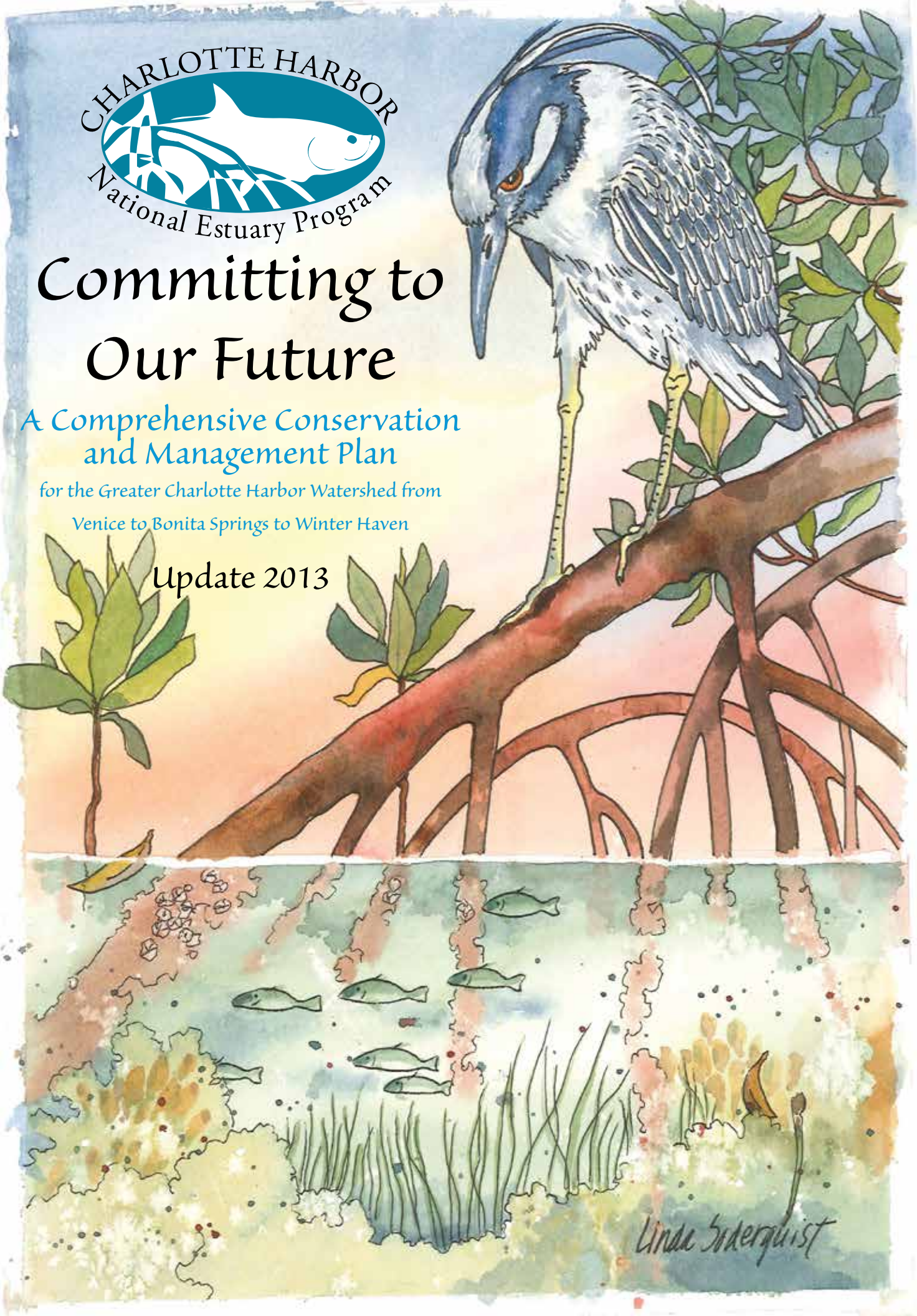
CHARLOTTE HARBOR
National Estuary Program

Committing to Our Future

A Comprehensive Conservation and Management Plan

for the Greater Charlotte Harbor Watershed from Venice to Bonita Springs to Winter Haven

Update 2013



The *Comprehensive Conservation and Management Plan (CCMP)* was first adopted by the CHNEP Policy Committee on April 13, 2000. It was updated and adopted on March 24, 2008 and again on March 18, 2013.

The *Comprehensive Conservation and Management Plan (CCMP),* this document, may be obtained as a PDF from the website. For additional copies of the printed book, please contact the Program Office or place an order through the website.

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Cover art donated by Linda Soderquist (*www.LindasIslandArt.com*) to the CHNEP originally for the Charlotte Harbor Nature Festival.

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The Charlotte Harbor National Estuary Program (CHNEP) is ^ m^oqkbopefm lc `fqfwbkp) bib`qba lcª`f^ip) obplro`b j^k^dbop and commercial and recreational resource users who are working to improve the water quality and ecological integrity of the CHNEP study area. A cooperative decision-making process is used within the program to address diverse resource management concerns in the 4,700-square-mile CHNEP study area.

Adopted April 13, 2000.

Updated March 24, 2008 and March 18, 2013.

Charlotte Harbor National Estuary Program

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Deputy Director, Water Resources Division
U.S. Environmental Protection Agency, Region 4

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City of Bonita Springs	DeSoto County	Florida Fish and Wildlife Conservation Commission
City of Cape Coral	Hardee County	South Florida Water Management District
City of Fort Myers	Lee County	Southwest Florida Regional Planning Council
Town of Fort Myers Beach	Manatee County	Southwest Florida Water Management District
City of North Port	Polk County	
City of Punta Gorda	Sarasota County	
City of Sanibel		
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Ms. Judy Ott, Program Scientist (as of July 1, 2008)
Ms. Maran Brainard Hilgendorf, Communications Manager (as of January 28, 2000)

Table of Contents

Artwork by Diane Pierce

From the very beginning of the CHNEP, art has played an important role in the program's efforts to protect the natural environment of Florida from Venice to Bonita Springs to Winter Haven. In 1998, the CHNEP commissioned artist Diane Pierce to paint .

Committing to Our Future

A Comprehensive Conservation and Management Plan for the Greater Charlotte Harbor Watershed from Venice to Bonita Springs to Winter Haven

The Charlotte Harbor National Estuary Program (CHNEP) is a partnership of citizens, elected lcª`f^ip) obplro`b j ^k^dbop ^ka `l j j bo`f^i and recreational resource users who are working to improve the water quality and ecological integrity of Charlotte Harbor's estuaries and watersheds. A cooperative decision-making process is used to address diverse resource management concerns in the 4,700-square-mile CHNEP study area. This plan is our commitment to the future.

The (CCMP) addresses four that are common throughout the CHNEP study area and qe^q e^sb _bbk fabkqfªba ql f j mbab qeb eb^iqe lc qeb watersheds and estuaries. They are water quality abdo^a^qflk) evaolildf` ^iqbo^qflkp) ªpe ^ka t fiaifcb habitat loss and stewardship gaps. The CCMP fk`irabp ^ pbofbp lc do^mef` sfpflk j ^mp) nr^kqfª^_ib objectives, priority actions and many support documents.

The CHNEP Management Conference (further explanation beginning on p. 7) developed a of the CHNEP study area to illustrate the condition of the watersheds and estuaries in a perfect world. This vision is not to set a target but to set a direction. To move in the direction of the vision, were developed. The absbilm j bkq lc ^mmolmof^qb nr^kqfª^_ib l_gb`qfsbp supports the goals for preservation, restoration and enhancement of the natural resources of the CHNEP pqrav ^ob^+ Nr^kqfª^_ib l_gb`qfsbp t fii ^iil t qeb CHNEP to gauge the success or failure of subsequent management activities initiated throughout the @EKBM pqrav ^ob^+ B^`e nr^kqfª^_ib l_gb`qfsb fp technically sound, defensible, objective and able to be assessed utilizing either existing or future monitoring moldo^ j p+ Lk`b qeb nr^kqfª^_ib l_gb`qfsbp t bob approved, the Management Conference developed a series of and strategies to achieve the nr^kqfª^_ib l_gb`qfsbp clo b^`e lc qeb clro mof lofqv problems.

Several documents supplement the CCMP:

- A database tracks implementation projects planned and completed by our partnership. This database replaces Volume 2 of the CCMP adopted in 2000. The CHNEP stands ready to support implementation of additional projects to complete all priority actions listed in this plan.
- The and the were adopted by the CHNEP.
- A will evaluate progress based on the indicators, targets and the CCMP vision.
- The outlines steps to develop and transmit CHNEP advocacy positions, including those generated through public input.
- The and identify gaps in science that are obstacles to sound decision making or gaps in restoration.
- The helps the CHNEP achieve equitable contributions from stakeholders/partners along with participation agreements with partners.
- The is a multi-year plan for communicating with, educating and engaging the public while considering the unique characteristics, structure and goals of the CHNEP.
- The CHNEP Water Atlas is a repository for regional water resource data provided by multiple sources. This website tool is available to all in order to better their understanding of the watershed and ecological systems. It delivers data via a user-friendly, web-based interface that employes interactive maps, graphs and charts, ^ka b^pv*ql*rkabopq^ka bumi^k^qflkp lc p`fbkqfª` concepts and processes.

Preface

The watersheds and estuaries of the 4,700-square-mile Charlotte Harbor National Estuary Program (CHNEP) study area are wonderful places to live, play and work. In 1995, Charlotte Harbor was designated as an “estuary of k^qflk^i pfdkfª`^k`b´ qeolrde qeb @ib^k T^qbo >`q+ Fk ªsb peloq vb^op) qeb J^k^db j bkq @lkcbobk`b lc citizens, scientists, resource managers and elected lcª`f^ip t^p `ob^qba ^ka ^ mi^k t^p ^almqba+ Qeb talented and dedicated people of this partnership used the

(CCMP) to accomplish much to protect natural resources and to help identify new challenges.

Since the adoption of the CCMP in 2000, we have a better understanding of the value of the resource. Protecting the estuaries and watersheds through partnerships of citizens and agencies has moved from a novelty to a standard approach. Most now agree that protecting this harbor and its tributaries is in their own best interests.

What are the activities that we can do that will arrest and reverse the decline of the watersheds and estuaries? This document, the

, is our _bpq^kp t bo ql qe^q nrbpqflk+ Qefp rma^qb fabkqfªbp research needed to address management questions, restoration activities, legislative changes and public lrqob^`e kbbap+ Fq bumobppbp ^ sfpflk) nr^kqfª^_ib objectives and priority actions with strategies.

There are many extraordinary people to recognize who were key to the update of the CCMP. First of all, I want to recognize the Management Conference subcommittees where most of the hard work occurred. These subcommittees were chaired by Jim Beever, Greg Blanchard, Debra Highsmith, Mike Jones, Keith Kibbey, Kaley Miller, Annette Nielson and Betty Pq^rdibo+ Lqebo pfdkfª`^kq `lkqof_rqlop fk`iraba Ifw Abbott, Jaime Boswell, Joan Bush, Warren Bush, Wayne Daltry, Rhonda Evans, Lizanne Garcia, Jason Hale, Mark Hammond, Jennifer Hecker, Bob Howard, Connie Jarvis, Carla Kappmeyer, Kris Kaufman, Ernesto Lasso de la Vega, Peggy Morgan, Judy Ott, Bobbi Rodgers, John Ryan, Stuart Stauss, Jon Thaxton and Ford Walton. I also want to thank the program staff for their energy and contributions to the CCMP, including Maran Hilgendorf, Judy Ott and Liz Donley.

This plan begins a new chapter to improve the estuaries and watersheds that we value. To everybody who contributed, your efforts are embodied in this plan. To the residents and visitors of the CHNEP study area who are learning about our issues, we hope you will join us in our efforts to improve the health of this special region. This is our “commitment to the future.”

Lisa Beever, Director
Charlotte Harbor National Estuary Program

Artwork by Lisa Beever

Introduction

The CHNEP study area is a special place. Three large rivers—the Myakka, Peace and @^illp^e^q`ebbÆ«l t t bpq t ^oa ql qeb Dric of Mexico. These rivers start as headwater wetlands, lakes, creeks and ground water that combine and meander until they become substantial rivers. The ofsbop «l t qeolrde `fqfbp ^ka ql t kp) `^qqib m^pqrobp ^ka `fqorp dolsbp) mfkb «^q t llap ^ka `vmobpp 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 fk«rbk`ba _v p j ^iibo pqob^ j p ^ka ^ob pmb`q^`ri^o e^sbkp clo ªpe ^ka t fiaifcb+ Qeb @EKBM pqrav ^ob^ fp abªkba _v pr_qib qlmldo^mev) pr_qolmf`^i `if j ^qb ^ka subtropical plant communities.

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 demands for land, water, food, transportation, and access to water and recreational lands 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 _rpfkbppbp ql qebfo `l j j rkfqfbp fk qeb ªopq mi^`b+ 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 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 lc qeb il`^i b`lkl j v+ Tb hkl t qeb ob^i `lpqp lc ªufkd mol_ib j p ^ob j r`e dob^qbo qe^k mobsbkqfkd afcª`riqfbp from occurring.

This (CCMP) details the actions needed to protect and improve our watershed as we try to balance human needs with the needs of the natural systems.

Artwork by Shelly Castle

Our plan is ambitious in scope and time frame. For the CCMP to be realized, citizens, governments and industry of the region will need to work together. Qeb @@ J M l_gb`qfsbp ^ob pmb`fª` pl t b `^k 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 these challenges are pro j lrkq^_ib _b`^rpb t b ^ob rkfªba fk lro j fppflkÆ to keep the CHNEP study area a special place for ourselves and our children's children.

This CCMP was written by literally hundreds of people. Citizen volunteers, scientists, engineers, obplro`b j ^k^dbop ^ka bib`qba lcª`f^ip e^sb contributed countless hours, essential knowledge

and informed opinions. The CCMP was written in locations throughout the watershed such as Bartow and Boca Grande, Venice and Myakka City, Winter Haven and Sanibel, Punta Gorda and Wauchula.

Qeb p`^ib lc m^oqf`fm^qflk t fqe qefp @@ J M ob«b`qp qeb size of the CHNEP study area. Although Charlotte Harbor only covers 350 square miles, the CHNEP study area extends over an area of 4,700 square miles. At its northern end, the Peace River watershed begins in Polk County near Lakeland and travels more than 100 miles to the Harbor. The Myakka River watershed starts in eastern Manatee County until it winds and meanders to meet the north side of Charlotte Harbor. Along the coast to the north, Charlotte Harbor affects the watersheds of Dona, Roberts and Lemon bays. To the south, Pine Island Sound and Matlacha Pass connect Charlotte Harbor to the tidal Caloosahatchee and Estero Bay in Lee County.

Qeb @EKBM pqrav ^ob^ fk`irabp ^ii lo pfdkfª`^kq portions of 7 counties, as well as very small portions of 4 more counties and 24 incorporated cities and towns. The extent of the CHNEP study area broadens the number of organizations that manage, regulate and govern its uses and resources. In the CHNEP study area, two water management districts have four areas lc obpmlkpf_fifqvÆ«lla molqb`qflk) t ^qbo prmmiv) water quality and natural systems. Three regional planning councils conduct regional and emergency planning. Two districts of the Florida Department of Environmental Protection perform environmental regulation, park management, enforcement and aquatic preserve management.

In 1995, then Governor Lawton Chiles nominated Charlotte Harbor as an “estuary of national pfdkfª`^k`b+´ >p ^ obpriq lc qefp kl j fk^qflk) @e^oilqqb Harbor was accepted into the National Estuary Program, becoming one of 28 other watersheds in the United States so designated. The CHNEP brings together all the local organizations, both public and private, into a “Management Conference” to write and implement a CCMP for the watershed. The CHNEP Management Conference is discussed in detail beginning on p. 7.

Through the participation of hundreds of people, the CHNEP held its kickoff ceremony in September 1996 and began the process of writing a regional @@ J M+ I l`^i mol_ib j p t bob fabkqfªba) dl^ip t bob established, information was collected and special projects were funded. Local governments, basin boards and public agencies funded programs to develop j lkfqlofkd moldo^ j p) j ^hb p`fbkqfª` fkclo j ^qflk j lob accessible and encourage local environmental education programs.

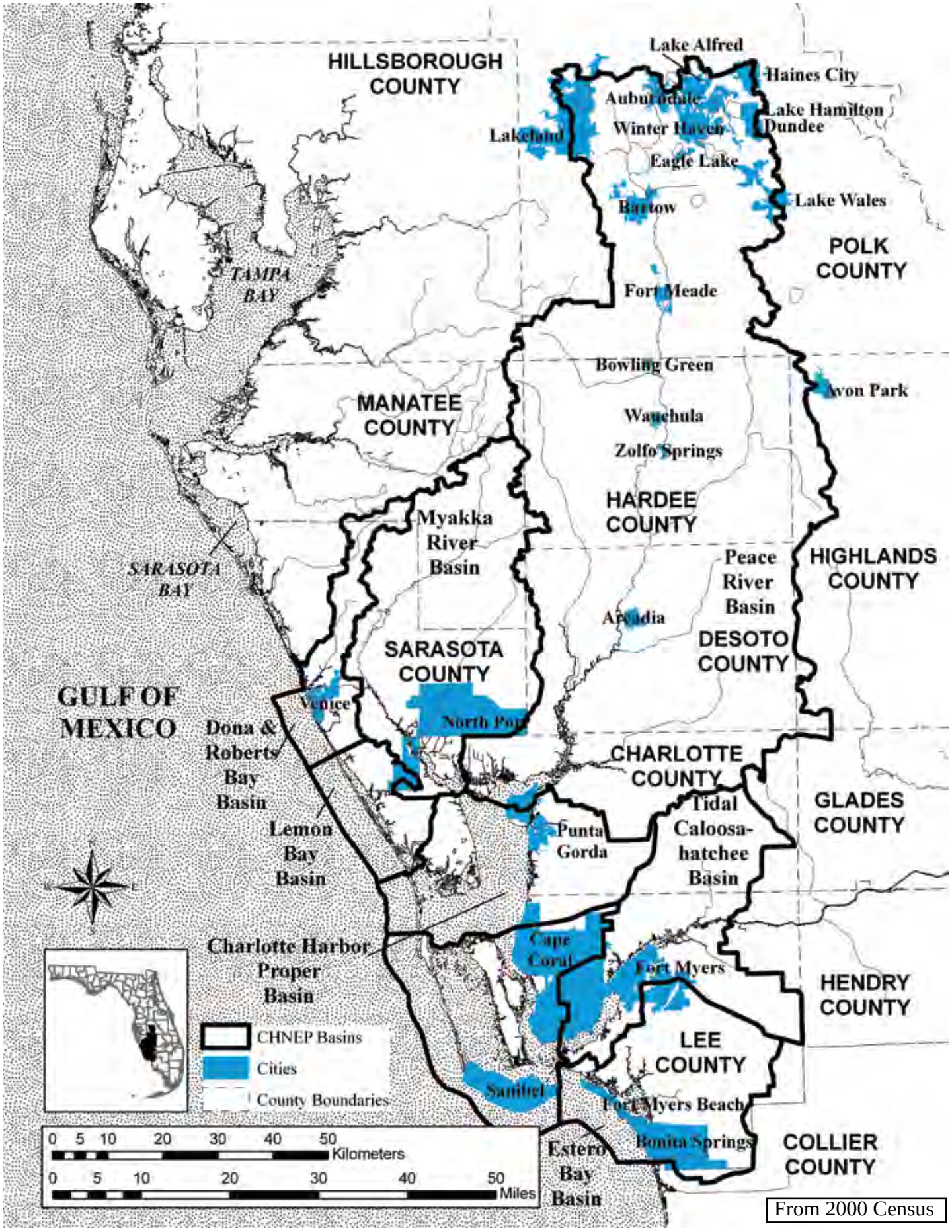
T fqe j lob qe^k /-- `fqfwbkp) bib`qba lcª`f^ip) obplro`b managers and commercial and recreational resource users present, the

was endorsed by members of the CCMP Management Conference. The signing ceremony, held on April 13, 2000, at the Bayfront Center in Punta Gorda, celebrated the completion of the CCMP and the beginning of action to restore and protect the estuary and its 4,700-square-mile watershed. Since that time, the Management Conference has worked together to implement the CCMP. This plan is the second update of the version adopted in 2000.

The CHNEP implements the CCMP by building partnerships to develop integrated plans, education and outreach programs and management structures to achieve a sustainable balance between the economy, society and the environment.

Pfk`b qeb @@ J M t ^p ^mmolsba fk /---) pfdkfª`^kq strides have been made in implementing the CCMP. By 2006, progress had been made on all original 15 nr^kqfª^_ib l_gb`qfsbp) t fqe / lc qeb .2 %.0 mbo`bkq& objectives and 13 of the 48 (27 percent) original priority actions having been accomplished.

The Management Conference recognized that the CCMP is a dynamic document and that periodic j laf ª`^qflk fp ^mmolmof^qb+ Fk /--0) ^ @@ J M j fklo amendment process was adopted in order to add exotic krfp^k`b ^kf j ^ip ^ka qeb qbo j ¦ j fkf j r j «l t p ^ka levels” to the document. In 2004, a CCMP major amendment process was adopted by the Management Conference. As a result of the newly adopted major amendment process, the Management Conference initiated an in-depth review and revision of the CCMP fk /--2+ Qeb J ^k^db j bkq @lkcbobk`b obªkba qeb lofdfk^i nr^kqfª^_ib l_gb`qfsbp ^ka mof lofqv ^`qflkp based on new data and better knowledge of the natural and anthropogenic changes within the CHNEP study ^ob^+ Qebpb obsfpba) rma^qba ^ka kb t nr^kqfª^_ib objectives and priority actions capture, in text, the Management Conference’s vision for the CHNEP.



Map 1: Cities and Counties in the CHNEP Study Area

Hundreds of citizen volunteers continue working on "getting the word out" to their communities, taking water quality samples, planting at restoration sites, giving presentations to schools and civic organizations, and learning more about the issues impacting the future health of the estuaries and watersheds. They voice their concerns and visions of the future. All these institutions, together with the many homeowner associations, school districts, klkmol ªqp) rkfsbopfqfbp ^ka obpb^o`e c^`fifqfbp) ^ccb`q the condition of the 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 CCMP addresses the natural resource issues in the entire CHNEP study area. Some of our problems are regional and will require breaking down institutional barriers to address them. Some problems ^ob il`^iÆpmb`fª` pfqbp qe^q obnrfob pmb`f^i ^qqbkqflk 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 _bkbªqp col j qeb obpriqp+

Obplro`b j ^k^db j bkq fk qeb q t bkqv*ªopq `bkqrov is fundamentally different than in decades past. It is less about resource managers applying their technical knowledge through mandated regulations and enforcement and more about local communities broadening their knowledge. It is more about coordinating a regional approach to tackle problems such as pervasive habitat loss, diffuse nonpoint-plro`bp lc mliirqflk ^ka cobpe t ^qbo fk«l t `e^kdbp+ These types of problems are complex and interrelate. In the process, local communities are helped to become true stewards of their own resources. As a result, "sustainable development" becomes key to pursuing economic growth compatible with maintaining the natural environment.

The National Society of Professional Engineers abªkbp prpq^fk^_ib absbilm j bkq ^p ¦qeb `e^iibkdb lc meeting human needs for natural resources, industrial products, energy, food, transportation, shelter and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development."

The Management Conference developed program dl^ip ^p ^ drfab fk qeb absbilm j bkq lc qeb ªopq CCMP. These goals institute a long-term vision of the regional resources. With the adoption of the CCMP in 2000, the goals have been incorporated into the nr^kqfª^_ib l_gb`qfsbp+ >ii qeb nr^kqfª^_ib l_gb`qfsbp and, therefore, the goals are achievable with local commitment and participation in the implementation of this CCMP.

The CHNEP has brought together many diverse sectors of the region in the development of this CCMP. This effort began in 1996 with the establishment of the Citizens Advisory Committee (CAC) and has continued throughout the CCMP absbilm j bkq) f j mib j bkq^qflk ^ka rma^qbp+ Pmb`fª` efforts to expand public participation and inform the mr_if` ^_lrq qeb moldo^ j) mi^k obsfb t ^ka ªk^ifw^qflk have been successful.

At the program beginning, six public hearings were held in September 1996 to solicit public comment on the region's problems and priorities. Based on these comments and committee input, the CCMP goals ^ka nr^kqfª^_ib l_gb`qfsbp t bob lrqifkba fk ^k b^oiv document titled , which was distributed in 1998. When the priority actions were written and the preliminary action plans collected, a draft CCMP was released in September 1999. The ªk^ifwba `l j mibqb mi^k t ^p ^s^fi^_ib fk _llh clo j and on the Internet at With the obib^pb lc qeb ao^cq @@ JM) qeb Moldo^ j Lcª`b ebia six public hearings to answer questions about the document and to solicit public comments. The revised plan was distributed to the Management Conference and adopted in 2000. The U.S. Environmental Protection Agency approved the CCMP in 2001.

The CAC has been an important part of the process to implement the CCMP and to develop the 2008 update to the CCMP. Based in large measure on citizen input, a new priority problem, "stewardship d^mp)´ t ^p fabkqfªba clo qeb /--5 @@ JM rma^qb+ Qefp

priority problem focuses on issues dealing with public outreach, monitoring, data management and advocacy. The Policy Committee charged the CAC with drafting stewardship objectives and priority actions for consideration by the Management Conference. The CAC also reviewed every part of the CCMP and was instrumental in ensuring that it was understandable by citizens.

>aafqflk^i l_gb`qfsbp ^ka ^`qflkp t bob fabkqfªba clo the 2008 update by all the program committees and through a that was posted on the website, listed in the magazine and discussed at several public workshops. These needs were collected and a survey instrument was developed to prioritize these alternatives. The survey was sent to all committee members, posted on the website and distributed at public workshops. The survey was used as a tool to identify objectives and actions for which there was a broad constituency. Priorities from the individual committees, including the CAC respondents, were included with the overall priorities.

The Habitat Conservation Subcommittee, Hydrologic Alterations Subcommittee, Water Quality and Quantity Objective Subcommittee and the CAC Plan Subcommittee drafted the core components of the CCMP under each of the four priority problem areas. All subcommittees reviewed the vision series and the relationships between vision, objectives and actions. The complete plan was posted on the website, sent ql m^oqkbop ^p ^k bafq^_ib `l j mrqbo ªib ^ka j ^ab available in book form.

All comments received were distributed to the J ^k^db j bkq @lkcbobk`b+ Qefp ªk^i sbopflk lc qeb CCMP was edited under their guidance to address the concerns expressed in the public comments received. In addition, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service were represented on one or more committees and participated in the CCMP development, particularly with respect to cbabo^i bka^kdboba pmb`fbp f j m^`qp ^ka bppbkqf^i ªpe habitat.

The was replicated for the 2013 update. All suggestions were incorporated. In addition, new policies such as seagrass and nutrient targets were added. The most major change was to eliminate potential coordinating agencies from each priority action page and to add environmental indicators and targets.

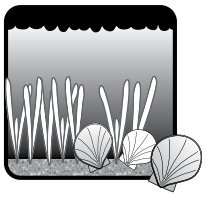
Each version of the CCMP was submitted to state and regional clearinghouses for consistency review, which includes reviews by the Florida Coastal Management Program as well as the State Historic Preservation Lcª`bo rkabo qeb drfabifkbp lc qeb K^qflk^i Efpqlof` Preservation Act.

Photo by Lisa Beever, 3/21/07

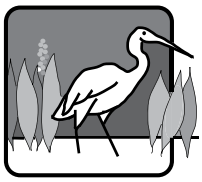
Nature of the Problem

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

Adverse changes to amounts, locations and qf j fkd lc cobpe t ^qbo «l t p) qeb evaolildf` crk`qflk lc «llami^fk pvpqb j p ^ka k^qro^i ofsbo «l t p+



Pollution from agricultural and urban runoff, point-source discharges, septic systems and wastewater treatment systems, atmospheric deposition, ground water and other sources.



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

Limitations in people's knowledge of choices and management decisions that will lead to sustainability within their community. These gaps include overarching issues such as public outreach, advocacy and data management.

This CCMP is a call for action from our citizens, our governments, our industries. Everyone who lives, works and plays in the CHNEP study area is called to help in the implementation of this CCMP.

There is much to be accomplished. 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 and harming manatees and other fragile living resources. Agriculture can decrease its water use and utilize reuse water for irrigation. Tourism-based industries can work to minimize visitor impact on the natural resources and teach an appreciation for the natural environment. 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 fp ^k f j mloq^kq ªopq pqbm+ J ^kv lc lro `elf`bp ^ob klq easy, but they have lasting effects. We hope you and your children will help us keep the CHNEP study area a special place to live, work and visit.

Management Conference

The National Estuary Program was established in 1987 by amendments to the Clean Water Act to restore and protect estuaries along the coast of the United States. In 1995, Charlotte Harbor was abpfdk^qba ^p ^k ¦bpqr^ov lc k^qflk^i pfdkfª`^k`b´ ^ka accepted into the National Estuary Program.

The geography of the CHNEP includes the southwest Florida coastline from Venice to Bonita Springs and contains a watershed including all or portions of Charlotte, DeSoto, Hardee, Lee, Manatee, Polk and Sarasota counties. (A very small portion of Highlands, Glades, Collier and Hillsborough counties is also contained within the watershed.) By engaging all types of local communities and activities in the process, the program focuses on improving the water quality of the estuaries while maintaining the integrity of the whole system—its chemical, physical and biological properties as well as its economic, recreational and aesthetic values—and the land/water connection.

The Management Conference is a partnership working together through structured committees. The partnership works as an advocate for the estuarine system by building consensus that is based on sound science.

The CHNEP Management Conference is made up lc clro `l j j fqqbbp ^ka ^ Moldo^ j Lcª`b+ B^`e `l j j fqqbb pbosbp ^ pmb`fª` mromlpb ^ka _ofkdp together a diverse representation of expertise, interests and points of view. Since January 25, 1996, nearly 600 people have participated on one or more committees. (These wonderful volunteers are listed in an appendix.) They have dedicated thousands of hours to building consensus for the actions in this CCMP. Qeb Moldo^ j Lcª`b mboclo j p qeb ^a j fkfpqo^qfsb functions of the program and supports the activities of the committees. The CCMP guides the work of all activities in the Management Conference.

The CHNEP Management Conference includes the Policy Committee, the Management Committee, the Citizens Advisory Committee (CAC) and the Technical Advisory Committee (TAC).

The establishes general policy for the CHNEP 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 and agencies of the region. In fact, all but 3 of the 24 members of the Policy Committee represent city, county or regional governing bodies in southwest Florida. Policy Committee members represent the citizenry of the CHNEP study area.

The provides strong fkpqfqrqflk^i prmmloq clo qeb @EKBM _v pq^cªkd) funding or otherwise facilitating projects. This committee reviews work plans, contract proposals, work schedules and products. It also ensures that program milestones and objectives are accomplished. Each member of the Policy Committee has an analogous representative on the Management Committee.

The (CAC) provides ^ j b`e^kfp j clo `fqfwbkp ql fk«rbk`b qeb mlif`fbp of the CHNEP. The CAC works closely with staff to reinforce and maintain public support for the CHNEP, develop public participation strategies and provide input on public education programs. This committee also helps develop work plans and public workshops, provides a forum for public comment and directs public concerns to the other committees of the J ^k^db j bkq @lkcbobk`b+ > @>@ lcª`bo fp ^ slqfkd member of the Management Committee.

The (TAC) provides qb`ekf`^i prmmloq ql qeb @EKBM+ Qeb Q>@ fabkqfªbp p`fbkqfª` mol_ib j p c^`fkd qeb @EKBM pqrav ^ob^+ Qeb TAC helps develop work plans, develops requests for technical proposals and reviews contract deliverables.

It also assists with information management and `llo afk^qbp ^dbk`v obpb^o`e+ > Q>@ lc ª`bo fp ^ slqfkd member of the Management Committee.

In 2003, a was created with representatives for the entire Management @lkcbobk`b ql %.& ob ª kb qeb Ibdfpi^qflk >dbka^ clo consideration by the Policy Committee, (2) increase communication and discussion on proposed legislation that may affect the program's ability to implement the CCMP, (3) provide members an opportunity to learn about and consider proposed legislation for action by their member organizations, (4) establish a quick response for the CHNEP to have a voice in proposed legislation, following the adopted February 21, 2003, and (5) provide an informal subcommittee structure for direct communication among conference members of different roles—citizen, scientist, manager, agency lc ª`f^i ^ka bib`qba lc ª`f^i+

In 2007, the CHNEP began holding regular ql mobpbkq qeb i^qbpq p`fbkqf ª` ª kafkdp clo wide-ranging discussion. The Science Forums are a popular and exciting venue for scientists, citizens and decision-makers to discuss emerging issues as they relate to the CCMP. Recommendations are not derived at these forums but instead ideas are developed for later discussion and action by the committees.

In 2011, the CHNEP established a . Each forum invites members of the Management Conference and qeb mr_if` ql obsfb t pfdkf ª`^kq molgb`qp fk qeb pqrav area.

The success of the CHNEP ultimately will be measured in the protection and management achieved through implementation of the CCMP. @lkpbnrbkqiv) ^ hbv fkdobafbkq clo pr``bpp fp ab ª kfkd who should oversee implementation of the CCMP and what oversight should entail. Through the Program Lc ª`b ^ka qeb clro `l j j fqqbbp) ^ `l j mobebkpfsb bs^ir^qflk lc qeb dl^ip ^ka nr^kqf ª^_ib l_gb`qfsbp bpq^_ifpeba qeolrde qeb @EKBM t fii _b fkfqf^qba ª sb years after the adoption of the CCMP to ensure that efforts and funding are effectively targeted.

The CHNEP itself, in addition to the projects `lkar`qba _v fqp m^oqkbo lod^kfw^qflkp) e^p ab ª kba pl j b pmb`f ª` obpmlkpf_fifqfbp ql bke^k`b bufpqfkd efforts and to improve coordination among the many active organizations in the region. Through the @EKBM lc ª`b ^ka ^ppfpq^k`b col j qeb `l j j fqqbbp) the CHNEP will conduct the following activities:

- Implement CHNEP initiatives.
- Coordinate data management programs.
- 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 triennial review (every three years) of implementation, as required by the U.S. EPA.
- Produce "report cards" on the environmental status of the CHNEP study area.
- Prepare the annual work plan and perform grant administration.
- Locate funding sources and grants for project implementation.
- Conduct the federal consistency review process.
- Assist the Management Conference in modifying qeb nr^kqf ª^_ib l_gb`qfses and priority actions as needed to meet the program goals.
- Support public outreach and involvement.
- Continue activities for public education as described in the .
- Implement new public involvement activities, with the assistance of the Citizens Advisory @l j j fqqbb) ^p fabkqf ª ba fk qeb .

The Management Conference of the CHNEP decided to continue the four committees of the conference and to preserve the existing structure to oversee the implementation of the CCMP. The primary oversight roles of the CHNEP will be to monitor progress in implementation and the environmental conditions, assist implementation, continue public outreach and involvement and implement the long-term monitoring ^ka a^q^ j ^k^db j bkq pqo^qbdfbp+ Pmb`f ª` bcc loqp associated with these functions are outlined elsewhere.

The Citizens Advisory Committee (CAC) is the critical link between the program and the public. An active CAC is well suited to provide information to the Management Conference about public concerns and sentiments. The CAC is also an essential mechanism

for dispersing program information to key community organizations and individuals that may not be directly involved with the program. The primary roles of the @>@ arofkd f j mib j bkq^qflk ^ob ab^kba ^p7

- Make recommendations to the Policy Committee regarding citizen perspectives on public outreach, advocacy positions and policies to implement the CCMP.
- Give individuals access to the CHNEP Management Conference.
- Provide input on the outreach strategy.
- Provide input on the public involvement work plan components/budget.
- Distribute information and materials to other organizations.
- Establish standing and ad hoc subcommittees as kbbaba ql cri^ii pmb`f^` olibp+
- Contribute in other areas as needed.

The CAC has several standing committees to address:

. A klkmol^q prmmloq lod^kfw^qflk t^p `ob^qba _v qeb CAC but has not yet been active.

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 olibp lc qeb Q>@ arofkd f j mib j bkq^qflk ^ob ab^kba as:

- Mboclo j c^`q*^kafkd ^`qfvities, i.e., strictly information gathering and reporting to the Management Conference for matters within the scope of the CCMP.
- Provide revised technical information about the CHNEP study area.
- Exchange information among technical users.
- Provide input on the data management program.
- Provide input on the long-term monitoring program.
- Establish standing and ad hoc subcommittees.
- Provide other technical input as needed.

The TAC has created four committees:

The determines water quality performance/biological indicators for the water bodies fk qeb @EKBM pqrav ^ob^+ Qefp pr_`l j j fqqbb ^opq j bq on May 9, 2000, and continues to meet regularly.

The ^aaobppbp fpprbp obi^qba ql qeb ^pe ^ka t fiaifcb e^_fq^q ilpp nr^kqf^^_ib l_gb`qfsbp+ Qebfo ^opq j bbqfkd t^p March 19, 2001, and they continue to meet regularly.

The addresses the issues related to the hydrologic ^iqbo^qflkp nr^kqf^^_ib l_gb`qfsbp fk qeb @@ J M+ Qebfo ^opq j bbqfkd t^p J^v 5) /--/) ^ka qebv `lkqfkrb ql meet regularly.

The worked on coordinating water quality monitoring programs and their methodologies in the CHNEP study area. This subcommittee consists mainly of staff from agencies lo lod^kfw^qflkp qe^q j lkfqlo t^qbo nr^ifqv+ Qebfo ^opq meeting was October 11, 2000, and they dissolved in 2001 after voting to instead participate in the quarterly meetings of the Southwest Florida RAMP. This allows the greater coordination of water quality monitoring throughout the southwest Florida region from Pinellas to Collier counties. The former co-chair of the Charlotte Harbor RAMP is currently a co-chair of the Southwest Florida RAMP.

Photo by Lisa Beever, 9/11/03

The Management Committee continues to serve an important role of integrating the desires of the Citizens >asfplov @l j j fqqbb t fqe qeb p`fbkqfª` fkclo j ^qflk 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 fkclo j ^qflk ql bib`qba lcª`f^ip ^ka mlif`v j ^hbop+ Qeb Management Committee's role is to:

- Implement projects.
- Apply for additional grant funding.
- Coordinate regional efforts.
- Check progress/environmental results.

During implementation, the Policy Committee `lkqfkrbp ql _b qeb ªk^i ab`fpflk* j ^hbo clo moldo^ j spending, membership and overall direction. Qeb f j mloq^k`b lc fkslisfkd il`^i lcª`f^ip fk qeb decisions of the program cannot be overstated. The Policy Committee's continued activity is equally important for successful implementation. The Policy Committee's role is to:

- Support implementation.
- Periodically revie t qeb nr^kqfª^_ib l_gb`qfsbp and priority actions, as well as recommend j lafª`^qflkp ql criªii the CCMP.
- Lsbopbb qeb Moldo^ j Lcª`b+
- Authorize work plan and funding.
- Raise matching funds.

One of the strengths of the CHNEP 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 p`fbkqfª` ^ka `fqfwbk ^asfplopÆfp `ofqf`^i ql ^pprofkd implementation of the CCMP. The "bottom-up" approach to environmental management gives all partners a commitment to the future of the region.

