmental Center, Inc.

Septic Tank and Drainage System Education

City of Cape Coral

Stormwater Utility Program (SWUP)/Utility Expansion Plan (UEP)

City of Lakeland

Lake Hollingsworth Sediment Removal Project And Lake Parker Southwest Outfall Retrofit

City of North Port

Septic Tank Alternatives Study

City of Venice

Venice Expansion of Sanitary Sewerage

Florida Department of Environmental Protection

Public Education Programs

Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN)

Lee County

Lee County Ambient Surface Water Monitoring Program

Polk County

Farm* A* Syst/ Home* A* Syst

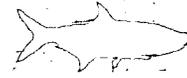
Lake Mariana Water Quality Improvements

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Coastal Nonpoint Program

Nonpoint Source Program



WQ-G: Provide central sanitary sewers or other alternative technology to residential areas (parcels of land one acre or less) and all commercial and industrial development within 900 feet of waters (canals, estuary, streams, and lakes) within the Charlotte Harbor NEP study area.

Background

Emphasis on the protection of groundwaters from pollutant loadings from septic systems should be given to areas nearest to any surface waters.

Quantifiable Objective - WQ-1, WQ-2, WQ-3, WQ-4, WQ-6

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Based on the results of WQ-F, prioritize areas for implementation.
- 2) In such areas where densities are low, require advanced on-site septic systems.
- 3) Improve quality and availability of package plants to service areas more developed areas.
- 4) Develop and implement plans to provide central sewer to highly developed areas.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department of Health
Florida Department of Community Affairs
Florida Coastal Management Program
Florida Department of Environmental Protection
Homeowner Associations
U.S. Environmental Protection Agency

Expected Benefits

Reduction of nutrient loads and sources of human pathogens.

Monitoring Response

Integrate shallow groundwater network with county stormwater and other appropriate ambient monitoring efforts.





Preliminary Implementation Projects

Charlotte County

Charlotte County Central Sewer Expansion

City of Cape Coral

Stormwater Utility Program (SWUP)/Utility Expansion Plan (UEP)

City of Fort Myers

Storm Water Management Program (SWMP) Surface Water Management Master Plan

City of North Port

City of North Port Water and Sewer Master Plan – Implementation

City of Venice

Venice Expansion of Sanitary Sewerage

City of Punta Gorda

Punta Gorda Central Sewer Expansion

Hardee County

Manatee County Planning Department

Sarasota County

Sarasota County Septic Tank Replacement Program

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



WQ-H: Install and maintain filtration marshes at appropriate locations around Lake Hancock.

Background

Thick layers of nutrient rich unconsolidated “muck” lie on the bottom of Lake Hancock. Nutrient levels within the surface waters of the lake are often extremely high and water quality (based on a Trophic State Index) are usually “poor.” The waters leaving Lake Hancock can result in degraded water quality and algal bloom in the upper Peace River. Construction of a “filtration marsh system” to reduce pollutant loads leaving Lake Hancock would help improve water quality in these areas of the Peace River.

Quantifiable Objective - WQ-1, WQ-5

Areas for Implementation - Lake Hancock northern Peace River basin

Strategy

- 1) Determine the design criteria for the construction of one or more effective filtration marshes to remove nutrient loads entering the Peace River from Lake Hancock.
- 2) Construct marsh(es).
- 3) Maintain marsh system(s) at such conditions to optimize removal of key limiting nutrients to the Peace River/Charlotte Harbor system.

Potential Responsible Agencies & Organizations

Florida Fish and Wildlife Conservation Commission
Florida Department of Environmental Protection
Polk County
Southwest Florida Water Management District.
U.S. Fish and Wildlife Service

Expected Benefits

Reduction of nutrient loads and algal bloom in the Peace River and Charlotte Harbor.

Monitoring Response

Determine nutrient concentrations in Lake Hancock and the upper Peace River, as well as determine the frequency and extent of algal blooms in the Peace River.





Preliminary Implementation Projects

Florida Department of Environmental Protection

Ecosystem Management Water Quality Assessment Section Lakes
Bioassessment

Mandatory Phosphate Reclamation & Permitting (Regulatory)

Non-Mandatory Phosphate Reclamation (Grants Program)

Saddle Creek Restoration and Alternative Mitigation

Polk County

Lake Hancock Advisory Group

Southwest Florida Water Management District

Lake Hancock Water and Nutrient Budget and Lake Hancock

Water Quality Improvement Project

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Coastal Nonpoint Program

Nonpoint Source Program



WQ-1: Expand the Florida Yards and Neighborhoods program to all counties in the Charlotte Harbor NEP study area and actively implement the program.

Background

One of the primary goals of the Florida Yards and Neighborhoods programs is to encourage, to the greatest extent possible, the planting of native, drought tolerant plant species in both yards and public areas. Such native species typically require far less water, fertilizers, and pesticides than commonly used non-native landscaping species, thus reducing both water consumption as well as non-point source pollutants in stormwater runoff.

Quantifiable Objective - WQ-3

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Improve education of homeowners about methods they can easily implement to reduce sources of pollution.
- 2) Make the business community aware of the kinds of activities and programs they can undertake to reduce non-point stormwater sources from their property.
- 3) Develop programs for providing training and certification for landscaping contractors.
- 4) Use mobile irrigation lab to reduce water use.
- 5) Promote xeriscaping, and where necessary provide for changes in zoning to allow and encourage such landscaping practices.

Potential Responsible Agencies & Organizations

Chambers of Commerce

County and Municipal Governments

Institute for Food and Agricultural Sciences (IFAS)/Cooperative Extension Service

Master Gardeners and Other Civic Associations

Not-for-Profit Conservation Organizations

Water Management Districts



Expected benefits

Reduction of the use of water. Reduction of the amounts of pollutants from yards and businesses.

Monitoring Response

County stormwater programs.

Preliminary Implementation Projects

Charlotte Harbor Environmental Center, Inc.

Florida Yards and Neighborhoods Program

City of Venice

City of Venice Public Information and Education

Florida Department of Environmental Protection

Citizen Support Organization (CSO) The Friends of the Charlotte Harbor Aquatic Preserves, Inc.

Hardee County

Hardee County Xeriscaping (Amendment of Hardee County Uniform Land Development Code)

Lee County

National Pollutant Discharge Elimination System (NPDES) Implementation

Manatee County

Manatee County Florida Yards and Neighborhoods Program

Polk County

Environmental Landscape Management Education Program
Polk County Extension Water School

Sanibel/Captiva Conservation Foundation, Inc.

Landscaping for Wildlife

Sarasota County

Florida Yards and Neighborhoods Program

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program
Coastal Nonpoint Program
Nonpoint Source Program



WQ-J: Establish a buffer zone around Lake Hancock.

Background

Currently much of the land surrounding Lake Hancock has yet to be developed. This status provides a window of opportunity to both preserve existing wildlife habitat as well as reduce future non-point source pollution to the lake through the establishment of buffer zones.

Quantifiable Objective - WQ-2

Areas for Implementation - Lake Hancock and upper Peace River basin

Strategy

- 1) Identify areas around Lake Hancock for public purchase or the acquisition of development rights.
- 2) Develop and implement plans for the reduction of non-point pollution.

Potential Responsible Agencies & Organizations

Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
Not-for-Profit Conservation Organizations
Polk County
Southwest Florida Water Management District
U.S. Fish and Wildlife Service

Expected benefits

Protection of native habitats surrounding the lake and reduction of nutrient loads.

Monitoring Response

Long-term ambient monitoring program for Lake Hancock.

Preliminary Implementation Projects

Florida Department of Environmental Protection

- Ecosystem Management Water Quality Assessment Section Lakes Bioassessment
- Greater Charlotte Harbor Ecosystem Management Area Initiative
- Mandatory Phosphate Reclamation & Permitting (Regulatory)
- Non-Mandatory Phosphate Reclamation (Grants Program)
- Saddle Creek Restoration and Alternative Mitigation



Polk County

- Environmental Lands Acquisition Program-In Polk County
- Lake Hancock Advisory Group

Southwest Florida Water Management District

- Lake Hancock Water and Nutrient Budget and Lake Hancock
Water Quality Improvement Project

U.S. Environmental Protection Agency

- Clean Water Act Section 320 National Estuary Program
- Coastal Nonpoint Program



WQ-K: Remove the muck component from the sediments of Lake Hancock.

Background

There are thick layers of nutrient-rich unconsolidated "muck" on the bottom of Lake Hancock. This muck provides a constant source of nutrients to the surface waters. As a result, water quality (based on a Trophic State Index) is "poor" and dense concentrations of algae are common. The removal of unconsolidated sediment layers should significantly improve water quality, both in Lake Hancock and the upper Peace River.

Quantifiable Objective - WQ-5

Areas for Implementation - Lake Hancock, upper Peace River

Strategy

- 1) Determine which (or what combination of) method(s) would provide a cost-effective and environmentally sound technique for the removal of unconsolidated sediments on the bottom of Lake Hancock:
 - ❖ draw down;
 - ❖ mining and restoration; and/or
 - ❖ sediment dredging/muck removal.

Potential Responsible Agencies & Organizations

Florida Fish and Wildlife Conservation Commission
Florida Department of Environmental Protection
Polk County
Southwest Florida Water Management District
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

Expected benefits

Reduction of nutrient concentration and the occurrence of algal bloom in Lake Hancock and the Peace River.

Monitoring Response

Measure ambient nutrient concentrations in the Lake Hancock and Peace River.



Preliminary Implementation Projects

Florida Department of Environmental Protection

Ecosystem Management Water Quality Assessment Section Lakes
Bioassessment
Mandatory Phosphate Reclamation & Permitting (Regulatory)
Non-Mandatory Phosphate Reclamation (Grants Program)
Saddle Creek Restoration and Alternative Mitigation

Polk County

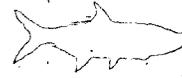
Lake Hancock Advisory Group

Southwest Florida Water Management District

Lake Hancock Water and Nutrient Budget and Lake Hancock
Water Quality Improvement Project

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



WQ-L: Create and establish a public involvement program for Lake Hancock.

Background

Local area support will be a key component in any of the proposed programs to restore water quality and preserve habitat within Lake Hancock and its watershed.

Quantifiable Objective - WQ-5

Areas for Implementation - Polk County

Strategy

- 1) Publish articles in public media;
- 2) Conduct school awareness programs; and
- 3) Target civic associations and chambers of commerce.

Potential Responsible Agencies & Organizations

Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
Not-for-Profit Conservation Organizations
Polk County
Southwest Florida Water Management District

Expected benefits

Increased public awareness of water quality problems associated with Lake Hancock and support for programs to improve existing conditions.

Preliminary Implementation Projects

Florida Department of Environmental Protection

Ecosystem Management Water Quality Assessment Section Lakes
Bioassessment

Polk County

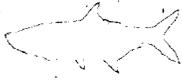
Lake Hancock Advisory Group

Southwest Florida Water Management District

Lake Hancock Water and Nutrient Budget and Lake Hancock
Water Quality Improvement Project

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



WQ-N: Reduce non-point source pollutants associated with stormwater runoff.

Background

As indicated within the *Synthesis of Existing Information* document prepared by the Charlotte Harbor NEP, the largest source of potential pollutants within each of the identified basins comes from non-point source stormwater runoff.

Quantifiable Objective - WQ-2, WQ-3, WQ-4, WQ-6

Areas for Implementation - All Charlotte Harbor NEP watersheds

Strategy

- 1) Elevate water quality criteria as part of county stormwater planning and develop integrated programs to reduce levels.
- 2) Encourage redevelopment of older properties and businesses to meet current stormwater treatment standards whenever possible.
- 3) Reduce impervious paved surface required by parking space and large commercial developments.
- 4) Encourage local governments to adopt integrated pest management policies and implement environmentally beneficial landscaping practices on all public property.
- 5) Assure and/or improve agricultural best management practices (BMPs).
- 6) Evaluate the impacts of sludge and sediments on water quality.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department of Environmental Protection
Florida Department of Agriculture
Florida Coastal Management Program
Florida Department of Community Affairs
Homeowners Associations
Institute of Food and Agricultural Sciences/Cooperative Extension Service
Not-for-Profit Conservation Organizations
Regional Planning Councils
U.S. Environmental Protection Agency
Water Management Districts

Expected benefits

Reduction in stormwater pollutant loadings to receiving waters.



Monitoring Response

Conduct existing and expanded surface water monitoring programs, as well as testing that may be required as part of National Pollutant Discharge Elimination System (NPDES) permit requirements.

Preliminary Implementation Projects

Charlotte County

- Development Review Process
- Greater Port Charlotte Canal Water Quality Enhancement
- Charlotte County Master Stormwater Plan
- Myakka River Master Plan
- South Gulf Cove Water Quality Enhancement
- Three Lakes
- U.S. 41 Water Quality Improvement

City of Cape Coral

- Stormwater Utility Program (SWUP)/Utility Expansion Plan (UEP)

City of Fort Myers

- Storm Water Management Program (SWMP) Surface Water Management Master Plan

City of Lakeland

- Lake Parker Southwest Outfall Retrofit
- Multiple Stormwater Quality Improvement Projects

City of Punta Gorda

- City of Punta Gorda – Burnt Store Isles Stormwater Treatment Retrofit

Florida Department of Environmental Protection

- Biological Assessment and Monitoring of Streams: Stream Condition Index and Biorecon
- Charlotte Harbor State Buffer Preserve Public Education
- Citizen Support Organization (CSO) The Friends Of The Charlotte Harbor Aquatic Preserves, Inc.
- Environmentally Responsible Marinas and Boat Maintenance Practices
- Florida Department of Environmental Protection Lakes Bioassessment Program
- Lake Howard Water Quality and Habitat Restoration Project
- Mandatory Phosphate Reclamation & Permitting (Regulatory)
- Non-Mandatory Phosphate Reclamation (Grants Program)
- Pollution Prevention (P2) Stormwater Pollution Reduction
- Pollution Prevention (P2)
- Public Education Programs
- Saddle Creek Restoration and Alternative Mitigation

Green Partners

- Green Partners - A Partnership of Polk County Businesses





Hardee County

Encouraging Pervious Surfaces (Hardee County Unified Land Development Code)

Lee County

Lake's Park Flow-Way/Filter Marsh

Lee County Ambient Surface Water Monitoring Program

Lee County Conservation Land Acquisition and Stewardship Committee (CLASAC)

National Pollutant Discharge Elimination System (NPDES) Implementation

Small Quality Hazardous Waste Generator Program

Stormwater System Inventory

Manatee County

The Manatee County Stormwater Basin Study

Natural Resources Conservation Service

Conservation Financial Assistance

Conservation Technical Assistance

Polk County

Crooked Lake Water Quality Enhancement (Seminole Ave. Stormwater Detention Pond)

Environmental Landscape Management Education Program
Farm*A*Syst/Home*A*Syst

Garden Grove Pines Stormwater Retrofit Project

Jan Phyl Village Stormwater Retrofit Project

Lake Mariana Water Quality Improvements

Polk County Extension Water School

Polk County Stormwater Management Plan Implementation

Stormwater Videos For Public Education

Sanibel-Captiva Conservation Foundation, Inc.

Enhancement, Monitoring, and Applied Research of Native Flora and Fauna

Habitat Management and Ecology Program: Prescribed Burning, Wetland and Upland

Southwest Florida Water Management District

Further Refinement of a Pollutant Load Reduction Goal for Charlotte Harbor

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Coastal Nonpoint Program

National Pollutant Discharge Elimination System (NPDES) Permit Program

Nonpoint Source Program

Water Quality Standards Program Overview



WQ-O: Investigate sources and effects of atmospheric deposition and develop action plans to address findings.

Background

There is only a single site within the entire Charlotte Harbor NEP study area where rates of atmospheric deposition are being collected. Due to the size and differing natures of the watersheds it is important that additional information be collected in order to account for potential sources of pollutants.

Quantifiable Objective - WQ-3

Areas for Implementation - Site(s) selected as being representative of watersheds within the Charlotte Harbor NEP

Strategy

- 1) Promote and encourage wet and dry atmospheric deposition monitoring.
- 2) Determine rates of atmospheric deposition of specific potential pollutants.
- 3) Assess if and where atmospheric deposition poses potential threats to surface waters and/or biological communities.
- 4) Identify the sources of such pollutants.
- 5) Determine if identified sources can be reduced with existing technology and/or best management practices.
- 6) Develop plans to reduce, where practical, amounts of pollutants from identified sources.
- 7) Implement the developed integrated strategy to reduce to the greatest practical extent.
- 8) Promote energy conservation to reduce emissions from power facilities.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department of Environmental Protection
Florida Department of Agriculture/Division of Forestry
Electric Utilities
U.S. Environmental Protection Agency
Water Management Districts



Expected benefits

Determination of levels of potential pollution associated with atmospheric deposition, and address identified sources where feasible and implement plan to reduce sources.

Monitoring Response

Install and collect appropriate information on levels of potential pollutants associated with atmospheric deposition within the Charlotte Harbor NEP watersheds.

Preliminary Implementation Projects

Florida Department of Environmental Protection

Watershed Management Program Watershed Approach

Lee County

Derelict Vessel Removal Program

Polk County

Lake Mariana Water Quality Improvements

Polk County Stormwater Management Plan Implementation

Sarasota County

South Lido Park Atmospheric Deposition Monitoring Station

Southwest Florida Water Management District

Estimates of Total Nitrogen, Total Phosphorus, and Total
Suspended Solids Loadings To Charlotte Harbor, Florida

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



WQ-P: Encourage, expand, and develop incentives for the use of reclaimed water.