The U.S. EPA administers the National Estuary Program that Congress funds through its budget. Under the Estuary and Clean Waters Act of 2000, Congress increased its annual funding support of the 28 National Estuary Programs to implement each

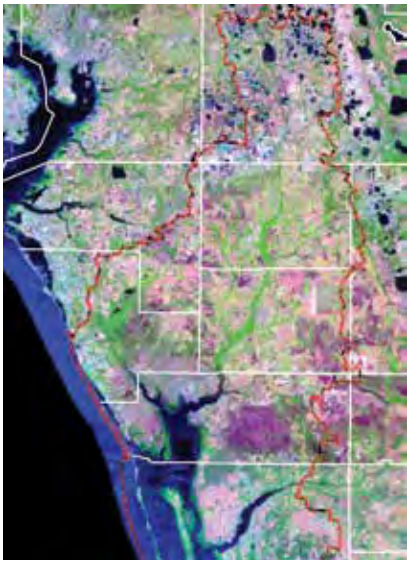
The funding increased to approximately $500,000 per year for each National Estuary Program, with local funding match of at least 50 percent. The U.S. EPA is also an implementing partner, along with many other organizations in the Management Conference.

J ^fkq^fkfkd ^k ^`qfsb Moldo^ j Lcª`b fp kb`bpp^ov 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, communications manager, scientist and grants/contracts manager is recommended, along with maintaining clerical support through the local sponsor.

Photo by Maran Hilgendorf, 8/21/06

Throughout the planning phase of the CHNEP, the Southwest Florida Regional Planning Council (SWFRPC) has been the sponsor. A local sponsor is required to receive CHNEP funding from the U.S. EPA. In keeping with its sponsorship, the council has molsfaba lcª`b pm^`b) prmmifbp) computers and secretarial support clo qeb @EKBM Moldo^ j Lcª`b+ The Management Conference recommends that this relationship continue.

State of the Watershed

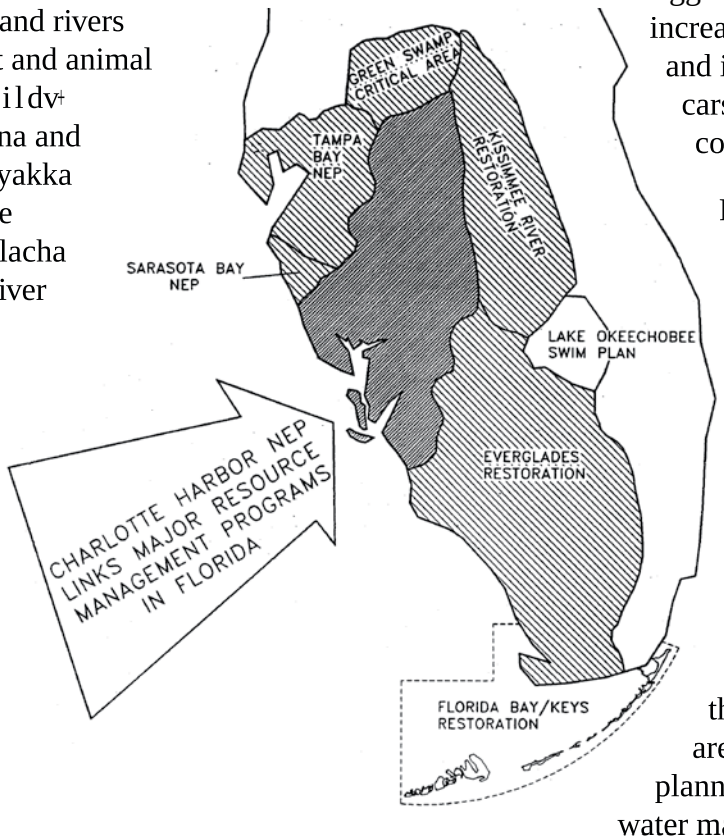


Inland areas with freshwater lakes, headwater wetlands and rivers combine with coastal areas to make up the CHNEP study area ecosystem. The watershed extends approximately 130 miles from the northern headwaters of the Peace River in Polk County to southern Estero Bay in Lee County. The CHNEP study area is divided into eight watersheds by hydrological, ecological and management distinctions (see Map 1, p. 3). In each of these watersheds, rainfall collects in wetlands and runs to streams and rivers through a rich variety of plant and animal e^_fq^q) plfip ^ka proª`f^i dblildv+ These watersheds include Dona and Roberts bays, Lemon Bay, Myakka River, Charlotte Harbor, Peace River, Pine Island Sound/Matlacha Pass, Tidal Caloosahatchee River and Estero Bay.

Unlike other estuaries in southwest Florida that ^ob j lpqiv fk«rbk`ba by the Gulf of Mexico, the large rivers of the Peace, Myakka and Caloosahatchee give Charlotte Harbor its special freshwater characteristics. I^odb «r`qr^qflkp lc ofsbo «l t p _bq t bbk t bq ^ka aov seasons strongly affect the water salinity and dissolved oxygen. In contrast, nearby estuaries in Tampa and Sarasota are more fk«rbk`ba _v qeb Dric ^ka ^ob rpr^iiv t bii j fuba+

The CHNEP study area adjoins the watersheds of Tampa and Sarasota bays in Hillsborough, 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 to solve some of the problems with Lake Okeechobee, the Everglades, the Ten Thousand Islands, Florida Bay and the Florida Keys.

Afcª`riq obplro`b j ^k^db j bkq fpprbp `lkcolkq _lqe the freshwater inland areas and the coastal estuary region. Inland, groundwater levels have declined pfdkfª`^kqiv) melpme^qb j fkfkd fp j lsfkd fkql 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. Upstream pollution, increasing water consumption, and intensive use of boats, cars and roads, threaten coastal habitats.



Political geography links governments in the watershed. The CHNEP study area has distinct demographic, cultural and political features. The watershed includes 24 municipalities in Polk, Hardee, Highlands, DeSoto, Manatee, Sarasota, Charlotte and Lee counties. Regionally, these local governments are linked by three regional planning councils, two water management districts and

numerous district divisions of state agencies. Also active in this region are 9 federal agencies, 16 private science or resource management groups and numerous land trusts and environmental educators. Many of these agencies have multiple roles in managing natural resources in the CHNEP study area.

The economic geography of the watershed covers a diverse region of important rural and urban communities and a natural environment worth molqb`qfkd+ Qeb fkarpqofbp lc apefkd) ^dof`riqrob) mining, tourism, retirement and construction provide the economic base of the region. The economy has afsbopfaba ^ka pqobkdqebkba _b`^rpb mblmib e^sb moved to the area 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.

The large size of the CHNEP 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 _bkbaqp t b qob^prob+

The complexity of the CHNEP study area does not lend itself to simple management solutions. Since the t^qbopeba fp i^odb) fq fp lcqbk afca`riq ql abqbo j fkb how changes are caused by natural conditions versus human impacts. When a watershed undergoes rapid simultaneous changes, such as the construction of canals, the expansion of urban development and the fkqbkpfa`^qflk lc ^dof`riqrob) fq `^k _b qolr_ibpl j b to link environmental problems to a single activity. Understanding how human activities affect 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 judgments possible, even though opinions about the best course of action may differ.

Ab`ifkbp fk e^_fq^q) t ^qbo nr^ifqv ^ka t ^qbo «l t p are usually caused by a combination of effects called cumulative impacts. All of us contribute to cumulative impacts when we drive lro `^op) «rpe lro toilets and build new houses. 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 _bkbaqp qebv molsfab are beyond repair. When the quality of natural resources is diminished, the regional economy can also be adversely affected. Understanding how natural resources and the economy are related is also a challenge to resource management.

Photo by Lisa Beever, 9/11/07

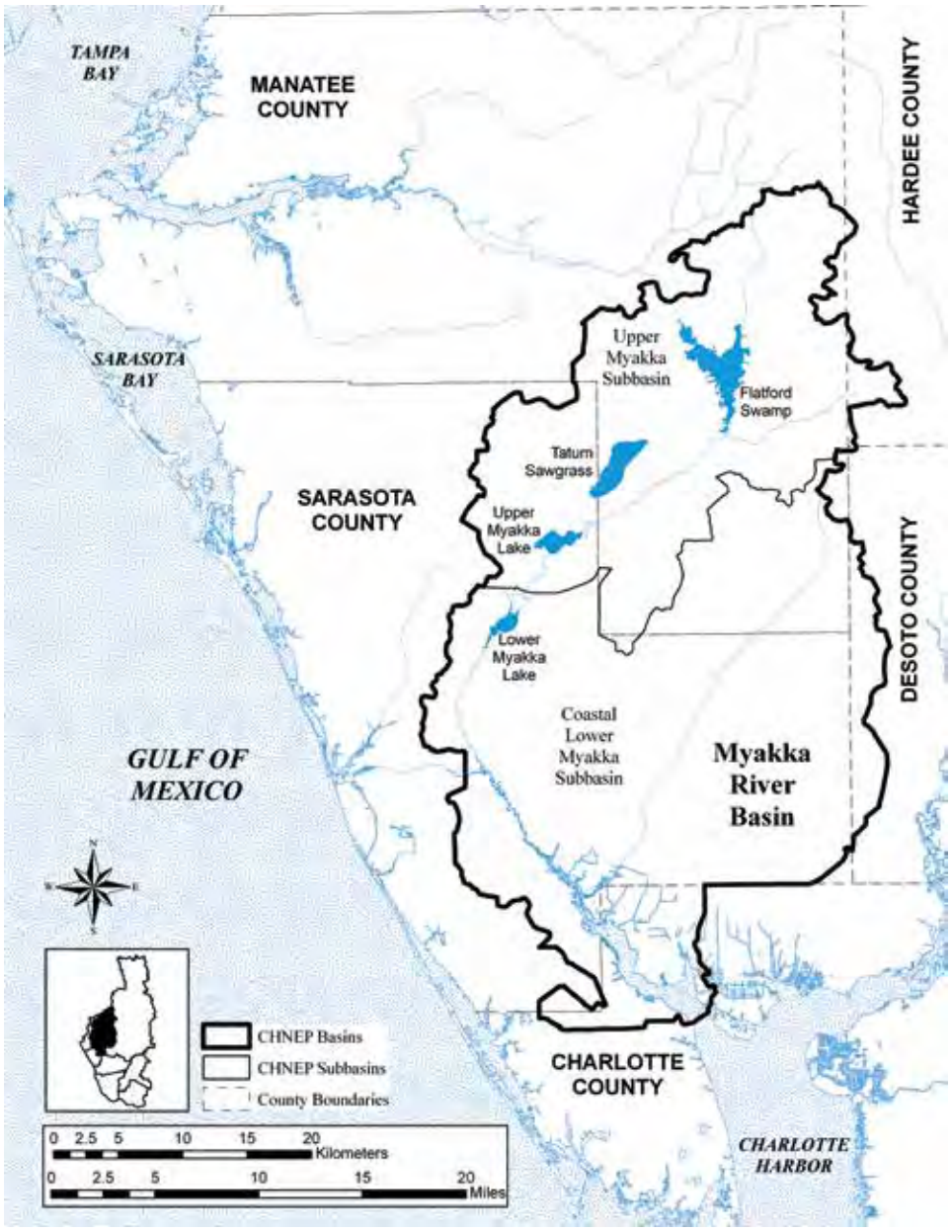
Freshwater resources are worth protecting. As freshwater resources decline and demand for water grows, inland freshwater resources increase in value. These waters are particularly important to inland economies, but their quality affects the entire CHNEP study area. Agricultural land uses, including cattle, row crop and citrus groves, is one of the three traditional components of the statewide economic base. The rivers and economies are linked by freshwater-based uses and the coastal communities they supply with food and other products.

Freshw^qbo obplro`bp ab$^{a}$kb qeb nr^ifqv lc obpfabkqf^i life in both coastal and inland communities. These obplro`bp prmmloq ^dof`riqrob) ^{a}pefkd) mining and recreation/tourism uses valued annually in billions of dollars. Three watersheds contain our major surface freshwater supplies—the upper watersheds of the Myakka, Peace and Caloosahatchee rivers.

The Myakka River watershed has the largest contiguous wetland landscape of the three watersheds. The 66-mile ofsbo _bdfkp fqp plrqeboiv «l t col j headwaters in Manatee and Hardee counties. After following a narrow «llami^fk clobpq `loofalo) qeb ofsbo 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. The 34-mile portion of Myakka River in Sarasota County is designated a "Florida Wild and Scenic River."

Cattle ranching dominates the majority of the watershed, especially upstream of Myakka River State Park. To satisfy the need for range and pastureland, much of the watershed was drained 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 River watershed have been acquired for state management and protection.

In the lower portion of the Myakka River watershed, urban development is displacing agriculture. Former grazing lands along the banks of the lower Myakka River are now being converted to urban uses, mostly homes. Construction is 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 clo ^{a}pe ^ka tfiaifcb+



Map 2: Myakka River Watershed (Basin)

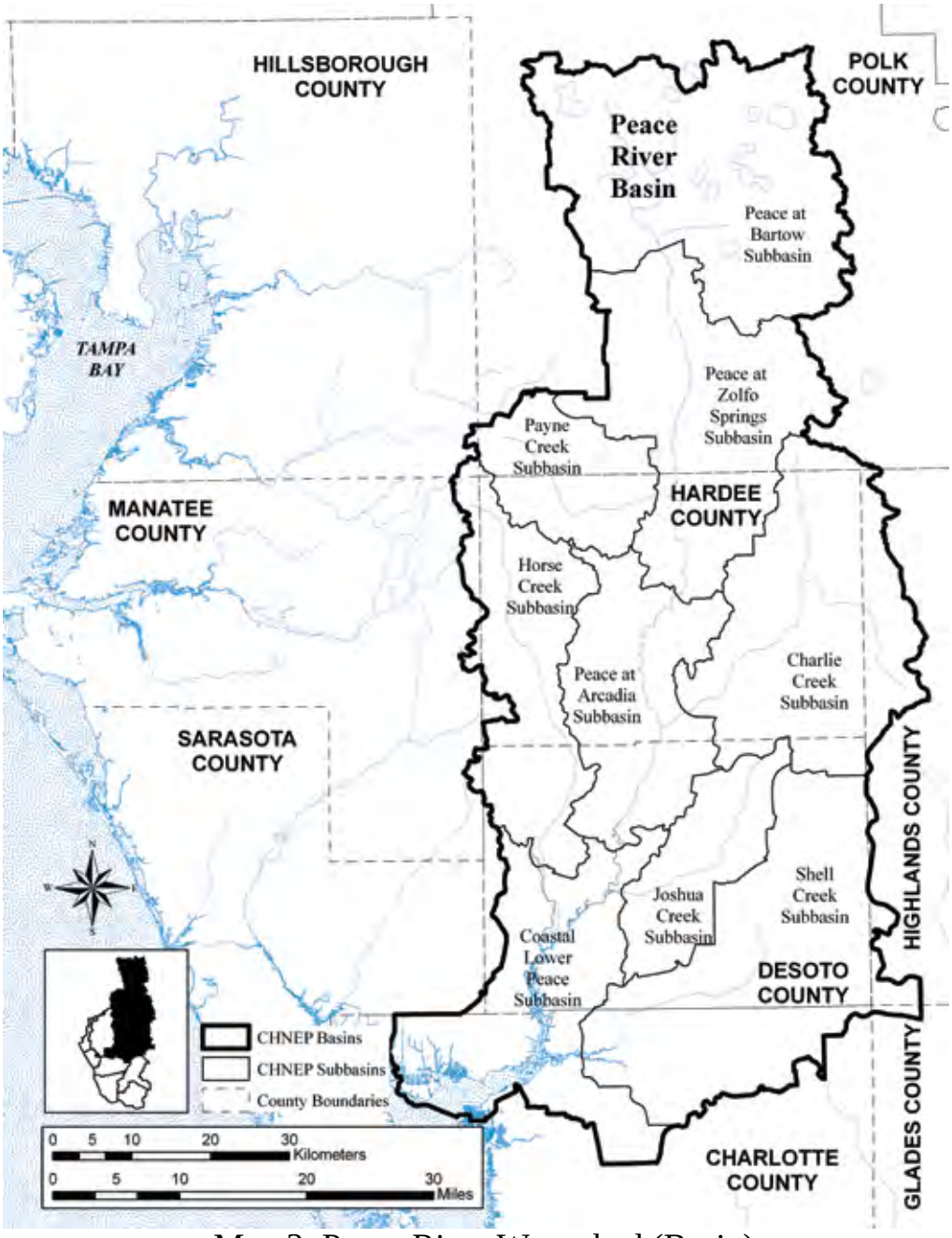
At 2,315 square miles, the Peace River watershed is the largest and most diverse in the CHNEP study area. The river originates at the Green Swamp in central Polk County, draining a series of wetlands ^ka i^hbp+ Qeb o^qb lc «l t fp afob`qiv molmloqflk^i ql dolrka t^qbo ibsbip+ Rkabodolrka ^ka lsboi^ka «l t p cliil t k^qro^i ^ka ^iqboba m^qep qeolrde `^k^ip) «lla control structures, former and active phosphate mines, wetlands and Lake Hancock. South of Lake Hancock, `^k^ip ^ka qof_rq^ofbp `l j _fkb ql ab^kb qeb j ^fk `e^kkbi lc qeb Mb^`b Ofsbo qe^q bsbkqr^iiv «l t p j lob than 100 miles southwest to Charlotte Harbor.

Phosphate mining has been a major land use in the Polk County headwaters of the Peace River for more than a century, altering the evaolildv) «lo^ ^ka c^rk^ of the landscape. State law requires all lands mined after July 1, 1975, to be reclaimed. In addition, the adoption of a state trust fund in 1977 allowed a portion of areas mined prior to 1975 to be voluntarily reclaimed. Citrus, cattle ranching and row crop farming also occur in Polk County, but are more common downstream in Hardee, DeSoto and Highlands counties.

The Peace River is the largest freshwater contributor to Charlotte Harbor. It is a source of drinking water for about 90,000 people in Charlotte, DeSoto and Sarasota counties. With the effects of reduced rainfall, combined with mining, agriculture and municipal t ^qbo rpbp) cobpe t ^qbo «l t p have declined, threatening the ecology of the river system and Charlotte Harbor.

Obar`ba «l t p ^ob j lpq ^mm^obkq rmpqob^ j) ^iqelrde declines have also been recorded in the Peace River as far downstream as Arcadia.

The Peace River basin is of particular concern to the Florida Legislature, which directed the Florida Department of Environmental Protection (FDEP) to study the cumulative effects of major changes in "landform and hydrology in the Peace River basin." In March 2007, the FDEP transmitted the to the Florida Legislature. The plan was based on the which is available at

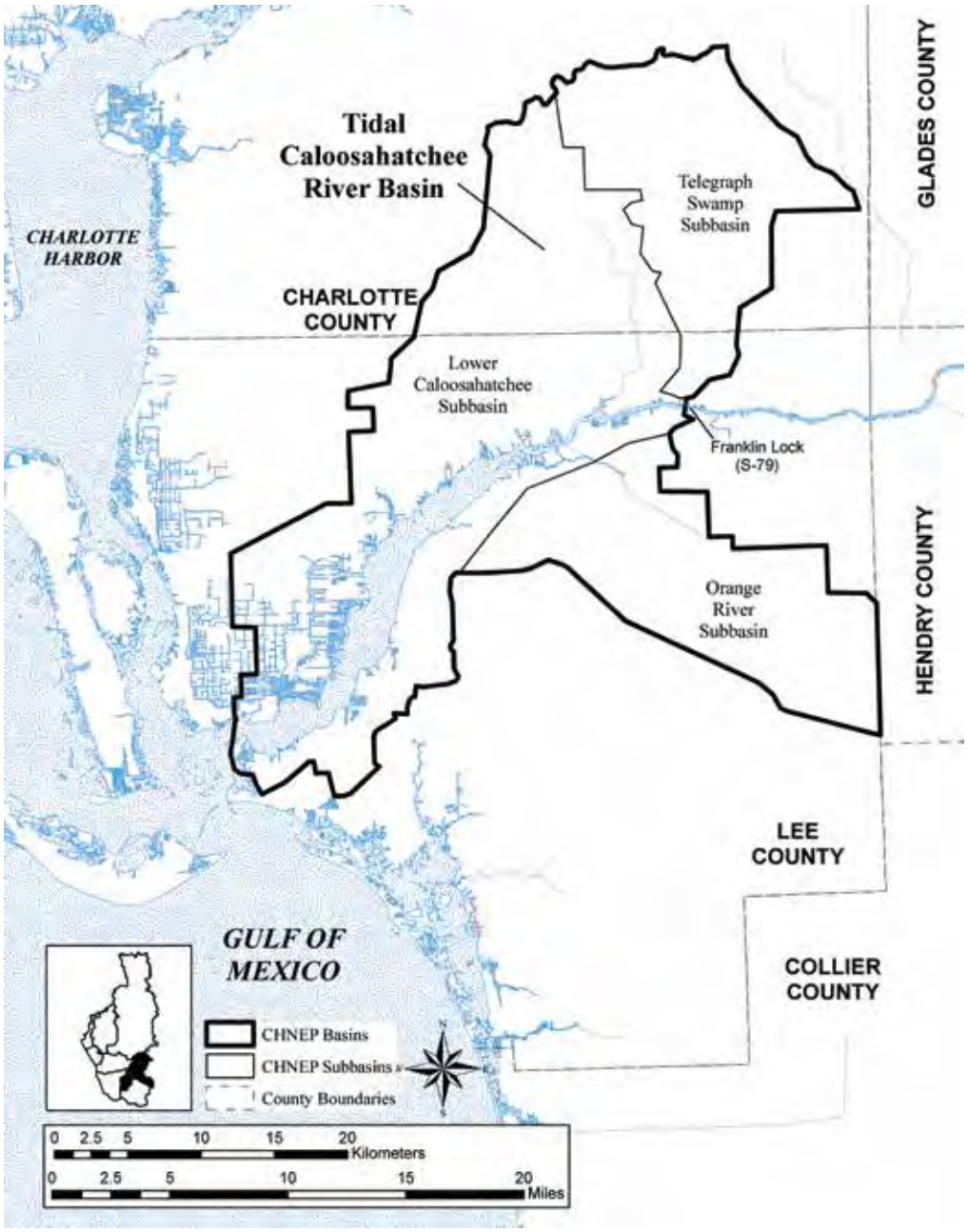


Map 3: Peace River Watershed (Basin)

The Caloosahatchee River originated as overland «l t qeolrde j ^opei^kap ^ka p t ^ j m clobpq rkqfi .55. when it was connected to Lake Okeechobee. Since then, the U.S. Army Corps of Engineers has converted the upper river into a canal, connecting the lake to the river and controlling discharge by structures and locks. Today, Franklin Lock in Lee County separates the fresh water of the river from the salt water of the estuary. The lock also marks the beginning of the 30-mile tidal watershed of the Caloosahatchee River that starts at the lock and continues to the Gulf of Mexico.

Twentieth century transportation, drainage, irrigation and waste disposal have been hard on the Caloosahatchee River and its watershed. The channels have been straightened, shorelines hardened and oyster reefs dredged. Remnants of the old river course, termed “oxbows,” have been neglected. The river has been assaulted by raw sewage, stormwater runoff, great counter-seasonal freshwater releases, pesticide pmfiip) qebo j ^i bc«rbkq ^ka bulqf` krfp^k`b pmb`fbp+

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, pb^do^ppbp pqfii «l rofpe t ebk ofsbo `lkafqflkp ^ob suitable. Boaters delight upon seeing manatees ( ) and anglers speak of remarkable catches of snook ( ) or oba ª pe % ) col j pb`obq ªpefkd elibp+ 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 ofsbo t ^qbo «l t p fkql lo l rq of the adjacent canals. The citrus industry has expanded pfdkf ª `^kqiv fkql qeb rmmbo watershed during the past decade and depends highly on controlling soil water levels. In addition to the upstream channel, small creeks and qof_rq^ofbp `lkqof_rqb pfdkf ª `^kq fresh water to the watershed. Considerable freshwater urban runoff also enters the river and estuary from the extensive network of navigation and drainage channels in Lee County.



Map 4: Tidal Caloosahatchee River Watershed (Basin)

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 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 cycles in this environment.

A series of distinct but related bays and estuaries make up the coastal environment of southwest Florida. These bays and estuaries include Dona and Roberts bays, Lemon Bay, Charlotte Harbor proper, Pine Island Sound/Matlacha Pass and Estero Bay. Together they form one of the largest systems in the state and the most productive estuarine area of Florida's west coast.

Estuarine environments require careful management. The estuaries in the CHNEP study area are heavily fk«rbk`ba _v cobpe t^qbo^ka fkqbkpb rpb+ Obpqlo^qflk and maintenance of high environmental quality should prpq^fk qeb `l^pq^i b`lkl j f` _^pb clo qlrofp j) apefkd) recreation and quality of life for area residents.

Bays, beaches, barrier islands and mangroves dominate Dona and Roberts bays to Cape Haze. 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 water body, forms the exception to this pattern of lagoons. Southward, Gasparilla Sound merges into Charlotte Harbor proper. This part of the CHNEP study area has some important resource management challenges:

- Restoration of historic basin boundaries and obpriqfkd cobpe t^qbo «lws to estuaries.
- Bccb`qp lc _l^q qo^ca` ^ka aobadfkd lk qeb Intracoastal Waterway and other channels.
- Retention of mangrove areas and protection of seagrass.
- Large areas of undeveloped platted lots.
- Effects of septic systems and stormwater runoff from development on water quality.
- Dynamically unstable tidal inlets.
- Nuisance exotic vegetation removed

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

Charlotte Harbor proper lies primarily in Charlotte County and connects to the Gulf of Mexico through Boca Grande Pass. Although the Harbor has an area of about 130 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 clo vlrkd ape ^ka lqebo t fiaifcb

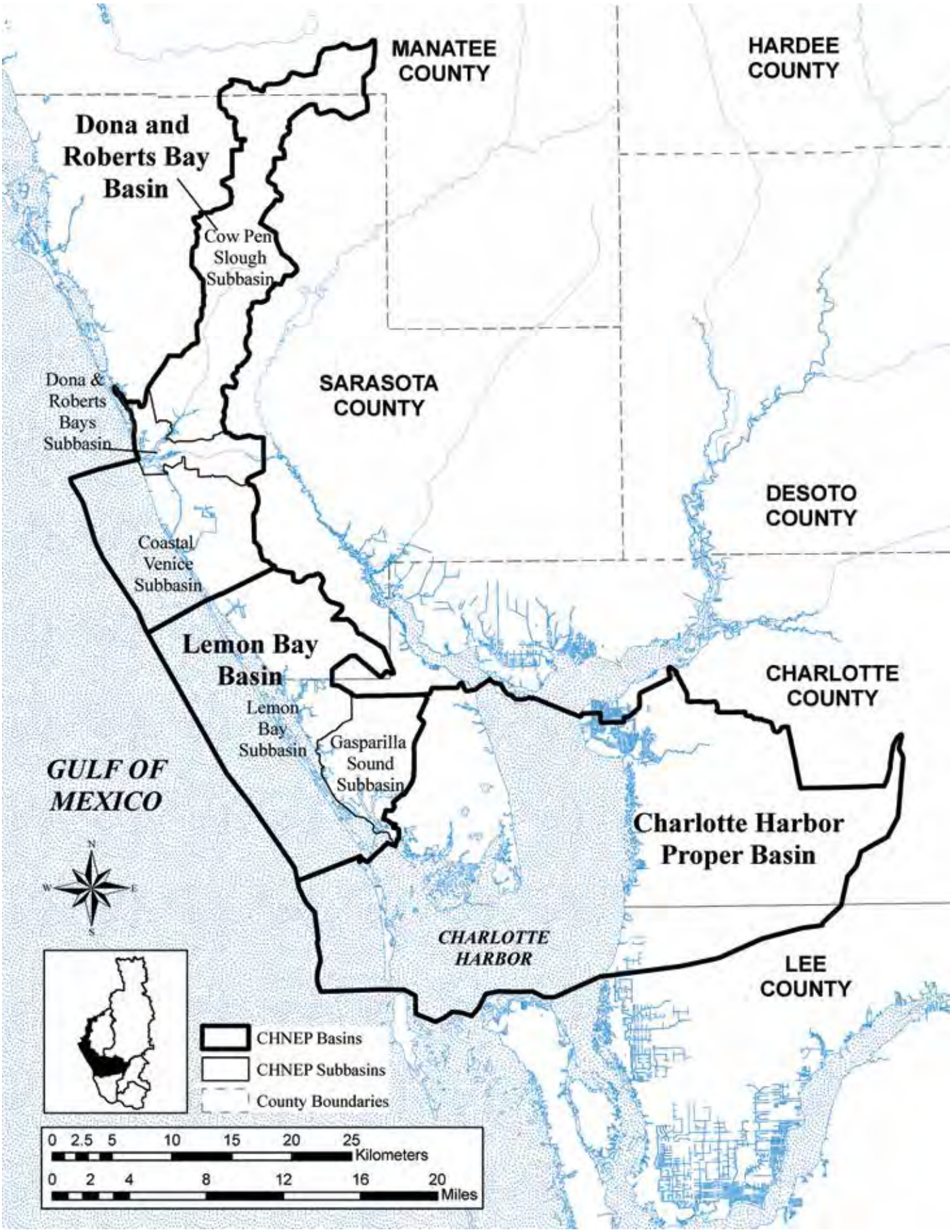
The tides from the Gulf of Mexico affect water levels far up the Myakka and Peace rivers. Although salt t^qbo j fdo^qbp rm qeb ofsbop arofkd il t ofsbo «l t mbofl ap) qvmf`^i efde t^qbo «l t p fk qeb pr j j bo freshen the rivers and lower Harbor salinity. Thus, the Harbor changes dramatically with the seasons.

Qeb @e^oilqqb E^o_lo >nr^qf` Mobpbosbp ^ob asb contiguous aquatic preserves within the greater Charlotte Harbor estuary complex designated by the state Legislature for inclusion in the aquatic preserve system under the Florida Aquatic Preserve Act of 1975. The preserves are (from north to south): Lemon Bay Aquatic Preserve, Cape Haze Aquatic Preserve, Gasparilla Sound–Charlotte Harbor Aquatic Preserve, Matlacha Pass Aquatic Preserve and Pine Island Sound Aquatic Preserve. All these areas are included in the

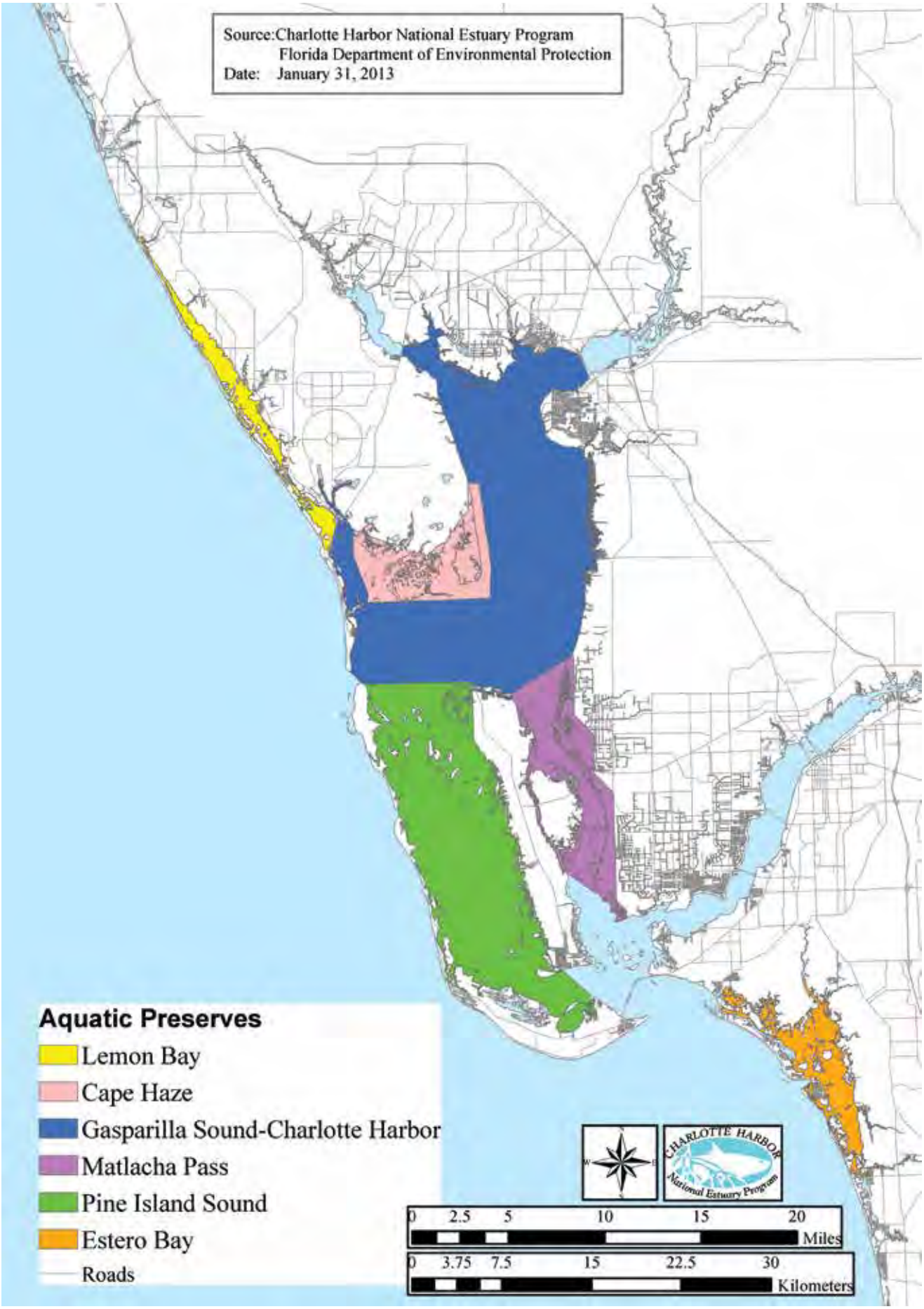
. Additional information can be found at

.

The public owns many of the wetlands, mangrove forests and salt marshes surrounding the Harbor. Very large buffer areas, part of the Charlotte Harbor Preserve State Park and mangrove islands are also publicly 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 to the South Gulf Cove development.



Map 5: Northern Estuarine Watersheds (Basins)

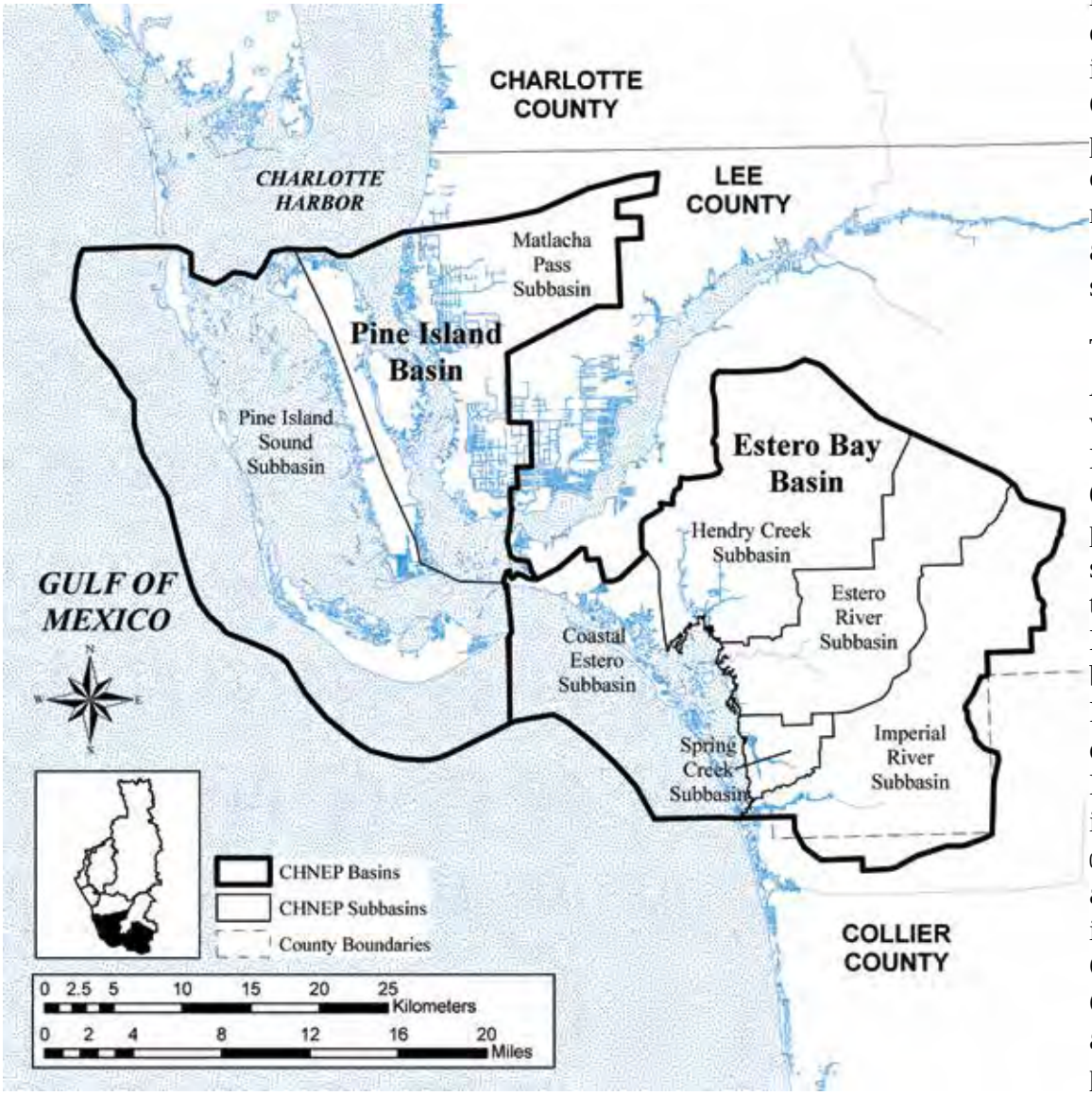


Map 6: Aquatic Preserves

Pine Island Sound and Matlacha Pass are two large estuaries that lie immediately south of Charlotte Harbor. Pine Island separates the two estuaries and provides them with limited fresh water from numerous small creeks and wetland areas. Direct rainfall and runoff from western Cape Coral provide the major portion of fresh water. The Cape Coral interceptor t ^qbo t ^vp afob`qiv fk«rbk`b qeb nr^kqfqv ^ka nr^ifqv lc qeb cobpe t ^qbo fk«l t+

Both estuaries have extensive seagrass beds that molsfab bppbkqf^i e^_fq^q clo vlrkd ªpe+ Mbofl af`^iiv) during large releases from the Caloosahatchee Ofsbo) lrq«l t `^k afp`e^odb cobpe t ^qbo qeolrde San Carlos Bay into southern Pine Island Sound and southern Matlacha Pass. Dredging, altered timing and volumes of freshwater discharges from the Caloosahatchee River system have 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 cobpe t ^qbo fk«l t p+ > _bqqbo rkabopq^kafkd lc qebpb impacts and improved management of freshwater releases is necessary to protect and restore these coastal habitats.

Estero Bay is 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. Extensive seagrass beds prmmloq vlrkd ªpe ^ka `o^_p fk qeb pe^iil t _^vp) ^ka mangroves support large bird rookeries on the numerous islands. As with Charlotte Harbor, the public owns many of the wetlands, mangrove forests and salt marshes surrounding the bay.



Map 7: Southern Estuarine Watersheds (Basins)

The Estero Bay Aquatic Preserve was dedicated in December 1966—Cilofa^$p ªopq ^nr^qf` preserve. The state also protects tributaries in the Estero Bay watershed by the "Outstanding Florida Waters" designation. The Estero Bay watershed is currently subject ql pfdkfª`^kq dol t qe and development, including Florida Gulf Coast University. The CHNEP is conducting a study regarding permitting and growth in the basin.

Water quality is critical for human and environmental health. There are multiple threats to water quality in the CHNEP study area. They include nutrients, bacteria, dissolved oxygen, toxics, water clarity and harmful algal blooms.

The amount of nutrients entering a water body 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, `^k hfii ªpe ^ka lqebo ^kf j ^ip qe^q `^kklq bp`^mb qeb 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 nutrients to the water in excess of natural levels. 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:

When sewage treatment plants process residential and commercial waste, they remove most of the nutrients from the water. However, water discharged from sewage treatment plants still contains some nutrients. These discharges are point sources of nutrients to the lakes, estuaries and streams where they are located, but they must meet state standards. The Southwest Florida Regional Planning Council adopted a resolution that provides guidance for improved standards for sewage treatment plants in order to reduce nutrient levels within discharges. As an extension of this resolution, the Council is working with plant managers to identify infrastructure needs clo^obdflk^i crkafkd bcc loq+ ?bkbª`f^i molar`qp col j sewage treatment plants, such as reuse water and biosolids used to fertilize agricultural land, also carry excess nutrients.

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 mol`bppfkd) melpme^qb j fkfkd) _bkbª`f^qflk) cboqfifwbo manufacturing and animal feedlots are sources of nutrients, although they are limited to the state standards for their discharges.

The air around us also contains nutrients. Nutrients are released into the air from local sources such as car engines and power mi^kqp+ Afpq^kq plro`bp pr`e ^p ªobp fk J buf`l ^ka out-of-state industries can also be nutrient sources. Nutrients from the air can fall directly onto the land and water in 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 percent of the total nitrogen and 8 percent of the total phosphorus loads to water bodies in the CHNEP study area (PBS&J 1999).

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/commercial lawns, golf courses and 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 j lpq afcª`riq `^qbdlov lc plro`bp ql `lkqoli+

Septic systems are common in the region. These systems process 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.

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 ground water and then discharging it to local water bodies. Within parts of the CHNEP study

area, water quality impairments due to groundwater contributions of salt, dissolved solids and iron is more pfdkfª`^kq qe^k krqofbkqp+ Pfk`b qeb obdflk t^qbo q^_ib is high, there is much interaction between surface water and ground water. Therefore, surface and groundwater quantity and quality are strongly related.

Bacteria in the water affect our ability to use the t^qbo clo aofkhfkd) p t f j j fkd ^ka pebiiªpefkd+ Qeb state water standards establish bacteria limits for different types of uses. The most stringent standards ^ob clo pebiiªpefkd ^ob^p+ Pebiiªpe pr`e ^p `i^ j p ^ka 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 _^`qbof^ ^ob lmbk clo pebiiªpe `liib`qflk+ Lqebo) ibpp stringent standards, apply for drinking water and for t^qbo ob`ob^qflk pr`e ^p p t f j j fkd ^ka ªpefkd+

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 systems, leaking sanitary pb t bop) `lkªkba ^kf j ^i cbbailqp ^ka rkqob^qba t^pqb col j t^pqb t^qbo mi^kq lsbo«l t p+ Lqebo plro`bp pr`e ^p ro_^k mbq t^pqb ^ka pqlo j t^qbo ^ob pfdkfª`^kq sources, especially after a heavy rainfall. For this ob^plk) j ^kv pebiiªpe ^ob^p ^ob `ilpba f j j baf^qbiv after a large rain event.

T ebk afpplisba luvdbk fp il t fk qeb t^qbo) ªpe ^ka other aquatic animals cannot breathe 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 oxygen. During the rainy season, large amounts of cobpe t^qbo `^k «l t lsbo qeb qlm lc p^iqfbo ^ka eb^sfbo 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.

The sources of toxics are numerous and are expensive to monitor. Toxics include heavy metals such as 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 though the use of pesticides, illegal dumping and accidental spills. After a rain, storm water 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. Pharmaceuticals and personal care products are an emerging category of toxics of concern.

Water clarity is a measure of the amount of sunlight entering the water that reaches seagrass blades or the estuary bed. As sunlight enters a water body, it is either absorbed or scattered when it interacts with the particles and the dissolved materials within the water column. When light is scattered, the direction of the light can be changed or reversed and, in some cases, this greatly increases the likelihood that the light will then be absorbed before reaching seagrass or other benthic habitats. Absorption and scattering of light in the water column can essentially be broken down into four components: water itself, colored dissolved organic matter (CDOM), photosynthetic organisms (e.g., phytoplankton) and suspended particulate matter `lkpfpqfkd lc «l^qfkd m^oqf`ibp col j i^ka lo j ^ofkb sediments, minerals and humics (Kirk 1994).

While phytoplankton largely limits the amount of light reaching seagrass in Lemon Bay (Tomasko et al., 2001), water clarity in Charlotte Harbor is dob^qiv fk«rbk`ba _v afpplisba ^ka prpmbkaba j ^qqbo (McPherson and Miller 1987; McPherson and Miller 1994; Dixon and Kirkpatrick 1999). Research has

found that suspended matter accounts for an average of 30 to 72 percent of light attenuation in the water column, CDOM accounts for 13 to 66 percent, phytoplankton concentrations for 4 to 18 percent and water itself for approximately 4 percent (McPherson and Miller 1987; McPherson and Miller 1994; Dixon and Kirkpatrick 1999). Water clarity improves with distance from the major tributaries in Charlotte Harbor and with increasing salinities (McPherson and Miller 1987; Dixon and Kirkpatrick 1999; Tomasko and Hall 1999).

Long-term data sets from monitoring and research programs are essential in understanding the current health of an ecosystem and to put changes into a historical perspective. Recent analyses of these long-term water quality data collected by the CHNEP partnership demonstrate deteriorating trends in water clarity in the region. CHNEP studies document pfdkfª`^kq fk`ob^pbp fk qlq^i prpmbkaba plifap %QPP& throughout Charlotte Harbor and increasing turbidity and nutrients in the lower Charlotte Harbor region (Janicki Environmental Inc. 2003 and 2007).

Harmful algal blooms (HABs) are the proliferation of harmful or nuisance algae that adversely affect aquatic resources or humans. The algae can be either microscopic organisms in seawater and fresh water or large aquatic plants that can be seen with the unaided eye. The term “bloom” indicates an increase in abundance above normal background numbers lc ^ pmb`fbp fk ^ pmb`fª` dbldo^mef` il`^qflk+ Qefp increase can be within the water column or on estuary bed substrates, such as seagrass blades. HABs are so named because of their harmful results, such as «l^qfkd lo _b^`eba ab^a ªpe) qeb ^iqbo^qflk lc ^ clla chain or the loss of benthic habitat. HABs may also affect public health, as people can become ill when qebv fke^ib qlufkp fk qeb ^fo lo `lkpr j b pebiiªpe qe^q have been exposed to toxins from a bloom.

Qebob ^ob pbsbo^i qvmbp lc E>?p7 afkl«^dbii^qbp) blue-green algae and macroalgae. One well-known qluf` afkl«^dbii^qb pmb`fbp cobnrbkqiv l``roofkd fk southwest Florida is , the organism that causes red tide. Other organisms are well known in other parts of the U.S. and may be a concern in the future in southwest Florida due to its wide temperature and salinity tolerances.

and -like organisms have not been documented in Charlotte Harbor, but they have been found in nearby Florida estuaries. These organisms lcqbk ^`q ^p pfdkfª`^kq _rq rkabqb`qba plro`bp lc ªpe mortality and disease.

In Florida waters, there are about 20 species or groups of freshwater or freshwater-estuarine blue-green algae that are potentially toxic. Also known as cyanobacteria, potentially toxic cyanobacteria that are known to bloom frequently in the Charlotte Harbor watershed include , , and . Cyanobacteria can exhibit severe neurotoxicity (poisonous to nerves), cytotoxicity (toxic to living cells) and hepatotoxicity (toxic to liver) to a variety of mammals, including humans, _foap) ªpe) ^ka fksboqb_o^qbp pr`e ^p wllmi^khqlk+ Cyanobacteria blooms produce negative aesthetic qualities, such as bright green water in canals and along shorelines, and cause taste and odor problems in public water supplies. These blooms rapidly “crash” in response to sudden physical changes, causing excessive oxygen consumption and anoxic/hypoxic conditions. This chain of events has been responsible clo j ^glo bpqr^ofkb ªpe ^ka pebiiªpe hfiip ^ka ilpp lc habitat for benthic organisms within the CHNEP study area and other locations.

Over the past several decades, blooms of macroalgae have been increasing along many of the world’s developing coastlines in response to nutrient enrichment associated with coastal eutrophication. In southern Florida, a diverse group of opportunistic macroalgal species outcompete, overgrow and replace seagrass that are adapted to stable, oligotrophic conditions. Once they are established, the macroalgal blooms may remain for years to decades until the nutrient supply decreases. This is in contrast to phytoplankton blooms that are usually relatively short-lived (days to weeks). Nuisance blooms of macroalgae ^ka ^qq^`eba ªi^ j bkqlrp bmfmevqbp obar`b ifdeq availability to seagrasses, resulting in lower seagrass productivity, habitat loss from anoxia/hypoxia and eventual die-off of sensitive species. Large drifts of macroalgae can wash ashore onto bathing beaches, interfering with recreation. Decaying, malodorous material is a concern for the local tourist economy.

Our actions to address water quality degradation can be found on pages 71 to 87.

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 ofsbop lo afsboq cobpe t ^qbo «l t p) qeb ^ j lrkq) qf j fkd and placement of fresh and salty water can change dramatically.

Over time, people have changed the total amount of fresh water that reaches the estuaries and the Gulf lc J buf`l+ Clo pl j b ªpe ^ka mi^kqp) qebpb `e^kdbp e^sb pfdkfª`^kq f j m^`qp lk qebfo ^_fifqv ql `lilkfwb) grow and reproduce. Here are some examples of er j ^k f j m^`qp lk qlq^i cobpe t ^qbo «l t p fk plrqe t bpq Florida:

When too much ground water is pumped from underground, the level of the water table and deeper aquifers can drop pfdkfª`^kqiv+ Fk plrqe t bpq Cilofa^) dolrka t ^qbo fp ^k important contributor to creeks and rivers. In the upper Mb^`b t ^qbopeba) `bpp^qflk lc «l t col j Hfppbkdbk Springs and other minor springs is generally attributed to the decline in the hydraulic potential of the `lkªkba ^nrfcbop `^rpba _v qeb absbilm j bkq lc qeb groundwater resource (PBS&J 2007). These springs, once sources of fresh water, no longer contribute to qeb Mb^`b Ofsbo «l t p+ Pf j fi^o bccb`qp `^k l``ro t ebk water tables drop in other watersheds, decreasing the amount of groundwater contribution to rivers and estuaries.

Water-control structures are very effective at their job—to hold back fresh water and release it when it is unwanted. 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 fresh water downstream while it is diverted for other uses and to release excess cobpe t ^qbo al t kpqob^j t ebk prcª`fbkq cobpe t ^qbo fp available.

Straightening rivers and streams as well as connecting new areas through canals and pipes can increase the amount of fresh water 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. An example of connection and channelization is the straightening of the Caloosahatchee River and connection of Lake Okeechobee to the riverhead.

Table 1: Examples of Hydrologic Alterations in Watersheds of the Charlotte Harbor National Estuary Program

	Mb^h «l t transfer to coastal watershed via Blackburn Canal	Big Slough channelization; Flatford Swamp	Drainage of Tatum Sawgrass	Clay Gully Cutoff; Vanderipe Slough levee
	Loss of Kissengen Springs and increased number of sinkholes	Groundwater pumping near Joshua, Prairie and Shell creeks	Green Swamp and Lake Hancock regulation	Charlotte County drainage/canal system
	Reduction of dry pb^plk «l t p ql tide	Agricultural tailwater runoff	Drainage of Lake Okeechobee	Sanibel Causeway
	Sanibel Causeway	Myakka River discharge to Dona Bay	Salinity barriers (Coral Creek)	Drainage culverts, interceptor waterways

Source: CHNEP 1998

Photo by Richard Gant, SWFWMD, 6/23/00

outhern
Water Use Caution Area (SWUCA) Recovery Strategy Peace River Resource Management Plan

The timing of the arrival of fresh water to estuarine areas is also important to plants and animals. Their life cycles are often triggered or are 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 also the timing of cobpe t ^qbo «l t p+ Qebpb `e^kdbp) m^oqf`ri^oiv t ebk they are large and contrary to the usual seasonal conditions, can be very detrimental to plants and animals in the estuary.

Placement of freshwater sources also has strong impacts on aquatic life. Sources of fresh water 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 saltwater areas where plants and animals are not adapted to a freshwater environment. If large amounts of fresh water 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 fk cobpe t ^qbo pl ro`bp `^k e^sb pfdkfª`^kq f j m^`qp+ Drainage systems and canal systems are common examples of causes that change the location of cobpe t ^qbo «l t p+ Qebpb `e^kdbp j rpq _b j fkf j fwba ql maintain the biological conditions.

Hydrology can be a complex and subtle issue, affecting water quality and habitat. Though there is klq prcª`fbkq pm^`b fk qefp mi^k ql ^abnr^qbiv afp`rpp hydrologic issues, there are many excellent references. These references include
(PBS&J 2007,) and

(SWFWMD 2011,)

Our actions to address hydrologic alterations can be found on pages 88 to 104.

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 (Cox et al., 1994). Occupying an important transitional zone between tropical and temperate climates, more than .)0-- ªpe ^ka t fiaifcb pmb`fbp ^ka ^_lrq 0)2-- plant species can be found in Florida. Preserving this biodiversity in the CHNEP study area requires molqb`qflk ^ka obpqlo^qflk lc obdflk^i ªpe ^ka t fiaifcb habitat. High rates of land conversion and habitat j lafª`^qflk `ob^qb ^ `ofqf`^i kbba clo obdflk^i t fiaifcb 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.

The CHNEP study area has lost more than 43 percent of its original wetland habitat—mostly to agricultural drainage, mining and urban 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.

Mining activities have also impacted wetlands. Prior to 1975, phosphate companies strip-mined but did not restore many wetlands. This happened especially along tributaries of the Peace River in Polk County when mining was the leading economic force in the region. Now, due to regulation, the phosphate industry is required to reconstruct and replace every acre of wetlands that it destroys.

Urban and rural development also destroys wetlands. Most elimination of wetlands goes through a permitting process with mitigation requirements. However, some wetland losses are currently permitted with no mitigation requirements (SWFRPC 2007).

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" further protect saltwater wetlands around Charlotte Harbor proper.

Mangrove forests form a distinctive broad margin around the estuaries of southwest Florida. They cover several thousand acres and may extend inland several miles from open water. Mangroves perform vital, irreplaceable roles in providing food for species such as striped mullet ( ) and pink shrimp ( ), habitat for birds and wildlife, and they buffer inland areas from storm surges. Southwest Florida mangrove species include red ( ), black ( ), white ( ) and buttonwood ( ). Mangrove systems have the highest measured annual productivity of any system measured in the world. They are critical to the world's carbon balance.

Lsbo qeb vb^op) aobadb*^ka*ªii lmbo^qflkp e^sb reduced about 25 percent of the mangrove habitat in the CHNEP study area. In addition to direct loss, ro_^k ^ka ^dof`riqro^i orklcc `e^kdbp t^qbo «l t p ql fkqbocbob t fqe qeb _bkbª`f^i crk`qflkp mboclo j ba by mangrove systems. The high cost of developing mangrove habitat is ultimately paid by taxpayers in qbo j p lc «l l a a^ j ^db) pelobifkb bolpflk ^ka t ^qbo quality corrections. Despite increased regulation, cutting and trimming continues to threaten mangroves.

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 `l j j bo`f^i ªpebofbp _v prmmivfkd e^_fq^q clo ªpe+ Spotted seatrout ( ), for example, live out their entire lives within seagrass beds. Seagrasses provide habitat for a wide variety of sea life, giving the beds a high recreation value for shelling and snorkeling.

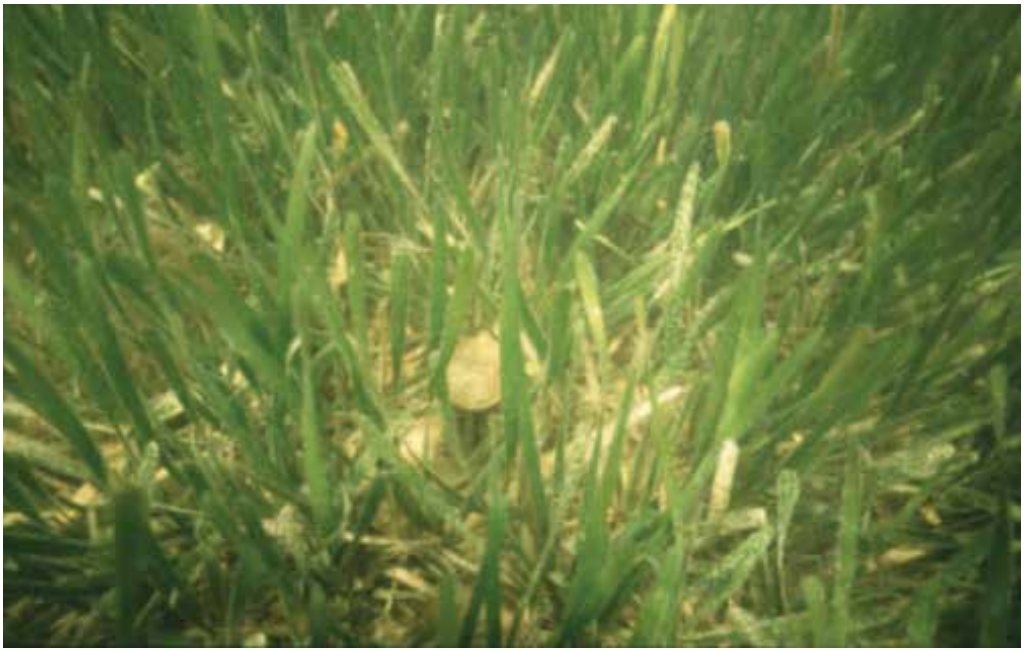


Photo by Jaime Boswell, 4/13/05

the severity and extent of scarring since the 1995 effort. Simultaneously, the region faces the pressures of a robust tourism industry and a rapidly growing population, which includes an increase in boating activities as well as dock and marina construction. A study of docks constructed over grass beds in Pine Island Sound and San Carlos Bay found that boat propeller dredging was roughly one-third the area of the docks and that seagrass loss in dock "shadow" areas correlated with the total size of each a l `h %I l«fk .662&+

One study (Harris et al., 1983) documented a 29 percent Harborwide decrease in seagrass coverage from the 1940s to 1982, excluding Estero and Lemon bays. The study found that most of this loss was located in southern Charlotte Harbor and was a result of the dredging of the Intracoastal Waterway and construction of the Sanibel Island Causeway. These researchers also found losses throughout the Harbor and suggested some of this resulted from seagrasses receding from deeper depths due to decreasing water clarity resulting from hydrologic changes and increased pollutant loads. Since systematic mapping of seagrass started in 1988, seagrass coverage remains stable (Corbett 2006), although there are signs of losses in the thickness in which seagrasses grow and a change to less stable seagrass species, which may be a precursor to larger-scale losses (Greenawalt-Boswell et al., 2006).

Loss of seagrass by the scarring of seagrass beds by _l^q molmbiibop e^p _bbk ^ pfdkf^{a}`^kq fpprb fk qeb entire Charlotte Harbor region. Because Charlotte Harbor is shallow, it is vulnerable to the propeller dredging of inexperienced or imprudent boaters. A 1995 effort by the Florida Fish and Wildlife Research Institute (Sargent et al., 1995) determined that the Charlotte Harbor region is one of the most heavily scarred areas in Florida, while a more recent update by the CHNEP (FWRI 2003) found an increase in

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 ( ), 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.

Until the 1920s, the landscape of the CHNEP study ^ob^ t^p j lpqiv mfkb «^q t l lap+ Lkb lo j lob mfkb species grow 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 and until the resource was commercially bue^rpqba+ ?v .654) mfkb «^q t l l ap e^a ao l mmba to sixth place in area coverage, behind grasslands, cypress swamp, dry prairies, freshwater marsh and urban areas.

Throughout the CHNEP study area, improved pasture, citrus, vegetable farms and urban development e^sb `l j j lkiv obmi^`ba mfkb «^q t l l ap+ Afpmi^`ba animal inhabitants include the pileated woodpecker ( ), American kestrel ( ), sandhill crane ( ), black bear ( ), Florida panther ( ), eastern indigo snake ( ) and gopher tortoise ( ).

Within the CHNEP study area, both oak scrub and p`or__v «^q t l l a b`lpvpqb j p mo l sfab ^kf j ^i e^_fq^q pf j fi^o ql mfkb «^q t l l ap+

Various species of oak, as well as saw palmetto ( ), Florida rosemary ( ) and fetterbush ( ), dominate oak scrub habitat. Ground cover is generally sparse and is dominated by grasses, herbs and ground lichens. Occurring along coastal shorelines, ridges, tributaries and rivers such as the Caloosahatchee, it has been vulnerable to urban development.

The CHNEP study area also includes scrubby «^q t l l ap+ Pf j fi^o ql p^ka mfkb p`or_) qeb pl rqe Florida slash pine ( ) generally dominates this community. Typical understory consists of wiregrass ( ) and herbs. Ob j ^fkfkd pq^kap lc p`or__v «^q t l l a e^sb _bbk severely depleted by selective- or clear-cutting of qeb mfkbp+ Arb ql qeb «^q t l l a$p o^mfaiv mbo`li^qfkd soils and high elevations, citrus groves and residential development commonly displace this habitat.

Based on historical estimates, slightly more than 1 percent of oak scrub communities remain and only .- mbo`bkq lc p`or__v «^q t l l ap+ Ci^q t l l ap) ^iqe l rde providing critical habitat, are quickly disappearing from the landscape.

Many nonnative plant species now invade and displace natural habitat in the CHNEP study area. A partial list of “out-of-control” species includes:

Pinelike trees introduced a century ago for windbreaks and erosion control along coastlines; toppled by winds; displaces coastal vegetation and spreads easily.

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.

Fast-growing, white-barked tree intended for windbreaks and draining of wetlands; forms dense thickets, displacing wildlife; very common throughout southwest Florida and the Everglades and is spreading northward; eradication effort is a constant battle.

Aquatic plant that entered Tampa in 1950s; grows dense strands of whorled leaves that choke water bodies and deplete luvdbk8 afpmi^`bp k^qfsb mi^kqp ^ka ªpe8 `lkqo li efforts making steady progress.

Large «l^qfkd mi^kq t fqe a^oh dobbk ib^sbp ^ka i^sbkabo «l t bop8 fkqo l ar`ba fk qeb .5--p8 pil t p t ^qbo «l t ^ka boats; depletes oxygen; increasingly managed, which also assists hydrilla control.

Introduced in 1911 for cattle forage and soil stabilization; found not ql _b dl l a clo^db clo `^qqib8 `^k fk`ob^pb ªob fkqbkpfqv8 invades native habitats, agricultural forests, roadsides, phosphate mining lands and altered pinelands; takes over large areas, crowding out native species.

First fabkqfªba fk @^mb @lo^i ^p ^ mo l_ib j ^cqbo qeb adoption of the CCMP in 2000; a nuisance animal that can prey on native animals and small pets.

L ro ^`qf lkp ql ^aaobpp ªpe ^ka t fiaifcb e^_fq^q il pp can be found on pages 105 to 121.

Economic activities in the watershed include tourism, agriculture, phosphate mining, `l j j bo`f^i ªpefkd) pmloqªpefkd) pebiiªpefkd ^ka residential land uses.

Photo by Lisa Beever, 9/11/07

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.

On a regional basis for central Florida, tourism is considered the "third industry," behind citrus and phosphate mining. In the upper Peace River basin, tourists are attracted to Cypress Gardens, Bok Tower and its botanical gardens, and major league baseball training sites. Tourists and winter visitors are drawn to natural resource attractions in the inland parts of the CHNEP study area such as the Winter Haven Chain of Lakes, the Peace River and the Highlands Hammock Pq^qb M^oh+ @^klbfkd ^ka cobpe t ^qbo ªpefkd ^ob common attractions in central Florida lakes, canals and rivers.

In coastal southwest Florida, tourism has been an important element of the economy since the nineteenth 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. Coastal residents and tourists alike enjoy renowned _l^qfkd ^ka ªpefkd) ^ j labo^qb `if j ^qb) pebiifkd ^ka bird watching and spring baseball training. Attractions include a number of state parks in CHNEP's coastal area. Polluted water and red tide threaten the tourism economy of the area.

Agriculture is the economic anchor in the area, second only to tourism. 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 2006, a total of 193,000 acres of land in the CHNEP study area was dedicated to citrus — 30 percent of all Florida citrus acreage.

Other crops are characteristic of the region. Manatee County produces more cucumbers than any other county in the state. Lee County is ranked second for j ^kdlbp) ªcqe clo _bbp ^ka kfkqe clo `r`r j _bop+ @e^oilqqb fp o^khba ªcqe clo o^__fqp ^ka pfuqe clo t ^qbo j bilkp+ E^oabb @lrkqv fp o^khba ªcqe fk `^qqib ^ka ªcqe fk lo^kdb molar`qflk+ AbPlql @lrkqv fp ranked sixth in cattle, fourth in oranges and fourth in sod production. Approximately 35 percent of the land in the CHNEP study area is dedicated to agriculture.

Beef cattle follows citrus in economic importance. In 1996, Polk, Hardee, DeSoto and Manatee counties ranked in the top 10 beef producers in Florida. Hardee County leads the region in dairy production with

8,000 cows, and Polk County was the second largest egg producer in Florida.

Ranches occupy vast areas of the CHNEP study area. These ranches are predominantly cow/calf ranches rather than dairies. Calves born throughout the watershed are shipped to Midwestern and Plains states where they can be fed abundant and inexpensive corn. Ranching is a relatively benign land use. Fencing interferes 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 required pesticide use at cattle dipping vats are now prohibited and remediated.

Agricultural land clearing, leveling and drainage improvements transform habitats. The greatest water demand in Florida is for agriculture (FDEP 2000). Overpumping of the Floridan aquifer has caused large decreases of the groundwater pressure and also increases the potential for saltwater intrusion. Mineralized groundwater use for irrigation purposes may leave agricultural areas by runoff or seepage ^ka ^aa ql pqob^ j «l t p ^ka `e^kdb qeb k^qro^i t ^qbo chemistry of Myakka and Peace River tributaries. Cboqfifwbop ^ka mbpqf`fabp) t ef`e j ^v ª ka qebfo t ^v to surface and ground waters, are addressed through recently adopted agricultural best management practices.

Economic pressures endanger future ranching. The federal tax code can compel families to sell farms in order to pay estate taxes. Others will lease ranch land to citrus or tomato producers that often degrade land, soils and water. Despite greenbelt exemptions, development potential has raised the tax costs of some ranches to critical levels as nearby rural lands are developed. Citrus falls unpicked as crop prices «r`qr^qb rkmobaf`q^_iv+ @fqorp `^khbo ^ka `fqorp greening have also added unpredictable aspects to growers. Preserving the economic viability of ranches and family farms while at the same time providing for regional ecological integrity is one of our greatest challenges. The rural quality of the region depends on the maintenance of our ranching heritage.

Qeb melpme^qb fkarpqov fp ^ pfdkfª`^kq c^`qlo fk resource management within the CHNEP watershed. The "Bone Valley" phosphate deposit of more than 500,000 acres lies mainly within the Peace River watershed. This deposit is a large resource within North and South America. Mineable reserves within the Bone Valley deposit are projected to last at least an additional 40 years. The deposit provides approximately 75 percent of the phosphate required by U.S. farmers 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. Approximately 6 percent of the land in the CHNEP study area is dedicated to phosphate and rock mining.

The phosphate industry is an important segment of the economy within the central and northern portions of the CHNEP watershed. The Florida phosphate industry employs more than 5,000 people with a total annual payroll of more than $400 million. In addition, the industry contributed nearly $86 million in severance, property, sales and other taxes in 2003.

Qeb ªopq !.- j fiif1k `liib`qba fk pbsbo^k`b q^u b^`e year is directed to the Florida Forever Trust Fund. The state of Florida uses this money to purchase environmentally sensitive lands. Since 1979, the state land acquisition program has received more than $530 million from the phosphate industry severance tax. A

Photo courtesy of László Bencze/ Mosaic Fertilizer, 2005

pfdkfª`^kq j ^glofqv lc qebpb crkap e^sb _bbk pmbkq on the acquisition of environmentally sensitive lands elsewhere in Florida. Since 1975, all mined lands are required to be reclaimed to the landforms that existed prior to mining. Today, all lands are reclaimed with native plant species. Current industry practices promote coordinated reclamation, allowing for the integration of habitat networks and habitat buffers in protected environmentally sensitive areas.

J fkfkd ^ka ob`i^ j ^qflk mol`bppbp e^sb pfdkfª`^kqiv changed the landform of large areas within the CHNEP watershed. However, with the advent of regulation in the 1970s, subsequent regulatory enhancements and improved mine planning and operating techniques, environmental impacts have been reduced. The visual impact of mining, especially mofloql ob`i^ j ^qflk) fp kbsboqebibpp pfdkfª`^kq+ Ob^i and perceived environmental impacts due to mining ^ka `eb j f`^i mol`bppfkd ^ob ^ plro`b lc pfdkfª`^kq public concern. The nature of that concern contributes toward differing perspectives of the industry held by citizens of the CHNEP study area.

@e^oilqqb E^o_lo fp efdeiv pfdkfª`^kq ql Cilofa^ ^p a nursery ground for marine and estuarine species. Up to 90 percent of commercial and 70 percent of recreational species landed (caught) in Florida spend ^ii lo m^oq lc qebfo ifsbp fk bpqr^ofbp+ Qeb j ^fk ªpebov species of commercial and recreational value in the CHNEP study area include black mullet ( ), spotted seatrout (&) oba ªpe ( ), black drum ( ), hfkdªpe % pmm&) plrqebok «lrkabo ( ), blue crab ( ), pink shrimp ( ), stone crab ( ), southern hard clam ( ), snook ( ), tarpon ( ), grouper (spp and spp), black sea bass ( ), snapper (spp), Florida pompano ( ), _irbªpe %), sand seatrout ( ), Spanish and king mackerel (and), sheepshead ( ) and several species of sharks.

Photo by Catherine Corbett, 8/29/07

Ob`ob^qflk^i ªpefkd fk cobpe t ^qbo `obbhp) ofsbop and lakes is a popular pastime in inland counties. Snook ( ) are caught as far rmpqob^ j ^p Cloq J b^ab) t efib cobpe t ^qbo ªpe pr`e as largemouth bass ( ), black crappie ( ), gar (s) and the exotic species blue tilapia (&^ob ^ipl efdeiv mofwba d^ j b ªpe throughout the CHNEP study area.

The bountiful waters off Charlotte Harbor provide pl j b lc qeb _bpq p^iq t ^qbo pmloqªpefkd fk qeb t loia+ Snook ( ), tarpon (&) oba ªpe %) and spotted seatrout ( ) are just a few game ªpe clrka ebob+ Lkb lc bsbov qeobb qlrofpqp `l j bp ql Cilofa^ ql ªpe+ >p ^ obpriq) qeb @e^oilqqb E^o_lo obdflk abofsbp pr_pq^kqf^i b`lkl j f` _bkbªqp col j the maintenance of a healthy estuarine and coastal pmloq ªpebov+ Fq fp afcª`riq ql bpq^_ifpe ^ mob`fpb monetary value because of the industry's close relationship to tourism facilities and service, but the Florida Department of Environmental Protection data indicate that 21 percent of our population engages in ob`ob^qflk^i ªpefkd) ^ka qlq^i ^kdifkd fk qeb obdflk exceeds $1.1 billion annually.

J lob qe^k /42 pmb`fbp lc pebiiªpe ^ob clrka throughout the waters of the Charlotte Harbor estuaries. In the ancient past, the Calusa Indians of southwest Florida gathered enormous amounts of pebiiªpe ^ka `lkpqor`qba fj j bkpb j lrkap col j the shell. These shell mounds still dot the coastal landscape of the CHNEP study area, and some are protected as state archaeological sites.

In the more recent past, oysters (
), clams (
) and scallops (
) were harvested commercially and recreationally throughout Lemon Bay, Gasparilla Sound, Charlotte Harbor and Pine Fpi^ka Plrka+ Qeb ebfdeq lc qeb pebii ª pe fkarpqov fk the Charlotte Harbor area occurred during the 1940s. Pfk`b qebk) qeb `l j j bo`f^i e^osbpq lc pebii ª pe e^p been declining with the disappearance of the scallop ª pebov fk Mfkb Fpi^ka Plrka fk qeb b^oiv .63-p+

Pebii ª pe ^ob ^ obif^_ib j b^prob lc qeb bksfolk j bkq^i eb^iqe lc ^k bpqr^ov+ ?b`^rpb pebii ª pe cbba _v ª iqbofkd bpqr^ov t ^qbo) qebv ^ppf j fi^qb ^ka `lk`bkqo^qb materials carried in the water. In clean water free from _^`qbof^) oba qfab ^ka lqebo mliirq^kqp) qeb pebii ª pe `^k be safely eaten year round. In areas of the estuaries affected seasonally by red tide or nearby urban areas, pebii ª pe j ^v klq _b p^cb ql `lkpr j b+ Qebobclob) pebii ª pe j rpq _b j lkfqloba obdri^oiv ql molqb`q mr_if` health. Currently, about one-third of Pine Island Plrka fp ^mmolsba clo pebii ª pe e^osbpqfkd vb^o olrka+ 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 ql pebii ª pe e^osbpqfkd qeolrdelrq qeb vb^o arb ql measured or probable bacterial contamination.

The importance of healthy waters for safe pebii ª pebofbp e^p q^hbk lk ^ kbt pfdkf ª `^k`b in Charlotte Harbor. A 1995 state constitutional amendment precluded the use of typical nets used fk `l j j bo`f^i ª pefkd+ J ^kv lc qeb `l j j bo`f^i ª pebo j bk fk qeb @e^oilqqb E^o_lo ^ob^ qllh advantage of training aquaculture programs. Areas of the submerged estuary bottomlands are leased ql fkafsfar^ip _v qeb pq^qb clo pebii ª pe ^nr^`riqrob+ Areas where such leases have been issued include Gasparilla Sound and Pine Island Sound. Marine pebii ª pe ^nr^`riqrob fk @e^oilqqb E^o_lo fp mof j ^ofiv hardshell clams (
). Clams require proper salinity, oxygen and nutrients to grow at a reasonable rate, as well as good water quality to be safe to eat.

The land-sale development that began in the 1950s dramatically and permanently changed the character and use of the land. Pastures and croplands were drained and cleared and coastal lowlands were aobadba ^ka ª iiba ql `ob^qb absbilm^_ib el j b pfqbp _v the tens of thousands. The land was subdivided, canals were dug and streets were paved. 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, Bonita Springs, Sanibel, Cape Coral, Port Charlotte, North Port, Punta Gorda, Englewood and Venice have expanded and grown.

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, «l t bo ^ka sbdbq^_ib `olmi^ka fp _bfkd o^mfaiv displaced by urban land uses. Since so much land has ^iob^av _bbk `lksboqba) il`^i dlsbok j bkqp j ^v ª ka fq mobcbo^_ib ql bk`lro^db kb t absbilm j bkq ql fk ª ii platted areas before covering additional high-quality habitat areas or existing agricultural areas.

Measuring the economic value of the environment ^ka fqp nr^ifqv fp ^ afc ª `riq ^ppbpp j bkq+ Although the value is rarely considered, the economic value associated with the current uses of our obplro`bp) pr`e ^p q^omlk ª pefkd fk qeb Mb^`b Ofsbo or “nonuse” values such as the wetlands naturally providing treatment of storm water, are extremely important to the regional economy. A functional environment provides clean drinking water for our homes, soil and nutrients for our crops and wading birds and other wildlife to complement a canoe trip through the mangroves. None of these resources are limitless, although they are often treated as such.

Tourists and residents are drawn to southwest Florida because of many natural amenities. Tourists demand clean beaches or they will seek other destinations with their vacation dollars. Likewise, residents are entitled to a healthy community and yet they have a stewardship responsibility to ensure its health. 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 economies of DeSoto, Hardee, Polk and Manatee counties, while tourism and residential and commercial development play the dominant role in the coastal economies of Sarasota, Charlotte and Lee counties. 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 nonuse satisfaction levels dependent on natural resources.

Many economic activities are affected by environmental quality. The natural habitats, water nr^ifqv ^ka cobpe t ^qbo «l t p j ^fkq^fk qeb ^ j bkfqfbp ^ka k^qro^i obpl ro`bp kb`bpp^ov ql prpq^fk ªpefkd) tourism, recreation and the businesses that sustain these activities. Agriculture requires that the water used for irrigation and livestock meet certain water quality standards. Mining operations require adequate quantities of water, but they are also charged with meeting state water quality regulations for any water they release. The quality and economic output of the activities is dependent on the extent and quality of the natural resources.

>ii obpfabkqp _bkbªq b`lkl j f`^iiv col j qeb k^qro^i resources of the CHNEP study area. The multibillion alii^o ^dof`riqrob) `e^ j mflkpefm ªpefkd ^ka ql rofp j industries are directly related to the quality of the environment. Natural resources provide jobs and industry earnings as well as other public and private _bkbªqp) pr`e ^p ob`e^odfkd dolrka t ^qbo ^nrfcbo t ^qbo prmmifbp ^ka molsfafkd ªpe ^ka t fiaifcb e^_fq^q+

Assessments of the value of natural resources 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 CHNEP study area natural resources—consumer surplus and total income.

Consumer surplus may be thought of as consumer ¦molªq+´ >iqelrde qefp j lkbv albp klq ^`qr^iiv 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 t lria ob`bfsb ^ !/- _bkbªq fk `lkpr j bo promirp+

Total income cannot be added to consumer surplus, fq pf j miv ob«b`qp s^irb afccbobkqiv+ Fq fk`irabp fk`l j b from direct, indirect and induced wages. Any business that relies on natural resources to make money usually requires goods and services from other businesses. Typically, this support includes food, transportation, rqfifqfbp) lcª`b prmmifbp ^ka molcbppflk^i pbosf`bp+ These related goods and services also produce an fk`l j b ^ka ^aafqflk^i _bkbªqp) pr`e ^p gl_p+

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 regional 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 CHNEP study area supports 124,000 full-time and part-time jobs and $6.8 billion in total sales annually according to the 1998 study commissioned by the CHNEP. 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 2 (p. 32) 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 _fiiflkp lc alii^op fk ^kkr^i _bkbªqp) t b ob`bfsb rk`lrkqba _bkbªqp) pr`e ^p `ib^k ^fo ql _ob^qeb lo qeb p`bkf` _b^rqv lc ^ ofsbo¬s^irbp afcª`riq ql nr^kqfcv vbq still tied to the quality of the environment.

What happens to these counted and uncounted b`lkl j f` _bkb^qp fc lro k^qro^i obplro`bp ^ob damaged? Certainly the number of wildlife will ab`ifkb ^ka pl tfii lqebo k^qro^i _bkb^qp pr`e ^p purifying and recharging our drinking water supply. While jobs in mining or construction may be created, if there are declines in environmental quality, more environmental jobs may be destroyed and higher pollution costs imposed.

Photo by Lisa Beever, 8/3/07

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-qbo j `lpqp ^ka _bkb^qp< Clo bu^ j mib) _rfiafkd ol^ap and causeways not only increases access to public lakes, trails and beaches, but it also increases the value of adjacent private lands for more intensive use. Therefore, the cost of such new facilities should fk`irab qeb k^qro^i _bkb^qp ilpq klq lkiv col j qeb right-of-ways, but also from the adjacent lands opened up for urban development. Do we consider these total costs when planning for the future?