Background

Utilities estimate that in-home use of water accounts for approximately half of the demand. Water reuse programs thus can be effective methods of reducing current and future pressures on surface and groundwater.

Quantifiable Objective - WQ-3

Areas for Implementation - All watersheds within the Charlotte Harbor NEP.

Strategy

- 1) Evaluate effectiveness and benefits of existing water reuse programs.
- 2) Assess the net effects of reducing or eliminating existing discharges and groundwater injections with regards to impacts to surface and groundwater.
- 3) Determine areas where reuse programs would be of the potential greatest benefit.
- 4) Evaluate potential actions with regards to public health concerns and perceptions concerning the use of reclaimed water.
- 5) Implement and expand programs where they meet health and environmental standards and are economically practical.

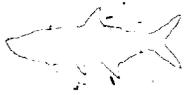
Potential Responsible Agencies & Organizations

Agricultural Industry
County and Municipal Governments
Florida Coastal Management Program
Florida Department of Environmental Protection
Industry
U.S. Environmental Protection Agency
Water Management Districts

Expected benefits

Reduction in new and increasing potable water demands on surface and groundwaters.





Monitoring Response

Determine and track water reuse in relation to overall increases in water consumption.

Preliminary Implementation Projects

Charlotte County

Promoting Reclaim Water in Charlotte County

City of Cape Coral

Cape Coral Dual Water System

City of Venice

Venice Wastewater Reuse

Florida Department of Environmental Protection

Mandatory Phosphate Reclamation & Permitting (Regulatory)

Non-Mandatory Phosphate Reclamation (Grants Program)

Reclaimed Water Use Development

Saddle Creek Restoration and Alternative Mitigation

Sarasota County

Expansion of the Reuse Distribution System

Southwest Florida Water Management District

Ongoing Efforts to Restore the Hydrology of the Upper Myakka River Watershed

Southwest Florida Water Management District's Reuse Program

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



WQ-Q: Reduce contaminants from marina and dock operations.

Background

The Charlotte Harbor NEP working groups felt that current rules and regulations probably sufficiently address such issues. However, there were concerns with regard to both enforcement as well as the regulation of boat hull cleaning operations and practices within NEP waters.

Quantifiable Objective - WQ-6

Areas for Implementation - Coastal areas, rivers, and larger lakes with the Charlotte Harbor NEP study area.

Strategy

- 1) Identify sources of pollutants and toxins associated with marina and dock operations within waters of the Charlotte Harbor NEP.
- 2) Design monitoring programs to assess potential impacts.
- 3) Implement or enhance monitoring programs to determine pollutant levels within previously identified areas.
- 4) Require effective corrective actions to reduce sources of identified pollutants.
- 5) Encourage development of regulatory best management practices (BMPs) at the county and municipal level.

Potential Responsible Agencies & Organizations

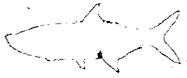
Commercial Marine and Boating Industry
County and Municipal Governments
Florida Coastal Management Program
Florida Department of Environmental Protection
Trade Associations
U.S. Environmental Protection Agency
West Coast Inland Navigation District

Expected benefits

Reduction in sources of pollutants and toxins associated with boating operations.

Monitoring Response

Specific monitoring programs of potential pollutants from identified marina and dock facilities.



Preliminary Implementation Projects

City of Fort Myers

Storm Water Management Program (SWMP) Surface Water
Management Master Plan

Florida Department of Environmental Protection

Charlotte Harbor Estuaries Volunteer Water Quality Monitoring
Network (CHEVWQMN)

Clean Marina Program (CMP) Assessment
Environmentally Responsible Marinas and Boat Maintenance
Practices

Evaluation of Biological/Physical Impacts of Anchorages
Landward-Source Petroleum Discharges
Southwest Florida Anchorages Monitoring

Lee County

Small Quality Hazardous Waste Generator Program

Polk County

Crooked Lake Water Quality Enhancement (Seminole Ave.
Stormwater Detention Pond)

Southwest Florida Regional Planning Council

Managing Selected Anchorages and Harbors - Southwest Florida

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program
Coastal Nonpoint Program
Nonpoint Source Program

Volunteer Scientific Research Team, Inc.

Marine Research and Education



FW-A: Where practical, identify and remove areas of heavy invasive exotic vegetation from the Charlotte Harbor NEP study area.

Background

Significant wildlife habitat in the study area has been extensively invaded and altered by invasive exotic vegetation. Programs and incentives need to be developed to reduce and control both the extent and spread of such invasive exotic vegetation.

Quantifiable Objective - FW-2, FW-4

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Identify areas of heavy invasive exotic vegetation and incorporate a ranking matrix for public lands.
- 2) Develop plans to reduce coverage in areas containing or linking significant habitats.
- 3) Require exotic removal and maintenance as a condition of all new permits (dock, surface water, land clearing, etc.) for development.
- 4) Develop and encourage county and community-based programs for the removal of exotics and the maintenance of native vegetation on public lands.
- 5) Develop and implement incentive (rebate) programs to encourage removal of exotics and the maintenance of native vegetation on private lands.
- 6) Alter permitting regulations to encourage landowners to remove exotic vegetation prior to land development.
- 7) Institute local ordinances for the removal of nuisance vegetation.

Potential Responsible Agencies & Organizations

Civic Groups
County and Municipal Governments
Exotic Pest Plant Council
Florida Department of Transportation
Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
Individual Property Owners
Mosquito Control Districts



National Marine Fisheries Service
Not-for-Profit Conservation Organizations
U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers
Water Management Districts

Expected Benefits

Reduction in the coverage of exotic vegetation of both existing and new areas. Increased habitat value.

Monitoring Response

Determine existing extent and maintenance of restored habitats.

Preliminary Implementation Projects

The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

Charlotte County

East Spring Lake

Charlotte County Exotic Eradication and Control Program

Charlotte Harbor Environmental Center, Inc.

Identification and Removal of Invasive Exotic Species From Within the Charlotte Harbor NEP Study Area

City of North Port

North Port Conservation Land Banking

City of Punta Gorda

Punta Gorda Geographic Information System

Punta Gorda Nature Park Restoration, Phase II

City of Sanibel

Environmental Restoration of Approximately 1600 Acres of Conservation Lands Along the Sanibel River Corridor

Eradication of Melaleuca and Brazilian Pepper from Sanibel Island

Sanibel Island Surface Water Management Plan

City of Venice

Venice Area Native Vegetation Protection

Florida Department of Environmental Protection

Alligator Creek Hydrological Restoration Project

Beker B (Wingate Creek)

Buffer Preserve Three Lakes Nature Trail

Cayo Costa State Park

Charlotte Harbor State Buffer Preserve Management Activities



- Charlotte Harbor State Buffer Preserve Public Education
- Citizen Support Organization (CSO) The Friends Of The Charlotte Harbor Aquatic Preserves, Inc.
- Don Pedro Island State Recreation Area
- Environmental Resources Permitting/Invasive Exotic Vegetative Removal
- Estero Bay Buffer Preserve Exotic Plant Removal Project
- Exotic Pest Plant Public Awareness Campaign
- Gasparilla Island State Recreation Area
- Greater Charlotte Harbor Ecosystem Management Area Initiative
- Invasive Pest Plant Management at Estero Bay State Buffer Preserve (EBSBP)
- Koreshan State Historic Site
- Lovers Key State Recreation Area
- Mandatory Phosphate Reclamation & Permitting (Regulatory)
- Mound Key State Archeological Site
- Myakka River State Park
- Myakka Wild and Scenic River
- Myakkahatchee Creek Environmental Park Restoration
- Non-Mandatory Phosphate Reclamation (Grants Program)
- Paynes Creek State Historic Site
- Public Access Facilities in Estero Bay State Buffer Preserve (EBSBP)
- Saddle Creek Restoration and Alternative Mitigation
- South Florida Coastal Ecosystem Restoration Initiative/Cape Haze Peninsula Melaleuca Removal Project/Education and Public Outreach
- Stump Pass State Recreation Area
- The Nature's Lovers Guide to Pine Island
- J.N. "Ding" Darling National Wildlife Refuge, U.S. Department of the Interior**
 - Exotic Species Control on Sanibel Island
 - J.N. "Ding" Darling National Wildlife Refuge Exotic Plant Control Plan
 - Partners for Fish and Wildlife Program/Challenge Grant Cost-Share
- National Marine Fisheries Service**
 - Fisheries Habitat Conservation Program





Polk County

Eagle Lake/Millsite Regional Drainage Project
Environmental Lands Acquisition Program In Polk County
Lake Parker/Saddle Creek - Regional Drainage Project
Peace Creek Canal/Wahneta - Regional Drainage System
Enhancement
Polk County Aquatic Weed Control Program

Sanibel-Captiva Conservation Foundation, Inc:

Habitat Management and Ecology Program: Prescribed Burning,
Wetland and Upland Enhancement, Monitoring, and
Applied Research of Native Flora and Fauna
Invasive Exotic Pest Plant Removal and Long-term Control
Program
Landscaping for Wildlife

Sarasota County

T. Mabry Carlton, Jr. Memorial Reserve and Pinelands Reserve
Monitoring and Stewardship Programs

Southwest Florida Water Management District

Habitat Restoration, Including Projects on Don Pedro Island, Cape
Haze Peninsula, Punta Gorda Isles, and the Alligator Creek
Addition of the Charlotte Harbor Buffer Preserve

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation
District



FW-B/FW-P: Enhance fish and wildlife habitat along shorelines including canals, lakes, riverine systems, and artificial waterbodies.

Background

In many areas of the Charlotte Harbor NEP, natural marine, estuarine, and freshwater shorelines have been hardened or modified during development. Programs and incentives should be developed to encourage "softening" and increase the habitat structure of these previously modified areas. In addition, such procedures should become standard operation procedures for any future permitted shoreline alterations.

Quantifiable Objective - FW-2

Areas for Implementation - Developed waterfront areas within the Charlotte Harbor NEP study area

Strategy

- 1) Encourage the use of riprap and artificial reef structures under docks and along existing seawalls to enhance habitat value.
- 2) Encourage riprap ordinances at the local level and encourage riprapping the toe of the existing seawalls.
- 3) Develop public education and awareness programs.
- 4) Develop and support incentive programs for private landowners, and review and improve existing permit process to reduce hurdles.
- 5) Encourage the use of alternatives to vertical bulkheads along developed shorelines through the permitting process.
- 6) Encourage planting of appropriate native vegetation and allow trimming and maintenance by property owners.
- 7) Develop education programs and literature directed at residents living along artificial canals.
- 8) Provide state/federal technical assistance to secure Clean Water Act - Section 319 nonpoint source pollution control grants.

Potential Responsible Agencies & Organizations

Artificial Reef Organizations
County and Municipal Governments
Florida Department Environmental Protection
Florida Fish and Wildlife Conservation Commission
Individual Property Owners



National Marine Fisheries Service
Not-for-Profit Conservation Organizations
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Water Management Districts

Expected Benefits

- Improved diversity of structure and increased marine, estuarine, and freshwater habitat value along modified shorelines.

Monitoring Response

Monitor and calculate the length of shoreline restored.

Preliminary Implementation Projects

Charlotte County

- Artificial Reef Program
- Artificial Shoreline Structure Prohibition

Charlotte Harbor Environmental Center, Inc.

- Natural Shoreline Education

City of Punta Gorda

- Punta Gorda Nature Park Restoration, Phase I
- Punta Gorda Reef Ball Project

City of Venice

- Venice Intracoastal Waterway Park

Florida Department of Environmental Protection

- Alligator Creek Hydrological Restoration Project
- Aquatic Preserve Management Maps
- Buffer Preserve Three Lakes Nature Trail
- Charlotte Harbor State Buffer Preserve Public Education
- Citizen Support Organization (CSO) The Friends Of The Charlotte Harbor Aquatic Preserves, Inc.
- Environmental Resources Permitting/Alternative Shoreline Stabilization
- Evaluation of Biological/Physical Impacts of Anchorages
- Greater Charlotte Harbor Ecosystem Management Area Initiative
- Myakka Wild and Scenic River
- Public Education Programs



Lee County

Beach Renourishment/Monitoring Program

National Marine Fisheries Service

Fisheries Habitat Conservation Program

Polk County

Environmental Lands Acquisition Program In Polk County

Sarasota County

Habitat Improvement: Modification of Previously Hardened
Natural Shorelines

Sanibel-Captiva Conservation Foundation, Inc.

Landscaping for Wildlife

Southwest Florida Water Management District

Habitat Restoration, Including Projects on Don Pedro Island, Cape
Haze Peninsula, Punta Gorda Isles, and the Alligator Creek

Addition of the Charlotte Harbor Buffer Preserve

U. S. Army Corps of Engineers

Fish and Wildlife Habitat Improvements and Programs

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Wetlands Regulatory Program



FW-C: Restore freshwater and estuarine wetland areas, especially those adversely impacted by ditching, using the following methods: the backfilling of ditches, the removal of spoil piles, the elimination of invasive exotic vegetation, and other restoration techniques.

Background

Many tidally flooded wetland areas within the coastal areas of the Charlotte Harbor NEP were historically "ditched" to hydrologically alter these habitats to reduce the breeding of saltmarsh mosquitos. Many of these areas have been heavily invaded by invasive exotic vegetation as a result of the spoil piles left by such ditching activities.

Quantifiable Objective - FW-2, FW-4

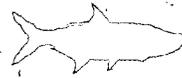
Areas for Implementation - State buffer and preserve lands, county and municipal lands, and marsh areas currently held in private ownership.

Strategy

- 1) Potential responsible agencies and organizations should develop a plan to identify and restore impacted areas within their communities or jurisdiction.
- 2) Develop an area-wide plan and rank areas for restoration.
- 3) Implement the restoration program.
- 4) Develop a program for off-site mitigation credits.
- 5) Develop a geographic information system (GIS) data layer of all mosquito ditching in the study area and use this information to prioritize restoration projects.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
Mosquito Control Districts
National Marine Fisheries Service
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
Water Management Districts



Expected Benefits

Improved hydrologic function of currently impacted high marsh/low marsh systems and increased native vegetation.

Monitoring Response

Conduct survey studies to determine effectiveness of exotic vegetation removal, restoration of wetland areas, and the filling of ditches.

Preliminary Implementation Projects

Charlotte County

Charlotte County Environmental Regulatory Program

The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

Charlotte Harbor Environmental Center, Inc.

Partial Restoration of Huckaby Creek, Phase II

City of Punta Gorda

Punta Gorda Geographic Information System
Punta Gorda Nature Park Restoration, Phase II

Florida Department of Environmental Protection

Alligator Creek Hydrological Restoration Project
Buffer Preserve Three Lakes Nature Trail
Charlotte Harbor State Buffer Preserve Management Activities
Greater Charlotte Harbor Ecosystem Management Area Initiative
Mandatory Phosphate Reclamation & Permitting (Regulatory)
Non-Mandatory Phosphate Reclamation (Grants Program)
Saddle Creek Restoration and Alternative Mitigation
The Nature's Lovers Guide to Pine Island

National Marine Fisheries Service

Fisheries Habitat Conservation Program

Polk County

Eagle Lake/Millsite Regional Drainage Project
Environmental Lands Acquisition Program In Polk County
Lake Parker/Saddle Creek - Regional Drainage Project
Peace Creek Canal/Wahneta - Regional Drainage System
Enhancement





Sanibel-Captiva Conservation Foundation, Inc.

Habitat Management and Ecology Program: Prescribed Burning,
Wetland and Upland Enhancement, Monitoring, and
Applied Research of Native Flora and Fauna
Invasive Exotic Pest Plant Removal and Long-term Control
Program

Southwest Florida Water Management District

Habitat Restoration, Including Projects on Don Pedro Island, Cape
Haze Peninsula, Punta Gorda Isles, and the Alligator Creek
Addition of the Charlotte Harbor Buffer Preserve

U. S. Army Corps of Engineers

Fish and Wildlife Habitat Improvements and Programs

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program
Wetlands Regulatory Program



FW-D: Develop a program to educate people about environmentally responsible boating practices.

Background

The development, distribution, and communication of information to the public concerning actions that can be taken to protect shallow water habitats and prevent pollution should be one of the primary goals of the Charlotte Harbor NEP's education strategy.

Quantifiable Objective - FW-2, FW-3

Areas for Implementation - Coastal Counties within the Charlotte Harbor NEP study area

Strategy

- 1) Develop slide programs for each of the major estuarine areas that show the habitat losses associated with prop damage and how boaters can avoid damage to grass beds.
- 2) Train volunteer speakers to make such presentations at local civic and business groups, local schools, as well as boating and fishing associations.
- 3) Integrate presentations into local area environmentally responsible boating courses.
- 4) Produce environmentally responsible boating practice literature and distribute to all watercraft owners.
- 5) Continue development of county and city manatee protection plans.

Potential Responsible Agencies & Organizations

Coast Guard Auxiliary
County and Municipal Governments
Florida Department Environmental Protection
Florida Fish and Wildlife Conservation Commission
Florida Coastal Management Program
Florida Sea Grant Program
Marine Advisory Committees
Not-for-Profit Conservation Organizations
Power Squadron
Local School Districts
Southwest Florida Regional Planning Council
State-wide and Local Boating and Fishing Organizations
U.S. Coast Guard
West Coast Inland Navigation District

Expected Benefits

Increase boater awareness of potential damage to marine habitats.

Monitoring Response

Feedback from target group evaluations and surveys.

Preliminary Implementation Projects

Charlotte County

Evaluation of Biological/Physical Impacts of Anchorages
Manatee/Seagrass Task Force

Charlotte Harbor Environmental Center, Inc.