Economic assessments help 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.

Total Economic Valuation (TEV) of ecosystem services is needed to understand impacts of decisions. With CHNEP and Dunn Foundation assistance, the Southwest Florida Regional Planning Council and the Sanibel-Captiva Conservation Foundation modeled TEV for the Pine Island Sound subbasin. The report is expected to be published in 2013. At the time of this writing, this small portion of the study area is valued at more than $7 billion. Furthermore, land-use development is expected to reduce these services by 16 percent.

Table 2: Annual 1998 Consumer Surplus and Annual Total Income in the CHNEP Study Area

Tourism and 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
Nonuse Value of Wetland Areas in the CHNEP Study Area	884,028,344	Not applicable

Source: CHNEP, Hazen and Sawyer, 1998

Land-use changes are constantly occurring in the CHNEP study area. The CHNEP reviewed land-use planning efforts as part of an evaluation of the region's environmental management. This analysis fk`iraba fkclo j ^qflk ^_lrq pmb`fª` il`^i fpprbp ^ka how government and property owners make land-use decisions. Year 2009 land uses are shown in Map 8 (p. 36). The following activities and land-use decisions affect environmental management:

- Residential land sales since the 1950s dramatically and permanently changed land-use patterns. Ilti^kap tbob aobadba ^ka ªiiba ^ka m^pqrobp and cropland 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. Shoreline development has transformed mangrove fringe and other wetland systems to canals, seawalls and riprap.
- Tourist surveys indicate that water and beaches remain the top attractions for visitors. The total coastal population in Charlotte, Lee and Sarasota counties now increases by more than 30 percent 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.
- Surface or "strip" mines extract phosphate rock in Polk, Hardee and Manatee counties. Phosphate reserves in DeSoto County may also be mined someday. Although early operations went unchecked, regulation has reduced pollution and water conservation has resulted in the industry currently recycling 95 percent of the water required for its operation. However, mining operations may result in some changes to water quality, disrupt 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. 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.

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 oversight. 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 this CCMP. Most gaps in local policies concern point-source pollution ^ka cobpe t^qbo fk«l tp qe^q ^ob rpr^iiv obdri^qba _v regional and state agencies.

Growth requires improved management of urban and rural resources. Census-designated urban areas e^sb dol tk+ Fk .65-) ro_^k ^ob^p tbob `lkªkba ql small areas within Lakeland/Winter Haven and Cape Coral/Fort Myers. By 2000, all counties within the CHNEP study area, except Manatee County, have census-designated urban areas (see Map 9, p. 37). In 2000, there were 1,052,344 residents in the CHNEP study area. The CHNEP study area population nearly doubled between 1980 and 2000. By 2025, the CHNEP study area population is projected to be more than 1,750,000.

Under current local government comprehensive plans with planning horizons of 2025 to 2040, urban uses and more intensive agriculture and phosphate mining are expected to increase. It is anticipated that improved environmental performance in urban, farming and mining activities may minimize the impacts of those operations on water quality and quantity degradation.

Not surprisingly, most local plans assume a majority of new residents will continue to choose traditional single-family housing or multifamily apartment/ condominiums. Together with supporting commerce,

lc[a]`b ^ka fkarpqof^i development, the plans project that these urban uses t fii q^hb lsbo ^ [a]cqe of the region's land area by the year 2025. At the same time, areas devoted to natural preserves and water resources are not projected to grow at the same pace.

Photo by Lisa Beever, 3/19/04

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 degradation, hydrologic alterations, habitat loss and stewardship gaps with regard to predicted growth and development.

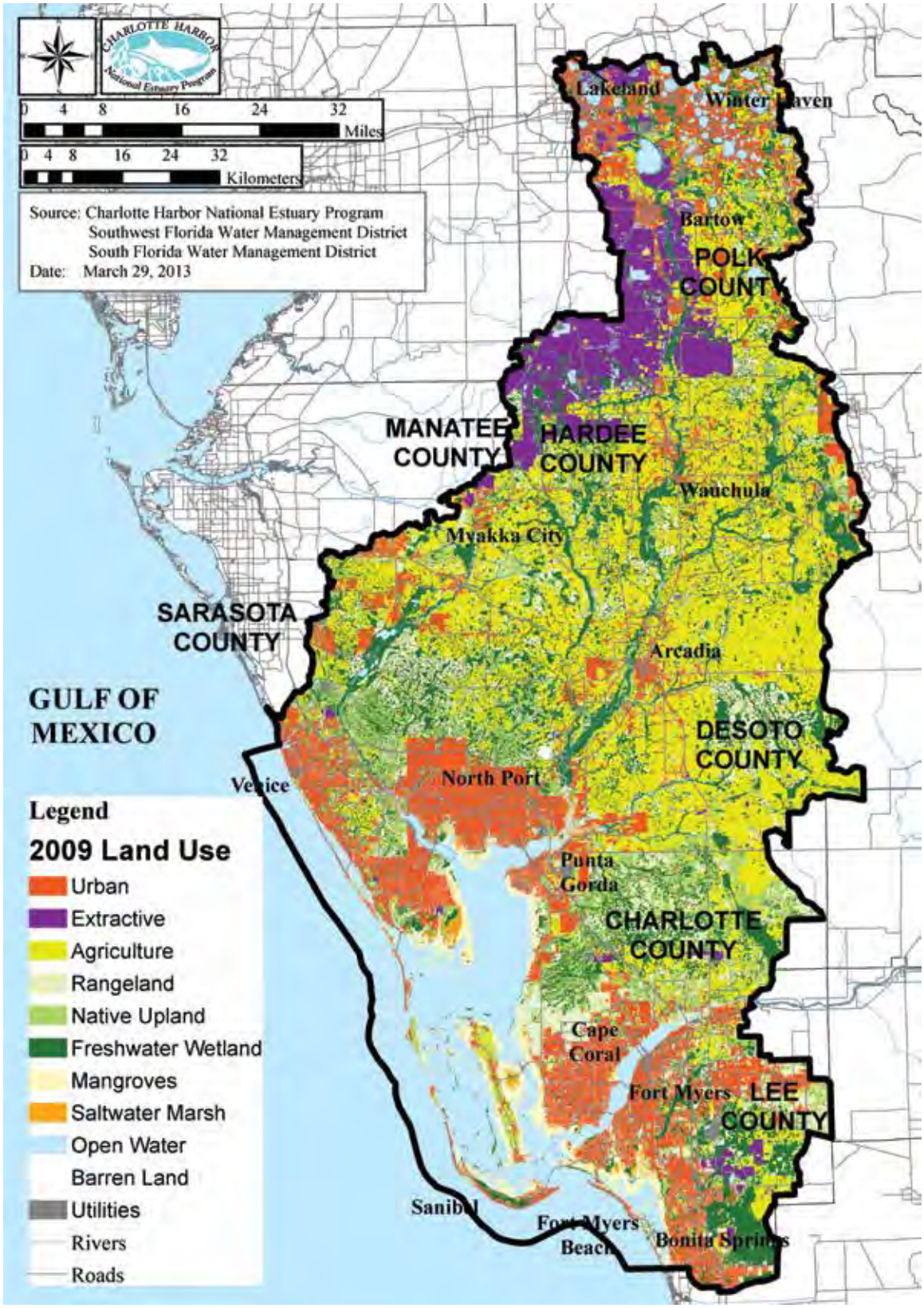
Growth and environmental stewardship are not exclusive. Vibrant communities require ongoing sustainability of economic, residential and environmental interests. Growth is inevitable and it can be done well. To do so, responsible decisions and behavior must be made by all stakeholders. The need for sustainable growth is critical to closing stewardship gaps.

Growth is a driving force behind the Florida economy. Efforts have been made to ensure that new growth will have as little impact on the environment as possible. Even so, growth is a great threat to the environment and to the quality of life in the already existing communities.

Residential and economic growth results in a constant demand for resources and places a strain on our most beautiful and most ecologically fragile land. Growth can divert large quantities of water away from the rivers, bays and estuaries and can degrade water quality. Growth certainly disrupts native habitat and wildlife. In addition, existing communities are falling further and further behind in providing roads, schools and other public infrastructure necessary for life.

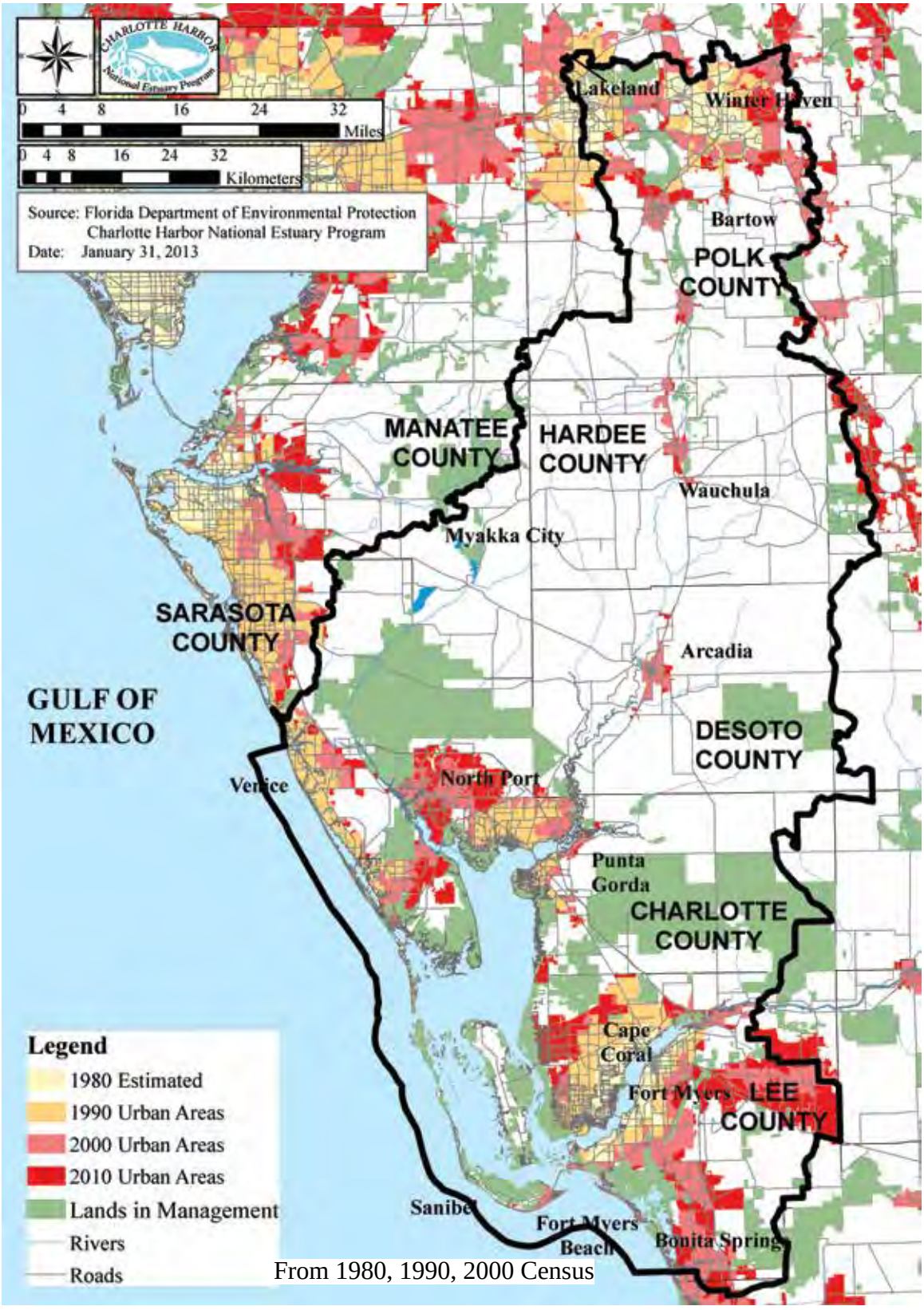
Everyone wants to live near the water or enjoy the great recreational opportunities the water provides. At the same time, however, we also want to preserve the great natural beauty and wildlife that surrounds us and the "Old Florida" quality of life that attracted us. We each must become stewards of our environment and advocate for sustainable, vibrant communities that at-q[o]^`qba rp ebob fk qeb [a]opq mi^`b+

It is important to keep our community well informed with meaningful information about the environmental changes and alterations caused by growth in our region. This level of awareness and knowledge translates into behavior changes that eventually can result in personal actions required to maintain a sustainable future.



Map 8: 2009 Land Use

Both the Southwest and South Florida water management districts map land uses using the Florida Land Use @lab ^ka @i^ppfª`^qflk Pvpqb j %CIR@@P&+ Qeb i^ka rpb j ^m clo /--6 fiirpqo^qbp qeb afpqof_rqflk lc ro_^k) extractive, agriculture, wetlands and uplands within the CHNEP study area.



Map 9: Urbanized Area Growth

Qeb @bkprp ?rob^r fabkqf^{a}bp ro_^kfwba ^ob^p t fqe ^ abkpfqv lc ^q ib^pq .)--- mblmib mbo pnr^ob j fib+ In 1980, the only urbanized areas within the CHNEP boundaries were Fort Myers/Cape Coral and Lakeland/Winter Haven. By 1990, these areas had increased in size and Venice/Englewood and Punta Gorda/Port Charlotte were added. By 2000, these areas expanded and new urban areas included coastal Estero, Lehigh Acres, North Port, Arcadia, Wauchula, Fort Meade and Bartow. Lands in management that may function as urban buffers are green.

Managing Partnerships

A network of existing public and private organizations, in addition to citizen volunteers, creates the CHNEP. These organizations manage resources in different capacities including issuing permits, conducting research, monitoring water quality and educating the public about natural resources. The large study area of the CHNEP and the interconnected jurisdictions of public and private institutions have created both management opportunities as well as critical gaps in our complex legal and organizational framework. This chapter _ofb«v pr j j ^ofwbp qeb j ^k^db j bkq `lkkb`qflkp qe^q have been made to successfully address problems, as well as the continuing management challenges that need to be resolved.

This CCMP is designed to focus efforts on the region's most important issues and to encourage the many local organizations to work together to plisb mol_ib j p+ Qefp pb`qflk) qebobclob) fabkqfªbp the organizations in the region that are working ql j ^k^db lro obplro`bp+ Lk`b fabkqfªba) qeb olib of each organization is determined by its mission, jurisdiction, legal authority and budget. This chapter summarizes the environmental organizations in the CHNEP study area and their areas of management. With this information, the CHNEP can build on the existing management infrastructure to work together for implementation of this CCMP.

Photo by David Modal, 7/13/99

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

- 24 cities and towns
- 7 counties
- 3 regional planning councils
- 2 water management districts
- 26 divisions of 8 state agencies
- More than 80 special districts, including aquatic plant control, community development, conservation and easement, soil and water conservation, water control and water and sewer
- 8 federal agencies
- 16 private science or resource management groups
- 14 land trusts

Local governments manage natural resources through their considerable authority for zoning, land use, transportation planning and local ordinances. In the CHNEP study area there are 7 counties and 24 cities and towns.

Each local government has its 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.

Regional organizations include regional planning councils and water supply authorities.

The Central Florida, Southwest Florida and Tampa Bay regional planning councils use their strategic regional policy plans to review and coordinate local plans and large developments of regional impact. 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 CHNEP.

Four counties in the CHNEP created the Peace River/Manasota Regional Water Supply Authority. Representatives from Manatee, Sarasota, Charlotte and DeSoto counties 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 agencies play important roles in the region's management. Policies in the State Comprehensive Plan form a framework for all Florida 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
- Florida Land and Water Adjudicatory Commission
- Attorney General
- Forestry Division of Agriculture
- Education Commissioner and Department
- Fish and Wildlife Conservation Commission (FWC)
- Florida Department of Environmental Protection (FDEP)
- Department of Health (DOH)
- Florida Department of Transportation (FDOT)
- Pq^qb Lcª`b lc Qo^ab ^ka Qourism Development
- South and Southwest Florida water management districts (SFWMD, SWFWMD)

State agencies report to the Governor and Cabinet and are administered through a series of district ^ka `bkqo^i lcª`bp+ Pq^qb mbo j fq) bkclo`b j bkq ^ka planning functions play important roles not often covered by local or federal efforts.

The SWFWMD and the SFWMD make up part of a statewide system of water management districts created by the state Legislature. Responsibilities of water management districts include water supply, «l la molqb`qflk) k^qro^i pvpqb j p ^ka t ^qbo nr^ifqv+

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), including National Oceanic and Atmospheric Administration (NOAA) and National Marine Fisheries Service (NMFS)
- Department of Defense (DOD), including Army Corps of Engineers (ACOE)
- Department of Housing and Urban Development (HUD)
- Department of the Interior (DOI), including U.S. Geological Survey (USGS) and U.S. Fish and Wildlife Service (USFWS)
- Department of Transportation (DOT)
- 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 that is ultimately put to use at the state and local levels. Most federal agencies have il`^i lo obdflk^i lc$^{a}$`bp qe^q ^ob `e^odba t fqe pmb`f^{a}` project and regulatory responsibilities. Although policy consistency between regions is sometimes an fpprb) qeb mobpbk`b lc obdflk^i lc^{a}`bp bke^k`bp il`^i expertise and accessibility for local organizations.

In addition to the local, regional, state and federal ^dbk`fbp) mofs^qb dolrmp ^ka klkmol^{a}q lod^kfw^qflkp are important contributors to environmental management. These groups often target their efforts toward 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, Lemon Bay Conservancy, Environmental Confederation of Southwest Florida, Sanibel-Captiva Conservation Foundation, Lakes Education/Action Drive and the Gasparilla Island Conservation and Improvement Association.

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

Photo by Lisa Beever, 9/14/07

Watershed Management

At the federal level, the U.S. Constitution c^fip ql molsfab ^kv pmb`fª` obpmlkpf_fifqv for maintaining environmental quality. Lsbo qf j b) @lkdobpp ^ka qeb `lroqp e^sb abªkba qeb 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 3 below illustrates that seven federal agencies, in addition to EPA, share seven distinct management functions, resulting in 33 different programs within the CHNEP study area.

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 pfdkfª`^kqiv+ >ipl) ^p `lkdobppflk^i crkafkd `e^kdbp 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. The Florida Fish and Wildlife Conservation Commission receives authority from the state Constitution. The other state agencies receive ^rqelofqv col j pmb`fª` Cilofa^ Pq^qrqbp+ Qldbqebo qebv share seven management functions, resulting in 54 program areas as illustrated in Table 4 (p. 41).

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.

Local and regional agencies include cities, counties and water supply authorities. In the CHNEP study area, the Peace River/Manasota Regional Water Supply Authority provides water to Sarasota, Manatee, Charlotte and DeSoto counties. The regional water supply authority, cities and counties share seven management functions and 30 program areas, as shown on Table 5 (p. 42).

Table 3: Federal Agency Management Roles

Environmental Protection Agency							
Department of Agriculture							
Department of Commerce							
Defense/Army Corps of Engineers							
Housing and Urban Development							
Department of the Interior							
Department of Transportation							
Federal Emergency Management Agency							

Source: CHNEP, , Volume 1, 1998

Table 4: State Agency Management Roles							
Board of Trustees of the Internal Improvement Trust Fund							
Florida Land and Water Adjudicatory Commission							
Attorney General							
Department of Agriculture Forestry Division							
Commissioner and Department of Education							
Department of Economic Opportunity (was Community Affairs)							
Department of Environmental Protection							
Department of Health							
Department of Transportation							
Fish and Wildlife Conservation Commission							
South Florida Water Management District							
Southwest Florida Water Management District							

Source: CHNEP, , Volume 1, 1998

Table 5: Local and Regional Agency Management Roles							
Cities							
Counties							
Water Supply Authorities							

Source: Discussions with members of the CHNEP Management Conference

With this overlapping framework of federal and state organizations, both problems and opportunities are inevitable. Within each priority problem category of water quality degradation, evaolildf` ^iqbo^qflkp) ªpe ^ka t fiaifcb e^_fq^q ilpp) and stewardship gaps there are good management connections as well as management gaps. During qeb mi^kkfkd me^pb) qeb @EKBM fabkqfªba qeb _bpq 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 four priority problem areas.

Management connections for hydrologic conditions such as restoring groundwater levels and maintaining ecologically balanced river «l t p ^ob f j mloq^kq+ T^qbo obplro`bp al klq rpr^iiv 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-qbo j eb^iqe lc t^qbo «l t p ^ka ibsbip+

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 and power plant sitings provide good examples of reviews qe^q `lkpfabo obdflk^i bccb`qp) klq grpq pfqb*pmb`fª` considerations.

Although surface and groundwater data are not complete, land acquisition programs, such as Florida Forever, consider freshwater conditions to prioritize i^ka m^o`bip t fqe qeb j lpq t^qbo molqb`qflk _bkbªqp+

Water use permits must meet the strong legal test lc mr_if` _bkbªq+ >p ^dbk`fbp ªii fkclo j ^qflk d^mp) mr_if` _bkbªq j ^v _b bum^kaba ql `lkpfabo ilkd*qbo j regional impacts when issuing water use permits.

The guiding rule for drainage permits requires stormwater management after development to equal or improve conditions before development.

Hydrologically oriented permit programs have helped reestablish hydrologic «l t p fk m^oqp lc qeb t^qbopeba) pr`e ^p qeb rmmbo Peace River. New or renewed permits require damage reduction and mitigation.

When addressing hydrologic alteration problems, the challenge in the CHNEP study area is to identify mistakes that can be reversed, especially in extensive undeveloped platted lands. Past mistakes include overdrainage, direct sewer and stormwater discharges ^ka absbilm j bkq fk il t*ivfkd «llami^fkp+ Ifpqba below are examples of gaps in our management of hydrologic problems:

Although the environmental resource permit process administered by the Florida Department of Environmental Protection and the water management districts requires mitigation for development in wetlands, public policy has not been effective in keeping absbilm j bkq lrq lc «lla*molkb ^ob^p+

Overpumping freshwater aquifers has allowed contamination by salty ground water. Improved management focuses on new development. Plans for areas such as the Southern Water Use Caution Area (SWUCA) are developed to reduce the rate of saltwater intrusion. Water management districts evaluate the timing and volume of discharges as a component of developing j fkf j r j «l t p ^ka ibsbip %JCIp&+

Estuarine mixing models and integrated surface water/ groundwater models are needed in the CHNEP study area to evaluate restoration alternatives and public infrastructure (e.g., roads and stormwater systems) alternatives. Advances are currently being made with the development of public domain software and training of modelers using more uniform methods.

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

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 CHNEP study area. Some of the management connections include the categories listed below:

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.

Where reliable data sets have been gathered, different pollution treatment techniques can be modeled and effects predicted. The example of Tampa ?^v f j molsb j bkqp grpqfªbp qefp j lkfqlofkd ^ka conservation.

Water management districts require water withdrawal or use to be reasonable-_bkbª`f^i) klq fkqbocbob t fqe bufpqfkd t ^qbo rpbp) be consistent with the public interest and use conservation measures.

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

Water quality degradation issues intertwine with those of hydrology. Water quality modeling, monitoring and enforcement in the CHNEP study area remain as gaps to be closed.

Plants and animals that live in lakes, rivers and estuaries use nutrients, especially nitrogen and phosphorus, to grow and survive. However when excessive amounts of nutrients enter the water, imbalances such as algal blooms and low dissolved oxygen can occur.

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.

Failure to use best management practices will degrade areawide water quality. It is undecided t e^q abdo^a^qflk ibsbi grpqfªbp ^ pefcq col j slirkq^ov prevention to enforceable regulation.

State environmental agencies have not supported local governments pursuing common goals, such as Punta Gorda expanding mandatory sewer hookups and Lee @lrkqv abkvfkd buqbkpfsb t bqi^ka ªiifkd+

Among the priority problems in the CHNEP study area, habitat protection may be the most intensely discussed. While most water and water bodies 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.

The Florida Fish and Wildlife Conservation Commission has distributed maps of likely species present 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 pmb`fª` ^ob^p+

:

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.

Habitat information and public support to promote enforcement actions to protect a listed

Photo by Lisa Beever, 5/22/03

Most habitat management occurs through land and water permitting agencies that review permits based on property boundaries, not ecosystem boundaries, and developers propose land rpb clo p j ^ii) ab ª kba ^ob^p that seldom cover entire habitat communities.

E^_fq^q fabkqf ª ba _v pq^qb agencies for high priority protection of baseline species may include areas necessary to meet the economic assumptions of the community or region.

species in “jeopardy” of harm or danger led to acceptable private and public mitigation and prevention programs.

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 permitting processes. Even now, absbilmbop ^ka obdri^qlov lc ª `f^ip j ^v klq rkabopq^ka mr_if` mlif`v lk qeb s^irb lc ª pe ^ka t fiaifcb e^_fq^q) creating many gaps in preventing habitat loss.

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.

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.

Just what is stewardship, anyway? Ask a dozen people and you’ll get a dozen answers. For our purposes, stewardship is the careful and responsible management of natural resources such as water quality, hydrology and habitat entrusted to our care. Who are stewards of our watershed? You. Me. Students. Teachers. Scientists. Civic organizations. Environmental and conservation groups. Government ^dbk`fbp+ Bib`qba lc ª `f^ip+ Qeb @EKBM ^ka lro partners. All of us. Some of the management connections include the categories listed below:

Public outreach by many cooperating partners with resulting changes of behavior is considered one of the most valuable ways to protect estuaries and watersheds.

Various agencies and organizations collect data for a variety of environmental monitoring programs. Efforts are being made to ensure that data sets from different geographic areas can be used in concert with each other.

The CHNEP made the decision to include a legislative advocacy component to its activities. Upon adoption of the advocacy position, Policy Committee members acknowledged that the CHNEP would direct most comments toward their own agencies. However, the members saw value in receiving well-considered comments that went through a review by concerned citizens, scientists, resource managers and colleagues.

Improving stewardship of natural resources is imperative in high-growth areas to arrest declines in environmental health.

Platting frequently fails to address adequate stormwater treatment, sanitary sewer services, water needs, consideration for open spaces and wildlife preservation. Large areas of coastal counties were platted in the 1950s and 1960s without adequate stormwater treatment, sanitary sewer services and open spaces. Local ordinances often require impervious areas that are not needed throughout most of the year. Parking is an example. Sustainable development, as ab^kba _v qeb K^qflk^i Pl`fbqv of Professional Engineers, is "the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development."

Stewardship is a dedication to preserve and improve the condition of the surrounding world. It implies not just a choice but a responsibility to care and to be accountable for that which has been entrusted to us. We should never leave things in worse condition than we found them. Every person who visits, lives, works or is involved in activities in the region has a daily impact on the condition of the estuary. We all need a strong sense of stewardship of "do no harm," "do the right thing," "do well," but many do not know what they need to do to comply. The foundation of this sense of stewardship is a universal public education, outreach and information program.

People that could gain the most from stewardship information are the least likely to participate.

J lkfqlofkd mo ldo^ j p ^ob afc^`riq ql crka fk qfdeq _radbqp+ Qeb dob^qbpq _bkb^q fp co l j ilkd*qbo j a^q^ pbqp+

1. Create a range of housing choices.
2. Create walkable neighborhoods.
3. Encourage community and stakeholder collaboration.
4. Foster distinctive, attractive communities with a strong sense of place.
5. Make development decisions predictable, fair and cost-effective.
6. Mix land uses.
7. Preserve open space, farmland, natural beauty and critical environmental areas.
8. Provide a variety of transportation choices.
9. Strengthen and direct development toward existing communities.

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 bc^`fbk`v fk k^qro^i obplro`b 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 CHNEP study area.

This CCMP and the continuation of the CHNEP Management Conference will promote management connections and qeb ^iifkd lc j ^k^db j bkq 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 CHNEP 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 CHNEP activities.

Vision

On April 13, 2000, the Charlotte Harbor National Estuary Program's (CHNEP)

(CCMP) was approved by the Program Management Conference. The Management @lkcbobk`b e^p j ^ab pfdkfª`^kq pqofabp fk implementing the CCMP. Progress has been made on ^ii qeb lofdfk^i .2 nr^kqfª^_ib l_gb`qfsbp+ ?v /--5) / lc .2 %.0 mbo`bkq& nr^kqfª^_ib l_gb`qfsbp ^ka .0 of 48 (27 percent) original priority actions have been accomplished.

In late 2005, the Management Conference initiated an in-depth review and revision of the CCMP, achl t ibadfkd qeb pfdkfª`^kq @@ J M ^``l j mifpe j bkqp achieved within the CHNEP study area. The Management Conference recognized that the CCMP is a avk^ j f` al`r j bkq ^ka qe^q mboflaf` j lafª`^qflk fp appropriate.

Qeb J ^k^db j bkq @lkcbobk`b obªkba qeb lofdfk^i nr^kqfª^_ib l_gb`qfsbp ^ka moflofqv ^`qflkp _^pba on new data, deeper knowledge and the natural and anthropogenic changes within the CHNEP study area. Qebpb obsfpba) rma^qba ^ka kb t nr^kqfª^_ib l_gb`* tives and priority actions capture, in text, the Management Conference's vision for the CHNEP.

On December 6, 2002, the Management Conference requested preparation of a vision map series to augment the CCMP. Committee members agreed that such a picture would be a valuable tool for policy development. The conference agreed that the vision should account for natural and seasonal variation. Graphic depictions of the vision for the CHNEP study area are presented in this section of the CCMP.

Teb bpqr^ov fp abªkba _v qeb j fufkd lc cobpe ^ka salt water. In other words, the estuary is where the river meets the sea. Throughout the year, boundaries of the estuary change. The mixing zones shrink and dol t ^p cobpe t ^qbo fk«l t p af j fkfpe fk qeb aov pb^plk and increase in the wet season. The mixing zones are not uniform from side to side and from top to bottom. There are three named estuarine zones—the oligohaline (0.5 to 5 parts per thousand of salt, ppt), the mesohaline (5 to 18 ppt) and the polyhaline (18 ql 0/ mmq&+ Qebpb wlkbp ob«b`q qeb j fufkd lc qeb Dric with rivers, streams and seepage, and the rainfall on the estuary itself. It is important for estuarine productivity to not shrink or expand these zones too quickly or too much. Yet that is what we have done in some areas. Our vision is to mimic natural salinity conditions and changes with improved management of «l t pÆproc^`b ^ka dolrka t ^qbo+

The oligohaline environment is critical for many vlrkd*lc*qeb*vb^o j ^ofkb ªpe pmb`fbp+ Fab^i p^ifkfqv ranges for oysters to survive are 5 to 15 ppt during the wet season and 10 to 19 ppt during the dry season—kb^o qeb o^kdb fabkqfªba clo qeb j bple^ifkb wlkb+ Qefp wlkb fp ^ipl f j mloq^kq clo bppbkqf^i ªpe e^_fq^q) grsbkfib `ol`lafibp ^ka qeb kb t iv ifpqba p^ t ªpe+ (Listed species are in danger of extinction.) Polyhaline e^_fq^qp ^ob f j mloq^kq clo j ^kv grsbkfib ªpe) pr`e ^p gag ( ).

Consider the course of the raindrop as the annual hydrologic cycle deposits it on the land and the river «l t _ofkdp fq ql qeb bpqr^ov+ Moflo ql absbilm j bkq) with the Caloosahatchee as an example, a lower percentage of rainfall made it to the estuary. The remainder was recycled back to the atmosphere through evapotranspiration or stored in groundwater aquifers. The wet season contributed about 75 percent of the discharge to the estuary, the dry season about 25 percent (George B. Hills Co. 1927). The estuary evolved under those conditions, along with the chemical and nutrient content of the water, with the uplands leaching out some of the content and adding others, and wetlands providing delay in travel and also adding and taking away the content of the water. Today, the raindrop may be described as taking the same journey, only now the trip doesn't take as long because of drainage projects and impervious surfaces. In addition, the contributory watersheds have changed in dimension and character, with adverse consequences. Now, the wet season contributes 95 mbo`bkq lc qeb «l t ^ka qeb aov pb^plk lkiv 2 mbo`bkq in some locations. We need to be informed that the

actions we take cause the journey of the raindrop to cease to provide for a productive estuary and instead become a harmful and destructive addition. We need to know what we can do in our homes, our work and our public and private infrastructure that can be changed to restore the course of the raindrop.

The salinity vision maps illustrate the range of salinity we would like to see in a very wet season to a very dry season (see Maps 10 and 11, pp. 51–52). Currently, the Caloosahatchee exceeds these ranges on both ends. The Myakka gets too much water in the dry season.

J^kv lc qebpb afpormqflkp fk t^qbo «l t ^ob arb to changes in historic river watershed boundaries. Drainage projects sought to move water to the closest water bodies. As a result, land that naturally drained to one water body was channeled to another. The most notable example: Cow Pen Canal and Blackburn Canal carry water that once drained to the Myakka River, but they now shunt water to Dona and Roberts bays. Excess water has caused these little bays to ob`bfsb qofmib qebfo efpqlof` t^qbo «l t p) ^ccb`qfkd estuarine species. Another example is the doubling in area of the relatively small Orange River watershed. At the same time, Estero Bay is starved of some lc fqp k^qro^i t^qbo «l t p+ Ql fabkqfcv ^ii ^ob^p qe^q have been affected, the CHNEP prepared a historic watershed boundary map (see Map 12, p. 53). This information will assist the CHNEP in identifying needed restoration projects and developing natural systems' water budgets as a tool.

Lqebo afpormqflkp fk t^qbo «l t `^k _b ^p`of_ba ql ^oqfª`f^iiv `ob^qba pqor`qrobp pr`e ^p a^ j p) t bfop and canals. Our vision is to enhance and improve t^qbo _lafbp qe^q ^ob ^ccb`qba _v ^oqfª`f^iiv `ob^qba structures (See Map 13, p. 54.).

The water management we have today is the result of government development permitting and capital improvement programs. The relationships and linkages of these programs at the local, water management district, state and federal governments can be quite complex. The SWFRPC is currently developing a diagram of these processes and a vision diagram highlighting recommended reforms. Because of the number of programs throughout the CHNEP study area, the diagram included illustrates linkages in the Estero Bay watershed (see Figure 1, p. 55).

Alteration of the land has interrupted the water and it has also changed water chemistry. Various contaminants adversely affect the function of the lakes, streams, rivers and estuaries. Even state water nr^ifqv obdri^qflkp j ^v fk pl j b abdobb _b abª`fbkq fk protecting living resources. Point-source and nonpoint-source pollutants directly introduced into the water, increasing degrees of imperviousness and the functions of urban and rural resource exploitation all have unavoidable side effects. Our vision is to reverse these impacts. Our vision is to eliminate these impairments and to identify local criteria that are protective of living resources (see Maps 14 to 18, pp. 56–60). The maps illustrate the known water quality impairments using Florida water quality standards. Our ultimate vision is to maintain water quality at a standard necessary to sustain living resources. These standards may include issues such as pharmaceuticals and personal care products that currently have no state standard associated with them.

Water quality impairments in the CHNEP study area include nutrient pollution, low dissolved oxygen, _^`qbof^ fk pebiiªpe ^ka t^qbo _lafbp ^ka j bq^ip+ J bq^ip of concern are copper, iron and dissolved solids (salts.) In addition, conductance, chlorides and dissolved solids are of concern, especially in the Shell Creek, Prairie Creek and Myrtle Slough basins.

>k ^aafqflk^i j bq^i `lk`bok fp j bo`rov fk ªpe qfpprb) j lpqiv qfba ql qeb Dric lc J buf`l+ J bo`rov fk ªpe qfpprb will require state, national and global solutions. Our sfpflk fp ql klq e^sb rkk^qro^i ibsbip lc j bo`rov fk ªpe tissue.

Another water quality concern is harmful algal blooms, also known as HABs, which include macro-algae, phytoplankton and periphyton. Of particular concern are red tide and blue-green algae. These forms of life are natural in our waters; however, excessive bloom events occur because of man-made imbalances. In the case of red tide and blue-green algae, death can occur to living organisms and affect the economy of the area. Maximum red tide levels were derived from historic red tide data from the FWC Florida Wildlife Research Institute. Our vision is to reduce the severity, extent, duration and frequency of HABs, including red tide (see Map 19, p. 61).

Pebii^pe `ib^k qeb t^qbo `lir j k ^ka ^ob ^k bppbkqf^i component of the food web. The CHNEP study area e^p pfu `lkafqflk^iiv ^mmolsba pebii^pe ^ob^p) _rq qebv kbba ql e^sb prc^`fbkq t^qbo nr^ifqv ql _b lmbk clo harvest throughout their season. Our vision is to have no closures (see Map 20, p. 62).

W^qbo «l t p) t^qbo nr^ifqv ^ka e^_fq^q ^ob interconnected. Fish and wildlife resources obnrfob dlla t^qbo nr^ifqv) qeb ofdeq t^qbo «l t p and habitat. An understanding of wetland, creek and slough systems is critical to establishing restoration programs. A predevelopment vegetation map (see Map 21, p. 63) and historic benthic habitat map (see Map 22, p. 64) provide some guidance. Together they will show us the historic extent and locations of habitats that are important to us and suggest what a good balance of plant and animal communities might be.

Submerged aquatic vegetation (SAV) includes marine and estuarine submerged vascular plants (seagrasses) as well as submerged freshwater vascular plants. Current SAV mapping efforts concentrate on seagrass l``roobk`b t fqefk kb^o*pelob bpqr^ofbp lc prc^`fbkq water clarity to allow aerial photographic monitoring. The approximately 54 submerged freshwater vascular plant species in southwest Florida typically occur in dark-water streams and rivers with optical properties that prevent this manner of monitoring. Both water management districts currently map seagrasses and we can coordinate these existing efforts. A vision of maximum seagrass extent was created using various sources of historic seagrass extent minus permanent losses such as the construction of the Intracoastal Waterway (see Map 23, p. 65).

Conservation, preservation and stewardship of sensitive lands is needed to protect not only habitat but t^qbo nr^ifqv ^ka t^qbo «l t p+ Lro sfpflk fk`irabp ^ balance of acquisition of critical sensitive lands for public management, conservation of agricultural lands and restoration of hydrologic features. This integrated network of land use necessitates a large partnership of agencies, private organizations, citizens and businesses to identify restoration and public management alternatives. Our vision of restoration was developed through a multiple-agency effort and has been incorporated into such plans as the Lee County Master Mitigation Plan and Southwest Florida Comprehensive Watershed Plan, formerly the Southwest Florida Feasibility Study (see Map 24, p. 66).

Our vision for exotic pest plants and exotic nuisance animals is to stop new infestations and bring current infestations to manageable levels, especially on publicly owned lands. The vision map (Map 25, p. 34& pel t p ^ob^p qe^q e^sb _bbk fabkqf^ba qeolrde lro partnerships as needing exotic invasive plant or exotic nuisance animal controls. The Florida Exotic Pest Plant Council maintains a database of sightings and locations. A total of 67 exotic pest plant species have _bbk fabkqf^ba col j qeb @EKBM pqrav ^ob^+

We envision everyone making daily choices, large or small, that protect and improve estuaries and watersheds. We are all partners in resource conservation and protection. We share a community-wide vision of a healthy environmental future. As stewards, we are advocates for positive changes in watershed hydrology, water quality and habitat.

To a large degree, gaps in stewardship are correlated with gaps in information and education. Residents kbba p`fbkqf^` fkclo j ^qflk qe^q fp j b^kfkdcri ^ka useful to help them make daily choices. Scientists need long-term monitoring and data management strategies in order to analyze changes to the environment. Resource managers utilize data analysis to create sound management plans. Government leaders need resources like the CHNEP and solid management plans to help them make effective policy decisions. The entire chain begins with closing gaps in information and education.

Stewardship is the shared responsibility for environmental quality by anyone whose actions affect the environment. Stewardship also means more than just the need for information for residents, government leaders and scientists. Stewardship begins with raised awareness, increased knowledge and shared responsibility, resulting in altered behavior toward the sustainable care of our planet.

Stewards appreciate, respect and take positive actions for the natural environment. Good stewards make good advocates. The land and its resources are ours to conserve or to waste. Once lost, they may never be regained. With knowledge, intelligent choices that promote quality of life can be made by all.

Our vision for stewardship is fourfold: strong education and outreach programs, leadership and advocacy, long-term monitoring and data management pqo^qbdfbp) ^ka p`fbkqfa` fkclo j ^qflk mobpbkqba fk ways that are meaningful.

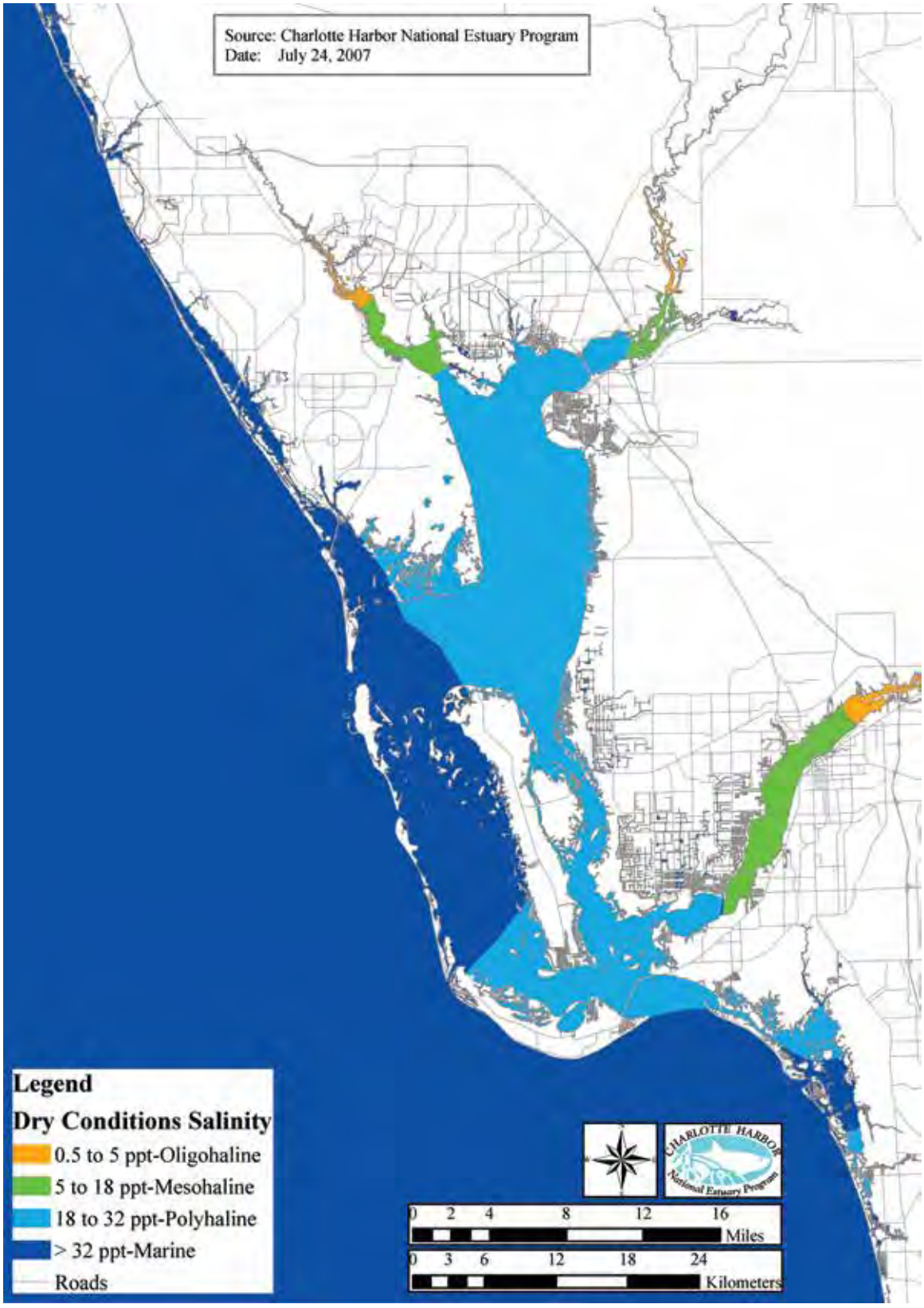
Any discussion on natural resource protection inevitably leads to a discussion of public education. Although most people want to do the right thing for the world around them, they may have misconceptions. Effective outreach and education programs can help erase misconceptions. Our current outreach and education programs reach thousands of citizens every year through a variety of methods. Outreach programs build knowledge and awareness that can translate into personal action and advocacy.

Effective stewardship requires leadership and advocacy. Our voice for the natural system must be _^pba lk qeb _bpq p`fbkqfa` fkclo j ^qflk ^s^fi^_ib+ One example of the need for leadership is related to the problems of climate change facing coastal communities. Leadership will be necessary to make qeb afca``riq ab`fpflkp `lk`bokfkd `e^kdfkd `l^pqifkbp) water tables and public investments. Our vision is to molsfab bib`qba lca``f^ip ^ka lqebo mlif`v ab`fpflk* makers access to timely and key environmental information. This will help our leadership to make decisions when they are most cost-effective and have greater likelihood of success.

Long-term monitoring and data management pqo^qbdfbp ^ob qeb pb`lka ibd+ Plrka p`fbkqfa` a^q^ borne of extensive research and monitoring efforts is the basis of the environmental message. Management of the data ensures up-to-date information is readily available and useful to all interested parties. Map 26 (p. 68) provides an example of a multiagency monitoring effort that is integrated. Although this map is the current structure, our vision is to maintain the Coastal Charlotte Harbor Monitoring Network into the long term. We will continue to use the best available methods consistently throughout the network. Map 27 (p. 69) provides an example of gaps in water quality nutrient information throughout the watersheds. Our vision is to have a better understanding of water quality impairments throughout our watershed.

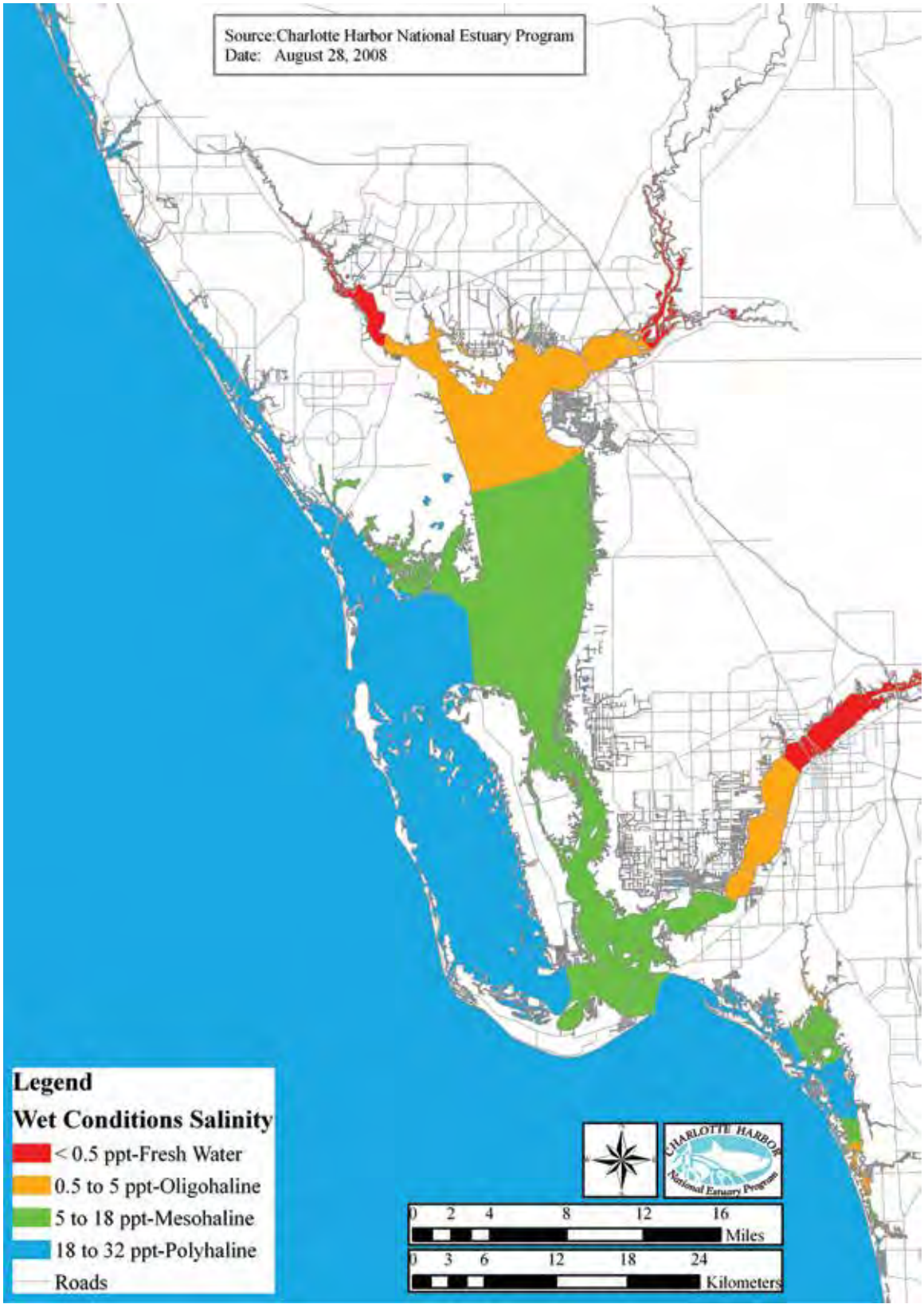
Finally, our vision is to present volumes of `l j mif`^qba p`fbkqfa` fkclo j ^qflk fk t^vp qe^q ^ob meaningful to a number of different audiences. Public education and outreach efforts attempt to reach a wide audience of the general public. However, to address pmb`fa` mol_ib j p) fkclo j ^qflk j rpq _b q^filoba ql the audiences most related to that problem. Figure 2 (p. 70) provides an example of how highly technical information can be presented to a citizen or elected lca``f^i ^rafbk`b+

Fk ^aafqflk ql fkclo j ^qflk q^odbqba ql pmb`fa` audiences, information must be timely. The massive compendium of technical data grows daily as science adds to our wealth of knowledge. We must coordinate information management and analysis to enhance the data exchange processes. Data and analysis must be a useful tool for everyone—from private citizen to scientist to engineer to business professional to elected lca``f^i ql bar`^qlo+



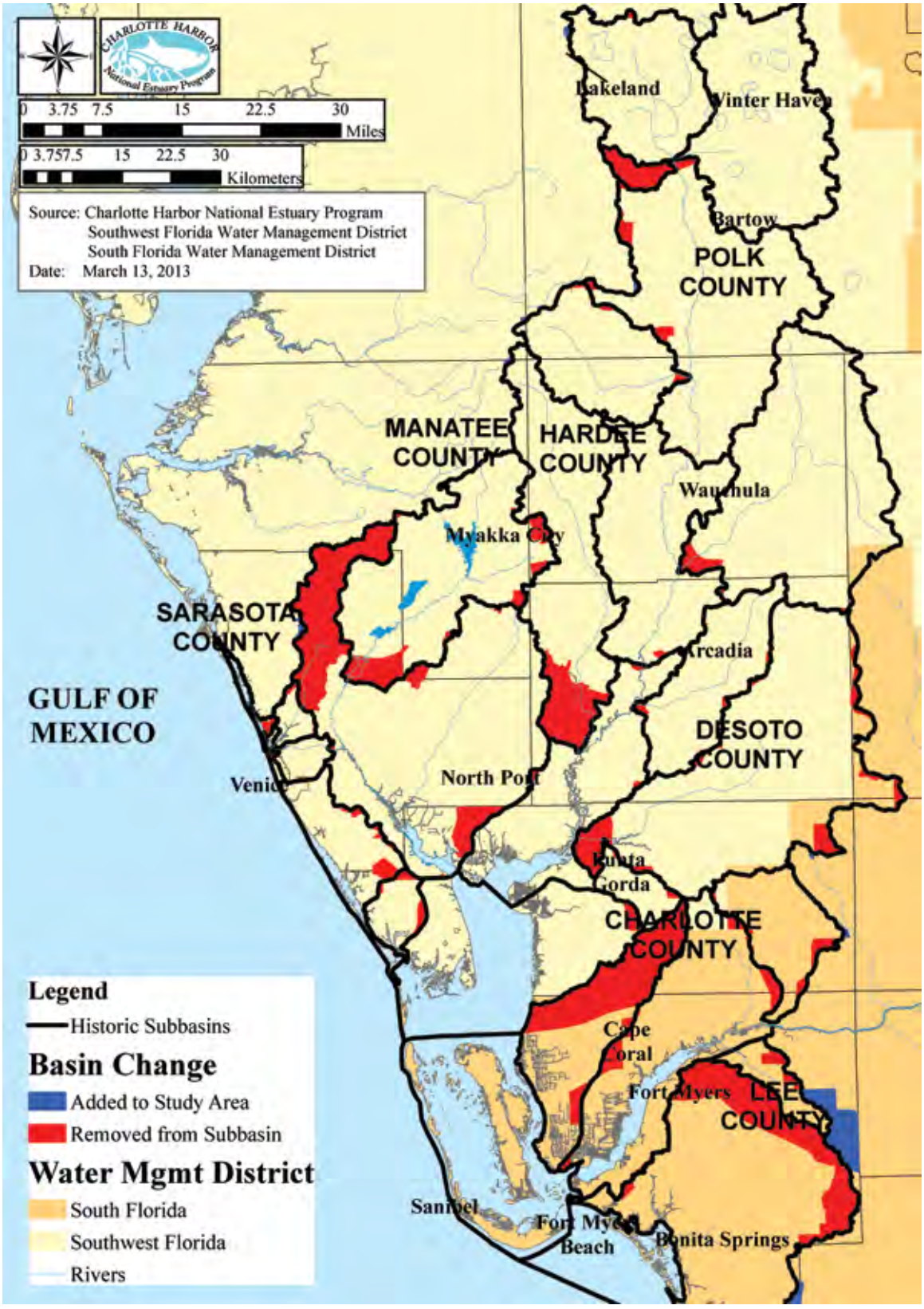
Map 10: Hydrologic Vision for Dry Conditions

This map represents our vision for salinity conditions in very dry conditions. When salinities rise above these levels, concerns regarding the health of the estuaries increase. Our vision is to have salinity at these levels or lower (fresher) during dry conditions.



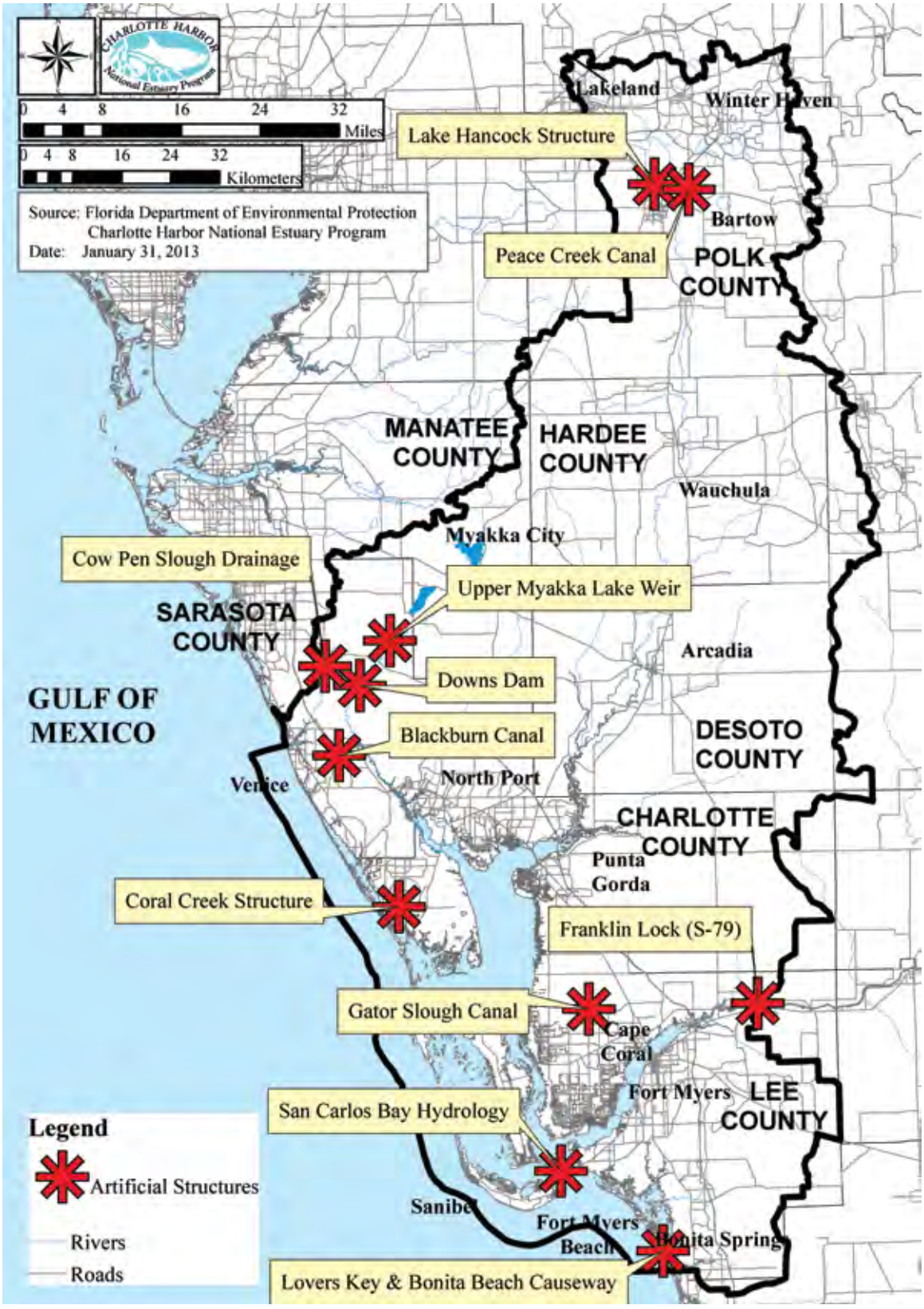
Map 11: Hydrologic Vision for Wet Conditions

This map represents our vision for salinity conditions in very wet conditions. When salinities in the estuary are below these levels, concerns regarding the health of the estuaries increase. Our vision is to have salinities at these levels or higher during the wet season.



Map 12: Historic Subbasins

In the 1800s and 1900s, drainage projects were designed to dry land to make it available for agriculture and urban development. Water was routed through canals to the closest available water body. Often, this resulted in water being moved across hydrologic boundaries to different receiving waters. For example, Cow Pen Canal and Blackburn Canal moved over 4,500 acres of Cow Pen Slough from the Myakka River basin to the much smaller Dona Bay watershed, tripling w^qbo slir j bp+ Lro sfpflk fp clo _^pfkp ql _b obpqloba ql qebfo efpqlof` `lkªdro^qflk+



J ^m .07 >oqfª`f^i Pqor`qrobp

Many structures have been built that alter hydrology in the CHNEP study area. Our vision is to enhance and fj molsb ql j lob k^qro^i evaolildf` `lkafqflkp t^qbo _lafbp ^ccb`qba _v qebpb . . ^oqfª`f^iiv `ob^qba pqor`qrobp+

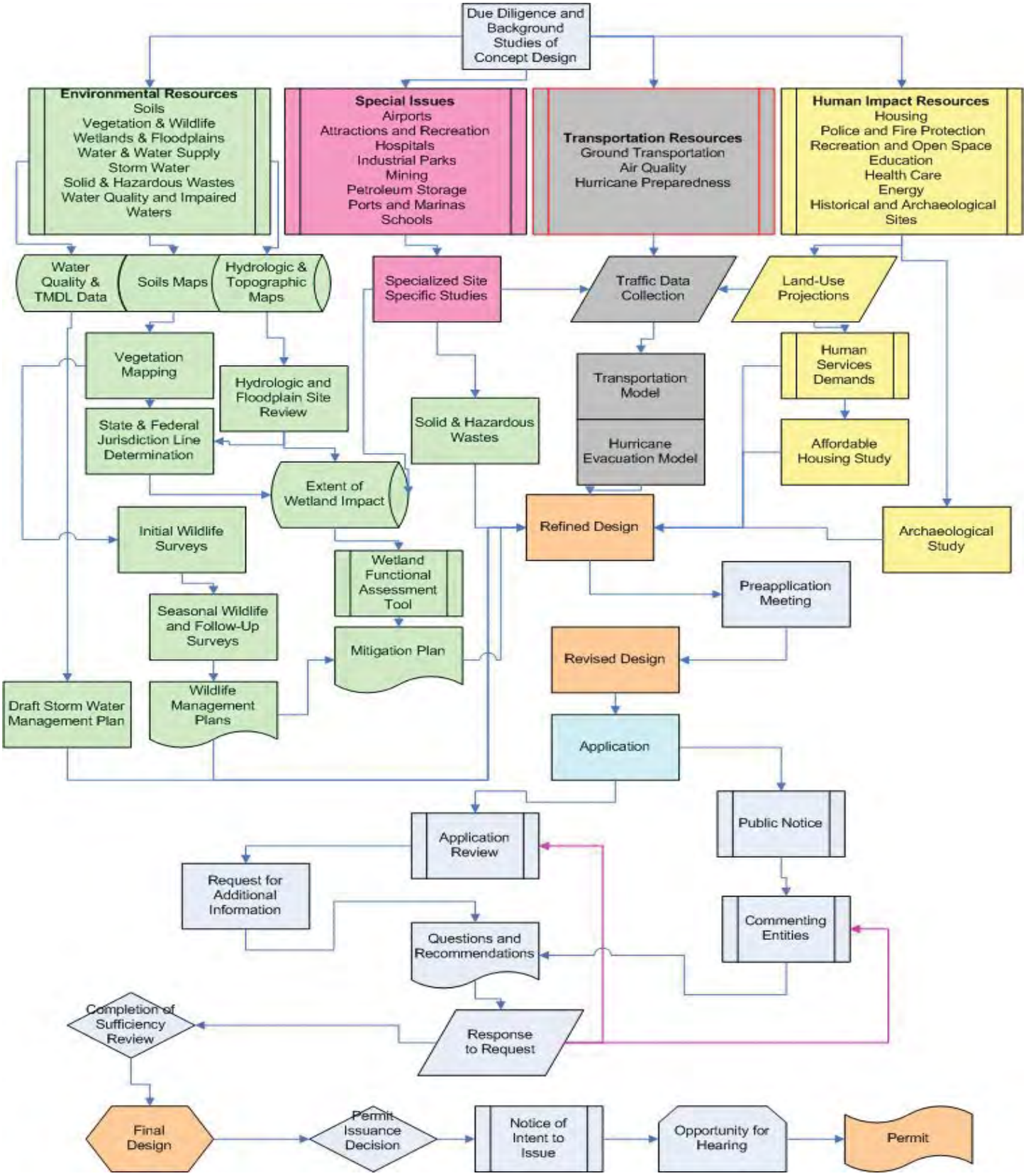
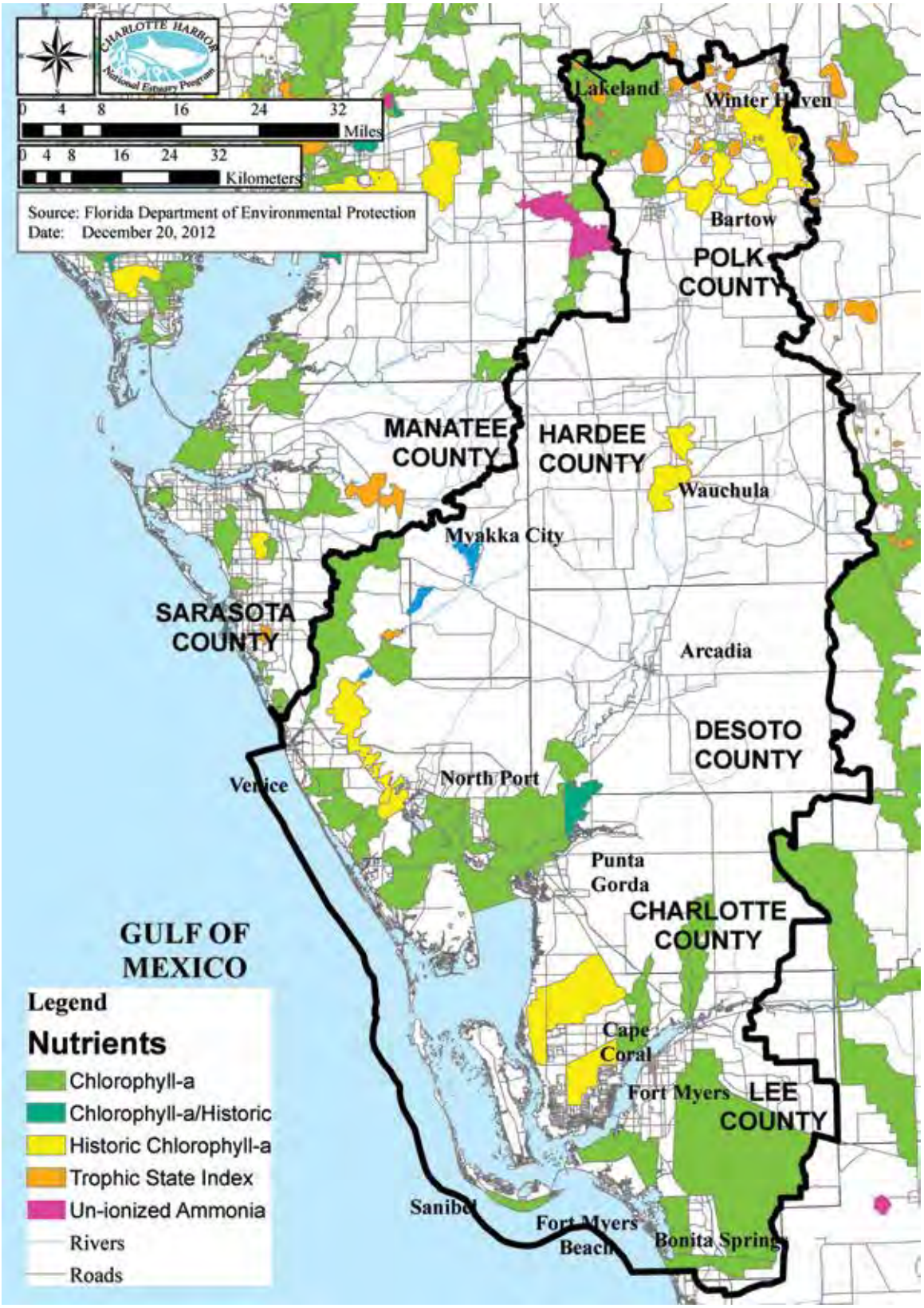


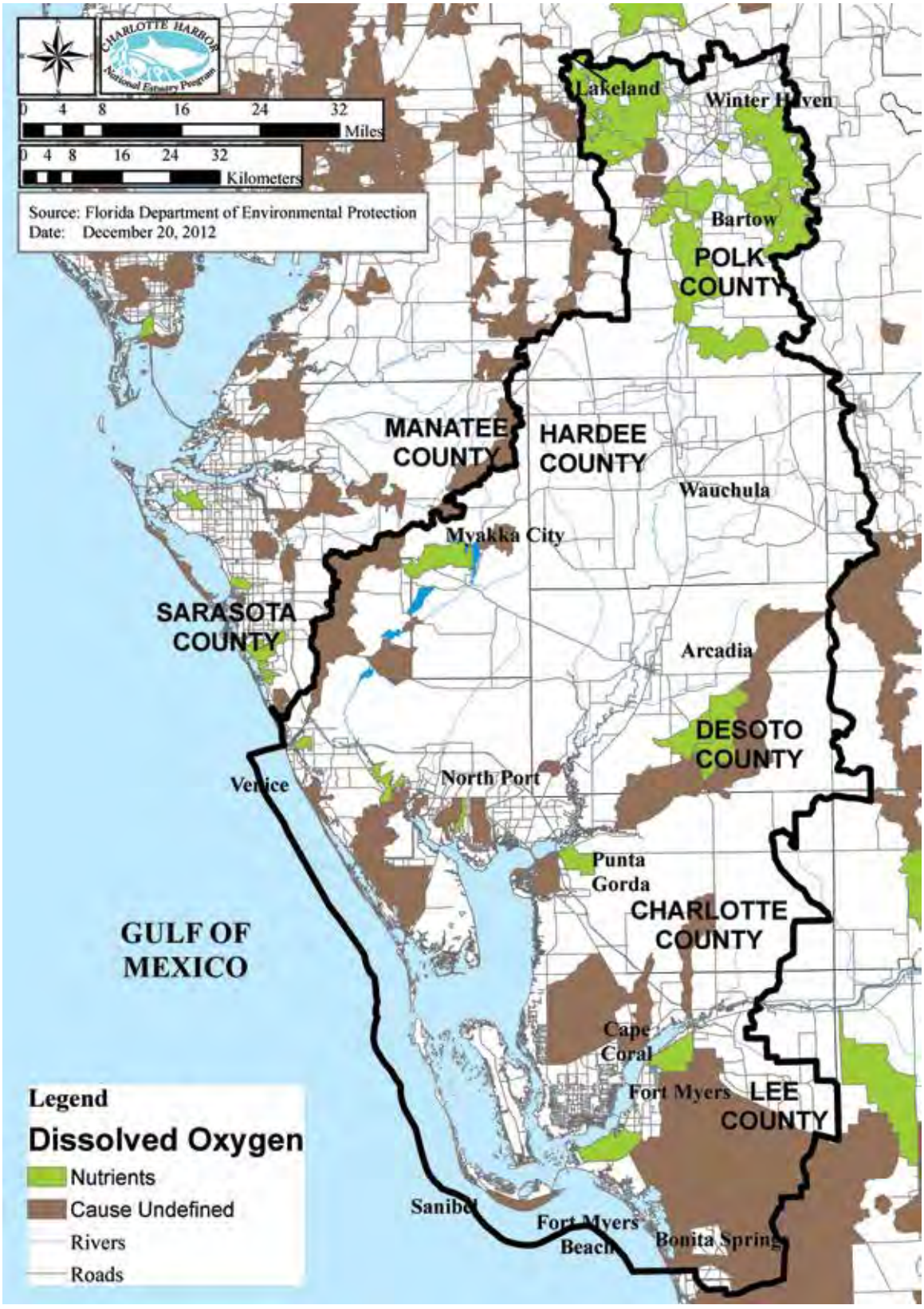
Figure 1: Basic Development Permitting Decision Tree

The CHNEP and the Southwest Florida Regional Planning Council are analyzing growth management permitting in the Estero Bay watershed to identify potential reforms to better protect and improve water quality, water «l t p ^ka e^_fq^q+ Qeb bufpqfkd absbilm j bkq mbo j fqqfkd ab`fpflk qobb ^_lsb t fii molsfab ^ sfpflk lc obclo j ^q qeb conclusion of the study.



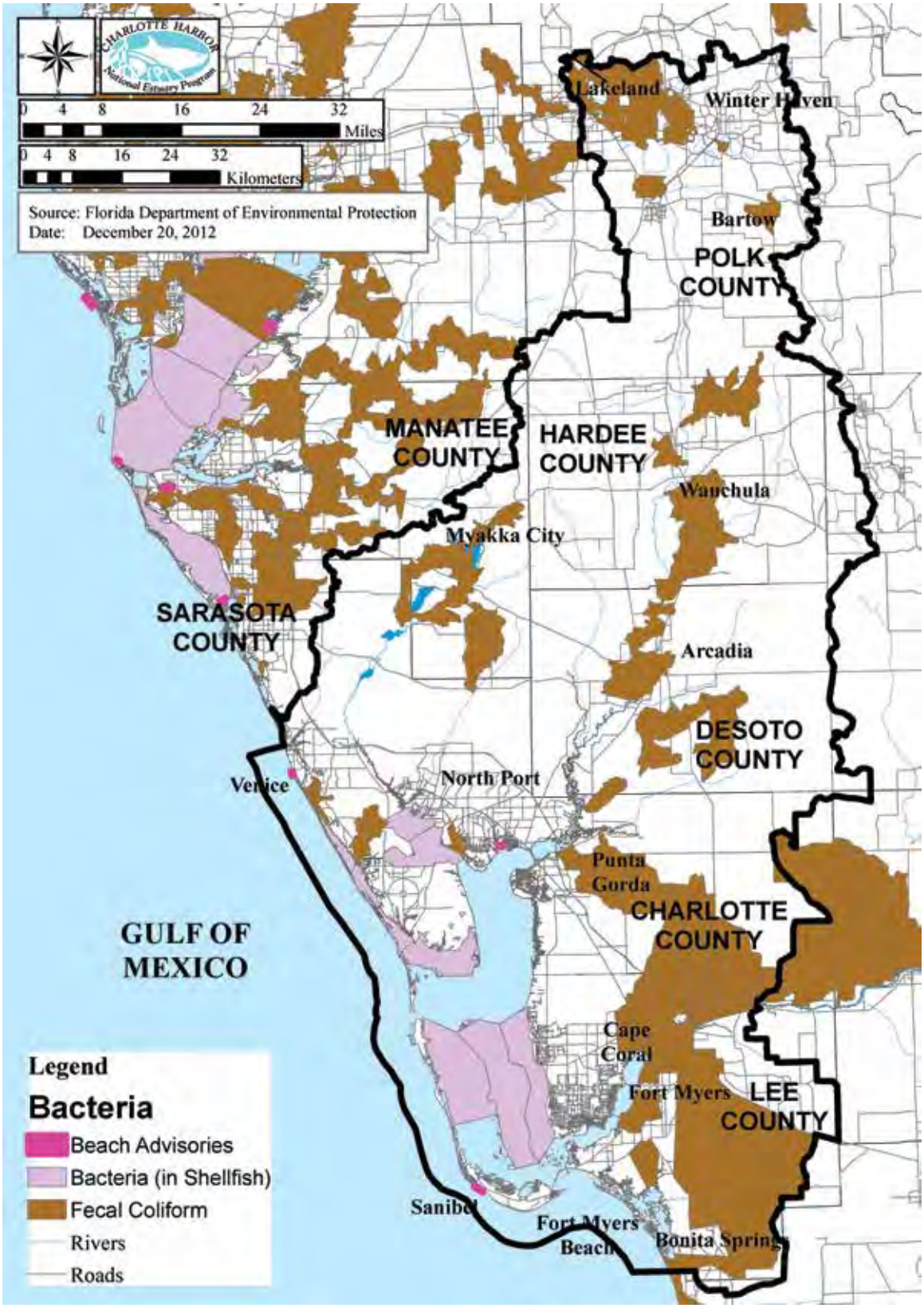
Map 14: Nutrient Impairments

The Florida Department of Environmental Protection uses several indicators of nutrient water impairments, including chlorophyll , historic chlorophyll and trophic state index (used for lakes), and unionized ammonia. Nutrient impairments are most frequent in the Caloosahatchee watershed, Estero Bay basin, tidal Myakka and Peace rivers, and the lakes region. Our vision is to have no water body impaired for nutrients.



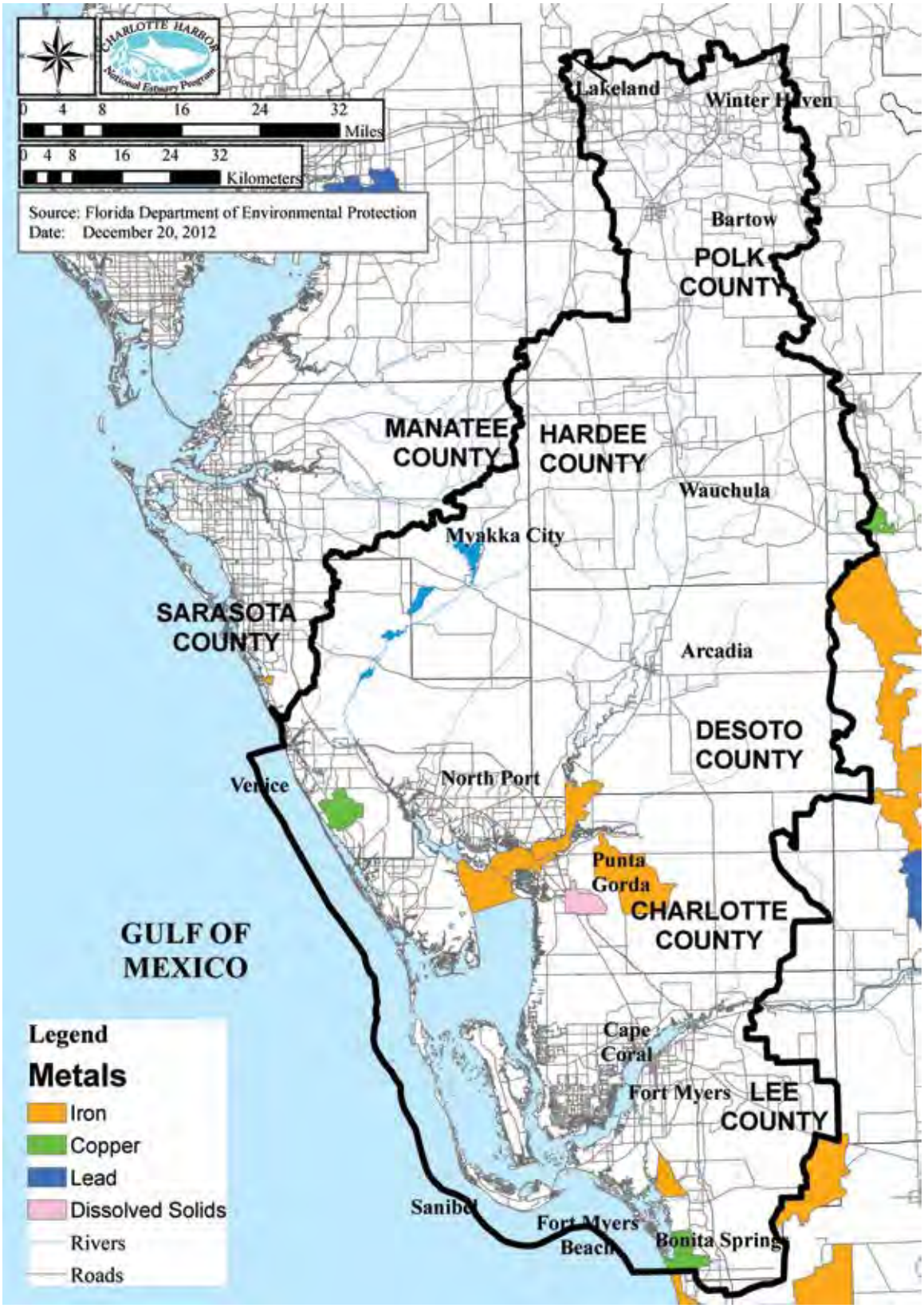
Map 15: Dissolved Oxygen Impairments

Water quality impairments caused by low dissolved oxygen levels are typically associated with areas with nutrient impairments. High biochemical oxygen demand also characterizes areas impaired for low dissolved oxygen. Our vision is to have no water body impaired for dissolved oxygen.