Environmental Boating Education

City of Venice

City of Venice Public Information and Education

Charlotte County

Environmental Information Center (EIC)

Florida Department of Environmental Protection

Aquatic Preserve Management Maps
Charlotte Harbor Estuaries Volunteer Water Quality Monitoring
Network (CHEVWQMN)
Citizen Support Organization (CSO) the Friends of the Charlotte
Harbor Aquatic Preserves, Inc.
Public Education Programs
Reduce Propeller Damage to Seagrass Beds
Southwest Florida Anchorages Monitoring

Lee County

Manatee Protection Plan

Sarasota County

Habitat Protection-While Boating

Sanibel-Captiva Conservation Foundation, Inc.

Captiva Cruises Partnership
Realtor Education Workshops
Realtors' Environmental Orientation
Resident Environmental Orientation

Southwest Florida Regional Planning Council

Managing Selected Anchorages and Harbors - Southwest Florida

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program
Wetlands Regulatory Program

Volunteer Scientific Research Team

Marine Research and Education

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation
District



FW-E: Develop both a public service announcement (PSA) and a longer video on boating impacts to seagrass beds and how to avoid seagrass damage.

Background

The development, distribution, and communication of information to the public concerning actions that can be taken to protect shallow water habitats and prevent pollution should be one of the primary goals of the Charlotte Harbor NEP.

Quantifiable Objective - FW-3

Areas for Implementation - Coastal counties within the Charlotte Harbor NEP

Strategy

- 1) Develop short public service announcements for radio and television explaining boating impacts on local seagrass beds, the effects, and how to avoid prop damage.
- 2) Educate local broadcasters of the need for the public service announcements.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Fish and Wildlife Conservation Commission
Florida Department Environmental Protection
Florida Coastal Management Program
Florida Gulf Coast University
Local Radio Stations
Local Television Broadcasting Stations
Marine Advisory Committees
Marine Manufacturing Association
Not-for-Profit Conservation Organizations
Public Broadcasting Stations
Local School Districts
Florida Sea Grant Program
State-wide and Local Boating and Fishing Organizations
West Coast Inland Navigation District

Expected Benefits

Increase public awareness of potential habitat losses resulting from prop damage to seagrass beds.





Monitoring Response

Feedback from target group evaluations and surveys.

Preliminary Implementation Projects

Charlotte County

Manatee/Seagrass Task Force

City of Venice

City of Venice Public Information and Education

Florida Department of Environmental Protection

Citizen Support Organization (CSO) the Friends of the Charlotte Harbor Aquatic Preserves, Inc.

Lee County

Manatee Protection Plan

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Wetlands Regulatory Program

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation District



FW-F: Develop, install, and maintain custom signs indicating the location of shallow areas (such as seagrass beds, mudflats, oyster beds, etc.) to be placed at boat ramps and other appropriate locations where there is high boat use.

Background

An effective method used to protect shallow estuarine habitats is to provide adequate public information about local waters and potential shallow areas. This public information should be provided at boat ramps and marinas where boaters will see the information.

Quantifiable Objective - FW-2; FW-3

Areas for Implementation - coastal counties within the Charlotte Harbor NER

Strategy

- 1) Within each of the major estuarine areas, develop signs specifically designed for individual boat ramps and marinas depicting how to avoid damage to local area seagrass beds, as well as the locations of oyster beds, etc.
- 2) Work with counties, marina owners, etc. to have these signs placed in appropriate locations and maintained.

Potential Responsible Agencies & Organizations

- County and Municipal Governments
- Florida Fish and Wildlife Conservation Commission
- Florida Department Environmental Protection
- Marine Advisory Committees
- Private Marinas and Yacht Clubs
- Florida Sea Grant Program
- State-wide and Local Boating and Fishing Organizations
- U.S. Fish and Wildlife Service
- West Coast Inland Navigation District

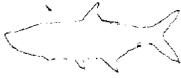
Expected Benefits

Reduce impacts to seagrass and oyster beds caused by boaters.

Monitoring Response

Long-term inventory of seagrass prop scarring damage.





Preliminary Implementation Projects

Charlotte County

Manatee/Seagrass Task Force

City of Punta Gorda

City of Punta Gorda Manatee Protection Plan

City of Venice

City of Venice Public Information and Education

Florida Department of Environmental Protection

Environmental Resources Permitting (ERP) Program/Clean Marina Program

Southwest Florida Anchorages Monitoring

Sarasota County

Educational Signage at Boat Ramps

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Wetlands Regulatory Program

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation District



FW-G: Develop and distribute boater maps and stickers for the Charlotte Harbor NEP areas, including resources to avoid.

Background

One of the methods that could be used to protect shallow water habitats is to provide detailed mapping and information of at-risk resources to boaters.

Quantifiable Objective - FW-3

Areas for Implementation - Coastal counties within the Charlotte Harbor NEP

Strategy

- 1) Continue to develop boater guides for each Charlotte Harbor NEP estuarine area emphasizing:
 - ❖ the importance of seagrass beds;
 - ❖ how to avoid damage to seagrasses;
 - ❖ local navigational channels and shallow areas to be avoided;
 - ❖ how to remove a boat from a seagrass bed;
 - ❖ manatee habitat and areas where they are known to frequent if different seasons;
 - ❖ proper anchorage locations;
 - ❖ proper pollution prevention practices; and
 - ❖ proper boat drafts.
- 2) Develop and implement a plan for the effective distribution of maps and stickers.
- 3) Identify areas of critical manatee habitat and specific locations where they are known to seasonally frequent. Highlight these areas on all educational materials.
- 4) Distribute educational materials at marine dealers, watercraft rental businesses, marinas, tackle shops, sporting goods stores, and include with boat registration packages.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Marine Research Institute
Florida Fish and Wildlife Conservation Commission
Florida Sea Grant Program
Florida Department Environmental Protection
Marine Advisory Committees
Not-for-Profit Conservation Organizations
State-wide and Local Boating and Fishing Organizations
West Coast Inland Navigation District



Expected Benefits

Reduction in habitat damage caused by lack of specific local knowledge by the general boating public.

Monitoring Response

Long-term inventory of seagrass prop scarring damage.

Preliminary Implementation Projects

Charlotte County

Manatee/Seagrass Task Force

City of Punta Gorda

City of Punta Gorda Manatee Protection Plan

City of Venice

City of Venice Public Information and Education

Florida Department of Environmental Protection

Southwest Florida Anchorages Monitoring

Lee County

Manatee Protection Plan

Sarasota County

Boaters' Guide for Upper Lemon Bay and Venice

Southwest Florida Regional Planning Council

Managing Selected Anchorages and Harbors - Southwest Florida

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Wetlands Regulatory Program

Volunteer Scientific Research Team

Marine Research and Education

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation District



FW-H: Develop and support digital resources map system on the Internet for the public to use.

Background

This system provides a method of distributing detailed information and mapping of local areas to citizens. A digital system can be easily updated as additional habitat information is developed.

Quantifiable Objective - FW-3

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

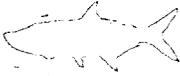
Develop an Internet site with the following types of information:

- ❖ the location and importance of at-risk benthic resources;
- ❖ major habitat types as well as methods to preserve and avoid damage to habitat;
- ❖ endangered species habitat in the study area;
- ❖ for each of the estuarine areas, develop maps specifically designed to show seagrass beds, oyster beds, major navigational channels, ramps and marinas as well as areas to be avoided based boat draft and given tidal stages;
- ❖ links to additional programs and databases; and
- ❖ within study area watersheds, show the location of parks, public access locations, public lands, conservation lands, greenways, blueways, and similar public resources; and groundwater level and withdrawal information.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department Environmental Protection
Florida Marine Research Institute
Florida Fish and Wildlife Conservation Commission
Florida Natural Areas Inventory
Florida Gulf Coast University
Florida Sea Grant Program
Florida Coastal Management Program
Marine Advisory Committees
Mote Marine Laboratory





National Oceanographic and Atmospheric Administration
Not-for-Profit Conservation Organizations -
State-wide and Local Boating and Fishing Organizations
West Coast Inland Navigation District

Expected Benefits

Reduced amounts of habitat damage by the general boating public.

Monitoring Response

Reduce amounts of habitat damage caused by the general boating public and increased environmental responsibility.

Preliminary Implementation Projects

The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

City of Punta Gorda

Punta Gorda Geographic Information System

Sarasota County

Resource Management Division Geographical Information Systems Program

Southwest Florida Regional Planning Council

Managing Selected Anchorages and Harbors - Southwest Florida
Strategic Land Acquisition/Conservation/Preservation Plan for
Southwest Florida

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program
Wetlands Regulatory Program

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation
District



FW-1/FW-T: Develop programs to improve public awareness of habitat and wildlife issues.

Background

The key to the protection of fish and wildlife habitat is public support for current and proposed programs. Without efforts to enhance the general public's awareness and/or involvement in these issues there may be a lack of the need for many of the NEP's habitat actions.

Quantifiable Objective - FW-2, FW-3

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Increase programs and opportunities for citizens to communicate with members of environmental agencies and policy-making commissions.
- 2) Support development of comprehensive environmental science and education curriculum at all levels of education.
- 3) Develop and implement information and education programs for developers, contractors, and builders about effective means of reducing habitat impacts.
- 4) Develop and provide environmental education materials to all new homeowners.
- 5) Develop displays with the following types of information:
 - ❖ the importance of seagrass beds;
 - ❖ how to avoid damage to seagrasses;
 - ❖ how to remove a boat from a seagrass bed;
 - ❖ maps specifically designed to show seagrass beds, oyster bars, major navigational channels, ramps and marinas, as well as areas to be avoided based on draft of boat and for given tidal stages; and
 - ❖ areas known to be seasonally frequented by numbers of manatees.

Potential Responsible Agencies & Organizations

Boards of Education

County and Municipal Governments

Florida Fish and Wildlife Conservation Commission

Florida Department of Environmental Protection

Not-for-Profit Conservation Organizations

U.S. National Marine Fisheries Service

U.S. Army Corps of Engineers





U.S. Fish and Wildlife Service
Water Management Districts
West Coast Inland Navigation District

Expected Benefits

Increased public awareness of habitat and wildlife issues and increase public support and participation.

Preliminary Implementation Projects

The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

Charlotte County

Charlotte County's Speaker Bureau Program
Environmental Information Center (EIC)
Manatee/Seagrass Task Force

Charlotte Harbor Environmental Center, Inc.

Habitat and Wildlife Education
Seagrass Exhibits
Watershed Environmental Education

City of North Port

Myakkahatchee Creek Preservation Corridor
North Port Conservation Land Banking

City of Sanibel

Eradication of Melaleuca and Brazilian Pepper from Sanibel Island

City of Venice

City of Venice Public Information and Education

Estero Bay Marine Laboratory

Project Pod

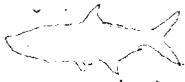
Florida Department of Environmental Protection

Aquatic Preserve Management Maps
Baker B. (Wingate Creek)
Buffer Preserve Three Lakes Nature Trail
Cayo Costa State Park
Charlotte Harbor Buffer Preserve Land Acquisition
Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN)
Charlotte Harbor State Buffer Preserve Public Education
Citizen Support Organization (CSO) The Friends Of The Charlotte Harbor Aquatic Preserves, Inc.



- Citizen Support Organization (CSO); Estero Bay Buddies
- Coastal Management Workshops
- Don Pedro Island State Recreation Area
- Evaluation of Biological/Physical Impacts of Anchorages
- Gasparilla Island State Recreation Area
- Koreshan State Historic Site
- Lake Howard Water Quality and Habitat Restoration Project
- Lovers Key State Recreation Area
- Mandatory Phosphate Reclamation & Permitting (Regulatory)
- Mound Key State Archeological Site
- Myakka River State Park
- Myakka Wild and Scenic River
- Non-Mandatory Phosphate Reclamation (Grants Program)
- Paynes Creek State Historic Site
- Public Access Facilities in Estero Bay State Buffer Preserve (EBSBP)
- Public Education Programs
- Saddle Creek Restoration and Alternative Mitigation
- South Florida Coastal Ecosystem Restoration Initiative/Cape Haze Peninsula Melaleuca Removal Project/Education and Public Outreach
- Stump Pass State Recreation Area
- Team Permitting - Net Ecosystem Benefit Planning and Permitting Process
- The Nature's Lovers Guide to Pine Island
- Fort Myers Beach Marine Resources Task Force**
 - Treasures of the Sea
- Lee County**
 - Manatee Protection Plan
- Peace River/Manasota Regional Water Supply Authority**
 - The Peace River Water Authority's Regional Transmission Pipeline Educational Trails
- Polk County**
 - Environmental Lands Acquisition Program In Polk County
 - Garden Grove Pines Stormwater Retrofit Project
 - Jan Phyl Village Stormwater Retrofit Project
- Sanibel-Captiva Conservation Foundation**
 - Habitat Management and Ecology Program: Prescribed Burning, Wetland and Upland Enhancement, Monitoring, and Applied Research of Native Flora and Fauna
 - Landscaping for Wildlife





Sarasota County

Sarasota County Public Information
Sea Turtle Protection Program

Southwest Florida Regional Planning Council

Managing Selected Anchorages and Harbors - Southwest Florida

Southwest Florida Water Management District

Communications Program

Turtle Time, Inc.

Turtle Time, Inc., Education and Monitoring Activities

U. S. Army Corps of Engineers

Fish and Wildlife Habitat Improvements and Programs

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

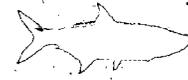
Wetlands Regulatory Program

Volunteer Scientific Research Team

Marine Research and Education

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation
District



FW-J/FW-K/FW-O: Develop a shallow water resource marking program that includes establishing "no motor zones" and "limited access zones" where appropriate, based on Florida Marine Research Institute (FMRI) seagrass studies and bird rookery information.

Background

The most feasible mechanisms to protect shallow areas and bird rookeries are "no motor zones" and "limited access areas". Support for implementation requires close coordination between the public and government agencies.

Quantifiable Objective - FW-2, FW-3

Areas for Implementation - Estuarine areas of coastal counties within the Charlotte Harbor NEP

Strategy

- 1) Review other similar programs in other areas of Florida and evaluate potential problems.
- 2) Investigate severely scarred areas to determine their locations and boundaries.
- 3) Establish criteria for resource areas that need protection.
- 4) Establish working group to determine criteria for "no motor zones" or "idle speed zones" such as:
 - ❖ areas of severely scarred seagrass beds;
 - ❖ areas often frequented by manatees; and
 - ❖ waters surrounding significant bird rookeries.
- 5) Work with local government and public groups and organizations to implement programs.
- 6) Establish effective enforcement and assessment mechanisms.
- 7) Install and maintain appropriate markers.
- 8) Determine areas where enhancement of boating channels would be expected to reduce impacts to seagrass and other benthic communities.
- 9) Maintain channels, install navigational signage, and monitor seagrasses to determine the effectiveness of channel enhancements keeping boaters out of the fragile areas.

Potential Responsible Agencies & Organizations

Coast Guard Auxiliary
County and Municipal Governments





Fishing and Guide Associations
Florida Fish and Wildlife Conservation Commission
Florida Department of Environmental Protection
Florida Marine Research Institute
Florida Coastal Management Program
Local Power Squadron
National Oceanographic and Atmospheric Administration
Regional Harbor Board
U.S. National Marine Fisheries Service
U.S. Coast Guard
U.S. Fish and Wildlife Service
West Coast Inland Navigation District

Expected Benefits

Reduced boating impacts to specific sensitive areas and habitats.

Monitoring Response

Determination of level of enforcement.

Preliminary Implementation Projects

Charlotte County

Manatee/Seagrass Task Force

Florida Department of Environmental Protection

Citizen Support Organization (CSO) the Friends of the Charlotte Harbor Aquatic Preserves, Inc.

Evaluation of Biological/Physical Impacts of Anchorages

J.N. "Ding" Darling National Wildlife Refuge, U.S. Department of the Interior

Refuge Boundary Buffer Establishment for Land Acquisition of the J.N. "Ding" Darling National Wildlife Refuge Complex

Tarpon Bay Recreational Area Channel Dredging/Extension

Lee County

Vessel Management

Sarasota County

Water Resource Marking Program

U. S. Army Corps of Engineers

Fish and Wildlife Habitat Improvements and Programs

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Wetlands Regulatory Program

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation District



FW-L: Provide additional support for environmental compliance and enforcement within the area of the Charlotte Harbor NEP.

Background

Existing laws provide a sound basis for habitat and wildlife protection. However, the law enforcement agencies responsible for enforcement of these laws deserve increased support.

Quantifiable Objective - FW-3

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Interact with judges, law enforcement officers, and state attorneys through a series of workshops on environmental issues and enforcement.
- 2) Review existing laws to determine whether civil fines would provide greater deterrents.
- 3) Seek additional support for enforcement agents. Evaluate need for civil penalties for violations (criminal penalties changed to civil penalties through state statute). Recognize enforcement agencies and individuals (e.g. reward system) who are active in enforcement of environmental regulations.
- 4) Implement financial incentives (Wildlife Alert) for pro-active reporting and implementation of existing laws.
- 5) Increase public awareness regarding violations and impacts to resources.
- 6) Develop an interagency task force to coordinate and reduce conflicts.
- 7) Increase the number of law enforcement officers and vessels in the Charlotte Harbor study area.

Potential Responsible Agencies & Organizations

Local and state law enforcement, including:

- Florida Fish and Wildlife Conservation Commission
- U.S. Fish and Wildlife Service
- Florida State Attorney Office
- U.S. Coast Guard
- County Sheriffs Departments
- Florida Marine Patrol

Local Elected Officials

Local Judiciary



Expected Benefits

Reduced violations of existing wildlife and habitat laws.