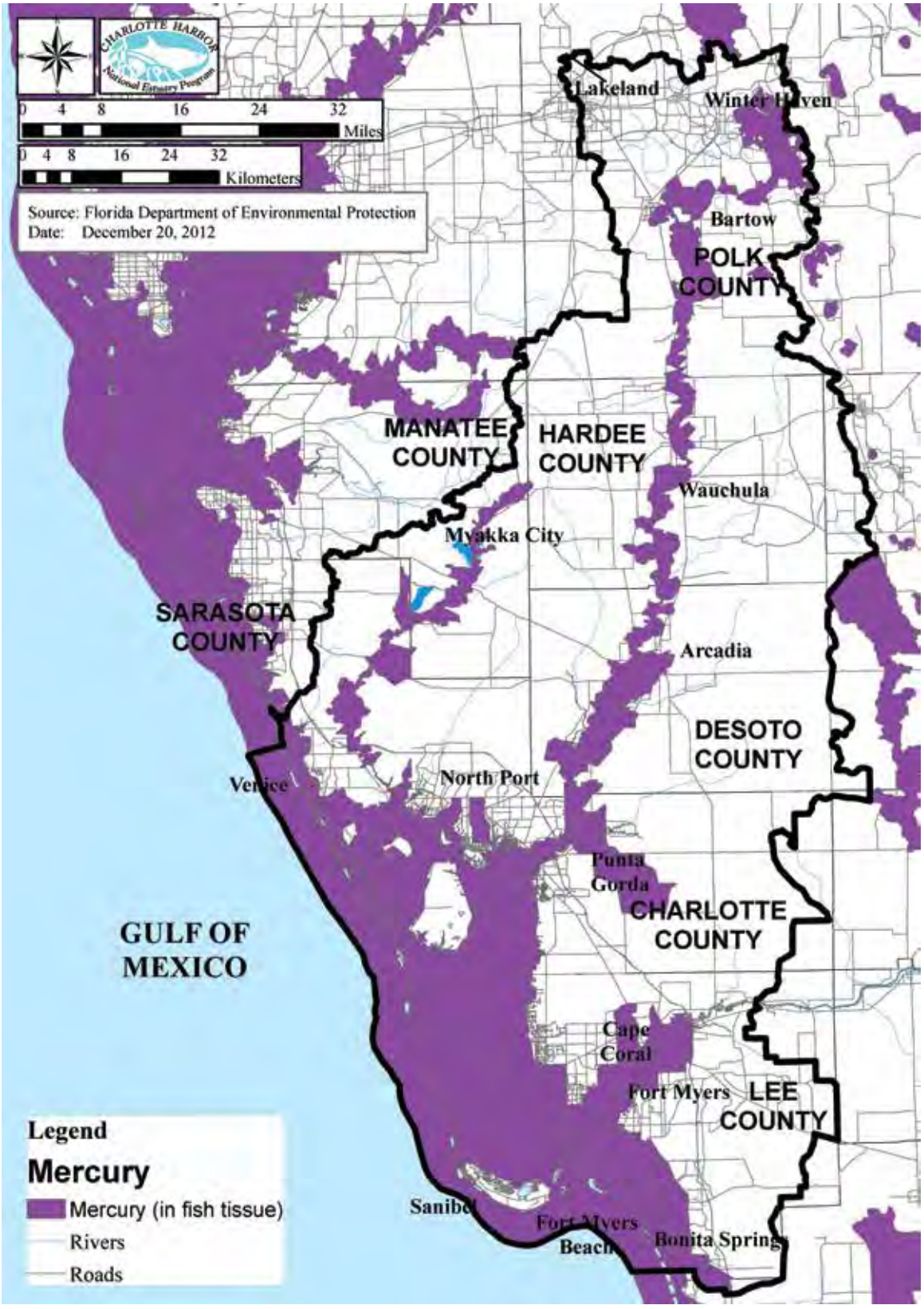
Map 16: Bacteria Impairments

?^`qbof^ f j m^fo j bkqp fk`irab _b^`e ^asfplofbp) cb`^i `lifclo j ^ka _^`qbof^ fk pebiiªpe+ Cb`^i `lifclo j impairments are located primarily in the Caloosahatchee, upper Myakka and Peace River watersheds. Nearly all ^ob^p lmbk ql pebiiªpefkd e^sb _^`qbof^ f j m^fo j bkqp) ^ka e^osbpqfkd `ilprobp l``ro olrqfkbiv+ Lro sfpflk fp ql e^sb kl t^qbo _lav f j m^foba clo _b^`e ^asfplofbp) _^`qbof^ fk pebiiªpe lo cb`^i `lifclo j +



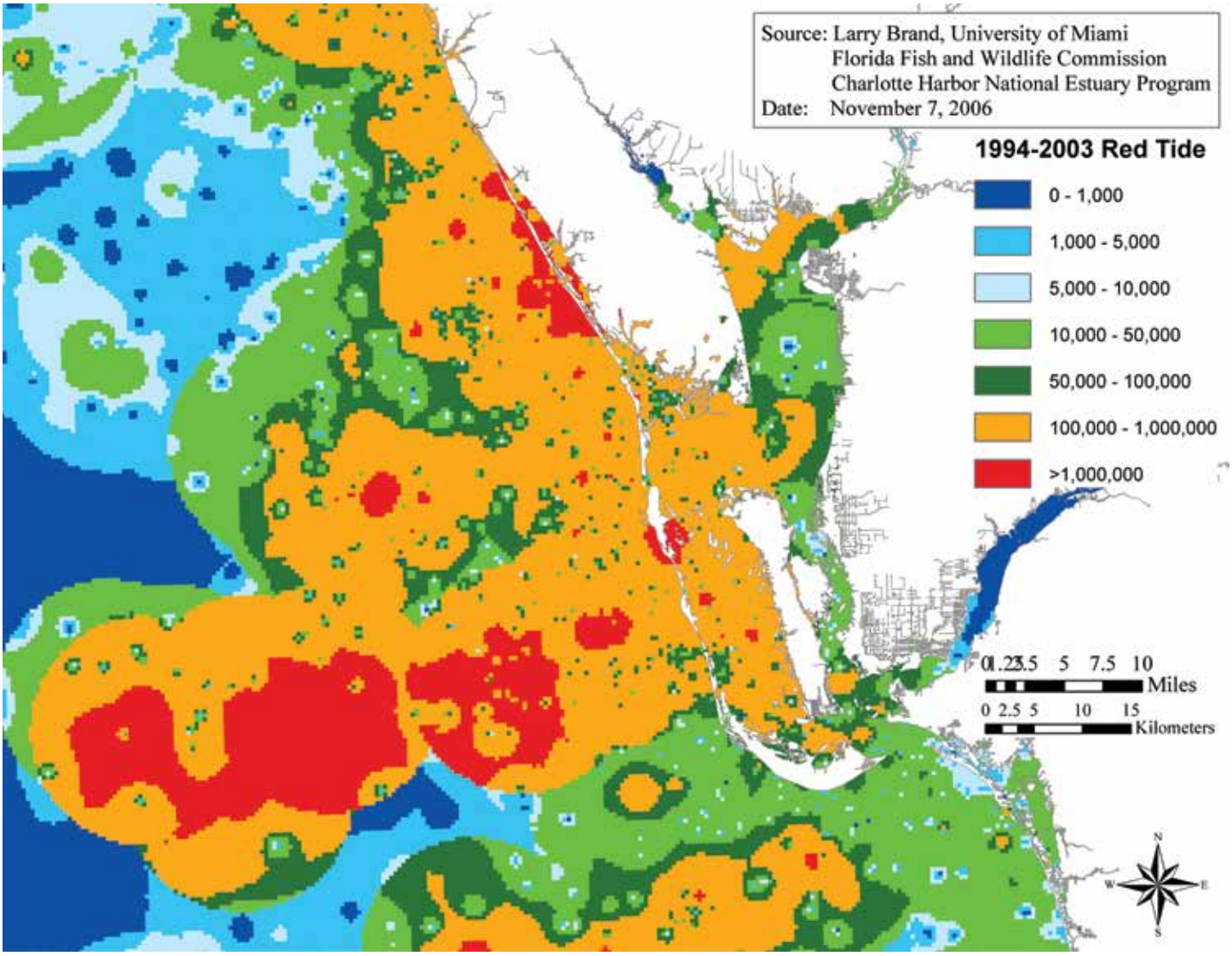
Map 17: Metals and Salts Impairments

Metal impairments occur in three general classes within the CHNEP study area: iron, copper and dissolved solids (salts). Conductivity (high mineral salt content), chlorides and dissolved solids impair the Shell, Joshua and Prairie creeks, for which there is a reasonable assurance plan. Our vision is to have no water body impaired for metals or dissolved solids.



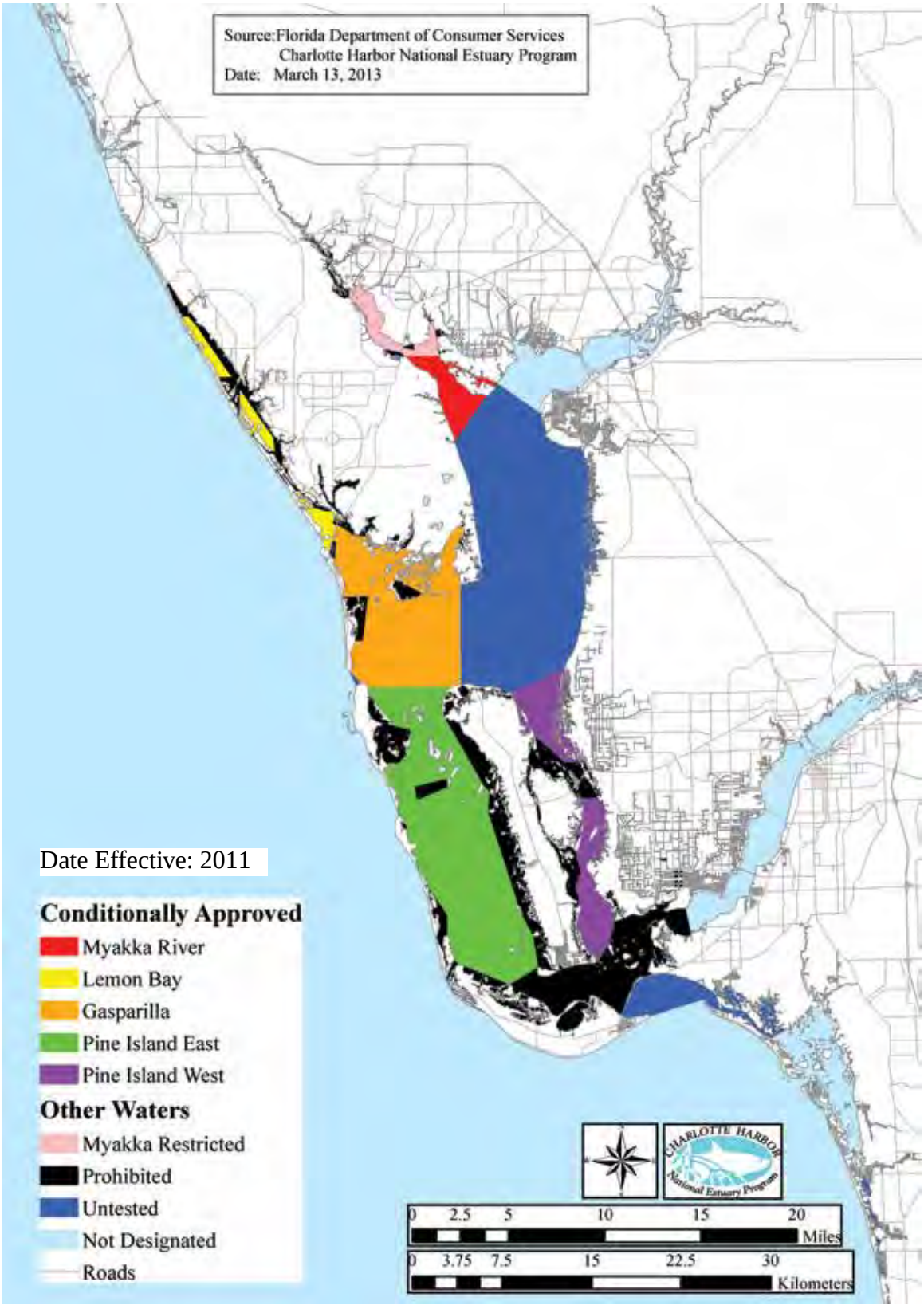
Map 18: Mercury Impairments

J bo`rov f j m^fo j bkqp ^ob abqbo j fkba _v j bo`rov clrka fk ªpe qfpprb+ J bo`rov f j m^fo* ments are found in estuarine waters near the Gulf of Mexico as well as in the Peace River and Myakka River watersheds. Our vision is to have no water body impaired for mercury.



Map 19: Red Tide Concentrations (1994–2003)

This map provides average red tide concentrations from 1994–2003. At 5,000 cells per liter (light blue), shell-ªpe ^ob^p ^ob `ilpba ql e^osbpq+ >q .-)--- `biip mbo ifqbo %dobbk&) er j ^k obpmfo^qlov foofq^qflk l``rop clo j lpq mblmib+ >q .--)--- `biip mbo ifqbo %lo^kdb&) ªpe hfiip ^ob mol_^_ib+ >q lsbo ^ j fiiflk `biip mbo ifqbo %oba&) discoloration occurs. Our vision is to reduce the severity, extent, duration and frequency of harmful algal blooms (HABs), including red tide.

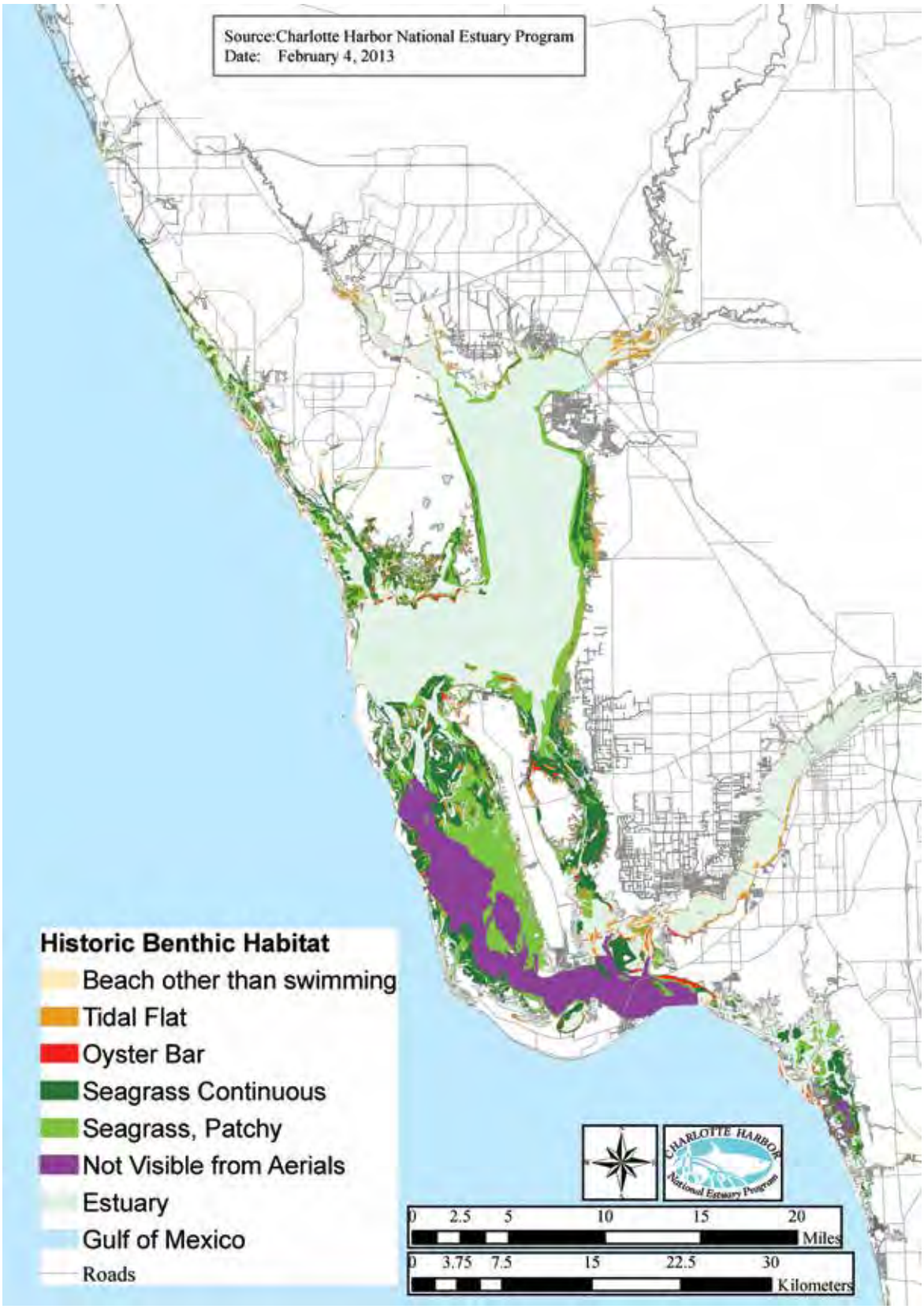


J ^m /-7 Pebii ª pe E^osbpq >ob^p

Qefp j ^m fkaf`^qbp pebii ª pe e^osbpq ^ob^p+ Qeb ^ob^p pe^aba fk _ofdeq `lilop obmobpbkq @i^pp / t ^qbop t ebob pebii ª pe e^osbpqfkd fp ^iil t ba t ebk t ^qbo nr^ifqv `lkafqflkp j bofq fq+ >ob^p pe^aba fk _i^`h t bob ^ipl abpfd* nated Class 2 waters by the Florida Department of Environmental Protection; however, historic water quality a^q^ fkaf`^qb qeb ^ob^ t ^p qll abdo^aba ql ^iil t `lkpr j mqflk lc eb^iqev pebii ª pe+ Lro sfpflk fp ql e^sb ^ii @i^pp / t ^qbop lmbk .-- mbo`bkq lc qeb qf j b clo pebii ª pe e^osbpq+

Map 21: Predevelopment Vegetation Map

This map illustrates the pattern of upland (light green), freshwater wetland (dark green), saltwater marsh (orange) and mangrove (light yellow) habitats prior to development. The information was developed using soils, bumboq lmfkflk) efpqlof` ^bof^i melqldo^mep ^ka j fa*.55-p Dbkbo^i I^ka Lc$^{a}$`b Prosbvlo klqbp^{+} Lro vision is to restore mangrove, saltwater marsh, freshwater wetland and native upland systems as much as possible. This map provides a tool to help with individual restoration project concepts.

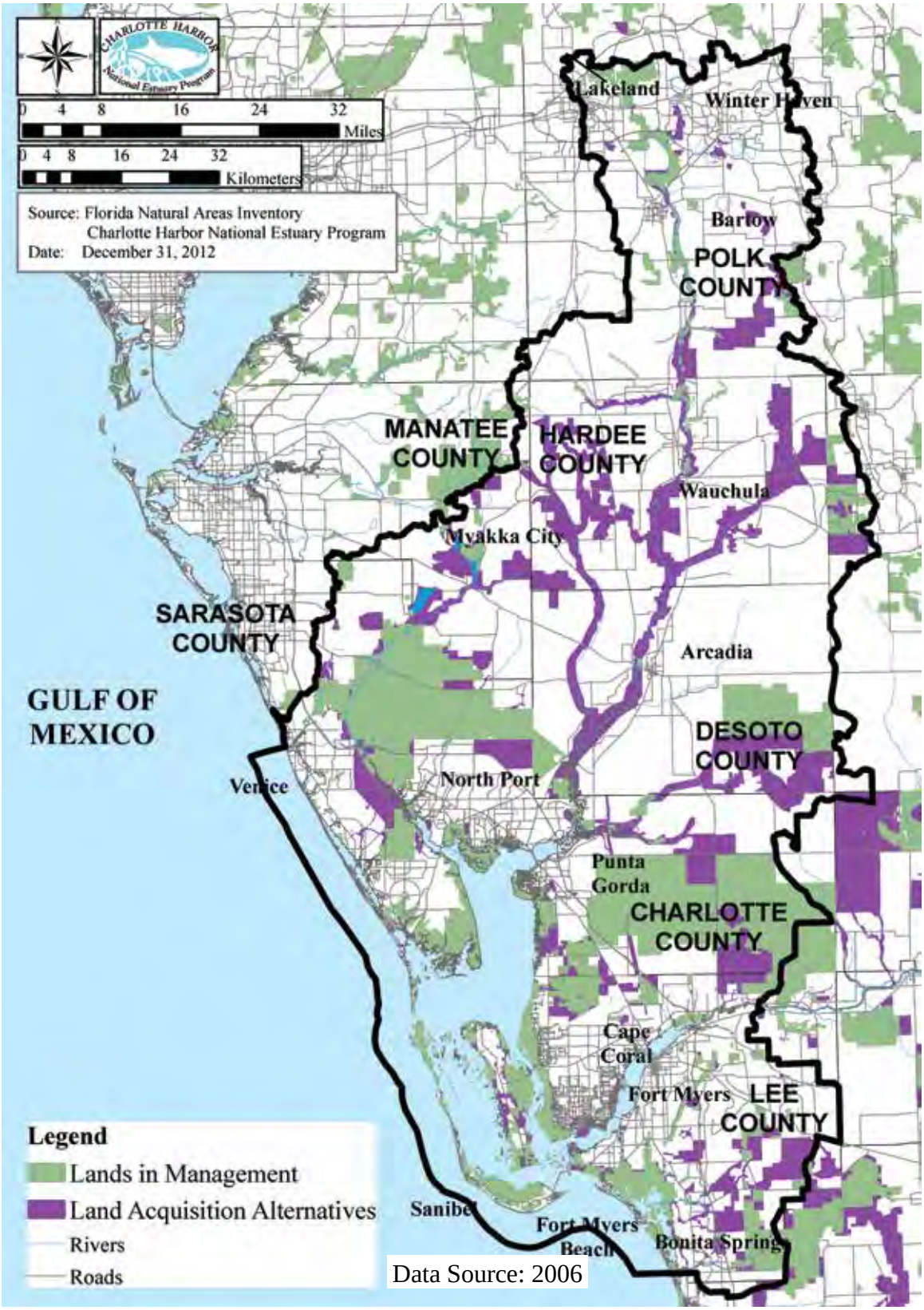


Map 22: Historic Benthic Habitat

Our vision for seagrass is based on benthic habitat information from 1950s-era aerial photographs. Our vision is to restore oysters, seagrass and unvegetated bottoms as much as possible. This map provides a tool to help with individual restoration project concepts.

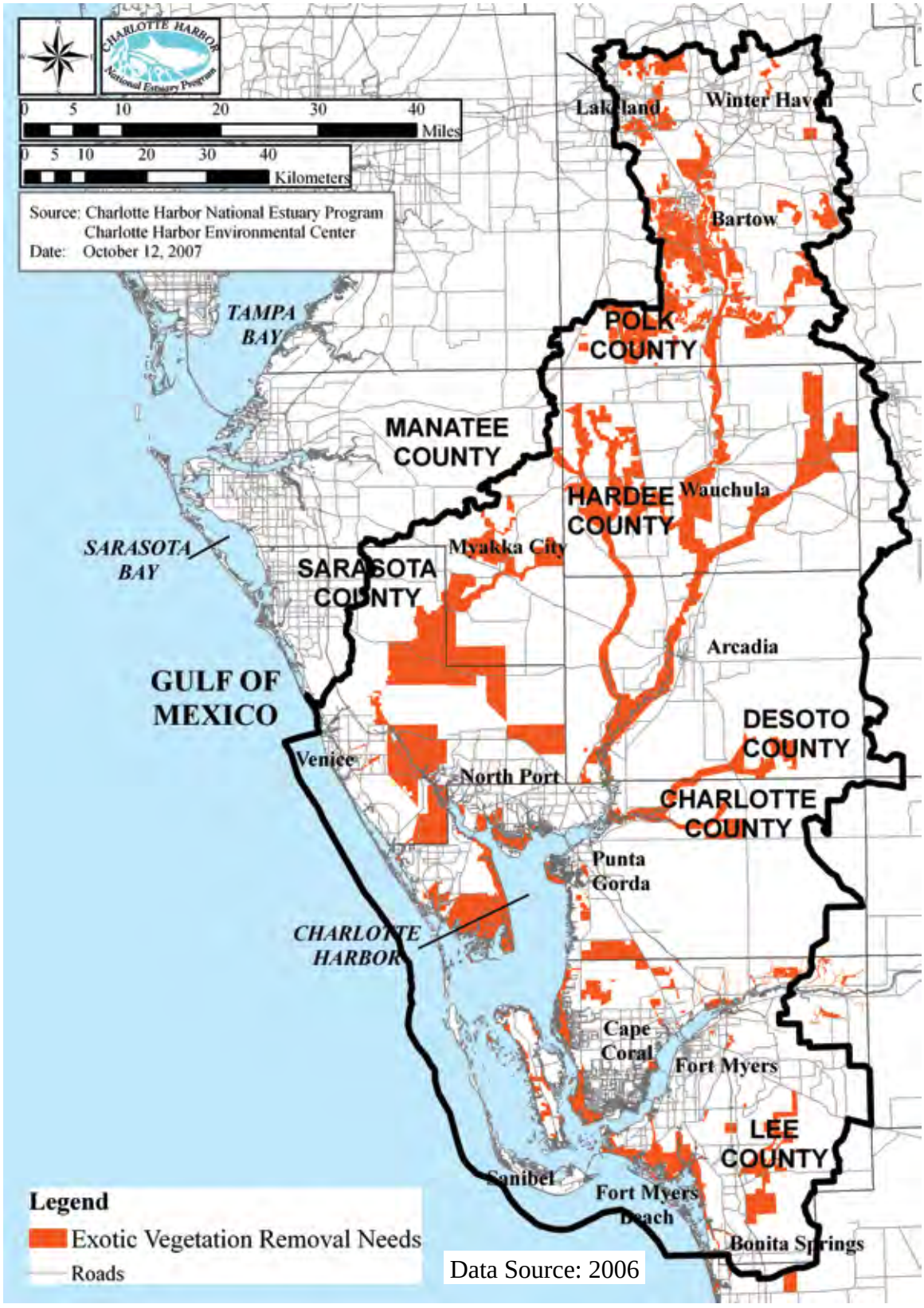
Map 23: Seagrass Vision

Our vision for seagrass is based on benthic habitat information from 1950s-era aerial photographs and mapping efforts that have been completed through the years. Permanent losses such as the Intracoastal Waterway and spoil islands are not included in this vision. Green represents the latest seagrass extent mapped, while the red is our vision for seagrass distribution expansion. More detailed mapping efforts occurred in 1982 and 1993 and are shown here for reference.



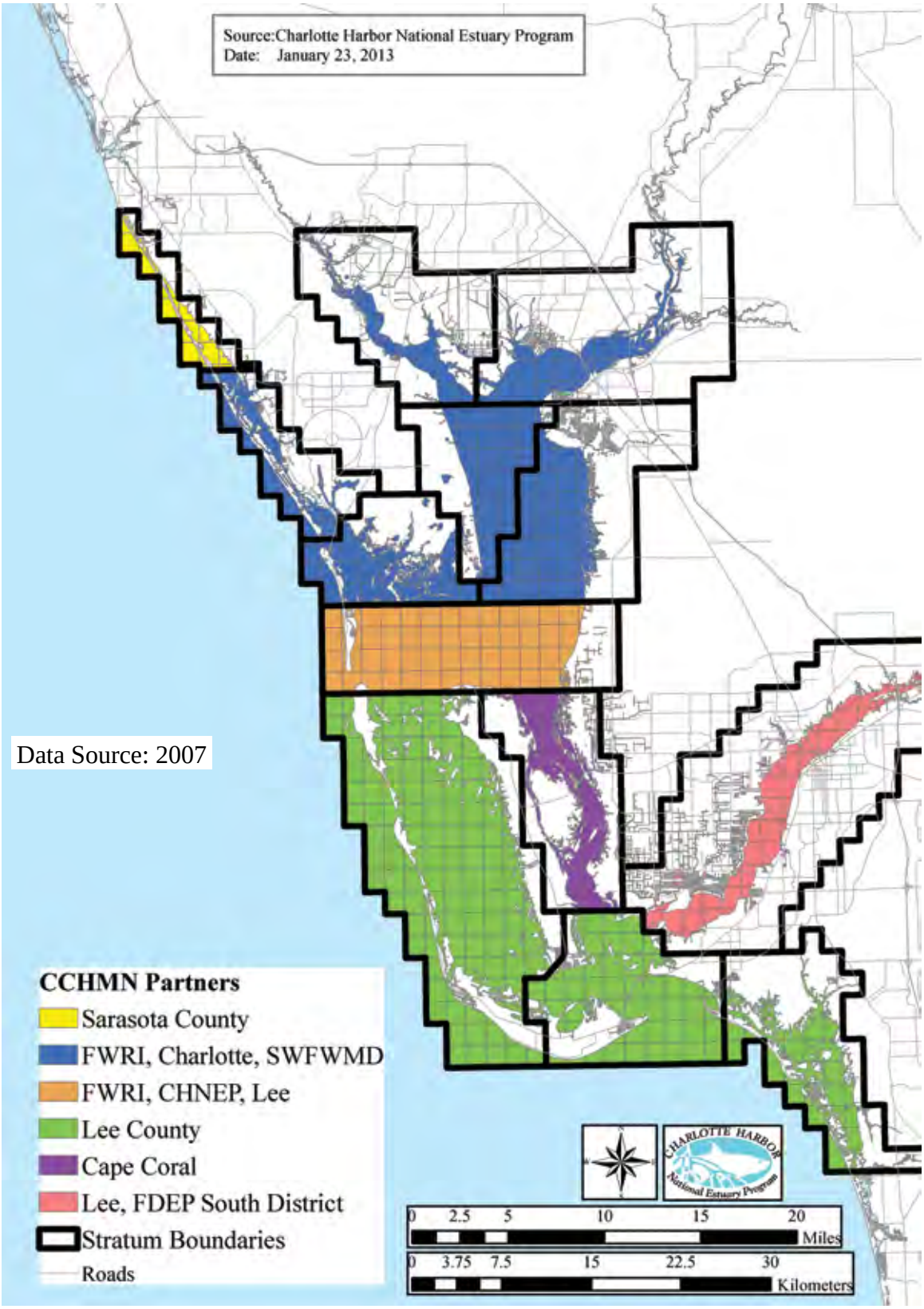
Map 24: Land Acquisition Alternatives

An interagency effort to identify potential habitat, water quality and hydrologic restoration activities was coordinated by the CHNEP and its partners. The projects shown are included in the Lee County Master Mitigation Plan and the Southwest Florida Comprehensive Watershed Plan. Existing land under some form of management, including conservation easements, is shown in green, while areas that would be useful for restoration and management are shown in purple. Our vision is to have the purple area under management.



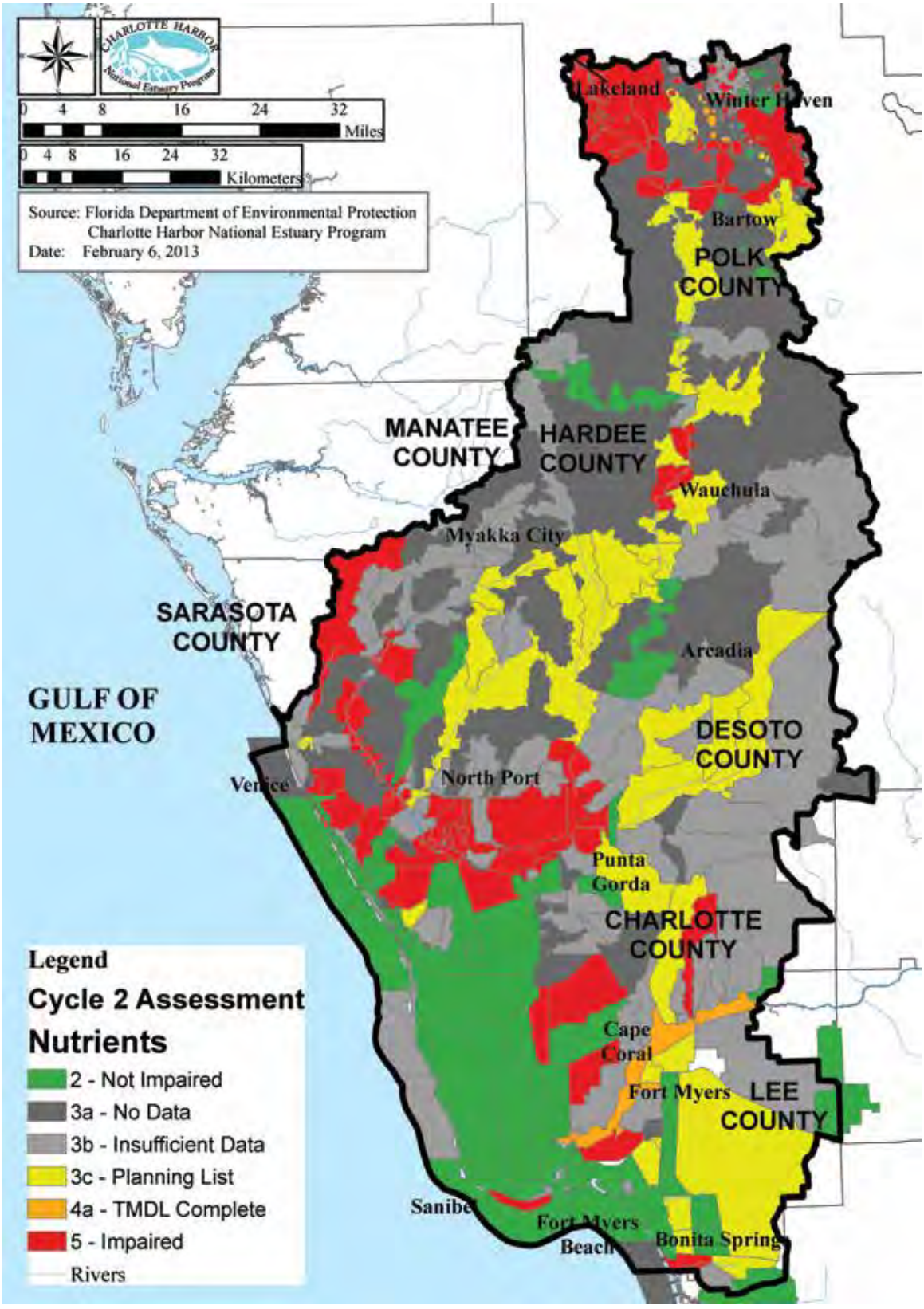
Map 25: Exotic Vegetation Removal Needs

Bulqf` sbdbq^qflk ob j ls^i kbbap lk _lqe mr_if` ^ka mofs^qb i^ka t bob fabkqfªba %oba& ^p m^oq lc ^k fkqbo^dbk`v restoration project. Our vision is to have exotic vegetation removed from the areas shown in red.



Map 26: Coastal Charlotte Harbor Monitoring Network

Our vision is to conduct integrated and long-term environmental monitoring programs. Integrated means that multiple agencies monitor but use consistent methods so that the data are comparable. Long-term data allows analysis of change with possible causes and restoration solutions. The Coastal Charlotte Harbor Monitoring Network is an example of our monitoring vision. Other examples include the Charlotte Harbor Estuary Volunteer Water Quality Monitoring Network and the Volunteer Tidal Shoreline Mapping Network.



Map 27: Water Quality Monitoring

Our vision is to have a better understanding of water quality impairments throughout our watershed. Within Map 27, the dark grey areas show where FDEP possesses no nutrient data to assess water quality impairments. Qeb ifdeq dobv ^ob^p pe l t t ebob qebob fp fkprc^{a}`fbkq krqofbkq a^q^ ql ^ppbpp t ^qbo nr^ifqv f j m^fo j bkqp+ Qeb green areas show where impairments have been assessed and the area is not impaired. Red and orange areas are impaired, while yellow areas are on a planning list.

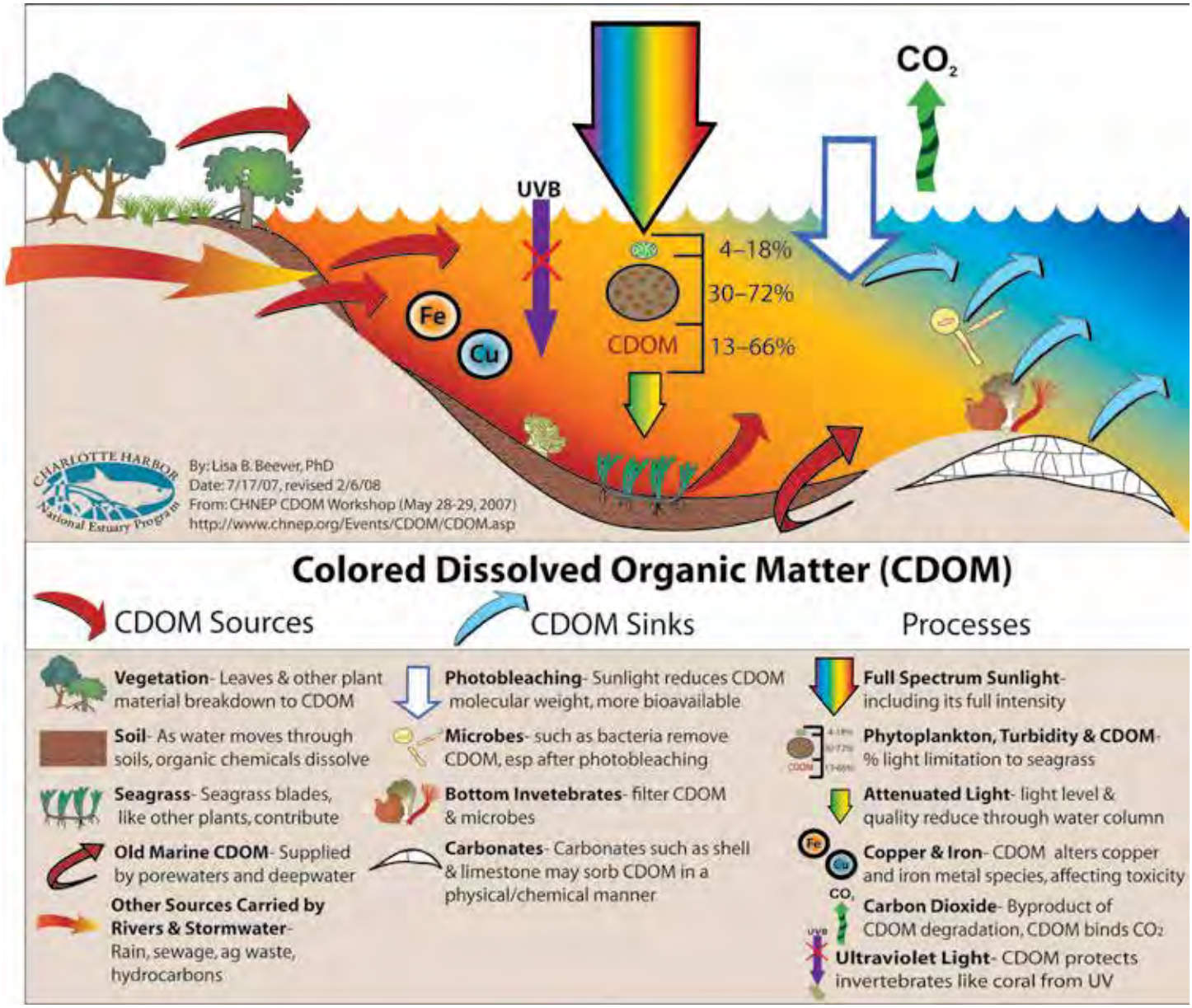
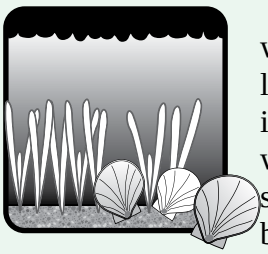


Figure 2: Communicating Science in Meaningful Ways

L ro sfpflk fp ql `l j j rkf`^qb rm*ql*a^qb obpb^o`e ªkafkdp fk j b^kfkdcri t^vp ql `fqfwbkp ^ka ab`fpflk* makers. On May 28–29, 2007, the CHNEP conducted a technical workshop on colored dissolved organic matter (CDOM). While CDOM is a natural component of the estuaries in this region, it limits the depth to which seagrass may grow. The above conceptual diagram was developed to encapsulate the major points of the workshop and serves as an example of our communication vision. The process of creating the conceptual diagram served as a valuable communication tool among the workshop participants.

Quantifiable Objectives

Teb cliil t fkd .2 nr^kqfª^_ib l_gb`qfsbp ^aaobpp pmb`fª` mol_ib j p ^ppl`f^qba t fqe t ^qbo nr^ifqv (WQ) degradation, hydrologic alteration (HA), ªpe ^ka t fiaifcb %CT& e^_fq^q ilpp ^ka pqb t ^oapefm d^mp %PD&+ Qebpb nr^kqfª^_ib l_gb`qfsbp t bob rpba to develop the priority actions for this management plan. All these objectives are measurable and have an ambitious timeline to provide incentive for action. Moldobpp t fii _b j b^proba ^d^fkpq qebpb nr^kqfª^_ib objectives.



Maintain or improve water quality from year 2000 levels. By 2018, bring all impaired water bodies into a watershed management program such as reasonable assurance or basin management action plan. By 2015, remove at least two water bodies from the impaired list by improving water quality.

By 2020, develop and meet water quality criteria that are protective of living resources for dissolved oxygen, nutrients, chlorophyll , turbidity, salinity and other constituents.

By 2025, reduce severity, extent, duration and frequency of harmful algal blooms (HABs), including macroalgae, phytoplankton and periphyton, through qeb fabkqfª`^qflk ^ka obar`qflk lc ^kqeolmldbkf` fk«rbk`bp+

?v /-/2) j bbq pebiiªpe e^osbpqfkd pq^ka^oap year round for the Myakka River conditionally restricted area and the conditionally approved areas of Lemon Bay, Gasparilla Sound, Myakka River, Pine Island Sound Western Section and Pine Island Sound Eastern Section.

By 2020, identify, establish and maintain a more natural seasonal variation (annual evaoldo^me& fk cobpe t ^qbo «l t p for:

- Caloosahatchee River.
- Peace River and its tributaries.
- Myakka River, with special attention to Flatford Swamp and Tatum Sawgrass.
- Estero Bay and its tributaries.

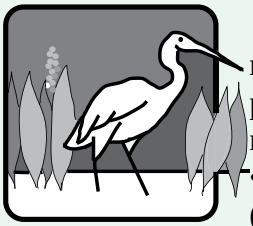
By 2020, restore, enhance and improve where practical historic watershed boundaries and natural hydrology for watersheds within the CHNEP study area, with special attention to Outstanding Florida Waters and Class I water bodies.

By 2020, enhance and improve to more natural hydrologic conditions water bodies affected by ^oqfª`f^iiv `ob^qba pqor`qrobp qeolrdelrq qeb @EKBM study area, including:

- Sanibel Causeway in Lee County.
- Franklin Lock (S-79) in Lee County.
- Dams on the Myakka Rivbo qe^q «l t p qeolrde Manatee, Sarasota and Charlotte counties.
- Causeway between Lovers Key State Recreation Area and Bonita Beach in Lee County.
- Water-control structure on the south end of Lake Hancock in Polk County.
- Structure on Coral Creek in Charlotte County.
- Gator Slough canal collector system in Lee and Charlotte counties.
- Peace Creek canal system in Polk County.
- Cow Pen Slough in Sarasota County.

Obar`b kbd^qfsb evaolildf` bccb`qp lc ^oqfª`f^iiv created structures such as weirs, causeways, dams, clay settling areas and new reservoirs.

By 2020, for each watershed, identify and recommend additional reforms to improve linkages between local, water management district, state and federal government development permitting and `^mfq^i moldo^ j p ^ccb`qfkd t ^qbo pqlo^db) «lla `lkqoli and water quality. By 2025, implement the additional reforms.



Protect, enhance and restore native habitats where physically feasible and within natural variability, including:

- Submerged aquatic vegetation (SAV);
- Submerged and intertidal unvegetated bottoms;
- Oyster;
- Mangrove;
- Salt marsh;
- Freshwater wetland;
- Native upland;
- Water column.

By 2020, achieve a 100 percent increase in conservation, preservation and stewardship lands within the boundaries of the CHNEP study area. The increase will be based upon 1998 acreage.

By 2020, achieve controllable levels of fks^pfsb bulqf` mi^kqp) ^p ab$^{a}$kba _v qeb Cilofa^ Bulqf` Pest Plant Council, and exotic nuisance animals, as ab^{a}kba _v qeb Cilofa^ Cfpe ^ka Tfiaifcb @lkpbos^qflk Commission, on publicly managed lands. Encourage and support the removal and management of invasive exotic plants and exotic nuisance animals on private lands.

By 2025, a minimum of 75 percent of all residents will have recalled attending a watershed event, reading watershed material or hearing watershed/estuary information on radio or TV. A minimum of 50 percent of all residents in the CHNEP study area can recognize estuaries and watersheds. A minimum of 10 percent of all residents will be able to claim personal actions that protect the estuaries and watersheds.

By 2020, the CHNEP will expand its role as a ob`ldkfwba obplro`b ql bib`qba lc$^{a}$`f^ip lo qebfo ^dbkqp from local, state and federal government for policy advice.

Through 2020, the CHNEP long-term monitoring strategy and data management strategy will continue and be enhanced. Resulting informational websites will be maintained systematically.

Qelrde /-/-) hbv dbldo^mef` ^ka p`fbkqf^{a}` information will be presented in ways that are meaningful to the majority of people.

Priority Actions

Priority actions describe the necessary j ^k^db j bkq ^`qfsfqfbp ql ^qq^fk qeb nr^kqfª^_ib l_gb`qfsbp+ J lpq lc qeb nr^kqfª^_ib l_gb`qfsbp are broad aims that require many individual tasks to be accomplished. Often tasks will address multiple objectives. 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 four priority problem areas: water quality degradation (WQ), hydrologic ^iqbo^qflkp %E>&) ªpe ^ka t fiaifcb e^_fq^q ilpp %CT& and stewardship gaps (SG). Each priority action describes the key elements of management action including:

is the activity that is kbbaba ql ^`efbsb qeb nr^kqfª^_ib l_gb`qfsb+

The section explains the priority action, elt fq t fii p^qfpcv fqp nr^kqfª^_ib l_gb`qfsb ^ka qeb rationale for its implementation. The background may include a description of how the priority action t fii ªq t fqe m^pq lo lkdlfkd j ^k^db j bkq ^`qfsfqfbp) how the priority action will achieve the objectives and bumb`qba _bkbªqp lc qeb ^`qflk+

Carrying out this priority action is progress toward achieving the . Many priority ^`qflk pqo^qbdfbp prmmloq j lob qe^k lkb nr^kqfª^_ib objective.

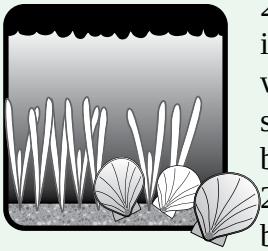
molsfabp pmb`fª` pqbmp ^_lrq elt qeb priority action could be carried out. Some of the priority actions will require several steps to be accomplished. The strategy details the steps that could be taken, but there may be shorter methods or more steps that will be necessary. This information was provided by the committees as suggestions for the project managers and implementing organizations on how this action could be carried out. The actual steps must be determined based on the location and the actual projects being carried out by the coordinating and implementing organizations.

is a list of the entities that may implement each priority action. These groups may include local, regional, state or cbabo^i dlsbok j bkq ^dbk`fbp) klkmolªq dolrmp) mofs^qb organizations, industry or other private interests. Each listed organization may play a role in only one part of the strategy or region.

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 regional management activities will require consistent measurement and evaluation as the _bkbªqp ^ob ob^ifwba ^ka molgb`qp ^ob `l j mibqbaª+ >ii priority actions describe timely, needed management ^`qflkp ql criªii the

Comprehensive Conservation and Management Plan

Water Quality Degradation



Maintain or improve water quality from year 2000 levels. By 2018, bring all impaired water bodies into a watershed management program such as reasonable assurance or basin management action plan. By 2015, remove at least two water bodies from the impaired list by improving water quality.

By 2020, develop and meet water quality criteria that are protective of living resources for dissolved oxygen, nutrients, chlorophyll , turbidity, salinity and other constituents.

By 2025, reduce severity, extent, duration and frequency of harmful algal blooms (HABs), including macroalgae, phytoplankton and periphyton, through qeb fabkqfª`^qflk ^ka obar`qflk lc ^kqeolmldbkf` fk«rbk`bp+

?v /-/2) j bbq pebiiªpe e^osbpqfkd pq^ka^oap year round for the Myakka River conditionally restricted area and the conditionally approved areas of Lemon Bay, Gasparilla Sound, Myakka River, Pine Island Sound Western Section and Pine Island Sound Eastern Section.

Participate in the development and implementation of coordinated watershed management programs that accommodate the variable mission and funding priorities of program participants. Bk`lro^db qeb ^mmif`^qflk lc «buf_ib) dl^i*lofbkqba approaches in reasonable assurance plans, basin management action plans (BMAPs),

s and nutrient reduction plans.

Continue collecting consistent water quality data from throughout the study area used to assess impairments, determine total maximum daily load (TMDL) limits and develop basin management action plans (BMAPs). Support key programs such as the Coastal Charlotte Harbor Monitoring Network, m^oqkbop$ ilkd*qbo j ªuba pq^qflkp ^ka slirkqbbo monitoring programs.

Use tools such as geographic information systems, integrated ground and surface water quality models and pollutant loading models to identify water quality problems and select less polluting alternatives.

Reduce nonpoint-source pollutants associated t fqe pqlo j t ^qbo orklcc+ Fkpq^ii lo obqolªq _bpq management practices (BMPs) to maintain or improve t ^qbo nr^ifqv ^ka «l t p+

Implement projects to improve or protect water quality to offset anthropogenic impacts.

Promote water conservation, stormwater treatment and intergovernmental coordination within local plans and codes to prevent the impacts of increasing levels of impervious surface and ªii ql ^`efbsb f j molsb j bkqp ql t ^qbo nr^ifqv ^ka groundwater and surface water storage.

Develop and implement water quality criteria that are protective of living resources for dissolved oxygen, nutrients, chlorophyll turbidity, salinity and other constituents as applicable.

Assess the bacteria, nutrient load and base «l t f j m^`qp lc pbmqf` pvpqb j p) t ^pqb t ^qbo qob^q j bkq plants and reuse water. Recommend effective corrective action.

Determine the relationship between macro- and micronutrients and phytoplankton/algal blooms. Support measures to reduce phytoplankton/algal blooms where relationships have been determined.

Provide central sanitary sewers to developed areas within 900 feet of waters such as estuarine shorelines, rivers, creeks, canals and lakes.

Implement conservation landscaping plant programs, including the Florida Yards & Neighborhoods program, throughout the CHNEP study area.

Increase the use of personal and home best management practices by residents and visitors throughout the watershed to reduce nonpoint-source pollution.

Support public involvement programs addressing water quality issues.

WQ-A

Participate in the development and implementation of coordinated watershed management programs that accommodate the variable mission and funding priorities of program participants. Encourage the application lc «buf_ib) dl^i*lofbkqba ^mmol^`ebp fk ob^plk^_ib ^ppro^k`b mi^kp) _^pfk management action plans (BMAPs),

s and nutrient reduction plans.

Total maximum daily loads (TMDLs) is a federal and state program to identify water bodies impaired by pollutants, to calculate a protective load and to regulate polluters so that the aggregate of all loads does not exceed levels acceptable for the "health" of the water body and its designated uses. Another term for this level is assimilative capacity. Reasonable assurance and basin management action plans (BMAPs) are watershed management plans that consolidate existing efforts in one document and set a course for restoration to acceptable pollutant loads. Because they are legally binding, TMDLs provide a unique opportunity to focus community efforts on maintaining bays, rivers and lakes in a sustainable condition. The FDEP, in cooperation with the EPA and water management districts, is eager to work with local stakeholders to use the TMDL framework to set water quality targets, monitor and assess status and trends, identify high priority projects and implement molgb`qp t fqe nr^kqfª^_ib lrq`l j bp+ ?b`^rpb qeb CHNEP is not subject to TMDL regulations, the CHNEP is a natural arbiter among stakeholders.

Qefp mofl ofqv ^`qflk ebimp criªii WQ-1.

1) Track and participate in review of EPA and FDEP regulations and policy changes, including designated uses, nutrient criteria, pollutant trading ^ka t^qbo _lav fabkqfª`^qflk mlif`fbp+
2) Review draft impaired water list for accuracy.
3) Ensure adequate, high-quality data are submitted ql pq^qb a^q^_^pb rpba clo f j m^fo j bkq sbofª`^qflk+
4) Review and correct station location relationship to t^qbo _lav fabkqfª`^qflk _lrka^ofbp ^ka pf j fi^o factual errors.
5) Revie t lc t^qbo _lav fabkqfª`^qflk %T ?FA& boundaries to ensure they are accurate and agree with watershed boundaries.
6) Evaluate proposed TMDLs, including watershed models used to develop load estimates, assimilative capacity determination and pollutant load reductions.
7) Provide comments as necessary within the comment period.
8) Participate in the development of watershed management plans such as reasonable assurance (RA) and BMAP development. Incorporate CCMP objectives and actions in such plans. Encourage effective alternatives such as

   and nutrient reduction plans.
9) Participate in the implementation of the

   reasonable assurance document. A copy is available at

10) Encourage implementation of capital improvement projects that reduce pollutant loads.
11) Encourage low-impact development and pollutant load reduction needs into new development projects.
12) Advocate consistency of point-source discharge permits with pollutant load reductions into impaired and potentially impaired water bodies. Permitted loads should not cause impairment.
13) Consider role of the CHNEP as facilitator of BMAP development and implementation.
14) Adopt and implement TMDL determinations and BMAPs for impaired surface w^qbop) ^p fabkqfªba through the

    .
15) Monitor

    to ensure protection of Punta Gorda's water supply; develop similar plans in other watersheds.

T^qbo _lafbp %fabkqfªba _v t^qbo _lav IDs) on the Florida Department of Environmental Molqb`qflk$p Sbofªba Ifpqp clo F j m^fo j bkqp %pbb surface water quality criteria as listed in 62-302.530 in Appendix B).

Remove at least two water bodies from the impaired list by improving water quality by 2015.

WQ-B

Continue collecting consistent water quality data from throughout the study area used to assess impairments, determine total maximum daily load (TMDL) limits and develop basin management action plans (BMAPs). Support key programs such as the Coastal Charlotte Harbor J lkfqlofkd Kbq t loh) m^oqkbop$ ilkd*qbo j ªuba pq^qflkp ^ka slirkqbbo monitoring programs.

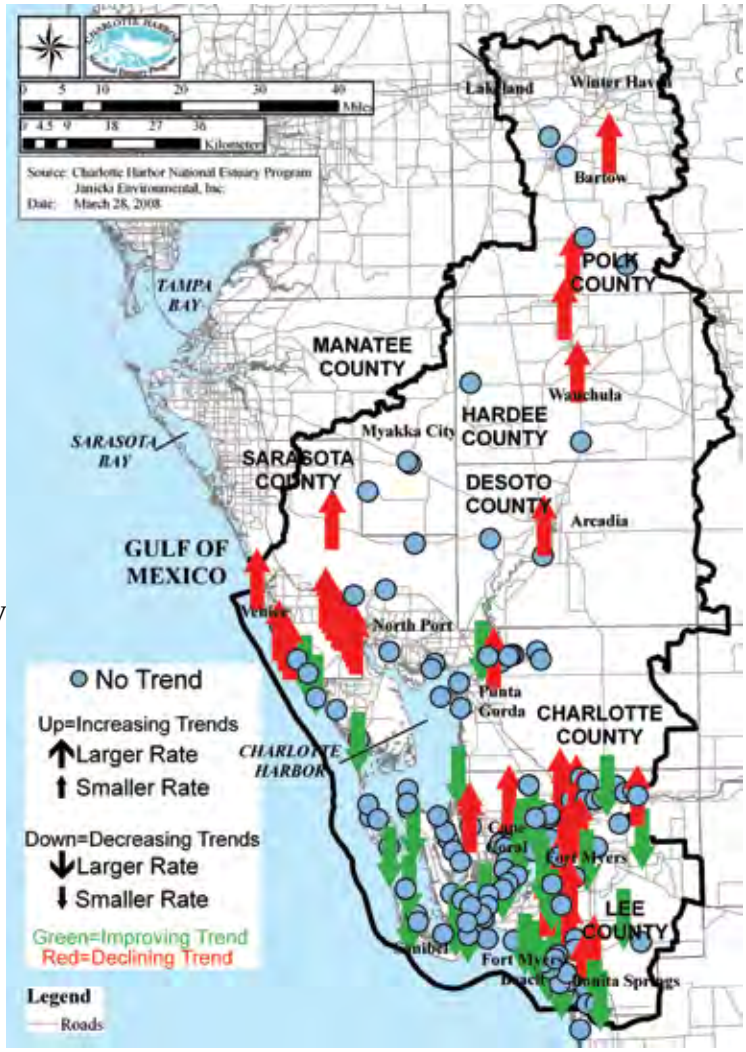
The Florida Department of Environmental Protection (FDEP) assesses impairments, establishes TMDLs for t ^qbo _lafbp t fqefk qeb pq^qb qe^q e^sb _bbk fabkqfªba as not meeting current water quality standards, and participates in the development of BMAPs. Over the last decade, FDEP has sampled water bodies for short mboflap) _rq prcª`fbkq ql sbofcv f j m^fo j bkqp+ Qelrde long-term stations are preferable to fully assess the status and trends of a water body, the short period sampling implemented by FDEP may be currently the j lpq `lpq*bccb`qfsb ^mmol^`e ql ªii fabkqfªba d^mp fk water quality data.

Qefp moflofqv ^`qflk ebimp criªii WQ-1.

1) Work with partners to keep the Coastal Charlotte Harbor Monitoring Network (CCHMN) fully lmbo^qflk^i+ Qeb @@E J K fp ^ pqo^qfªba o^kal j sample program designed to assess ambient conditions. Partners follow the same protocols to obtain consistently derived data. These data were used to determine nitrogen and phosphorus numeric criteria.
2) Support volunteer monitoring networks such as FDEP's Charlotte Harbor Estuaries Volunteer Monitoring Network (CHEVWQMN), Lee County Hyacinth Control District's PondWatch, Cape Coral's CanalWatch and Polk County Extension's LakeWatch programs. Support may include technical transfer and serving data on the CHNEP Water Atlas.
3) Evaluate w^qbo _lav fabkqfª`^qflk %T ?FA& boundary changes or other assessment changes (e.g., reach-based National Hydrologic Data) in relation to monitoring programs.
4) Continue to support adding water quality data to the standard common database (e.g., STORET) and its availability to citizens and scientists through the CHNEP Water Atlas.
5) Continue to identify parameters of concern such as various pharmaceuticals and potential sources, including reuse water and other wastewater treatment products.
6) Conduct water quality analyses to identify trends.

O^kal j pqo^qfªba p^ j mib t ^qbo nr^ifqv monitoring program for 13 strata, monthly.

Continued monthly water quality monitoring through the CCHMN.



Map 28: Turbidity Trends

This map is a product of the Triennial Water Quality Status and Trends, representing turbidity trends from 1995–2005. Turbidity is cloudiness in the water.

WQ-C

Use tools such as geographic information systems, integrated ground and surface water quality models and pollutant loading models to identify water quality problems and select less polluting alternatives.

The amount of pollutants entering water bodies has important effects on water quality. It is necessary to understand the relationship between pollutants and land use. Spatial analyst application in geographic information systems can be used to express water quality data as maps that can expose locations with consistent or acute water quality problems. Accurate pollutant loading rates from event mean concentration (EMC) and runoff estimates are useful for National Pollutant Discharge Elimination System (NPDES) permits for municipal (and county) stormwater systems and basin management action plans (BMAPs). For NPDES permits, Rule 62-624.5, FAC, requires an estimate for seasonal pollutant load and the EMC of a representative storm for each major outfall or watershed within the Municipal Separate Storm Sewer System (MS4), which are included in an annual report. Parameters for all Florida Phase I permits include: biochemical oxygen demand (BOD5), total phosphorus, chemical oxygen demand (COD), dissolved phosphorus, total suspended solids (TSS), total recoverable copper, total dissolved solids (TDS), total recoverable lead, total nitrogen (N), total recoverable zinc, total ammonia plus organic N, and total recoverable cadmium. Highways and future highway projects are critical since they also require drainage facilities that will gather, concentrate and discharge many of the pollutants mentioned above. Common public domain GIS-based models include HSPF (Hydrological Simulation Program - FORTRAN), found at

Qefp mofl ofqv ^`qflk ebimp criªii WQ-1.

1) Review loading/water quality models for Florida and CHNEP study area, including ACOE and FDEP pre-/post-construction loading models.
2) Through review of models and other literature, identify which land uses are the largest contributors of pollutants per unit area.
3) Collect information to determine event mean concentration (EMC) and runoff estimates for different local crop types within the general agricultural land use. Information collected may include runoff rates and surveys of farmer ^ppl`f^qflkp ql abqbo j fkb ^`ob^db lc pmb`fª``olmp grown.
4) Rank land uses considering two criteria: loading potential and the potential to ameliorate loading through management. Support mitigation of hydrologic alterations and impacts to water quality as part of future roadway improvement projects.
5) Determine the land use of highest priority, then characterize the uncertainty in EMC and runoff estimates for that land use.
6) If it is determined that existing data does not adequately characterize the priority land use, design and implement a monitoring efcloq ql obªkb the estimate(s) and reduce the uncertainty to an acceptable level.
7) @lkªoj ^ka rma^qb bufpqfkd mlfkq afp`e^oge information through NPDES permit reported data review.
8) Compile data on or conduct a study of implemented BMP reuse water projects in the CHNEP study area.
9) Inventory BMP manuals with monitoring program data.
10) Estimate remov^i bcª`fbk`v lc afccbobkq ? J Mp+
11) Establish an EMC working group, similar to what was done by Tampa Bay Estuary Program. Charge the working group with determining whether to develop pollutant load models or to rely on a Level 1 spreadsheet that provides bounds or the magnitude of pollution.

Mliirqflk plro`bp qe^q e^sb _bbk fabkqfªba using tools such as geographic information systems and models.

@lkªoj ªsb plro`bp lc mliirqflk ^ka bif j fk^qb qeb j by 2018.

WQ-D

Reduce nonpoint-source pollutants associated with stormwater runoff.
Fkpq^ii lo obqolªq _bpq j ^k^db j bkq mo^`qf`bp %? J Mp& ql j ^fkq^fk lo f j molsb t ^qbo nr^ifqv ^ka «l t p+

According to the 2010 CHNEP study to estimate pollutant loads, the largest source of total nitrogen (TN), total phosphorus (TP) , total suspended solids (TSS) and biochemical oxygen demand (BOD) t fqefk b^`e lc qeb fabkqfªba t ^qbopebap `l j bp col j nonpoint-source stormwater runoff, 70 percent, 68 percent, 95 percent and 90 percent respectively. The atmosphere deposits 6 percent of TN loads within the study area. Industrial point sources account for 20 percent of TN, 28 percent of TP, 3 percent of TSS and 7 percent of BOD. The CHNEP assessed pollutant loads by land use and by basin for the periods from 1975 to 1990 and from 1995 to 2007. Final estimates showed an apparent reduction of pollutant loads between the two 12- to 15-year blocks.

Qefp mofl ofqv ^`qflk ebimp criªii WQ-1.

1) Implement source reduction of pollutants. Examples include adoption of Urban Fertilizer Ordinances in accordance with SWFRPC Resolution 2007-01, implementation of low-impact development regulations, adoption of the draft Lower West Coast basin rule, tailwater recovery and/or surface water reservoir systems on agricultural property and acquisition of conservation lands.
2) Encourage redevelopment of older properties and businesses to improve stormwater treatment whenever possible.
3) Reduce impervious paved surface required by various land uses. Monitor using periodic land-use updates and impervious estimates. Correlate with load and event mean concentration (EMC) estimates.
4) Evaluate the impacts of sludge and sediments on water quality.
5) Identify locations to install stormwater treatment areas (STAs) and pursue installation of top-priority STAs.
6) Implement Florida Department of Agriculture and Consumer Aff^fop Lcª`b lc >dof`riqro^i Water Policy best management practices (BMP) manuals found at:

: Nitrogen, phosphorus, suspended solids and biochemical oxygen demand pollutant loads estimated and validated by land use, per acre and by basin.

Reduce average nitrogen, phosphorus, suspended solids and biochemical oxygen demand pollutant loads by land use on a per acre basis by 2025.

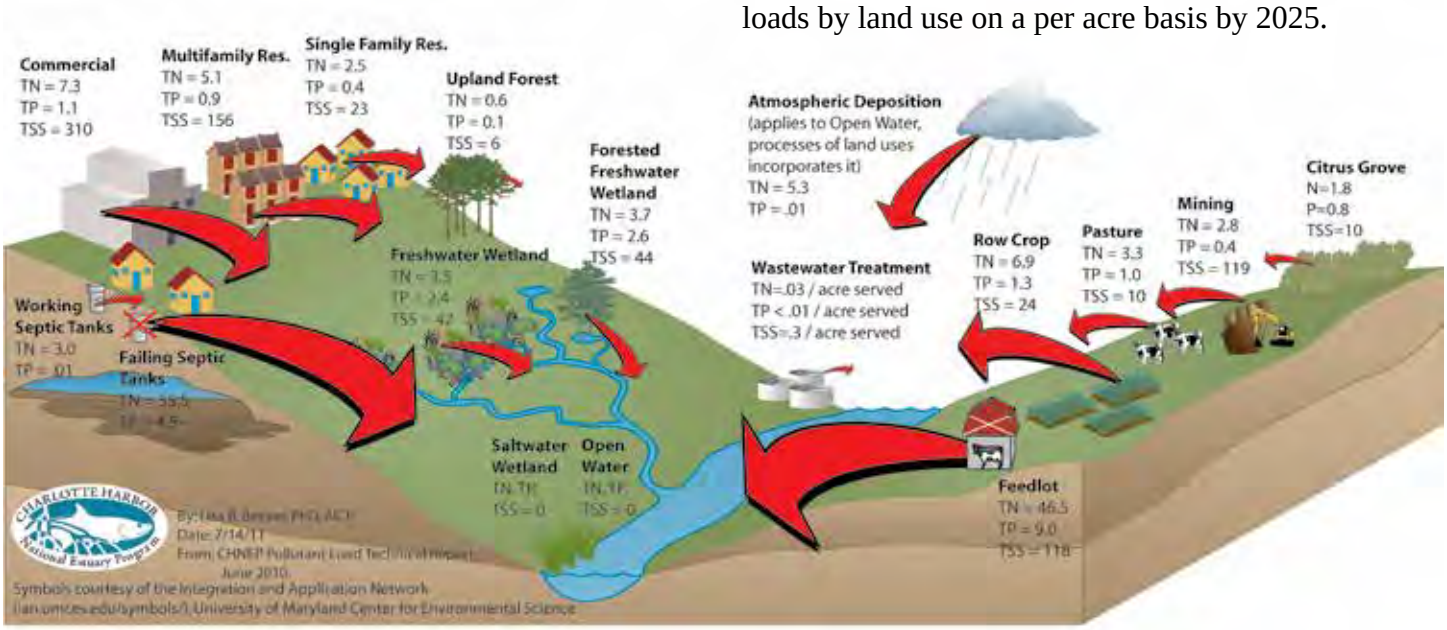


Figure 3: Conceptual Diagram of Pollution Load Estimates

Pollutant Load Estimates

WQ-E

Implement projects to improve or protect water quality to offset anthropogenic impacts.

Southwest Florida is one of the fastest-growing areas in the country. Adverse water quality impacts usually accompany increases in population and additional impervious surface. Some water bodies within the Charlotte Harbor region may suffer from adverse anthropogenic (man-made) impacts without triggering FDEP water quality standards. A variety of reasons exist for not triggering standards, including lack lc a^q^ clo pl j b m^o^ j bqbop ^ka _^pf` afc$^`riqv fk absbilmfkd p`fbkqf$^`^iiv abcbkpf_ib pq^ka^oap qe^q `^k be broadly applied. Therefore, water quality projects that are developed with watersheds in mind can yield positive results.

An example is at Prairie Creek. Although there is a long-term dataset collected by USGS on Prairie Creek at Fort Ogden, chlorophyll was not a collected parameter. Although there were other agencies collecting chlorophyll at that site, according to the Impaired Waters Rule qualitative nutrient standards, fkprc$^`fbkq a^q^ t bob ^s^fi^_ib ql `lk$^o j ^ krqofbkq impairment. Chloride, conductance and dissolved plifap f j m^fo j bkqp t bob sbof$^ba al t kpqob^ j ^q the Shell Creek (public water supply) Reservoir. Management actions taken by the SWFMWD under the Facilitating Agricultural Resource Management Systems (FARMS) program and area property owners included well back-plugging and surface water tailwater recovery ponds. After the projects were implemented, these best management practices %? J Mp& ^ipl ^aaobpp sbof$^ba f j m^fo j bkqp) t ebob_v nitrogen and phosphorus levels also decreased at Prairie Creek. In 2011, numeric nutrient criteria were proposed for streams. Although Prairie Creek exceeded these standards for nutrients before 2001, Prairie Creek has met the numeric standards all years since the management actions.

Pmb`f$^` mi^kkfkd clo f j molsb j bkqp fk mbo j fqqba abpfdk ^ka fk obqol$^q pq^ka^oap fp kbbaba ql obar`b fabkqf$^ba krqofbkq mliirqflk fk j ^kv pr_t ^qbopebap+ Obqol$^q mi^kp clo qeb j ^glo pr_t ^qbopebap fabkqf$^ba as having the highest nutrient loading are needed to begin to address existing and future nutrient pollution in the watershed. In order to reduce current pollution ^ka ^slfa `r j ri^qfsb f j m^`qp) pmb`f$^` t lohp molgb`qp will be needed—including regional stormwater treatment facilities, regional stormwater conveyance reconstruction to retain rather than drain water, expanded on-site detention, and designs that utilize BMPs in series.

Qefp moflofqv ^`qflk ebimp cri$^ii WQ-1.

1) Determine if a water body is degraded or has declining trends and target it for restoration.
2) Identify appropriate numeric pollutant load reduction goal(s) for maintenance or restoration activities to offset and decrease anthropogenic water quality impacts.
3) Establish partners and funding sources to implement projects.
4) Review the SFWMD report

   and identify which subwatersheds are the largest contributors of pollutants to the area.
5) Collect information to determine source land uses that are contributing the major part of the current nutrient loading. Assess potential changes in pollutant loads using projected build-out scenarios derived from local government comprehensive plan future land uses and proposed zoning changes. Provide resulting information to improve management decisions.
6) Prioritize the nutrient and other pollutant sources of highest concern in each subwatershed and identify available actions that could be undertaken to reduce/eliminate those sources. Other pollutant plro`bp lc efdebpq `lk`bok fk`irab pmb`f$^` t ^qbo quality impairments and emerging contaminants.

Percent of water quality stations showing declining and/or improving trends by parameter by basin.

No more than 10 percent of water quality stations shall show a declining trend.

WQ-F

Promote water conservation, stormwater treatment and intergovernmental coordination within local plans and codes to prevent the impacts of fk`ob^pfkd ibsbip lc f j mbosflrp proc^`b ^ka ªii ql ^`efbsb f j molsb j bkqp to water quality and groundwater and surface water storage.

Research has shown that watersheds with increasing percentages of impervious surface had higher levels of total organic carbon, total phosphate and fecal coliforms. The diagram below illustrates the relationship between impervious surface, changes in the physical and chemical environment and ecological responses. These changes begin at 10 percent impervious surface. Models developed by Lee County indicate that the some watersheds within the CHNEP study area currently have impervious surface coverage of 10 to 20 percent, but growth projections indicate impervious coverage of 20 to 40 percent by 2050. Moreover, percentage coverage within various land-use categories shows an increasing trend. Local comprehensive plans should be consistent with and help to implement the CCMP.

Qefp moflofqv ^`qflk ebimp criªii WQ-1.

1) Identify the drainage watersheds for water courses.
2) Continue to monitor the degree of impervious surfaces within the watershed.
3) Forecast the degree of change of these conditions to the end of the planning period.
4) Evaluate the current capacity of stormwater systems of the watershed to store and treat storm water from the design storm and its frequency, under current conditions and future conditions.
5) Pursue coordinated approaches with neighboring jurisdictions.
6) Subsequent to local comprehensive plan amendments, implement land development regulations that restore, mitigate or prevent the impacts of increasing levels of impervious surface ^ka ªii col j e^sfkd ^ kbd^qfsb bccb`q ^ka ^`efbsb improvements to water quality and groundwater and surface water storage.
7) Develop accurate analytical tools.
8) Work with water management districts and area local governments to improve the use of zoning, land-use and comprehensive planning tools to protect water resources in the watershed. Provide technical assistance to evaluate, plan and initiate ªk^k`fkd clo bksfolk j bkq^i fkco^pqor`qrob necessary to assure sustainable water supplies and improved water quality.

Reforms within government development permitting and capital improvements that improve hydrology and water quality.

Five major reforms within government development permitting or capital improvement standards that improve hydrology and water quality between 1998 and 2020.

Figure 4: Conceptual Diagram of the Relationship of Impervious Surface to the Environment
The Tidal Creek Project

WQ-G

Develop and implement water quality criteria that are protective of living resources for dissolved oxygen, nutrients, chlorophyll , turbidity, salinity and other constituents, as applicable.

Qefp moflofqv ^`qflk ebimp criªii TN*/+

In 2008, the CHNEP embarked on developing seagrass targets and related water clarity targets. In January 2009, and as a result of a lawsuit, the EPA informed the FDEP that their narrative nutrient standards do not comply with the Clean Water Act and directed them to develop state numeric nutrient standards for rivers and lakes by January 2010 and estuarine and coastal waters by January 2011. The Tampa Bay Estuary Program, Sarasota Bay Estuary Program and the CHNEP developed and ob`l j j bkaba bpqr^ov*pmb`fª` kr j bof` krqofbkq criteria (NNC), using the NEP science-driven and consensus-based process. The three NEPs used similar analytical methods to develop their criteria. By 2011, the CHNEP adopted recommended nitrogen, phosphorus and chlorophyll criteria by estuary segment, based on seagrass light requirements and water clarity. These criteria were included in the September 29, 2011 draft FDEP rule under consideration by the EPA. Between 2006 and 2009, the CHNEP sponsored several studies to investigate pharmaceuticals in tidal rivers. Ecoestrogens, steroids, impotence treatments, lipid-lowering drugs and anti-depressant chemicals were either undetectable or at near detectable levels.

1) Continue to develop water quality criteria that are protective of living resources for consideration by state and federal agencies.
2) Develop water clarity (spectral) models to accurately describe the annual state of estuarine waters, according to seagrass light needs.
3) Investigate the relationship between conductivity variations caused by groundwater pumping and aquatic life use support in predominantly freshwater areas.
4) Establish or expand monitoring programs for emerging contaminants such as pharmaceuticals and personal care products, pesticides in sediment and nanomaterials.

Chlorophyll, nitrogen, phosphorus and water clarity conditions that are protective of seagrass and ªpe _v _^pfk+

Meet or exceed the annual arithmetic mean of chlorophyll, nitrogen and phosphorus for the below-ifpqba pbd j bkqp fk ^q ib^pq q t l vb^op lc bsbov ª sb+

	Goal	Total Target	Restore Acres	Chlorophyll (µg/L)	Nitrogen (mg/L)	Phosphorus (mg/L)
Dona and Roberts	Restore	112	21	4.9	0.42	0.18
Upper Lemon Bay	Preserve	1,009		8.9	0.56	0.26
Lower Lemon Bay	Restore	2,882	380	6.1	0.62	0.17
Tidal Myakka	Preserve	456		11.7	1.02	0.31
Tidal Peace	Restore	975	591	12.6	1.08	0.50
Charlotte Harbor	Restore	16,344	632	6.1	0.67	0.19
Pine Island Sound	Preserve	26,837		6.5	0.57	0.06
Matlacha Pass	Restore	9,315	1,733	6.1	0.58	0.08
Tidal Caloosahatchee	Restore	93	6	TBD	TBD	TBD
San Carlos Bay	Preserve	4,372		3.5	0.56	0.07
Estero Bay	Restore	3,662	591	5.9	0.63	0.07
Total		66,057	3,954			

Table 5: Living Resource and Nutrient Targets

WQ-H

>ppbpp qeb _^`qbof^) krqofbkq il^a ^ka _^pb «l t fj m^`qp lc pbmqf` systems, wastewater treatment plants and reuse water. Recommend effective corrective action.

Florida regulations refer to septic systems as onsite sewage treatment and disposal systems (OSTDS). A basic OSTDS can contain one or more of the following components: septic tank, subsurface drain ªbia) ^bol_f` qob^q j bkq rkfq) do^v t ^qbo q^kh) lo laundry wastewater tank. An OSTDS must provide clo pr_proc^`b bc«rbkq afpmlp^i ^ka klq e^sb ^kv open tanks. In 2010, the state legislature adopted a statewide septic evaluation program to require septic tank maintenance. Though this requirement was repealed in 2012, legislation allows local governments to adopt septic tank maintenance ordinances. In preparation for the implementation date within the 2010 legislation, the Department of Health prepared a draft rule (

), components of which may be used for development of septic tank maintenance ordinances.

Qefp moflofqv ^`qflk ebimp criªii WQ-2 and WQ-4.

1) Identify sources of bacteria, nutrients and other indicators in water bodies.
2) Conduct appropriate groundwater and surface water studies necessary to determine the cumulative impacts of high densities of septic systems.
3) Promote recommendations of the

regarding wastewater discharge,

regarding wastewater package plants of less than 100,000 gpd capacity, and

regarding onsite wastewater system planning, treatment and management.

4) Identify appropriate indicators and rapid cost-effective methods to identify septic system discharges.
5) Support appropriate changes in state laws and local septic system ordinances to mitigate impacts to the greatest practical extent.
6) Support periodic inspection of all septic systems where impacts to ground water/surface waters have been shown. Counties should be encouraged to include such language within their updated comprehensive plans.
7) Enhance enforcement to ensure appropriate repairs are made when necessary.
8) Establish homeowner education programs.

Percent of urbanized areas served by septic tanks where maintenance is required.

By 2020, 75 percent of urbanized areas have regular septic system maintenance programs implemented.

Photo by Lisa Beever, 5/19/03

WQ-I

Determine the relationship between macro- and micronutrients and phytoplankton/algal blooms. Support measures to reduce phytoplankton/algal blooms where relationships have been determined.