Monitoring Response

Track enforcement, citations, and public awareness.

Preliminary Implementation Projects

City of Punta Gorda

City of Punta Gorda Manatee Protection Plan

City of Venice

City of Venice Public Information and Education

Charlotte County

Development Review Process

Florida Department of Environmental Protection

Mandatory Phosphate Reclamation & Permitting (Regulatory)

Myakka Wild and Scenic River

Non-Mandatory Phosphate Reclamation (Grants Program)

Saddle Creek Restoration and Alternative Mitigation

J.N. "Ding" Darling National Wildlife Refuge, U.S. Department of the Interior

Interagency Task Force Participation

Lee County

Manatee Protection Plan

National Marine Fisheries Service

Fisheries Habitat Conservation Program

Southwest Florida Regional Planning Council

Managing Selected Anchorages and Harbors - Southwest Florida

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation District



FW-M: Develop methods to enhance seagrass recovery from prop scarring.

Background

Seagrasses damaged by prop scarring are very slow to recover. Research suggests that slow growth is attributable to changes in the sediments where seagrass rhizomes grow. Methods can be developed which reduce seagrass stresses and promote a rapid recovery of damaged areas.

Quantifiable Objective - FW-2, FW-3

Areas for Implementation - Coastal estuarine areas in the Charlotte Harbor NEP study area

Strategy

- 1) Encourage research into the recovery of seagrass areas damaged by prop scarring.
- 2) Continue seagrass mapping, scarring assessments, and concurrent water quality monitoring efforts.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Marine Research Institute
Florida Department of Environmental Protection
Universities and Research Institutes
Water Management Districts
West Coast Inland Navigation District

Expected Benefits

Enhanced recovery of damaged seagrass beds.

Monitoring Response

Determine if rates of recovery in experimental test areas are significantly different from natural processes.





Preliminary Implementation Projects

Charlotte County

East Spring Lake
Manatee/Seagrass Task Force

Florida Department of Environmental Protection

Southwest Florida Anchorages Monitoring

Lee County

Vessel Management

Southwest Florida Water Management District

Ongoing Seagrass Mapping Efforts in Lemon Bay and Charlotte Harbor

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program
Wetlands Regulatory Program



FW-N: Request local delegates to introduce state legislation to require a boater operator's license and support increased presence of enforcement officers on marine and fresh waters.

Background

Rapid increase in recreational boat usage has increased the potential for impacts in important habitats. A boater operator's license would provide an excellent opportunity for new operator's to become aware of potential boating impacts to key resources. Licensing process would teach boater's the existing laws and regulations regarding natural resources, as well as ways to reduce damage to seagrass beds and shallow benthic habitats.

Quantifiable Objective - FW-3

Areas for Implementation - Statewide

Strategy

- 1) Investigate legislation from states that have small boat operators' license programs.
- 2) Ask legislative delegations to implement boaters to obtain an operator's license.
- 3) Require knowledge of rules and regulations pertaining to environmental protection as part of the program.
- 4) Encourage legislative delegations to require boaters to obtain an operator's license.
- 5) Require that boaters have the knowledge of rules and regulations pertaining to environmental protection as part of the program.
- 6) Aid and expand the existing juvenile license program.
- 7) Increase the number of law enforcement officers and vessels in the Charlotte Harbor study area.

Potential Responsible Agencies & Organizations

- Boater and Fishing Organizations
- Coastal Conservation Association
- County and Municipal Governments
- Florida Fish and Wildlife Conservation Commission
- Local Elected Officials
- Not-for-Profit Conservation Organizations
- Sheriff and Police Departments





Expected Benefits

Increased boater awareness of laws and rules regarding environmental protection.
Reduced impacts to critical habitats.

Preliminary Implementation Projects

City of Punta Gorda

City of Punta Gorda-Manatee Protection Plan

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



FW-Q: Ensure uniform compliance and enforcement of environmental regulations and permitting criteria.

Background

Existing laws and permitting criteria provide a sound basis for habitat and wildlife protection. However, law enforcement agencies responsible for enforcement of these laws deserved increased support. Enforcement of permitting and other environmental regulations should be uniform throughout the NEP study area.

Quantifiable Objective - FW-2, FW-3, FW-4

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Identify areas of non-compliance with local, state, district and federal rules and regulations.
- 2) Cooperate with regulatory agencies to develop protocols for annual reports that track the effectiveness of permit compliance within the Charlotte Harbor NEP study area.
- 3) Develop an interagency task force to review enforcement of regulations and permitting criteria.

Potential Responsible Agencies & Organizations

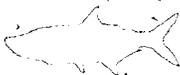
County and Municipal Governments
Florida Department of Environmental Protection
Florida Department of Community Affairs
Florida Fish and Wildlife Conservation Commission
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. National Marine Fisheries Service
U.S. Army Corps of Engineers
Water Management Districts

Expected benefits

Increased awareness of potential problems with compliance of existing regulations.
Enhanced preservation of fish and wildlife habitats under existing regulations.

Monitoring Response

Determine if existing regulations are effective and if post-permit compliance/enforcement is being adequately implemented as intended by current rules and regulations.



Preliminary Implementation Projects

Charlotte County

Development Review Process

City of Venice

City of Venice Public Information and Education

Florida Department of Environmental Protection

Environmental Resources Permitting/Alternative Shoreline
Stabilization

Environmental Resources Permitting/Invasive Exotic Vegetative
Removal

Mandatory Phosphate Reclamation & Permitting (Regulatory)

Myakka Wild and Scenic River

Non-Mandatory Phosphate Reclamation (Grants Program)

Reduce Propeller Damage to Seagrass Beds

Saddle Creek Restoration and Alternative Mitigation

Hardee County

Local Phosphate Mining Regulations

Manatee County

Interdepartmental Coordination with the U.S. Fish and Wildlife
Service

National Marine Fisheries Service

Fisheries Habitat Conservation Program

Polk County

Garden Grove Pines Stormwater Retrofit Project

Sarasota County

Habitat Improvement: Improve Law Enforcement and Provide
Consistent Regulatory Authority Throughout the Charlotte
Harbor NEP Area

U. S. Army Corps of Engineers

Fish and Wildlife Habitat Improvements and Programs

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Wetlands Regulatory Program

West Coast Inland Navigation District

Waterway Management for the West Coast Inland Navigation
District



FW-R: Promote development and enhancement of plans and programs to improve fish and shellfish resources.

Background

There are a number of projects and plans currently under consideration by local, regional, state, and federal agencies related to the maintenance and enhancement of fish and shellfish resources. The effectiveness of these programs would be enhanced by closer coordination and joint support among all active parties.

Quantifiable Objective - FW-2

Areas for Implementation - Primarily riverine, estuarine, and coastal waters within the Charlotte Harbor NEP study area

Strategy

- 1) Support scallop restoration programs.
- 2) Continue and expand critical independent fisheries monitoring programs.
- 3) Strengthen regulatory programs that protect vital fisheries habitats including: submerged aquatic vegetation, shellfish beds, spawning areas, and critical juvenile fish habitats.
- 4) Encourage programs to restore wetlands, seagrasses, and vital fisheries habitats.
- 5) Develop and implement management plans for the recovery of depleted commercial and recreational fishery stocks.
- 6) Encourage shellfish enhancement programs, including seeding programs to improve fisheries, water quality, and habitat value.
- 7) Support increased regulation and enforcement of recreational fisheries.
- 8) Continue to improve juvenile fisheries habitat around manmade structures such as docks, piers, and hardened shorelines.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Fish and Wildlife Conservation Commission
Florida Department of Environmental Protection
U.S. National Marine Fisheries Service
U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers
Water Management Districts





Expected Benefits

Enhanced preservation of fish and wildlife habitats. Maintenance of and/or increased fish and shellfish resources.

Monitoring Response

Long-term seasonal studies of fish and shellfish populations to determine changes caused by natural variation and those associated with human influences.

Preliminary Implementation Projects

Charlotte County

Artificial Reef Program
Manatee/Seagrass Task Force

City of Punta Gorda

City of Punta Gorda Manatee Protection Plan
Punta Gorda Nature Park Restoration, Phase I

City of Venice

Venice Intracoastal Waterway Park

Florida Department of Environmental Protection

Coastal Management Workshops
Evaluation of Biological/Physical Impacts of Anchorages
Mandatory Phosphate Reclamation & Permitting (Regulatory)
Non-Mandatory Phosphate Reclamation (Grants Program)
Saddle Creek Restoration and Alternative Mitigation

J.N. "Ding" Darling National Wildlife Refuge, U.S. Department of the Interior

J.N. "Ding" Darling National Wildlife Refuge Annual Water Management Plan
Wildlife Drive Water Control Structure Rehabilitation Project

Lee County

Lee County Artificial Reef Program

Sanibel-Captiva Conservation Foundation, Inc.

Enhancement, Monitoring, and Applied Research of Native Flora and Fauna
Habitat Management and Ecology Program: Prescribed Burning, Wetland and Upland

Southwest Florida Water Management District

Ongoing Seagrass Mapping Efforts in Lemon Bay and Charlotte Harbor

U. S. Army Corps of Engineers

Fish and Wildlife Habitat Improvements and Programs

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



FW-S: Bring environmentally sensitive land under protection through ownership and/or management, and expand conservation areas, reserves, and preserves.

Background

Important areas of existing natural habitat are currently threatened with substantial alteration due to rapid rates of development. The NEP process should encourage, promote, and support efforts by government and private organizations, as well as private landowners to increase the protection of these habitats through expanded conservation, reserve, preserve, and stewardship programs.

Quantifiable Objective - FW-1

Areas for Implementation - Entire Charlotte Harbor NEP study area

Strategy

- 1) Identify key habitats in existing natural areas within each basin for protection.
- 2) Expand and enhance habitat inventory and monitoring programs.
- 3) Promote private stewardship of vital habitats through incentives and technical assistance to landowners, local governments, and other parties.
- 4) Develop and implement public land acquisition programs for critical habitat adjacent to public lands.
- 5) Continue to pursue "less-than-fee" simple acquisition programs to acquire critical lands for fish and wildlife as well as water management, water supply, and the conservation and protection of water resources.
- 6) Work with mining companies to develop permanent reserves and preserves from post-mined land.
- 7) Develop a funding resource and management plan for acquired lands before purchase or acquisition.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
Land Acquisition Organizations





Mining Industry
Not-for-Profit Conservation Organizations
Private Property Owners
U.S. Fish and Wildlife Service
Water Management Districts

Expected Benefits

Maintained and preserved critical wildlife habitats.

Monitoring Response

Keep a running inventory of 1) the existing acreages of each type of identified critical habitat within the Charlotte Harbor NEP; 2) lands within conservation, reserves, or preserves; and 3) the annual amount of habitat converted to development.

Preliminary Implementation Projects

The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

Charlotte County

Environmental Lands Acquisition Advisory Committee (ELAAC)
Land Use and Transportation Buildout Scenario

Charlotte Harbor Environmental Center, Inc.

Habitat Inventory, Monitoring and Protection of Charlotte Harbor
Environmental Center Managed Sites In Charlotte County

City of Sanibel

Sanibel Environmentally Sensitive Lands Acquisition Program
Sanibel Island Beach Management Plan Implementation

City of Venice

Venice Intracoastal Waterway Park

Florida Department of Environmental Protection

Charlotte Harbor State Buffer Preserve Public Education
Citizen Support Organization (CSO) The Friends Of The Charlotte
Harbor Aquatic Preserves, Inc.

Florida Greenways and Trails Program

Greater Charlotte Harbor Ecosystem Management Area Initiative

Mandatory Phosphate Reclamation & Permitting (Regulatory)

Non-Mandatory Phosphate Reclamation (Grants Program)

Saddle Creek Restoration and Alternative Mitigation

Team Permitting - Net Ecosystem Benefit Planning and Permitting
Process

The Nature's Lovers Guide to Pine Island



J.N. "Ding" Darling National Wildlife Refuge, U.S. Department of the Interior

Expansion of the Acquisition Boundary of the J.N. "Ding" Darling National Wildlife Refuge Complex

Lee County

Lee County Conservation Land Acquisition and Stewardship Committee (CLASAC)

Manatee County

Environmental Lands Management and Acquisition Committee (ELMAC)

Polk County

Environmental Lands Acquisition Program In Polk County
IMC-Agrico Peace River Park, Off CR 640, Homeland

Sanibel-Captiva Conservation Foundation, Inc.

Habitat Management and Ecology Program: Prescribed Burning,
Wetland and Upland Enhancement, Monitoring, and
Applied Research of Native Flora and Fauna
Landscaping for Wildlife

Sarasota County

Proposed Acquisition of the Verna, Eastern Ranchlands, and
Myakkahatchee Creek Environmentally Sensitive Lands

South Florida Water Management District

Save Our Rivers

Southwest Florida Water Management District

Site Identification/Land Acquisition

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



FW-U: Acquire lands to increase wildlife habitat currently privately held within large, undeveloped, platted areas.

Background

Within Sarasota, Charlotte, and Lee counties there are extensive areas of platted, undeveloped lands slated for future intense single family development. These areas are the result of large land development projects from the 1950s, 60s, 70s and 80s and are currently largely vacant. Many of these areas were sold prior to the implementation of current environmental regulations. Thus, many of these areas contain important habitats that are at risk once landowners choose to develop their property.

Quantifiable Objective - FW-1

Areas for Implementation - Entire Charlotte Harbor NEP study area.

Strategy

- 1) Create a tax-exempt Land Trust for the acquisition of wildlife habitat.
- 2) Inventory platted lands to identify areas of critical upland and wetland habitat.
- 3) Obtain the names and addresses of absentee property owners of targeted undeveloped lands from county tax offices.
- 4) Contact targeted property owners requesting:
 - ❖ land donation in exchange for income tax write-off;
 - ❖ exchange for equivalent land in non-targeted areas;
 - ❖ permanent wildlife easement; and
 - ❖ sale of land to the trust.
- 5) Use acquired targeted properties for matching funds from:
 - ❖ The Trust for Public Lands;
 - ❖ The National Audubon Society;
 - ❖ The Nature Conservancy;
 - ❖ Water Management Districts;
 - ❖ Local, State and Federal Agencies; and
 - ❖ Private Businesses.
- 6) The Trust can turn over large acquired tracts to appropriate government entities for management as permanent conservation areas.



Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Department of Community Affairs
Florida Department of Environmental Protection
Not-for-Profit Conservation Organizations
Private Property Owners
Regional Planning Councils
Water Management Districts

Expected Benefits

Preserved critical upland and wetland habitats that are currently platted for future development.
Reduce urban sprawl and need to provide services to areas outside current development. Reduced future development in flood plain areas.

Monitoring Response

Develop a geographic information system (GIS) based inventory of undeveloped platted lands, critical upland, and wetland habitats, and an annual update of acquired lands.

Preliminary Implementation Projects

The Calusa Land Trust and Nature Preserve of Pine Island, Inc.

Pine Island Watershed Natural Resource Assessment Geographic Information System (GIS)

Charlotte County

Environmental Lands Acquisition Advisory Committee (ELAAC)

City of North Port

North Port Conservation Land Banking

City of Sanibel

Sanibel Environmentally Sensitive Lands Acquisition Program

Sanibel Island Beach Management Plan Implementation

Sanibel Island Surface Water Management Plan

Florida Department of Environmental Protection

Charlotte Harbor Buffer Preserve Land Acquisition

Charlotte Harbor State Buffer Preserve Public Education

Citizen Support Organization (CSO) The Friends Of The Charlotte Harbor Aquatic Preserves, Inc.

Florida Greenways and Trails Program

Greater Charlotte Harbor Ecosystem Management Area Initiative

Mandatory Phosphate Reclamation & Permitting (Regulatory)



Non-Mandatory Phosphate Reclamation (Grants Program)
Saddle Creek Restoration and Alternative Mitigation
The Nature's Lovers Guide to Pine Island

Lee County

Lee County Conservation Land-Acquisition and Stewardship
Committee (CLASAC)

Sarasota County

Sarasota County Environmentally Sensitive Lands Program

South Florida Water Management District

Save Our Rivers

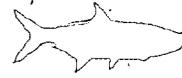
Southwest Florida Regional Planning Council

Site Identification/Land Acquisition

Strategic Land Acquisition/Conservation/Preservation Plan For
Southwest Florida

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program



FW-V: Identify the potential living oyster bars for restoration within the estuarine waters of the Charlotte Harbor NEP study area. Identify the potential (recent and historic) dead oyster bar areas for restoration. Associate oyster enhancement with water quality, improved hydrology, and reassessed recreational harvest levels.

Background

Based on the studies by Harris et. al. (1983), the total area of oyster bars within the waters of the Charlotte Harbor NEP was approximately 400 acres in 1982. This is in comparison to an estimated 800 acres in 1954. Much of this loss may be attributable to changes which have resulted from the large increase in the human population that have occurred around the Charlotte Harbor complex since the early 1950s. Presently, many of the remaining historic oyster bars within the waters of the NEP are in poor condition.

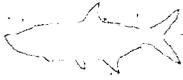
The South Florida Water Management District (SFWMD) is currently using oysters as part of a valued ecosystem component study to help determine how potential regulatory changes in the controlled discharges from the Caloosahatchee River may affect estuarine communities in San Carlos Bay and lower Pine Island Sound.

Habitat Restoration

The Florida Department of Environmental Protection's Shellfish section is very familiar with acceptable methods of recreating and restoring declining oyster bars. Management processes and their costs are well known for maintaining commercial bars in the panhandle and big bend regions of Florida. Such methods have been successfully been implemented in other southeastern and gulf coast estuarine areas.

Environmental Factors

Do decade-long, wetter than average years and drier than average years affect the distribution and abundance of oyster bars in the Charlotte Harbor complex? The answer is probably, "yes." Salinity variability above 20 parts per thousand (ppt) salinity or below five ppt is known to affect the presence and abundance of oysters. There is some limited evidence that there were die-offs of some oyster bars near the mouth of the river in 1995 and 1998 due to unnaturally excessive freshwater discharges from the Caloosahatchee River.



In addition many well known, popular oyster bars have declined as a result of recreational harvesting. The primary reason for the declines in the size of these viable oyster bars is that, unlike natural mortality, no cultch is returned to the bars from such recreational harvesting.

Oyster bars have intrinsic value as complex hard bottom habitat for many species, foraging areas for some species, and as temporary night roosting areas for a number of bird species. Other human use of these bars as habitat includes fishing and bird watching. In addition, oyster bars filter water and can have a positive effect on water quality.

Quantifiable Objective - FW-2

Areas for Implementation -Estuarine waters within the Charlotte Harbor NEP study area

Strategy

- 1) Develop a comprehensive inventory of existing oyster beds and determine the relative health of major bars.
- 2) Identify areas for restoration based both on historic and current bars.
- 3) Develop long-term plan for implementation of restoration plans, including funding sources.
- 4) Implement restoration.
- 5) Monitor effectiveness of restoration and, if necessary, make modifications based on the results.

Potential Responsible Agencies & Organizations

County and Municipal Governments
Florida Coastal Zone Management Program
Florida Department of Environmental Protection
Florida Game and Freshwater Fish Commission
Florida Marine Fisheries Commission
Florida Marine Research Institute
U.S. National Marine Fisheries Service
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency, Gulf of Mexico Program
U.S. Fish and Wildlife Service
Water Management Districts



Expected Benefits

The presence and abundance of oyster bars can be one of the primary indicators that more natural hydroperiods have been established for the Caloosahatchee River and other areas where there have been major hydrologic alterations of freshwater inflows. The increased opening of shell fishing areas can also serve as an indicator of an improvement in water quality within these estuarine areas. Increasing oyster bar habitat will also be beneficial to other fish and wildlife that use these areas, including many threatened wading bird species.

Monitoring Response

Aerial photography (past, present, and future) conducted by the Water Management Districts and the Florida Marine Research Institute can be used to identify oyster bar areas. Visual inspections can then be done to assess the relative health of identified major bars. In addition, the presence of oyster larvae in water samples can be identified for whether there is potential for re-establishing dead bars. Correlation between oyster bar elevations and tidal range should be determined and characterized.

Preliminary Implementation Projects

City of Punta Gorda

Punta Gorda Geographic Information System

Florida Department of Environmental Protection

Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN)

Evaluation of Biological/Physical Impacts of Anchorages

Sarasota County

Restoration of Oyster Resources in the Coastal Venice, Myakka River, and Lemon Bay Basins

Southwest Florida Water Management District

Ongoing Seagrass Mapping Efforts in Lemon Bay and Charlotte Harbor

U. S. Army Corps of Engineers

Fish and Wildlife Habitat Improvements and Programs

U.S. Environmental Protection Agency

Clean Water Act Section 320 National Estuary Program

Volunteer Scientific Research Team, Inc.

Marine Research and Education





PUBLIC EDUCATION AND OUTREACH

"I have learned a great deal about the various tributaries of the Peace River, the communities along the river, and the impacts of human settlement in the upper river watershed."

- Glenn E. Heath, TAC member

"The most important thing I have learned as a CAC member is the necessity for the art of consensus to accomplish the ideal ends." -Anna Bowditch, CAC member

MISSION STATEMENT

The Public Education Strategy of the Charlotte Harbor National Estuary Program is to educate and to motivate the people within the greater Charlotte Harbor watershed to understand, to participate in, and to implement the *Comprehensive Conservation and Management Plan* (CCMP) for the future.

PUBLIC EDUCATION GOALS

- 1) To increase public awareness, understanding, and support of the action items in the *Comprehensive Conservation and Management Plan* through involvement in educational programs, resource-based activities, and special events.
- 2) To establish and maintain environmental education efforts with organizations, educational centers, and government agencies.
- 3) To increase awareness and understanding of the natural and cultural resources of the greater Charlotte Harbor watershed.
- 4) To develop stewardship and a sense of shared responsibility for our estuaries, rivers, tributaries, and their watersheds.



PUBLIC EDUCATION OBJECTIVES

- 1) To maintain a core staff, including a Public Affairs Specialist, at the Charlotte Harbor National Estuary Program office to ensure implementation of the *Comprehensive Conservation and Management Plan*.
- 2) To support and further the educational action items of the *Comprehensive Conservation and Management Plan*.
- 3) To assess annually the progress of the Public Education Strategy.
- 4) To develop future directions based upon the annual assessment.

TARGET AUDIENCES

The public education and outreach efforts of the Charlotte Harbor National Estuary Program attempt to reach a wide audience of the general public. However, specific action plans will target the most relevant audience in the particular locations where implementation takes place. These target audiences for the strategy are grouped into five broad categories.

Business and Industry:

- ❖ Mining
- ❖ Agriculture
- ❖ Developers and Real Estate Professionals
- ❖ Hotel and Tourism
- ❖ Marine Trades/Fisheries
- ❖ Recreation
- ❖ Transportation

Government
Education
Clubs, Organizations, and Associations
Media



Kayaker

Artwork by Victor McGuire



ONGOING PUBLIC EDUCATION AND OUTREACH ACTIVITIES

(to be continued under implementation)

Quarterly Newsletter

A quarterly newsletter is produced for general distribution. This newsletter provides information on topics relevant to the study area, issues, events, as well as updates on program activities. A mailing list of management conference members, public and private organizations, and interested persons is maintained for distribution of the newsletter. The newsletter is also posted on the program's website.

Volunteer Speaker's Bureau

A group of volunteer speakers representing the various counties in the program's study area have been trained to provide presentations about the program. They are equipped with the necessary materials and audio-visual equipment and contribute significantly to public outreach on behalf of the program.

Resident Orientation Program

The program funds a project whereby the contractor(s) hold a series of public workshops to provide information on Florida's natural systems and how humans interact with them. These forums also provide an opportunity to suggest and promote responsible actions by Florida's newer residents on behalf of the state's environment.

Fact Sheets

The program office produces a series of fact sheets that briefly describe projects that have been undertaken. The fact sheets provide a synopsis of information for the lay audience and can be used as sound bites for the media.

Mini-Grants

These grants target education-related projects that directly relate to one of the program's priority problems. Requests up to \$3,000 qualify and do not require matching funds.



***Portable Displays
(Partner with offices, organizations, and educational institutions to
place displays where there will be a lot of traffic)***

A portable display has been purchased and display items have been developed including photographs, maps, and text. The display is being used for general audiences at local events, conferences, and workshops. The display is sufficiently portable for one person to set up and dismantle. Photos and graphics are produced and modified to create different messages as needed.

Website

The program office regularly maintains and updates its own home page on the World Wide Web. The World Wide Web is globally accessible to anyone with the necessary equipment and Internet access. The program's home page has links to other related and appropriate websites.

Florida Yards and Neighborhoods Program (FYN)

The program funds a project that encourages residents to tailor their landscapes to become more environmentally friendly. The FYN offers community workshops, lectures, meetings, field demonstration events, yard certifications, and other activities to promote participation in its program, and to educate the public about the Charlotte Harbor National Estuary Program itself.

Special Events (Earth Day, Coastfest, Estuaries Day, beach clean-ups)

The program office coordinates events to bring attention to special environmentally-related celebrations or activities.

Media Relations

Use of the media to communicate program activities and relevant issues is the most effective and efficient way to reach a broad, general audience. The program office systematically sends out press releases at the beginning of every month to members of radio, television, and the printed press in the study area. Additionally, press releases announce requests for proposals, the distribution of documents and materials, and report the results of projects.



NEW OR UPDATED PUBLIC EDUCATION AND OUTREACH ACTIVITIES

Develop presentations for the Volunteer Speaker's Bureau

The Volunteer Speaker's Bureau currently presents five versions of one slideshow program. As the program moves into implementation of the action plans it will be necessary to update the slideshow programs to convey the information contained in the *Comprehensive Conservation and Management Plan*.

Develop and expand mailing list database

The program office continuously updates its mailing list database as requests are made. These efforts should be continued. However, the Citizens' Advisory Committee formed an *Alliance Subcommittee* that produced a document with information on groups and organizations that the program should be attempting to reach. It is recommended that greater emphasis be placed on increasing the mailing list database and in increasing participation in the activities of the program.

Develop data and information management

The Citizens' Advisory Committee recommended that the program serve as a central location for information on current issues. A strategy for gathering and disseminating information should be developed and implemented.

Develop intern/volunteer program

The Citizens' Advisory Committee recommended that volunteers and/or interns be used to assist with many of the tasks that need to be accomplished to maintain the program office. A strategy for setting up and supporting a volunteer/intern program should be developed and implemented.

Increase information to schools and local governments

The Citizens' Advisory Committee recommended that a mechanism be established to disseminate information to local government partners on a more consistent basis. Likewise, greater efforts should be made to set up partnerships and projects with schools in the study area.



Issue media releases

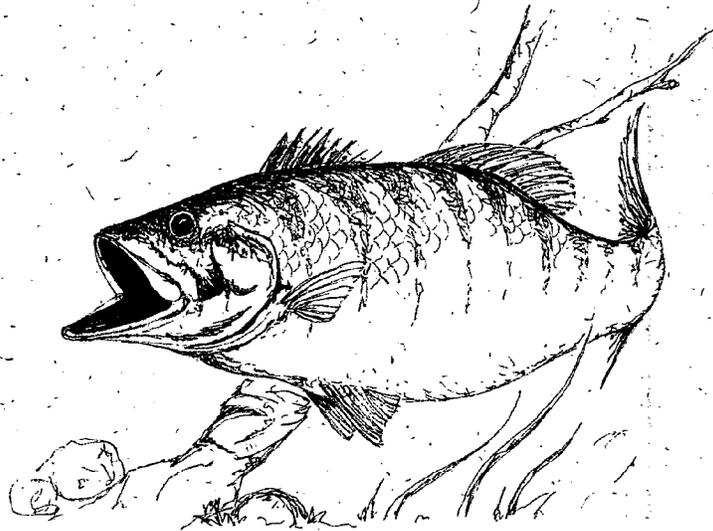
The Citizens' Advisory Committee recommended that media releases that focus on the results of projects and mini-grants be produced. Additionally, the program office should continue seeking outside contributors for articles to the newsletter and other printed media.

Organize and/or facilitate forums for sharing information about watershed issues

The Charlotte Harbor NEP is well suited to serve as an organizer and facilitator of forums to discuss issues and to share information regarding the priority problems. These efforts should be increased when the program is in implementation of the *Comprehensive Conservation and Management Plan*.

Video/Public Service Announcement production

The Citizens' Advisory Committee recommended that video production be utilized in during implementation of the action plans as a tool for public outreach.



Largemouth bass

Artwork by Victor McGuire





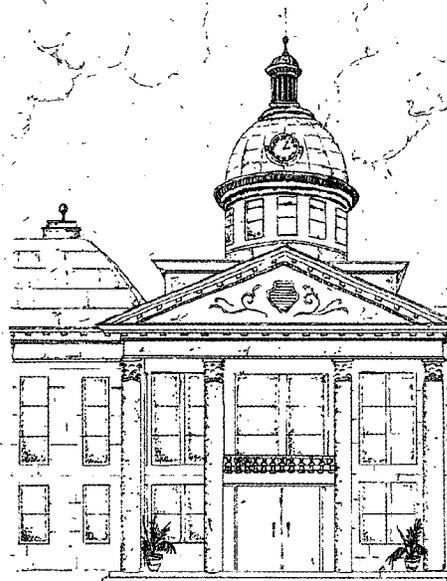
GOVERNANCE, IMPLEMENTATION & FINANCING

"Meeting inland and up the river introduced me again to the fascinating riverine ecosystem, quiet and rich in wild-life. I hadn't seen this area since I was a child when it seemed wild and savage. Now it is incorporated into my concept of home." - Molly Krival, CAC member

This chapter describes how the *Comprehensive Conservation & Management Plan* (CCMP) will be implemented by local governments, agencies, and other watershed stakeholders. This section also details the implementation role of the Charlotte Harbor National Estuary Program (NEP) in ensuring that the goals and objectives of this plan are achieved.

Local government and agency partners in the Charlotte Harbor NEP anticipate signing agreements in the year 2000 pledging to carry out the recommendations of the final management plan. The agreements will include specific goals for each partner and their responsibilities for meeting those goals, along with a timetable for achieving them.

The mechanisms, staff, and resources to accomplish these *priority actions*, however, are left up to the individual communities, who may select the most suitable options from among a range of alternatives. The first set of preliminary actions—projects that are planned or underway—are detailed in *Volume II* of this document. These actions provide some first steps for implementation and provide some ideas for projects that require additional partners or financial support. These projects, however, are only the first steps in the overall implementation of the *quantifiable objectives* and *priority actions* in this management plan.



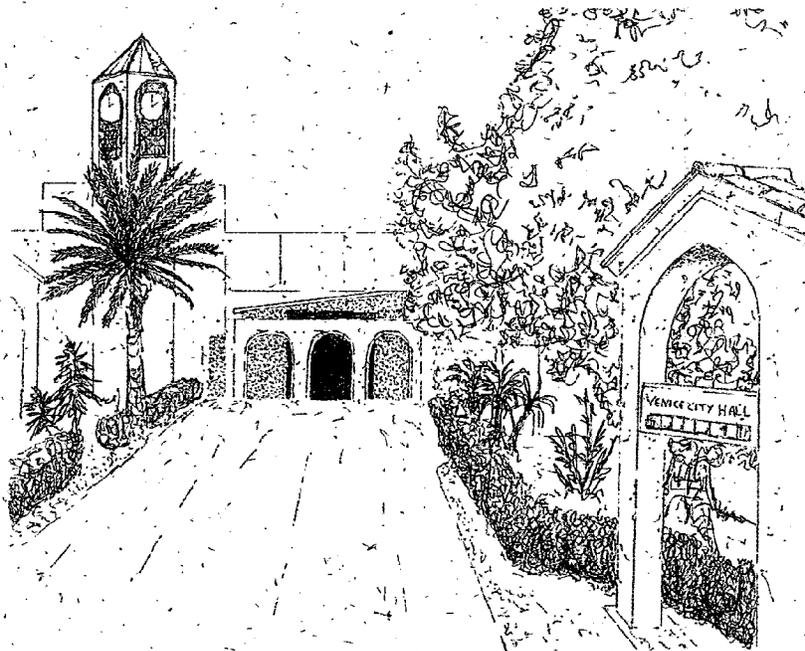
Bartow City Hall

Artwork by Victor McGuire



This approach provides local commitment and a list of projects that can begin quickly. Written agreements provide some assurance that all of the partners are working toward common goals while providing local flexibility. This approach not only emphasizes flexibility, but also allows local governments to focus their limited resources in the most cost-effective and environmentally beneficial manner. Additionally, the implementation strategy outlined in this chapter addresses how these goals and initiatives for the Greater Charlotte Harbor Watershed will be integrated into existing management programs and regulatory programs.

Existing regional management expenditures also are presented to provide an understanding of how much money is currently allocated and where it is going. Financing options that follow illustrate possible sources of revenue and approaches to accomplish goals of the plan that might not otherwise be achieved with existing resources. Wherever possible, the Charlotte Harbor NEP advocates the reallocation and more efficient use of existing revenues to carry out recommended actions.



Venice City Hall

Artwork by Victor McGuire



IMPLEMENTING THE PLAN FOR THE GREATER CHARLOTTE HARBOR WATERSHED

Successful implementation of the *Comprehensive Conservation and Management Plan* will require the following:

- 1) Firm commitments for action;
- 2) Flexibility for local governments to pursue the most cost-effective strategies to achieve a particular goal;
- 3) Integration of goals and strategies into existing regulatory programs and rules; and
- 4) Effective oversight to ensure that actions are carried out in a timely manner.

Commitments will be secured through an implementing agreement that NEP partners expect to sign in the year 2000, after the final *Comprehensive Conservation and Management Plan* has been approved. These partners include the following:

<i>Agencies</i>	<i>Counties</i>	<i>Cities and Towns</i>	<i>Regional Planning Councils</i>
Environmental Protection Agency	Charlotte County	Arcadia	Southwest Florida
Florida Coastal Management Program/ Florida Department of Community Affairs	DeSoto County	Bartow	Central Florida
Florida Fish & Wildlife Conservation Commission	Hardee County	Cape Coral	
Florida Department of Environmental Protection	Lee County	Fort Myers	
Peace River/ Manasota Regional Water Supply Authority	Manatee County	Fort Myers Beach	
South Florida Water Management District	Polk County	North Port	
Southwest Florida Water Management District	Sarasota County	Punta Gorda	
		Sanibel	
		Venice	
		Wauchula	

The goals of the CCMP, which were detailed in the Introduction chapter, will be the goals of the implementation agreements.



INTEGRATING THE PLAN INTO EXISTING ENVIRONMENTAL RULES & PROGRAMS

Once government and agency *priority actions* to achieve regional goals are approved by the program's Management and Policy Committees, these *priority actions* will be incorporated into state and federal water quality permits addressing direct or point discharges and stormwater management. Local governments will amend their comprehensive plans to promote, and assure consistency with, the final *Comprehensive Conservation and Management Plan*.

The management plan has been developed in cooperation with the region's local governments, broad-based community interests, and environmental agencies at the local, state, and federal levels, to reach consensus on the plan's restoration goals and action plans. The Charlotte Harbor NEP also has coordinated closely with local environmental alliances devoted to improving and protecting specific regions of the watershed.

Key partners in the Charlotte Harbor NEP have been these types of alliances. The Southwest Florida Water Management District's *Surface Water Management and Improvement (SWIM) Program* should play a key role in the implementation of the *Comprehensive Conservation and Management Plan*. The South Florida Water Management District's *Caloosahatchee Advisory Committee* and *Lower West Coast Water Supply Plan Committee* are important local planning efforts for water quality and water supply. The *Estero Bay Agency on Bay Management* is significant for its focus on the activities in the Estero Bay basin. Additional groups such as the *Lake Hancock Advisory Committee* and the *Myakka River Coordination Council* also play important roles in their specific watersheds.



FEDERAL CONSISTENCY REVIEW

The U.S. Environmental Protection Agency (EPA) requires each National Estuary Program to have a federal consistency review process. This process evaluates federal activities for consistency with the *Comprehensive Conservation and Management Plan* (CCMP). Federal programs and federally-funded activities must be consistent with this management plan or demonstrate why consistency is not possible. The Charlotte Harbor NEP proposes a two-part strategy for facilitating this review process. The first strategy is to encourage early coordination and review of projects that potentially conflict with or further the goals of the plan. The purpose of the early coordination step is to identify if and where conflicts exist and to explore options for resolving those conflicts at the earliest possible opportunity.

The second strategy is to incorporate the existing federal consistency review process of the State Clearinghouse and Florida Coastal Management Program. These offices coordinate federal consistency reviews in Florida. The Charlotte Harbor NEP will identify the types of federal activities and programs it wishes to review; will receive specific proposals within these categories from the Florida Coastal Management Program via the three regional planning councils in the study area: Tampa Bay; Central Florida; and Southwest Florida Regional Planning Councils. The Charlotte Harbor NEP will determine if the activity is consistent with priority goals and objectives of the *Comprehensive Conservation and Management Plan* (CCMP). If concerns arise, comments will be sent to the Florida Coastal Management Program through the representative regional planning council, which accumulates all comments from local governments.

For more information, please refer to "The Charlotte Harbor National Estuary Program Federal Consistency Report."



ROLES OF THE CHARLOTTE HARBOR NEP IN OVERSEEING IMPLEMENTATION

The success of the Charlotte Harbor NEP ultimately will be measured in the protection and management achieved through implementation of the *Comprehensive Conservation and Management Plan*. Consequently, a key ingredient for success is defining who should oversee implementation of the plan and what oversight should entail. Through the program office and the four committees, a comprehensive evaluation of the goals and quantifiable objectives established through the Charlotte Harbor NEP will be conducted five years after the adoption of the plan to ensure that restoration efforts and funding are effectively targeted.

The Charlotte Harbor NEP itself, in addition to the projects conducted by its partner organizations, has defined some specific responsibilities to enhance existing efforts and to improve coordination among the many active organizations in the region. Through the NEP office and assistance from the committees, the NEP will conduct the following activities:

Implement NEP Initiatives

- ◆ Coordinate data management program.
- ◆ Assist in implementation of the long term monitoring strategy.

Monitor Progress and Assist Implementation

- ◆ Support the *management conference* structure and activities.
- ◆ Monitor progress of the implementation of the CCMP.
- ◆ Conduct the *biennial review* (every two years) of implementation, as required by U.S. EPA.
- ◆ Produce annual "report cards" on the environmental status of the study area.
- ◆ Prepare the annual workplan and perform grant administration.
- ◆ Locate funding sources and grants for project implementation.
- ◆ Conduct the Federal Consistency review process.
- ◆ Assist the *management conference* in modifying the *quantifiable objectives* and *priority actions* as needed to meet the program goals.

For more detail, please refer to the chapter
 "Public Education and Outreach."

Public Outreach and Involvement

- ◆ Continue selected activities for public education, as described in the Public Education Strategy.
- ◆ Implement new public involvement activities, with the assistance of the Citizens' Advisory Committee, as identified in the Public Education Strategy.

In 1999, the *management conference* of the Charlotte Harbor NEP decided to continue the four committees of the conference and to preserve the existing structure to oversee the implementation of the plan. The primary oversight roles of the Charlotte Harbor NEP will be to monitor progress in implementation and the environmental conditions, assist implementation, continue public outreach and involvement, and implement the long term monitoring strategy as well as the data management strategy. Specific efforts associated with these functions are outlined below.

Citizens' Advisory Committee Role

The Citizens' Advisory Committee (CAC) is the critical link between the program and the public. An active CAC is well-suited to provide information about public concerns and sentiments. The committee is also an essential mechanism for dispersing information to key community organizations and individuals that may not be directly involved with the program. The primary roles of the CAC during implementation are defined as:

- ◆ Assist in the implementation of the outreach strategy;
- ◆ Review public involvement workplan components/budget;
- ◆ Distribute information and materials to other organizations; and
- ◆ Other contributions as needed.

Technical Advisory Committee Role

The Technical Advisory Committee (TAC) provides a wealth of knowledge and a diversity of technical expertise to the program and its projects. As more information is gathered and new projects are initiated, additional technical input will be needed. The main roles of the TAC during implementation are defined as:

- ◆ Provide revised technical information about the study area;
- ◆ Exchange information among technical users;



- ◆ Provide input on the strengths and weaknesses of the data management program;
- ◆ Provide input on the strengths and weaknesses of the long term monitoring program; and
- ◆ Other technical input as needed.

During implementation, it is recommended that the TAC and CAC each should meet quarterly, although they can meet more often if needed. At least once a year, there should be a joint meeting of the committees to promote interaction and exchange of information. The committees may want to hold their individual meetings on the same day to allow members to attend both sessions.

Management Committee Role

The continuing role of the Management Committee is also defined. The Management Committee serves an important role of integrating the desires of the Citizens' Advisory Committee with the scientific information from the Technical Advisory Committee. The Management Committee members are also primary advisors to their Policy Committee counterparts and are therefore, an important source of accurate information to elected officials and policy makers. The role of the Management Committee is defined as:

- ◆ Implement projects;
- ◆ Apply for additional grant funding;
- ◆ Coordinate regional efforts; and
- ◆ Check progress/environmental results.

Policy Committee Role

During implementation, the Policy Committee continues to be the final decision-maker for program spending, membership, and overall direction. The importance of involving local officials in the decisions of the program cannot be overstated. The Policy Committee's continued activity is equally important for successful implementation. The role of the Policy Committee is generally defined as:

- ◆ Support implementation;
- ◆ Periodically review the *quantifiable objectives* and *priority actions* as well as recommend modifications to meet program goals;
- ◆ Oversee program office;
- ◆ Authorize workplan/funding; and
- ◆ Raise matching funds.

After a review of the responsibilities of the Management and Policy Committees, it is recommended that they should meet two to four times per year.

One of the strengths of the Charlotte Harbor NEP is the alliance of local government and regulatory agencies for the entire region represented on the Policy Committee. Our local government and agency partners feel that maintaining this decision-making structure - with regulators and regulated interests working together toward common goals and assisted by scientific and citizen advisors, - is critical to assuring implementation of the plan. The "bottom-up" approach to environmental management gives all partners a place in the commitment to the future of the region.

U.S. Environmental Protection Agency Role

U.S. EPA has set aside \$1.2 million, or \$300,000 per year over four years (beginning in October 1999) to assist the Charlotte Harbor NEP in overseeing implementation of the *Comprehensive Conservation and Management Plan*. The federal contribution requires a local funding match of at least 25 percent, to be provided by the NEP's local governments and agency participants. It should be noted, however, that the U.S. EPA funding must be appropriated annually by Congress, and is therefore dependent upon those appropriations. The U.S. EPA is also involved as an implementing partner along with the many other organizations in the management conference. U.S. EPA has submitted several projects as early implementation programs, which are included in *Volume 2*.

Staff and Local Sponsorship

Maintaining an active program office is necessary to support committee activities, manage the U.S. EPA grants and other funding, provide a central information source, and conduct the federal consistency review process. Maintenance of a core staff including a director, public involvement specialist, and environmental planner/administrator is recommended along with maintaining secretarial support through the local sponsor.

Throughout the planning phase of the Charlotte Harbor NEP the Southwest Florida Regional Planning Council (SWFRPC) has been the sponsor. A local sponsor is required to receive NEP funding from U.S. EPA. In keeping with its sponsorship, the council has provided office space, supplies, computers, and secretarial support for the program office. Unless the existing situation becomes unwieldy for either party, the *management conference* recommends that this relationship continue.



COST & FINANCING

Support for the activities of the *management conference* and the program office will continue during implementation. Additional funding may also be needed to fund the projects and programs detailed in the *priority actions* and the preliminary implementation projects. It is anticipated that U.S. EPA will provide core funding of at least \$300,000 annually. The match for our EPA/NEP grant should be contributed by a combination of the agencies and local governments. The distribution and amounts of match needed should be detailed into the inter-local agreements so that the expectations for each partner are clear and specific. The purpose is to provide the needed match in cash so that there are adequate funds to support the annual workplan, committee activities, and the program office. Funding for actual implementation projects such as monitoring, restoration, and scientific studies does not need to be administered by the program office and will likely be in the forms of both cash and in-kind services. These efforts are needed in addition to the basic financial support of the program office, committees, and coordination functions.

Costs for the implementation of each priority action will vary, depending upon the resources of the organizations carrying out the projects. Some *priority actions* can be conducted with existing staff and infrastructure; others require substantial new efforts to be dedicated toward their completion. Estimating the cost of each *priority action* based upon the existing resources of a "generic" organization was determined to be too coarse of an estimate to be useful to the individual partners. Instead, each organization has estimated the resources they will require (if any) to complete the implementation projects detailed in *Volume 2*.

As implementation continues and new projects are detailed, specific cost estimates will be determined, based upon the cost-effective use of existing resources and a clear return on investment. Additional funds required to implement the *priority actions* in this management plan will be obtained through many sources. Possible sources of existing and additional funding are described in an appendix report to this document, *1999 Funding Sources Inventory for the Greater Charlotte Harbor Watershed*.



Several themes have been identified to direct funding and resources towards funding the comprehensive management plan for the Greater Charlotte Harbor Watershed:

- ◆ Maintain existing levels of expenditures for programs making cost-effective contributions to restoration goals;
- ◆ Evaluate programs that fall short of these aims and investigate opportunities to redirect resources to accomplish more with public dollars;
- ◆ Aggressively pursue state and federal funding assistance for watershed management;
- ◆ Promote public-private partnerships with the potential for real economic and natural resource benefits;
- ◆ Support local option taxes, when deemed essential for the implementation of action plans; and
- ◆ Pursue new funding sources beyond those described above only if strategies fail to achieve adequate progress towards management and implementation.

If additional funds are necessary in the future, the Charlotte Harbor NEP has identified various funding sources for local and state partners to consider. These include three broad categories of revenue sources:

Debt instruments, such as long-term municipal bonds or the state revolving loan fund, that support large projects involving substantial engineering and construction, such as wastewater treatment and reuse facilities;

Recurring sources, such as taxes or user fees, that might be utilized for restoration purposes, although this would probably require budget allocations on the part of local governments; and

Short-term revenue sources, such as federal, state and private grants, which can provide short-term financing for projects. Their availability in the future is uncertain, but these sources have been aggressively and successfully pursued by NEPs, agency, and local government partners.



Revenue sources are summarized and evaluated in a separate report available from the Charlotte Harbor NEP. The report notes that some revenue sources are currently not being used to their full legal capacity. Federal grants and various debt instruments fall into this category. Most local governments level *ad valorem* (property) taxes, but operate below the maximum millage cap, although the margin may be small in some cases. Impact and user fees as a funding mechanism for environmental programs also appear to be underutilized by local governments. The report also notes that other funding mechanisms that are allowed by law but has limited local implementation, such as a saltwater fishing license surcharge and a marine fuel surtax.

Some of these revenue sources may even serve as incentives for environmentally responsible behavior, as this chart illustrates:

<i>Funding Source</i>	<i>Incentive Mechanism</i>
User fees	Fee based on usage, reduces impact on resource.
Anchorage fees	Reduce anchor damage to nearshore areas.
Privilege fees	Can be implemented to manage use at public facilities.
Stormwater utility fees	May reduce runoff pollution from properties by encouraging on-site retention/stormwater treatment.
Impact fees	Reduce septic tanks and package treatment plants.
Fines and penalties	Encourage compliance with environmental laws.
Marine fuel surtax	Reduce use of marine fuels and associated pollution.
Shellfish license fees	Encourage local shellfish management plans.

Sufficient funding for implementation projects is critical to the long-term management, improvement, and protection of the Greater Charlotte Harbor Watershed. Continued efforts will be required to work with federal, state, regional, and local partners to secure sufficient implementation funding. The continued activities of the *management conference* and its members will be of great assistance to these activities.



MONITORING WATERSHED IMPROVEMENTS & EXCHANGING INFORMATION

"As a phosphate industry member to the Charlotte Harbor NEP Citizens Advisory Committee I appreciate, more now than ever, the need for our industry communicating the responsible environment and reclamation stewardship we practice." - E.E. (Ernie) Helms, CAC member

Efforts to monitor the status and health of the Greater Charlotte Harbor Watershed are central to the success of implementation. Monitoring enables communities to measure the return on investment for management efforts and allows environmental managers to validate or refocus their activities.

An effective monitoring program provides the data necessary to assess the status and trends in the health and abundance of the harbor's wildlife and habitats. This information allows local governments and agencies to evaluate progress made in regional restoration and protection. The data also provide insights into the effectiveness of current management strategies, indicating when goals have been met, if actions should continue, or whether more stringent efforts are warranted.

Monitoring the changes caused by management actions in a watershed is not as simple as counting fish or measuring water quality. Watersheds, by their very nature, are dynamic systems. Populations of fish, birds, and other organisms fluctuate with natural cycles. Water quality also varies, particularly as seasonal and annual weather patterns change. The task of tracking environmental changes in an estuary can be difficult — and distinguishing changes caused by human actions from natural variations can be even more difficult.



The Charlotte Harbor NEP is establishing a regional monitoring strategy, including efforts to measure changes in water quality, quantity, and habitat. These efforts utilize the existing organizations and measurement efforts already occurring in the region. Many programs, both public and privately funded, contribute to the overall knowledge of the study area.

Once monitoring information is collected, it is also important that the facts are analyzed and made widely available. Both the general public and technical users are interested in the information that is collected. To promote the availability and accessibility of environmental information, a data management strategy is also detailed. Providing accurate information to scientists, reporters, teachers, and voters will enhance good decision-making and management.

EXISTING MONITORING PROGRAMS

One of the first projects conducted by the Charlotte Harbor NEP was to document the existing monitoring programs in the study area. Public agencies such as local governments, state resource agencies, and federal offices were queried about their monitoring programs. Private organizations such as industrial facilities, not-for-profit, and volunteer groups were also surveyed and their efforts were documented.

The results demonstrated that there are many programs, both small and large, that measure water quality, water flows and levels, habitats, and wildlife populations. These efforts, however, are geographically specific and are often conducted for a limited period of time. The usefulness of the collected information, therefore, varies greatly depending on the collection method, the length of the dataset, and the time in which it was collected. Despite the limitations to the universal use of the many datasets in the region, it was still helpful for the technical community to be aware of what programs were already being conducted.

The *Compendium of Existing Monitoring Programs* facilitated the technical community to share information and to be more efficient with their monitoring resources. Sites could now be selected to build upon previous datasets or to complement existing programs. The compendium provided an initial assessment of the monitoring efforts in the region.

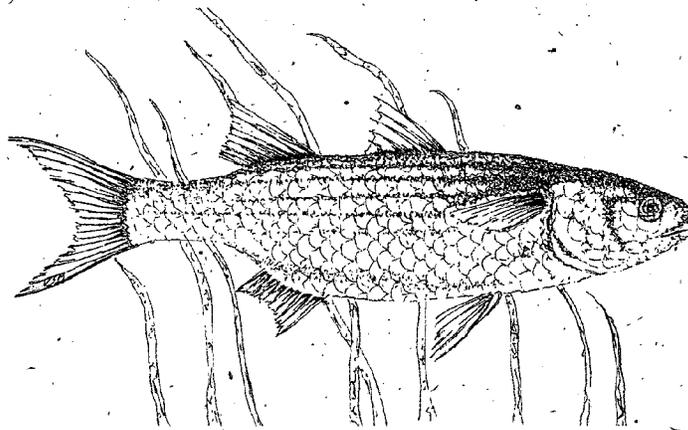
For more information, see the *Compendium of Existing Monitoring Programs in the Greater Charlotte Harbor Watershed*, Charlotte Harbor NEP.



BASICS OF DEVELOPING A MONITORING PROGRAM

To measure the effectiveness of our management efforts, monitoring information is needed that specifically answers the question, "Are we reaching our management plan's *quantifiable objectives*?" A process was defined to create an effective monitoring program that provides information to answer this important question. The following steps were outlined to create the long term monitoring strategy for the Greater Charlotte Harbor Watershed:

- ◆ List the environmental conditions (e.g. program goals) identified in the *Comprehensive Conservation and Management Plan* as specific improvements expected to result from the recommended management and regulatory actions.
- ◆ Translate these goals into specific monitoring objectives.
- ◆ Select specific indicators to address each monitoring objective.
- ◆ Review existing monitoring programs; identify programs that are measuring the same or similar indicators.
- ◆ Define the sampling design: fixed stations, randomized stations, and/or stratified designs.
- ◆ Select methods for collecting and processing samples.
- ◆ Test the ability of the proposed program to meet performance criteria.



Striped mullet

Artwork by Victor McGuire



APPROACHES TO MONITORING

Experience related to monitoring programs, data acquisition, and data analysis supports the idea that focusing on very specific questions will provide more useful information than programs that have vague objectives. Monitoring program objectives should reflect public concerns, existing research, and perhaps modeling efforts to refine our knowledge of a particular issue.

Monitoring programs are able to answer or help guide questions about an issue that can be made more understandable with quantitative information and analysis. The actual design of a monitoring program should reflect the uncertainty associated with the chosen approach and the extent of the area for which management decisions are being considered. Different monitoring designs are employed when different management questions are asked. As the *quantifiable objectives* and *priority actions* for the CCMP were developed, the actions were designed to be as measurable as possible. With this specificity, our progress can be measured through corresponding monitoring efforts.

Of course, with any data collection effort it is important that the equipment works properly and that the samples or counts are accurately measured. Additionally, it is important to know how the sites were selected. When *fixed stations* are monitored, samples are taken at the same location each time samples are collected. The fixed station approach provides very good information about how the conditions at that place change over time. The information may not be applicable, however, to any other sites. Therefore, sampling at fixed stations allows us to conclude a lot with relatively few samples about a particular site, but the information is difficult to extrapolate to other areas.

Taking samples with *census coverage* is used when the information has geographic characteristics suitable for mapping. This type of measurement is very complete over a large area, but may not provide much detail about changes at a specific site the way fixed station monitoring can.

A third approach, using a *stratified random design*, can also be used. The stratified random method picks sites randomly for each time samples are taken, so long as the sites have specific characteristics. Since the sites are picked randomly, the results are very strong statistically and are very reliable. The weakness of the stratified random method is that samples should be taken over a very long time period to make

For additional information, see *Long Term Monitoring Strategy and Gap Analysis*.



conclusions about any particular site. If the status of a particular location is a concern, conclusions can be drawn more rapidly with a fixed station design.

Finally, a *before-and-after* approach can be used to measure if a desired event has occurred or whether something has been done. For example, when measuring the amount of conservation lands that have been acquired for quantifiable objective FW-1, conservation lands should be counted prior to implementation of the *Comprehensive Conservation and Management Plan* and during each year of implementation. Then the change in the total amount of conservation lands can be computed and monitored. This type of measurement is the simplest measurement to make, as long as the information is collected at the desired time intervals to make the computation.

Each of the *quantifiable objectives* and *priority actions* in this management plan has been evaluated on how to measure our progress towards achieving them and the status of the resources of concern. For each *quantifiable objective* and *priority action*, a specific monitoring approach or approaches have been identified. With this information, we will develop specific monitoring plans for each plan component.

Further, these approaches have been compared to the existing information that is available and information gaps that have been identified. The specific monitoring programs will focus on these gaps and ensuring that sufficient information is collected to assess the status and trends of our *quantifiable objectives*.



Photo by David Moldal

Researchers, Tom Riese and Peggy Wilzbach, study the seagrass beds in Charlotte Harbor.



SPECIFIC MONITORING EFFORTS

Monitoring will be conducted to measure long term trends as well as to measure specific progress in the *priority actions*. Ambient water quality monitoring in marine and estuarine areas will be conducted with a stratified, randomized approach and the parameters measured as described in the accompanying tables. The study area has been divided into six geographic strata, to ensure that each basin can be characterized. At least 30 samples will be taken within each geographic strata per year with an estimated annual total cost of \$104,000. Some parameters are recommended as core analytes to be measured at all locations, others are designated "optional" as they are only important at certain sites, times of year, or for very specific pollutant problems.

Freshwater systems will be monitored primarily at fixed stations, particularly stations that correspond to gages that measure flow. Coupling water quality information with flow measurements allows

<u>Marine/Coastal/Estuarine/ Tidal Rivers Core Analytes</u>	
<i>Analyte/Parameter</i>	<i>Method</i>
PAR (light attenuation, k)	approved RAMP protocol
secchi disc	20 cm
temperature	EPA (1983), 170.1
salinity	SM 117th Ed., 25.213 (from conductivity)
specific conductance	EPA (1983), 120.1
dissolved oxygen	EPA (1983), 360.1
pH	EPA (1983), 150.1
color (PCU)	EPA (1983), 110.3 (spectrometer) RAMP method issue
turbidity (NTU)	EPA (11983), 180.1
total suspended solids	EPA (1983), 160.2
chlorophyll-a (corrected for phaeophytin)	SM 16th Ed., 1002G, SM 17th Ed., 10200 H
total nitrogen	calculation (TKN + NO ₂ -NO ₃ -N)
total Kjeldahl nitrogen	SM 17th Ed., 4500-N org B or C
total ammonia nitrogen	A (1983), 350.1 RAMP method issue
total nitrite+nitrate nitrogen	EPA (1983), 353.2
dissolved orthophosphate	EPA (1983), 365.1 (requires field filtration)
total phosphorus	EPA (1983), 365.1 or 365.4
total organic carbon	EPA 415.2

scientists to compute total loads, which is a critical piece of information about the watershed, especially in the development of total maximum daily loads (TMDLs). Additional parameters need to be measured in freshwater systems such as chloride, sulfate, total carbon, and ammonia.

<u>Optional Marine/Coastal/Estuarine/ Tidal Rivers Analytes</u>	
<i>Analyte/Parameter</i>	<i>Method</i>
dissolved silica	USGS 102700-8 (autoanalyzer)
5-day biochemical oxygen demand	EPA (1983), 405.1
total coliform bacteria	SM 9221B (most probable number)/SM 9222B (membrane filter)
fecal coliform bacteria	SM 9221C (most probable number)/SM 9222D (membrane filter)

Habitat will be measured through the use of maps produced by geographic information systems (GIS) that track land use changes, public land acquisition, and private property designated as conservation lands. Seagrass extent

Lakes and Non Tidal Rivers Core Analytes	
<i>Analyte/Parameter</i>	<i>Method</i>
secchi disc	Lakes only, 20 cm.
temperature	EPA (1983), 170.1
dissolved oxygen	EPA (1983), 360.1
pH	EPA (1983), 150.1
color (PCU)	EPA (1983), 110.3 (spectrometer) RAMP method issue
turbidity (NTU)	EPA (1983), 180.1
total suspended solids	EPA (1983), 160.2
chlorophyll-a (corrected for phaeophytin)	SM 16th Ed., 1002G, SM 17th Ed., 10200 H
total nitrogen	(calculation (TKN + NO ₂ -NO ₃ -N))
total Kjeldahl nitrogen	SM 17th Ed., 4500-N org B or C
total ammonia nitrogen	A (1983); 350.1 RAMP method issue
total nitrite+nitrate nitrogen	EPA (1983), 353.2
dissolved orthophosphate	EPA (1983), 365.1 (requires field filtration)
total phosphorus	EPA (1983), 365.1 or 365.4
chloride	EPA 300.0
sulfate	EPA 300.0
total organic carbon	EPA 415.2

will be measured and mapped every two to three years through the use of aerial photography and periodic ground-truthing.

Measuring these parameters will provide a comprehensive evaluation of any changes occurring in the watershed over time. By recording these parameters, the data will identify pollution trends and the magnitude of change. This monitoring will be conducted through many partners to reduce overall costs, increase the use of the information, and to prevent duplication of effort. The Technical Advisory Committee is the central forum to discuss monitoring practices and coordination. Examples of the existing monitoring programs incorporated into this strategy include counties (Sarasota, Manatee, Charlotte, Lee and Polk Counties), South and Southwest Florida Water Management Districts, Florida Department of Environmental Protection, and U.S. Geo-

logical Survey. Additional wildlife and habitat monitoring programs will also be utilized including the U.S. Fish & Wildlife Service, National Marine Fisheries Service, and the Florida Fish and Wildlife Conservation Commission.

Monitoring results will be conveyed in the program's newsletter, during the Technical Advisory Committee meetings, and the Charlotte Harbor Information Resource Center described in this chapter. These communication methods were selected based upon our surveys of both public and technical information users. By providing information in these manners, both types of audiences will have access to the information in a format that they prefer.

Optional Marine/Coastal/Estuarine/ Tidal Rivers Analytes	
<i>Analyte/Parameter</i>	<i>Method</i>
dissolved silica	USGS 102700-8 (autoanalyzer)
5-day biochemical oxygen demand	EPA (1983), 405.1
total coliform bacteria	SM 9221B (most probable number)/SM 9222B (membrane filter)
fecal coliform bacteria	SM 9221C (most probable number)/SM 9222D (membrane filter)



ENHANCED INFORMATION AND EXCHANGE

A *data management strategy* is a required element of each National Estuary Program. The purpose of these activities is to assist with the following needs:

- ◆ Provide information about the technical information that is available;
- ◆ Facilitate the exchange of information among different organizations; and
- ◆ Support efforts for the analysis of scientific information.

The general public, engineers, managers, and scientists desire relevant resource information in a timely and easy-to-use manner. Government agencies may be capable of reducing overlapping data acquisition efforts and filling in data gaps without significantly increasing budgets and personnel if they are aware of efforts outside their individual organizations. Providing timely information by maximizing the existing systems is the goal of a coordinated information management, analysis, and exchange process.

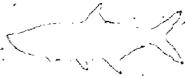
Members of the Charlotte Harbor NEP *management conference*, both citizens and technical members, provided the information for the *data management strategy*. The first objectives of the Charlotte Harbor NEP *data management strategy* are designed to:

- ◆ Identify data gaps;
- ◆ Identify data needs; and
- ◆ Identify access and exchange needs.

Once the needs were described, the strategy identified the organizations to fill data gaps. It also identifies tools such as geographic information systems (GIS) to analyze information. The strategy documents preliminary coordination efforts needed with local institutions who collect and store data. Finally, the strategy documents specific recommendations for actions to fill data gaps, mechanisms for the coordination of analyses, and the facilitation of information exchanges among organizations.

Examples of Important Environmental Data

Rainfall
Map (spatial) information
Land use information
Groundwater levels
Population growth
Water quality
Wildlife populations
Habitat
River flow
Pollutant loads



Through a process of meetings, workshops, and surveys, the data gaps and needs were identified. The needs of both the general public and scientists were considered. Participants were interested in both maximizing the use of data that has already been collected and also identifying information that is needed to make good decisions. Scientists were concerned about preventing overlapping efforts in research and monitoring and to ensure that the data used for management decisions were reliable. Non-technical participants such as property owners, students, and reporters were interested in promoting the availability of clear, accurate analyses of data in terms that a lay person can understand.

Not surprisingly, once public and technical users were surveyed, it was demonstrated that both the types of information needed and their format were different between scientists and the general public. Scientists had greater ability to use information in electronic forms; they actually preferred information to be transferred in a computer-compatible format. Teachers, reporters, students, and voters preferred more general information and information in paper format such as books and newsletters.

Identified Data Gaps & Needs

- ◆ Create a regional data exchange system.
- ◆ Document existing data collection efforts.
- ◆ Utilize new technologies to promote information exchange.
- ◆ Compile site-specific land use information.
- ◆ Encourage cumulative impact assessments.
- ◆ Identify critical information needs.
- ◆ Evaluate the effectiveness of a centralized database system.



Photo by Melissa Upton

Volunteers monitor sea turtle nesting sites on the beaches of Sanibel Island.



CHARLOTTE HARBOR INFORMATION RESOURCE CENTER

The data management strategy recommends that an information resource center be established at Florida Gulf Coast University Library. The center, which has already been established, includes both a web site and a special collection located at the library. The website is located at <http://library.fgcu.edu/enep/>. The materials are reviewed and catalogued by the trained librarians at the university. The Charlotte Harbor NEP continues to financially support the establishment of the center, the website, and the initial accumulation of reports and materials for the special collection. The total cost to establish the center and collect the existing materials will be approximately \$60,000, which has already been budgeted and funded.

Once the collection contains the watershed's existing reports and analyses, the library will support the on-going maintenance of the collection, lending of materials through inter-library loan, and the website. Since a primary mission of the university is to support environmental education and understanding, the support of this collection is complementary to the goals of the university. Additionally, through the Southwest Florida Library Network, materials located at the Florida Gulf Coast University Library can be requested at any public library in the system. The collection can be searched through a custom search engine and, in the case of short reports or papers, be viewed and printed directly from the website. The public can access the website through personal computers or with the computers available at each public library in the region's library network.



Photo right: Corey Franklin, of the Polk County Natural Resources and Drainage Division, collects water quality stormwater samples.

Photo by David Moldal



ON-GOING DATA COLLECTION AND INFORMATION SHARING

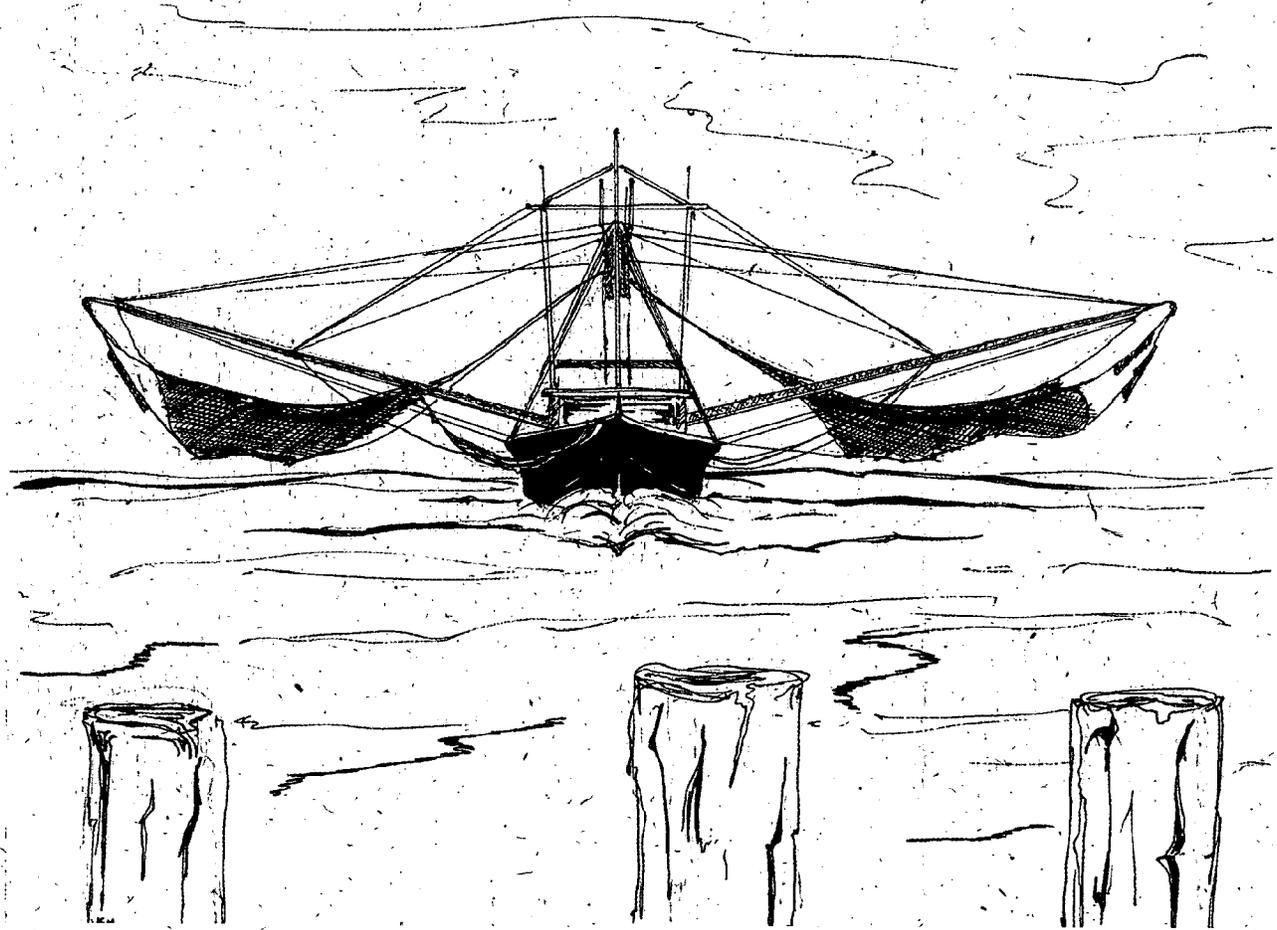
As new reports and papers are generated, the Technical Advisory Committee will encourage the technical community to submit new information to the library and its special collection. Actual datasets with monitoring information will not be stored at the Charlotte Harbor Information Resource Center. Instead, monitoring programs are encouraged to enter their information in STORET, as required by monitoring efforts receiving state funding. There is no cost to the program for the state STORET system. The STORET system does not provide statistical, graphical, and report generating tools. Most scientists prefer to use their own statistical software to analyze data. However, the Charlotte Harbor Information Resource Center has sponsored the library's acquisition of ArcExplorer software and some of the major spatial datasets to provide universal access to projects and maps created with the geographic information system (GIS) software called "ArcInfo". ArcInfo is the most common GIS software used by both the public and private sectors.

The Charlotte Harbor NEP will review the monitoring efforts and data management efforts at least once every two years to assess performance and correct problems. The progress of the monitoring and data management systems will be reported to the *management conference*, included in newsletter articles, and described in the biennial review submitted to the U.S. Environmental Protection Agency.



Photo by David Moldal

Volunteers test water samples early in the morning at Matlacha Pass.



Shrimp trawler

Artwork by Victor McGuire

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GLOSSARY

algae – a group of small aquatic plants; occur as one-celled, filaments, or colonial; having no true root, stem or leaf; the base of the aquatic food chain.

algae bloom – a heavy growth of algae in a body of water; blooms commonly caused by high concentrations of nutrients in the water column.

anoxic – a condition of no oxygen in a water body.

anthropogenic – resulting from human activities.

aquifer – a water-storing underground rock formation.

atmospheric deposition – the transfer of pollutants and nutrients suspended in the air to the ground or open water; deposition commonly metals and compounds of nitrogen and sulfur.

beach re-nourishment – the process of pumping sand onto eroded beaches; material for this process commonly taken from channels and off-shore resources.

beneficiation – an industrial process to transform phosphate pebble (rock) into commercially marketable phosphate. The process is an energy intensive activity.

benthic – referring to the bottom of a body of water.

Best Management Practices (BMP) - A practice or combination of practices that provide the most effective and practicable means of controlling point and nonpoint pollutants at levels compatible with environmental quality goals.

Biochemical Oxygen Demand (BOD) - The quantity of oxygen demand present in a sample as measured by a specific test. A major objective of conventional wastewater treatment is to reduce the biochemical oxygen demand so that the oxygen content of the water body will not be significantly reduced. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

biodiversity - A network of composition, structure, and function of a given system that encompasses the natural biological wealth of organisms.



brackish – water with salinity common to estuaries; this condition has a salinity concentration between fresh and marine.

carnivore – flesh-eating organism.

coliform bacteria – a type of bacterium that in high concentrations indicates a polluted water body; this type occurs in animal feces.

deep-well injection – a process whereby a liquid, usually treated water or waste water, is pumped underground.

detritus – small particles of rock, sand, and/or dead organic and disintegrating vegetation.

dredge spoil – sand and/or mud removed from the bottom of a water body after dredging.

ecosystem – a system formed by the interaction of a community of organisms with their environment.

effluent – water released into the environment; commonly from waste water treatment processes or industrial processing.

epiphytes – refers to growing on the surface. Epiphytes are a general classification of algae commonly attached to seagrasses.

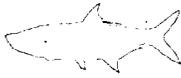
estuary – a semi-enclosed land and water interface where fresh water mixes with marine waters, allowing unique plants and animals to thrive; tidal mixing actions are common in an estuary.

eutrophic – a water quality condition typified by high productivity and nutrient inputs, with periods of oxygen deficiency from algae decomposition. This condition can be accelerated by pollution.

exotic species – a plant or animal species not native to an ecosystem.

fauna – animals of a region.

flora – plants of a region.



groundwater – water stored in underground sand rock formations; replenished from surface infiltration.

habitat - the specific place or environment where a particular plant or animal lives. An organisms habitat must provide all the basic requirements for life and should be free of harmful contaminants.

hypoxia – a condition of low dissolved oxygen in the water; hypoxia typically indicates less than or equal to two milligrams of oxygen per liter.

inlet – a short, narrow waterway connecting a bay or lagoon with the sea.

intertidal – the area of bay bottom that is alternately covered with water and then exposed due to the rise and fall of tide waters.

littoral drift – the parallel movement of suspended sand along the beach; drift caused by wave and tidal action.

mangrove – a salt-tolerant, sub-tropical tree found in estuarine and marine environments; mangrove leaves are an integral part of the food web.

non-point source pollution – pollution from no specific source. This type of pollution is generally from surface, ground, or rain water coming in contact with contaminants on the land or air such as pesticides, herbicides, fertilizers, animal waste, gasoline, vehicle exhaust, power plant emissions, and liquid waste from failing household septic tank systems. This source of pollution is difficult to measure.

nutrients - any substance required by organisms for normal growth and maintenance. Mineral nutrients usually refer to inorganic substances derived from soil and water. Excessive amounts of nutrients, including nitrogen and phosphorus, may result in excessive growth of algae, leading to oxygen depletion and water quality degradation.

photosynthesis - the synthesis of organic matter from inorganic substrates using light as a source of energy.

plankton – passively floating or weakly motile microscopic plant and animal life; refers to various species of plants and animals at the base of the aquatic food chain.



point source pollution – pollution from a specific source such as a stormwater pipe, waste water plant discharge, or industrial discharge; easier to quantify this source.

red tide – characterized by an above average concentration of the toxic phytoplankton *Gymnodinium breve*; red tide causes fish and manatee mortality and shellfish contamination; process thought to be linked to high freshwater flows and nutrients into marine waters.

rookery – the breeding or nursery ground of birds or animals.

runoff – the portion of precipitation on the land that reaches a water body.

SAV – abbreviation for “submerged aquatic vegetation,” including seagrasses and other emergent aquatic vegetation.

salinity – a measure of the dissolved salts in a water body, especially of sodium, magnesium, and potassium.

salt marsh – coastal ecosystems with communities of salt tolerant plants occupying intertidal zones that are at least occasionally inundated with salt water; refers to a type of marsh that exists at interface of land and marine waters.

saltern – a tidal area where sea water evaporates and salt concentrates.

saltwater intrusion – a process of high salinity groundwater moving inland and mixing with low salinity groundwater; intrusion commonly results from over pumping groundwater resources.

sea grass – extremely productive flowering marine plants found in estuaries and shallow open shelves off the coast; sea grass provides habitat for numerous fishes and invertebrates. Three common species exist in Florida (turtle grass, manatee grass, and shoal grass).

seawall – a wall or embankment constructed along a shore to reduce erosion from wave action; the structure greatly reduces tidal habitat.

septic tank system – a system of tanks and porous pipes in which waste water is treated by aerobic and anaerobic bacterial decomposition in the surrounding soil; septic systems are a common source of pollution to surface and groundwater if not functioning properly.



stormwater runoff – water from rain, often carrying oils, trash, dissolved metals, and other pollutants. Storm water is a major source of pollution to rivers, lakes, and estuarine waters.

tide – periodic rising and falling of the oceans resulting from lunar and solar forces acting upon the rotating earth. Tide action strongly influences estuarine plants, animals, and bottom configuration.

tributary – a body of water that supplies a larger body of water.

trophic state – the nutritional status of a particular body of water. Nitrogen and phosphorus, the principal waterborne nutrients, commonly influence the trophic state.

turbidity – a measurement of water clarity; caused by a suspension of fine solids.

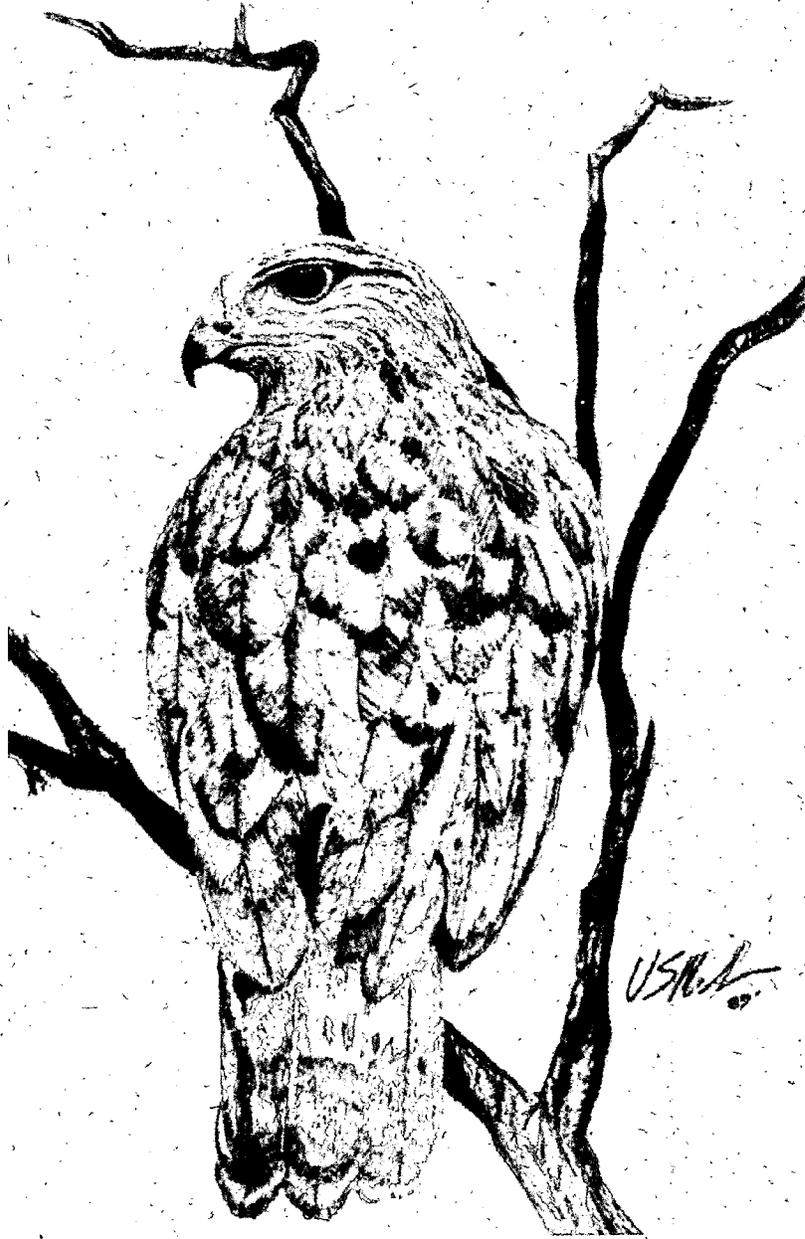
uplands – terrestrial areas above the influence of tide waters.

urbanization – the conversion of low density open spaces to high density human development such as houses or shopping malls; process decreases the volume of groundwater infiltration and increases storm water runoff.

watershed – a drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

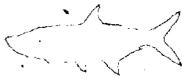
wetland – an ecosystem defined by unique plants, soils, and hydrology; plants in wetlands are adapted to tolerate wet conditions.

zooplankton – microscopic animals that float freely in water, graze on detritus particles, bacteria, and algae, and may be consumed by fish.



Red shouldered hawk

Artwork by Victor McGuire

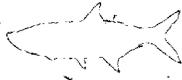


LIST OF ACRONYMS

ABM	Agency for Bay Management (Estero Bay)
ACEE	Advisory Committee on Environmental Education
ACOE	Army Corps of Engineers
ADCP	Acoustic Doppler Current Profiler
AGWQMP	Agricultural Ground-Water Quality Monitoring Program
AIRMoN	Atmospheric Integrated Research Monitoring Network
ASR	Aquifer Storage and Recovery
AWWA	American Water Works Association
BEST	Biomonitoring Environmental Status and Trends
BMP	Best Management Practice
BoCC	Board of County Commissioners
BOMP	Bureau of Mine Reclamation
BPA	Base Programs Analysis
BSLER	Bureau of Submerged Lands and Environmental Resources
CAC	Citizens' Advisory Committee
CARL	Conservation and Recreation Lands
CCMP	Comprehensive Conservation and Management Plan
CCU	Charlotte County Utilities
CDBG	Community Development Block Grant
CDM	Camp Dresser & McKee, Inc.
CES(a)	Center for Environmental Studies
CES(b)	Cooperative Extension Service
CFRPC	Central Florida Regional Planning Council
CHASBP	Charlotte Harbor Aquatic & State Buffer Preserves
CHEC	Charlotte Harbor Environmental Center
CHEVWQMN	Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
CLASAC	Conservation Lands Acquisition and Stewardship Committee
CMP	Clean Marina Program
COE	Army Corps of Engineers
CREW	Corkscrew Regional Ecosystem Watershed
CROW	Clinic for Rehabilitation of Wildlife
CRP	Conservation Reserve Program
CSO	Citizen Support Organization
CWA	Clean Water Act
CWM	Comprehensive Watershed Management
CWMP	Caloosahatchee Water Management Plan



CZMA	Coastal Zone Management Act
CZARA	Coastal Zone Act Reauthorization Amendments
DCA	Department of Community Affairs
DEP	Department of Environmental Protection
DO	Dissolved Oxygen
DOA	Department of Agriculture
DOC	Department of Commerce
DOD	Department of Defense
DOH	Department of Health
DOI	Department of the Interior
DOT	Department of Transportation
DRI	Development of Regional Impact
DRP	Division of Recreation & Parks
DW	Domestic Water
DWMP	District Water Management Plan
EAR	Evaluation and Appraisal Report
EBA&BP	Estero Bay Aquatic & Buffer Preserves
EBB	Estero Bay Buddies
ECARP	Environmental Service Conservation Acreage Reserve Program
ELMAC	Environmental Lands Management and Acquisition Committee
EM	Ecosystem Management
EMA	Ecosystem Management Area
EMAP	Environmental Monitoring and Assessment Program
EMC	Ecosystem Management Coordinator
EMWQAS	Ecosystem Management Water Quality Assessment Section
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EQIP	Environmental Quality Incentives Program
ERD(a)	Environmental Research and Design, Inc.
ERD(b)	Environmental Resources Division
ERP	Environmental Resource Permitting
ESIP	Environmental Integration Services Program
ESQG	Exempt Small Quantity Generators
FAC	Florida Administrative Code
FACEE	Florida Advisory Committee on Environmental Education
FCHAP	Friends of the Charlotte Harbor Aquatic Preserves
FCT	Florida Communities Trust
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FFWCC	Florida Fish and Wildlife Conservation Commission



FGCU	Florida Gulf Coast University
FIP	Forestry Incentives Program
FIPR	Florida Institute of Phosphate Research
FIRM	Flood Insurance Rate Map
FL	Florida
FLUCCS	Florida Land Use/Cover Classification System
FMRI	Florida Marine Research Institute
FRDAP	Florida Recreation Development Assistance Program
FS	Florida Statutes
FW	Fish and Wildlife Habitat Loss
FY&N	Florida Yards & Neighborhoods Program
GCHEMA	Greater Charlotte Harbor Ecosystem Management Area
GDC	General Development Corporation
GFC	Florida Game and Fresh Water Fish Commission
GICIA	Gasparilla Island Conservation and Improvement Association
GIS	Geographic Information System
GPS	Global Positioning System
HA	Hydrologic Alterations
HUD	Department of Housing and Urban Development
IFAS	Institute of Food and Agricultural Sciences
IR	Infrared
ISTEA	Intermodal Surface Transportation Efficiency Act
IW	Industrial Water
IWRM	Integrated Water Resources Monitoring
LDR	Land Development Regulation
LE/AD	Lakes Education/Action Drive
LOS	Level of Service
LPA	Local Planning Agency
LRTP	Long Range Transportation Plan
LSU	Louisiana State University
LWC	Lower West Coast
M/WBE	Minority or Women Owned Business Enterprise
MFL	Minimum Flows and Levels
MGATV	Manatee Government Access Television
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MPRSA	Marine Protection, Research, and Sanctuaries Act
MS4	Municipal Separate Storm Sewer System
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSSW	Management and Storage of Surface Waters



MTC	Manufacturing Technology Center
NADP/NTN	National Atmospheric Deposition Program/ National Trends Network
NAWQA	National Water Quality Assessment Program
NBS	National Biological Service
NEP	National Estuary Program
NEPA	National Environmental Policy Act
NEXTEA	National Economic Crossroads Transportation Efficiency Act
NGVD	National Geodatic Vertical Datum
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service
NRPS	Natural Resources Planning Section
NWR	National Wildlife Refuge
OFW	Outstanding Florida Waters
OGT	Office of Greenways and Trails
P2	Pollution Prevention
P2000	Preservation 2000
P-2000	Preservation 2000
PA	Priority Action
PLRG	Pollution Load Reduction Goals
POTWS	Publicly Owned Treatment Works
PR/MRWSA	Peace River/Manasota Regional Water Supply Authority
PSA	Public Service Announcement
PSC	Public Service Commission
QO	Quantifiable Objective
QWIP	Quality of Water Improvement Program
RBNERR	Rookery Bay National Estuarine Research Reserve
RC&D	Resource Conservation and Development Program
RCRA	Resource Conservation and Recovery Act
RPC	Regional Planning Council
SARA	"Superfund" Amendments and Reauthorization Act
SCCF	Sanibel-Captiva Conservation Foundation
SD	South District, Florida Department of Environmental Protection
SDWA	Safe Drinking Water Act
SFWMMD	South Florida Water Management District
SOR	Save Our Rivers
SRF	State Revolving Fund





SRPP	Strategic Regional Policy Plan
SWAMP	Surface Water Assessment and Monitoring Program
SWD	Southwest District, Florida Department of Environmental Protection
SWFRPC	Southwest Florida Regional Planning Council
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement and Management
SWMMP	Surface Water Management Master Plan
SWUCA	Southern Water Use Caution Area
SWUP	Stormwater Utility Program
TAC	Technical Advisory Committee
TBNEP	Tampa Bay NEP
TBRPC	Tampa Bay Regional Planning Council
TDS	Total Dissolved Solids
TEA21	Transportation Equity Act for the 21 st Century
TIITF	The Board of Trustees of the Internal Improvement Trust Fund
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TSI	Trophic State Index
TSS	Total Suspended Solids
UIC	Underground Injection Control
UEP	Utility Expansion Program
UPREPC	Upper Peace River Ecosystem Planning Committee
USC	United States Code
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
UST	Underground Storage Tank
VSR	Volunteer Scientific Research
WCIND	West Coast Inland Navigation District
WCS	Water Control Structure
WET	Water Efficient Toilet
WICP	Water Information Coordination Program
WMD	Water Management District
WQ	Water Quality Degradation
WRM	Wetlands Resource Management
WRP	Wetland Reserve Program
WUP	Water Use Permit
WWTP	Waste Water Treatment Plant



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