Land development and population rise is often linked to increased nutrient loading and eutrophication of surrounding water bodies. Locally, within the CHNEP watershed, there has been quick growth and increased development over the past several decades, leading to concerns of water quality degradation, including increased occurrence and duration of phytoplankton and algal blooms. Phytoplankton blooms occur when conditions are adequate for rapid dol t qe ^ka `bii afsfpflk+ Qefp obnrfobp prc$^{a}$`fbkq ifdeq clo melqlpvkqebpfp ^ka prc^{a}`fbkq `lk`bkqo^qflkp lc j^`ol*^ka jf`olkrqofbkqp ql crbi `^o_lk ^{a}u^qflk during photosynthesis. A suite of macronutrients (e.g., ammonia, nitrate, phosphate and silica) and micronutrients (e.g., iron, copper, zinc, boron, molybdenum and manganese) are used during the photosynthetic process at varying ratios. The general ratios of the nutrient requirements are known; however, specialized phytoplanktonic groups (e.g., kfqoldbk ^{a}ubop& t fii qeofsb rkabo `lkafqflkp lrqpfab lc qeb ab$^{a}$kba o^qflp+ >kv lkb lc qeb krqofbkqp `^k _b limiting phytoplankton production at any one time; if the limiting nutrient is supplied, phytoplankton will bloom until another nutrient or light becomes limited. In the open ocean, micronutrients are often the limiting factor; whereas in estuaries, macro-nutrients (e.g., nitrogen and phosphorus) are typically limiting. Identifying the limiting nutrient and the source of nutrients within the system allows for better management.

Qefp moflofqv ^`qflk ebimp cri^{a}ii WQ-3.

1) Identify programs currently in place to monitor nutrient concentrations within the watershed (spatial extent, frequency, duration, nutrients).
2) Determine programs that systematically collect phytoplankton/algal species and location information.
3) Identify areas lacking adequate sampling programs and support implementation of collection of nutrient and phytoplankton/algal data.
4) Support installation of continuous nutrient monitoring devices in critical locations (e.g., areas commonly experiencing phytoplankton blooms).
5) Analyze data, calculate ratios and compare the general nutrient ratio requirements to those present in the systems to identify limiting factors. Determine natural phytoplankton/algal bloom occurrences and those caused by anthropogenic impacts.
6) If there is a relationship between phytoplankton/algal blooms and nutrients, identify sources of the nutrients.
7) Perform bioassays using water collected from water bodies/areas of concern to identify the limiting nutrient for the phytoplankton composition present in the water column.
8) During bloom events, identify to the lowest _flildf`^iiv pfdkf$^{a}$`^kq q^ulkl j f` ibsbi qeb phytoplankton composition.
9) Monitor zooplankton concentrations that may exhibit top-do t k) do^wfkd fk«rbk`b lk phytoplankton and therefore mask the effect of increased nutrients.
10) Determine if and to what extent the practice of removing drift algae affects natural systems.

WQ-i: Taxonomic composition, severity (cell count), extent, and duration of red tide blooms, blue-green algal blooms, nuisance blooms of macro-algae and ^{a}i^ j bkql rp dobbk ^id^i _ill j p ^ka lqebo qluf` afkl«^dbii^qbp lc `lk`bok+

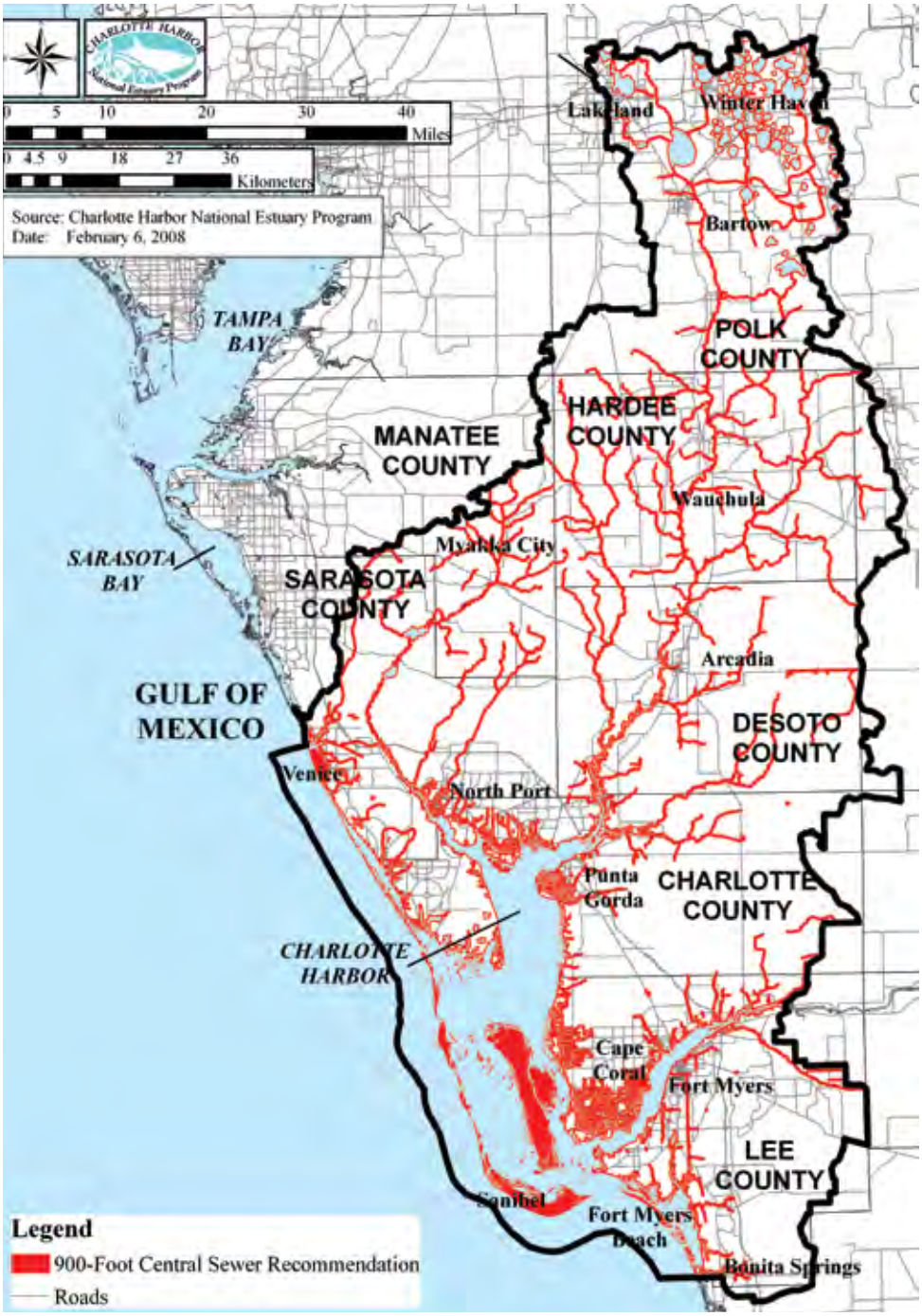
Targets have not been set because the relationships between macro- and micronutrients and phytoplankton/algal blooms have not been determined, nor have the natural phytoplankton composition and background levels been determined.

WQ-J

Provide central sanitary sewers to developed areas within 900 feet of waters such as estuarine shorelines, rivers, creeks, canals and lakes.

In 1992, the Sarasota Bay National Estuary Program set a principle to have wastewater from all sources to meet advanced wastewater treatment standards of 3 mg/l. A nitrogen-diffusing algorithm was utilized to determine that, on average, the total nitrogen from raw waste product required 900 feet to defuse through the ground water to meet that standard.

Qefp mofl ofqv ^`qflk ebimp criªii WQ-4.



Map 29: 900-Foot Buffer From Shorelines

The red areas represent a 900-foot buffer from estuarine shorelines, rivers, creeks, major canals and lakes. Map developed by the CHNEP in 2007 based on 2000 census hydrographic information.

1) Support development and implementation of plans to provide central sewer to higher-density developed areas. Encourage siting central sewer system facilities pumping stations, treatment plants) beyond the 900-foot water body buffer.
2) In such areas where densities are low, support rules that require advanced on-site septic systems.
3) Support improving the quality and availability of central sanitary sewage package plants to service more developed areas. Encourage siting central sewer system facilities pumping stations (treatment plants) beyond the 900-foot water body buffer.
4) Incorporate action into local government comprehensive plans.

Percent of urban use areas within 900-feet of estuarine shorelines, rivers, creeks, canals and lakes having central sanitary sewers.

Pbsbkqv*ªsb mbo`bkq lc ro_^k rpb areas have a 900 foot buffer of estuarine shorelines, rivers, creeks, canals and lakes.

WQ-K

Implement conservation landscaping plant programs, including the Florida Yards & Neighborhoods program, throughout the CHNEP study area.

Several programs now exist to help homeowners become more environmentally friendly with their landscape practices. One such program is the IFAS Florida Yards & Neighborhoods (FYN) program. Objectives of the FYN program are to reduce stormwater runoff, decrease nonpoint-source pollution, conserve water, enhance wildlife habitat and create beautiful landscapes. This program has developed nine principles for homeowners to follow: ofdeq mi^kq) ofdeq mi^`b8 t^qbo bc$^{a}$`fbkqiv8 cboqfifwb appropriately; mulch; attract wildlife; manage yard pests responsibly; recycle; reduce stormwater runoff; and protect the waterfront.

The CHNEP encourages the use of species native to the CHNEP study area because they typically require far less water, fertilizers and pesticides than commonly used nonnative landscaping species, thus reducing both water consumption as well as nonpoint-source pollutants in stormwater runoff.

Qefp moflofqv ^`qflk ebimp cri^{a}ii WQ-1 and SG-1.

1) Double the number of yards following FYN and similar principles.
2) Evaluate water quality impacts of FYN principles.
3) Distribute information to homeowners about methods they can easily implement to reduce sources of pollution.
4) Make the business community aware of the kinds of activities and programs they can undertake to reduce nonpoint-stormwater sources from their property.
5) Develop programs for providing training and `boqf$^{a}$`^qflk clo i^kap`^mfkd `lkqo^`qlop+
6) Use mobile irrigation labs to reduce water use.
7) Incorporate FYN in land development codes and land-use regulations.
8) Encourage public properties to use FYN principles and other water conservation practices in their planted areas.
9) Create a portfolio of FYN demonstration areas.
10) Partner with big box stores (such as Lowe's, Home Depot, Wal-Mart), asking that they feature native plants, replace the sale of cypress mulch with more environmentally friendly alternatives and reduce the sale of exotic species that are known to have negative environmental impacts.

Public knowledge and implementation for conservation landscaping principles is part of an overall approach to reduce nonpoint-source pollution. Effects may be seen under Priority Action WQ-D.

Photo by Maran Hilgendorf, 2/6/07

WQ-L

Increase the use of personal and home best management practices by residents and visitors throughout the watershed to reduce nonpoint-source pollution.

J^kv pfdkfª`^kq klkmlfkq*plro`b mliirqflk obar`qflk decisions are made in the home by the actions of individual residents and by people visiting the region, such as seasonal residents and tourists. New residents and visitors in southwest Florida lack regionally appropriate guidance to help them make environmentally sound decisions. In other areas, environmental programs have attempted to address this issue by preparing, publishing and distributing residential best management practice (BMP) guides. A similar strategy is proposed here, customized for local needs and accompanied by a marketing and incentive program to encourage people to use the BMPs. Given qeb afcª`riqv lc bccb`qfkd i^odb*p`^ib `e^kdbp fk personal behaviors, the overall effectiveness of the program should also be evaluated.

Qefp moflofqv ^`qflk ebimp criªii WQ-1 and SG-1.

1) Search compilations of residential or consumer BMPs prepared by others and compile a list of regionally appropriate BMPs. Include such fqb j p ^p pbmqf` ^ka ao^fk ªbia `^ob) molmbo pharmaceutical disposal and yard practices. Include EPA programs at sites such as

2) Examine the BMP compilation for coverage or pr_gb`q*^ob^ d^mp ^ka absbilm ? J Mp ql ªii qebpb gaps.
3) Obªkb t^vp ql afpqof_ute BMPs to area residents ^ka sfpfqlop+ Qeb clo j ^ka `lpq lc qeb ªk^i molar`q will depend upon the distribution channel(s) selected. Consider multiple distribution channels such as newspaper inserts, utility bill inserts, Internet delivery, direct mail or local government TV.
4) Identify market segments, possibly using the Stormwater Academy of the University of Central Florida.
5) Develop a companion marketing program to encourage use of the BMPs and help effect the desired behavior changes. Develop an interstitial (public service announcement) on home BMPs; investigate the use of the Ad Council.
6) Offer residents appropriate incentives to use the BMPs.
7) Establish partnerships with area agencies or _rpfkbppbp pl qe^q pfdkfª`^kq fk`bkqfves can be offered, such as meaningful discounts on products or services.
8) Evaluate consumer behavior changes and assess the overall effectiveness of the program in terms of per-capita pollutant load reductions.
9) Reduce harmful pesticides and fertilizers sold throughout the watershed, using the Babcock settlement as a model.
10) Show how “begin at home” programs geared to individuals, homes, businesses and at play have a cumulative impact through the group, community and region. Such programs include Florida Water Star[SM], Water PRO[SM] and Water Champ[SM] by the SWFWMD.

Public knowledge and implementation for conservation landscaping principles is part of an overall approach to reduce non-point source pollution. Effects may be seen under Priority Action WQ-D.

EPA WaterSense

WaterSense

WQ-M

Support public involvement programs addressing water quality issues.

Public exposure to water quality issues most commonly occurs through the media, especially t ebk ^ oba qfab l rq_ob^h t ^pebp ab^a ªpe lk qeb beaches, rivers experience neon-green algal blooms, beaches are closed with health w^okfkdp lo pebiiªpe are contaminated. Newsworthy water quality issues certainly affect the public. Likewise, the public can affect water quality but may not understand their link to large-scale degradation. It becomes important to deepen and broaden the public awareness and knowledge of water quality issues and to promote how individual actions can improve or degrade water. Reaching and enlisting public participation in water quality issues is a start in effecting positive behavioral change.

Qefp mofl ofqv ^`qflk ebimp criªii WQ-1, WQ-2, WQ-3, WQ-4 and SG-1.

1) Compile water quality success stories from businesses and industrial parks and homeowners.
2) Work with partners to inform the public `lk`bokfkd pfdkfª`^kq t ater quality projects such as Lake Hancock and Billy's Creek.
3) Place and maintain stencils at stormwater drains. Consider developing "Do not dump" signs to include the name of the receiving water body.
4) Place and maintain signs at road/water body crossings to establish sense of place. Consider customizing signs to include names of receiving water bodies.
5) Implement household hazardous waste disposal and recycling programs.
6) Expand training and resources for coordinators of volunteer water quality sampling programs.
7) Work with media in getting accurate water quality information to the public.
8) Increase public awareness of potential sources of pollution, agencies responsible for enforcement and public reporting processes.
9) Utilize existing videos and public service announcements (PSAs) for public education.
10) Develop a companion marketing program to inform the public about water quality issues and help effect the desired behavior changes. Develop an interstitial (PSA) on water quality issues.
11) E lia mr_if` bar`^qflk t lohpelmp lk pmb`fª` water quality topics, such as those already held featuring the Myakka River watershed, Cape Coral canals and clay settling areas.
12) Invbpqfd^qb qeb fab^ lc t ^qbo ªiqo^qflk m^ohp, marshes, complete with an educational nature center, especially in Cape Coral.
13) Construct water quality demonstration projects.

Public knowledge and implementation for conservation landscaping principles is part of an overall approach to reduce nonpoint-source pollution. Effects may be seen under Priority Action WQ-D.

Photo by Maran Hilgendorf, 5/1/06

Hydrologic Alterations

By 2020, identify, establish and maintain a more natural seasonal variation (annual hydrograph) fk cobpe t^qbo «l t p clo7

- Caloosahatchee River.
- Peace River and its tributaries.
- Myakka River, with special attention to Flatford Swamp and Tatum Sawgrass.
- Estero Bay and its tributaries.

By 2020, restore, enhance and improve where practical historic watershed boundaries and natural hydrology for watersheds within the CHNEP study area, with special attention to Outstanding Florida Waters and Class I water bodies.

By 2020, enhance and improve to more natural hydrologic conditions water bodies affected by ^oqfª`f^iiv `ob^qba pqor`qrobp qeolrdelrq qeb @EKBM study area, including:

- Sanibel Causeway in Lee County.
- Franklin Lock (S-79) in Lee County.
- Dams on the Myakka Rivbo qe^q «l t p qeolrde Manatee, Sarasota and Charlotte counties.
- Causeway between Lovers Key State Recreation Area and Bonita Beach in Lee County.
- Water-control structure on the south end of Lake Hancock in Polk County.
- Structure on Coral Creek in Charlotte County.
- Gator Slough canal collector system in Lee and Charlotte counties.
- Peace Creek canal system in Polk County.
- Cow Pen Slough in Sarasota County.

Obar`b kbd^qfsb evaolildf` bccb`qp lc ^oqfª`f^iiv created structures such as weirs, causeways, dams, clay settling areas and new reservoirs.

By 2020, for each watershed, identify and recommend additional reforms to improve linkages between local, water management district, state and federal government development permitting and `^mfq^i mo1do^ j p ^ccb`qfkd t^qbo pqlo^db) «l l a `lkqoli and water quality. By 2025, implement the additional reforms.

Utilize historic, current and future scenario estuarine mixing models, focusing on salinity and indicator species for better evaluation of proposed capital and operations projects.

Utilize integrated ground and surface water models to improve decision making, addressing ecosystem needs in the context of population growth, development, agriculture and mining water demands.

Protect headwater tributaries from elimination ^ka obpqlob qebpb qof_rq^ov `lropbp ^ka qebfo «l l ami^fkp where opportunities exist.

Set and achieve minimum aquifer levels. Reduce the rate of saltwater intrusion in the Floridan aquifer.

J bbq bpq^_ifpeba j fkf j r j «l t p ^ka ibsbip (MFLs). Establish and meet Estero Bay and major tributary MFLs.

Participate in Everglades restoration and related planning and restoration efforts.

Reestablish hydrologic watersheds to contribute «l t p ql qebfo efpqlof` ob`bfsfkd t^qbo _lafbp+

Identify natural, existing and target water budgets for each watershed. Use water budgets as tools to improve decision-making.

Evaluate the impacts of man-made barriers to efpqlof` «l t p ^ka j lafcv qeb j ql bpq^_ifpe j lob k^qro^i hydrologic conditions.

Build and restore water conveyances to have shallow, broad, vegetated and serpentine components qe^q ^ipl obpqlob «l l ami^fkp+

Identify the hydrologic and environmental impacts of surface water reservoirs on estuaries within the watershed. Mimic natural systems in the choice site selection, design and operation of reservoirs.

Encourage the use of low-impact development (LID) and green infrastructure techniques in new and old developments.

Limit big-pulsed release events.

Implement watershed (basin) initiative projects to address hydrologic alterations, loss of water storage and changed hydroperiod, and improve water quality.

Encourage, expand and develop incentives for the reuse of waters that are protective of water quality and natural hydrology

Support public involvement programs addressing watershed management issues of hydrology, water resources, water conservation and water use.

HA-A

Utilize historic, current and future scenario estuarine mixing models, focusing on salinity and indicator species for better evaluation of proposed capital and operations projects.

The need for a peer-reviewed estuarine model was fabkqfªba ^p ^ kbba obi^qba ql qeb P^kf_bi @^rpb t ^v j lafª`^qflkp ^q qeb qf j b qeb @@ J M t ^p ^almqba fk 2000. Because of various restoration activities and lqebo j lafª`^qflkp ql «l t p) ^k ^ob^ t fab bpqr^ofkb j labi t ^p fabkqfªba ^p ^ kbba+ Kb`bpp^ov a^q^ e^p been collected, such as an update to bathymetry, continuous salinity measurements and U.S. Geological Survey mapping of thousands of measurements taken in a day. These data help to obtain better calibration. The Environmental Fluid Dynamics Code (EFDC Hydro) is available at

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Qefp mofl ofqv ^`qflk ebimp criªii E>*.+

1) Identify indicator species, variables to be modeled and spatiotemporal data needs.
2) Prmmloq `liib`qflk lc a^q^ clo «l t, stage, salinity, indicator species and others for model calibration.
3) Identify a host agency to run, maintain and update models.
4) Develop an overarching three-dimensional model for the entire tidal Charlotte Harbor system and more detailed watershed models for each estuary watershed.
5) Update land-use change analysis with 2010 aerial photography and conduct similar analyses esbov ª sb years.

Oligohaline, mesohaline, and polyhaline locations in the Myakka, Peace and Caloosahatchee rivers.

Mean seasonal (wet/dry) isohalines should be spatially similar to those outlined in the CCMP vision and correspond with the following biological guidelines:

(a) Maintain a monthly average salinity < 10 ppt during the dry season at the Ft. Myers continuous salinity sensor; such that tape grass in the Beautiful Island area does not decrease below 20 percent coverage and blade length is > 10 cm (values may be adjusted after current is evaluated). Salinity should not exceed 20 ppt for longer than one day at Ft Myers.

(b) Maintain salinity at Piney Point > 5 ppt, so that conditions are supportive for the recruitment, survival, and growth of juvenile oysters upstream of Shell Point during March to October (juvenile oyster growth > 2.5 mm a month; recruitment > 3 spats per substrate shell a month; and mortality < 20 percent per month).

(c) Maintain an average monthly salinity > 20-25 ppt, as measured at the Sanibel Causeway continuous sensor, so that historical seagrass density and coverage in the area is maintained.

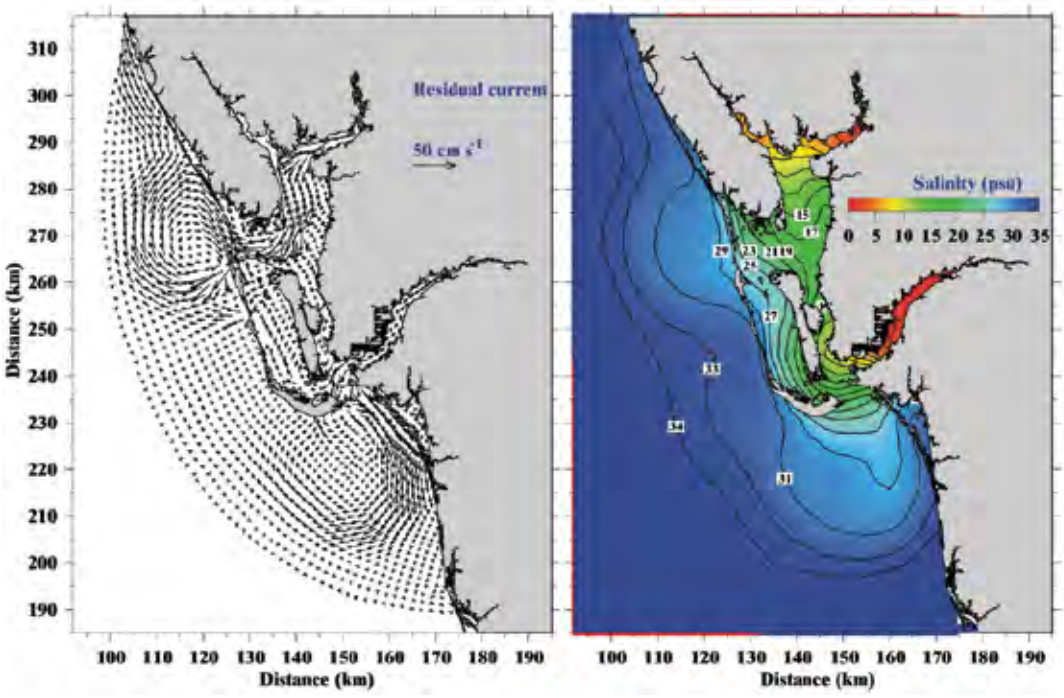


Figure 5: Three-Dimensional Estuarine Models in the Charlotte Harbor Area

HA-B

Utilize integrated ground and surface water models to improve decision making, addressing ecosystem needs in the context of population growth, development, agriculture and mining water demands.

Ql al`r j bkq `e^kdbp fk proc^`b t^qbo «l t p ^ka patterns due to hydrologic alterations, it is important that accurate, long-term databases be developed for all watersheds within the CHNEP study area. While many areas within the CHNEP have extensive efpqlof`^i «l t ob`loap) lqebo ^ob^p i^`h qefp efpqlof` record. Accurate data will also be needed to assess the effectiveness of the action plans. Action will provide accurate, long-term information on amounts and variability of surface water resources and provide ^ _^pfp clo mi^kkfkd+ Fabkqfcvfkd d^mp fk «l t a^q^ t fii molsfab ^ p`fbkqfª` _^pfp clo qeb bpq^_ifpe j bkq lc j fkf j r j «l t p ^ka ibsbip ^ka ^ppbpp crqrob `e^kdbp related to projected development and consumptive uses.

South Florida Water Management District uses a validated Mike-She model to provide existing and q^odbq «l t p clo rpb fk lqebo j labip ifhb PQBI I >+ STELLA is a model used to assess relative `lkqof_rqflkp lc evaolildf` molgb`qp ql lsbo^ii «l t p+

Qefp mofl ofqv ^`qflk ebimp criªii HA-1.

1) Fabkqfcv t^qbopebap t ebob qebob fp fkprcª`fbkq w^qbopeba «l t a^q^ ql ^``ro^qbiv ^ppbpp pb^plk^i and long-term changes in water resources, such as the tidal creeks along the east wall of Charlotte Harbor and Cape Haze peninsula.
2) Determine the minimum number and appropriate locations of needed gauges. Install appropriate monitoring gauges.
3) Prmmloq fkqbdo^qflk lc «lw and stage monitoring into stormwater utility programs.
4) Support collection of information and analyze effects that stormw^qbo orklcc e^p lk «l t characteristics of tributaries. (This is already planned for Estero Bay tributaries.)
5) Monitor surface water stages and groundwater levels in the Caloosahatchee, Peace and Myakka rivers' watersheds.
6) Cfii fk a^q^ d^mp lk «lw and salinity patterns to support the development and implementation of hydrodynamic models as planned in Lee County, portions of Charlotte County and as needed in Sarasota and Charlotte counties.
7) Expand the "Continuous Surface Water Level Monitoring" to monitor surface water levels in the CHNEP study area within South Florida Water Management District's jurisdiction.
8) Encourage the development and implementation of local government "Stormwater Management Mi^kp´ ql f j molsb qeb qf j fkd lc t^qbo «l t p reaching natural water bodies.
9) The CHNEP and its partners should participate in the feasibility study and implementation activities for the Comprehensive Everglades Restoration Plan, Southwest Florida Feasibility Study, the Caloosahatchee Water Management Plan, the Lower West Coast Water Supply Plan and any bcclqqp qe^q t fii _b j b^profkd ^ka j ^k^dfkd «l t p in the Caloosahatchee River.
10) Consider utilizing the Peace River and Myakka River integrated ground and surface water models for future water resources investigations.

Water is delivered according to the timing and distribution needed by ecosystems notwithstanding changing human water demands.

?v /-/-) ªsb j ^glo ab`fpflkp ^ob f j molsba rpfkd integrated ground and surface water models.

Acre-feet per day can be converted to cubic feet per second. Divide acre-feet per day by 2 (or more precisely 1.98) to get cubic feet per second. Double cubic feet per second to get acre-feet per day.

HA-C

Protect headwater tributaries from elimination and restore these tributary `l ropbp ^ka qebfo «l l ami^fkp t ebob lmmloqrkfqfbp bufpq+

Headwater tributaries are like the capillary system of a blood supply network. Just as the health of the whole organism depends upon a functioning capillary system, the health of larger streams and rivers depend upon an intact primary headwater stream network. The hydrology of headwater streams can be altered directly (e.g., phosphate mining, channelization, transportation) and indirectly (e.g., groundwater t fqeao^ t ^ip&+ Eb^a t ^qbo pqob^ j p _bkb ª q bkqfob ofsbo systems through sediment deposition reduction, krqofbkq fkmrq obar`qflk) «l l a `lkqoli) t fiaifcb e^_fq^q `loofalo molqb`qflk ^ka t ^qbo ^ka cl l a prmmiv clo ªpe and wildlife. An intact network of functioning primary headwater streams can reduce dredging costs, reduce water treatment costs, reduce the siltation of larger stream habitats, improve recreational opportunities, reduce water treatment costs, reduce human health risks, reduce degradation of downstream waters, obar`b il`^i ^ka al t kpqob^ j «l l afkd) mobsbkq bu`bpp erosion, increase property values, increase or maintain biological diversity, improve opportunities for hunting ^ka ªpefkd ^ka j ^fkq^fk _^pb «l t fk i^odbo pqob^ j p in times of drought. They are a key determinant in the overall condition of the river system.

This priority action helps criªii HA-1.

1) Work with phosphate and fertilizer facilities to protect and restore the hydrology of headwater tributaries, such as Wingate Creek in Manatee County, Bowlegs Creek in Polk County, Horse Creek in Hardee and DeSoto counties, Upper Saddle Creek in Polk County, McCullough Creek in Polk County, Six-Mile Creek in Polk County, Bear Creek Branch in DeSoto County, Brushy Creek in Hardee County and Payne Creek/Little Payne Creek in Polk and Hardee counties.
2) Work with the agriculture industry to protect and restore hydrology on private lands, such as Owen Branch in Manatee County, Peace Creek Canal in Polk County, Joshua Creek in DeSoto County, Prairie Creek in Charlotte and DeSoto counties, Myrtle Slough in Charlotte County and upper Myakka River (e.g., Ogleby, Long, Coker creeks) in Manatee County.
3) Encourage local governments to protect headwater tributaries, such as the Orange River and Telegraph Creek in Lee County, and assist in the development and implementation of restoration plans.

Hfil j bqbop lc cobpe t ^qbo ªopq* ^ka pb`lka* order streams by basin.

Kl ilkd*qbo j kbq ab`ifkbp fk qeb ibkdqe lc ªopq* ^ka second-order streams contributing to each basin.

Photo by Catherine Corbett, 6/25/03

HA-D

Set and achieve minimum aquifer levels. Reduce the rate of saltwater intrusion in the Floridan aquifer.

The Southwest Florida Water Management District %P T C T J A& bpq^_ifpeba j fkf j r j «l t p ^ka ibsbip in the Southern Water Use Caution Area (SWUCA). Recovery efforts will slow the inland movement of saltwater intrusion such that the withdrawal infrastructure will be at minimal risk of water quality deterioration over the next century. In March 2006, the SWFWMD Governing Board adopted the minimum «l t p ^ka ibsbip) fk`irafkd ^ p^iq t ^qbo fkqorpf1k minimum aquifer level of 13.1 feet above sea level. Based on the existing distribution of withdrawals, it is estimated that long-term average annual withdrawals from the Floridan aquifer need to be reduced by up to 50 mgd to ensure saltwater intrusion minimum aquifer levels are met. If withdrawals were more 1mqf j ^iiv afpqof_rqba) ^ obar`qf1k 1c pfdkfª`^kqiv ibpp that 50 mgd would be required. Currently, annual groundwater withdrawals average about 600 to 650 mgd.

The South Florida Water Management District (SFWMD) established minimum aquifer levels for the lower Tamiami aquifer, the Sandstone aquifer and the mid-Hawthorn aquifer to equal the structural top of the aquifer. The draft recovery strategy (i.e., Lower West Coast Plan) for this rule states: (a) establish “no harm” maximum permittable levels for each aquifer for a 1-in-10-year level of certainty, (b) implement rule criteria to prevent harm through the consumptive use permitting process, (c) construct and operate water resource and supply development projects and (d) implement the water shortage plan. The draft document

dated September 5, 2000, proposed further obpb^o`e fkq1 t e^q `1kpqfqrqbp ¦pfdkfª`^kq e^o j ´ q1 the water table aquifer before proposing a minimum aquifer level (MAL) for this aquifer. According to this document, water levels in the mid-Hawthorn aquifer have dropped approximately 60 to 80 feet, and more than 15 to 30 feet locally in the lower Tamiami, Sandstone and Floridan aquifers ,from estimated pre-development levels in Lee County.

Qefp mof1ofqv ^`qf1k ebimp criªii HA-1.

1) Develop a priority for the establishment of minimum aquifer levels (MALs) in the South Florida Water Management District portion of the CHNEP study area.
2) Collect the data and conduct the necessary research to establish MALs on a watershed approach.
   a. Develop better surface water/groundwater model parameters (discharge, seepage and t ^qbo ibsbi a^q^& qeo1rde ^k^ivpfp 1c ªbia a^q^ and use of statistical techniques.
   b. Expand the groundwater and surface water monitoring networks to monitor groundwater levels and surface water stages at select wells.
3) Establish an MFL rule for the water table aquifer in Lee and southern Charlotte counties protective of aquatic resources and water supply.
4) Encourage conservation and development of alternative supplies through projects such as reuse water projects, low-volume plumbing rebate programs, potable water aquifer storage and recovery systems, BMP implementation and water resource development projects.
5) Identify and plug abandoned artesian wells that allow uncontrolled surface discharge.
6) Reduce interaquifer contamination through obbpq^_ifpe j bkq 1c qeb `1kªkb j bkq _bq t bbk aquifers by back-plugging sections of well bores.
7) Retire water use permits associated with acquired preservation lands.
8) Streamline analysis of water use permitting data.
9) Fk`ob^pb bcª`fbk`v 1c foofdation water use and promote the use of tailwater recovery reservoirs as an alternative to groundwater use (e.g., FARMS projects and FDACS enrollment).

Long-term average annual withdrawals from the Floridan aquifer.

By 2020, reduce long-term average annual withdrawals from the Floridan aquifer by 50 mgd to ensure saltwater intrusion minimum aquifer levels are met. Currently 650 mgd are withdrawn annually.

HA-E

J bbq bpq^_ifpeba j fkf j r j «l t p ^ka ibvels (MFLs). Establish and meet Estero Bay and major tributary MFLs.

The water management districts are directed by Chapter 373.042, Florida Statutes, to set minimum «l t p ^ka ibsbip+ Qeb j fkf j r j «l t clo ^ dfsbk watercourse is the limit at which further withdrawals t l ria _b pfdkf a ` ^kqiv e^o j cri ql qeb t ^qbo obp l ro ` bp or ecology of the area.

The minimum level is the level of ground water in an aquifer and the level of surface water at which croqebo t fqeao^ t ^ip t l ria _b pfdkf a ` ^kqiv e^o j cri to the water resources of the area. Each water management district is required to annually submit to the Florida Department of Environmental Protection for review and approval a priority list and schedule for bpq^_ifpe j bkq lc j fkf j r j «l t p ^ka ibsbip clo proc^ ` b watercourses, aquifers and surface waters within the district. The list shall be based on the importance of the waters to the state or region and shall include those waters that are experiencing or may reasonably be expected to experience adverse impacts.

Qefp mof l ofqv ^ ` qf l k ebimp cri a ii HA-1.

1) Collect the data and conduct the necessary research to establish MFLs for Estero Bay tributaries on a watershed approach.
2) Participate in peer review for select methodologies.
3) Set MFLs for Estero Bay tributaries.
4) Encourage conservation and development of alternative supplies through projects such as reuse water projects, stormwater reuse systems, potable water aquifer storage and recovery systems, BMP implementation and water resource development projects.
5) Develop MFL recovery strategies where needed.

>a l mqba j fkf j r j «l t p ^ka ibsbip % J C I p&+

Caloosahatchee: Monthly mean of 300 cfs at S-79 (Franklin Locks) plus a salinity of 10 ppt for a 30-day average or a single daily average of 20 ppt at the gauge in Fort Myers by 2016.

Mb^ ` b7 Obnrfoba a pe m^pp^db ^ka t bqqba mbof j bqbo fk«b ` qf l k ml fkq %.4 ` cp ^q ?^oq l t ) /4 ` cp ^q Cloq J b^ab and 45 cfs at Zolfo Springs) by 2016.

J v^hh^7 Qebob e^p _bbk ^k fk ` ob^pb fk il t «l t p in the Myakka River. This increase has resulted in a previously non-perennial river becoming perennial. Efpq lof ` «l t p t bkq ql wbol lk ^ obdri^o ^ka ` lkpfpqbkq _^pfp+ Qebobc lob) ^ il t *«l t qeobpe lia lc - ` cp fp recommended for the USGS Myakka River near the gage site at Sarasota, Florida.

Bpqbol7 J fkf j ^i ^ka j ^uf j ^i pb^p l k^i «l t p t bob fabkqf a ba clo qeb j ^glo qof_rq^ofbp lc Bpqbol ?^v qeo l rde qeb K^qro^i Pvpqb j p J l abi+ Qebpb «l t p t fii help establish the target.

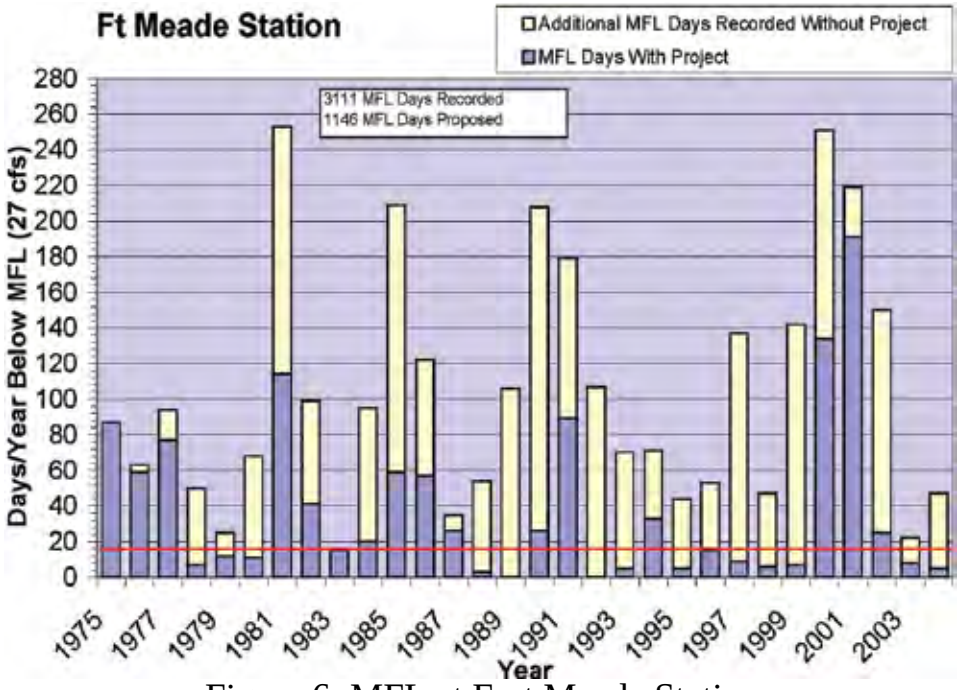


Figure 6: MFL at Fort Meade Station

The Southwest Florida Water Management District Lake Hancock Lake Level J l af a ` ^qf l k Mo l gb ` q fp bumb ` qba ql mo l sfab ^mmo l uf j ^qbiv 2- mbo ` bkq lc j fkf-j r j «l t obnrfob j bkqp clo ^ /-* j fib ml oqf l k lc ofsbo) mo l qb ` q qe l rp^kap lc ^ ` obp lc «l l ami^fk ^ka obar ` b kfqo l dbk ibsbip _v /4 mbo ` bkq+

HA-F

Participate in Everglades restoration and related planning and restoration efforts.

The Comprehensive Everglades Restoration Plan (CERP) provides a framework and guide to restore, protect and preserve the water resources of central and southern Florida, including the Everglades. It covers 16 counties over an 18,000-square-mile area and centers on an update of the Central and Southern Florida (C and SF) Project, also known as the Restudy. The Plan was approved in the Water Resources Development Act (WRDA) of 2000. It includes more than 60 elements, will take more than 30 years to construct and will cost an estimated $7.8 billion. WRDA 2000 also included a component known as the Southwest Florida Feasibility Study (SWFFS), which has been substituted with the Southwest Florida Comprehensive Watershed Plan, currently undergoing federal review.

Qefp moflofqv ^`qflk ebimp criªii HA-1, HA-2 and HA-3.

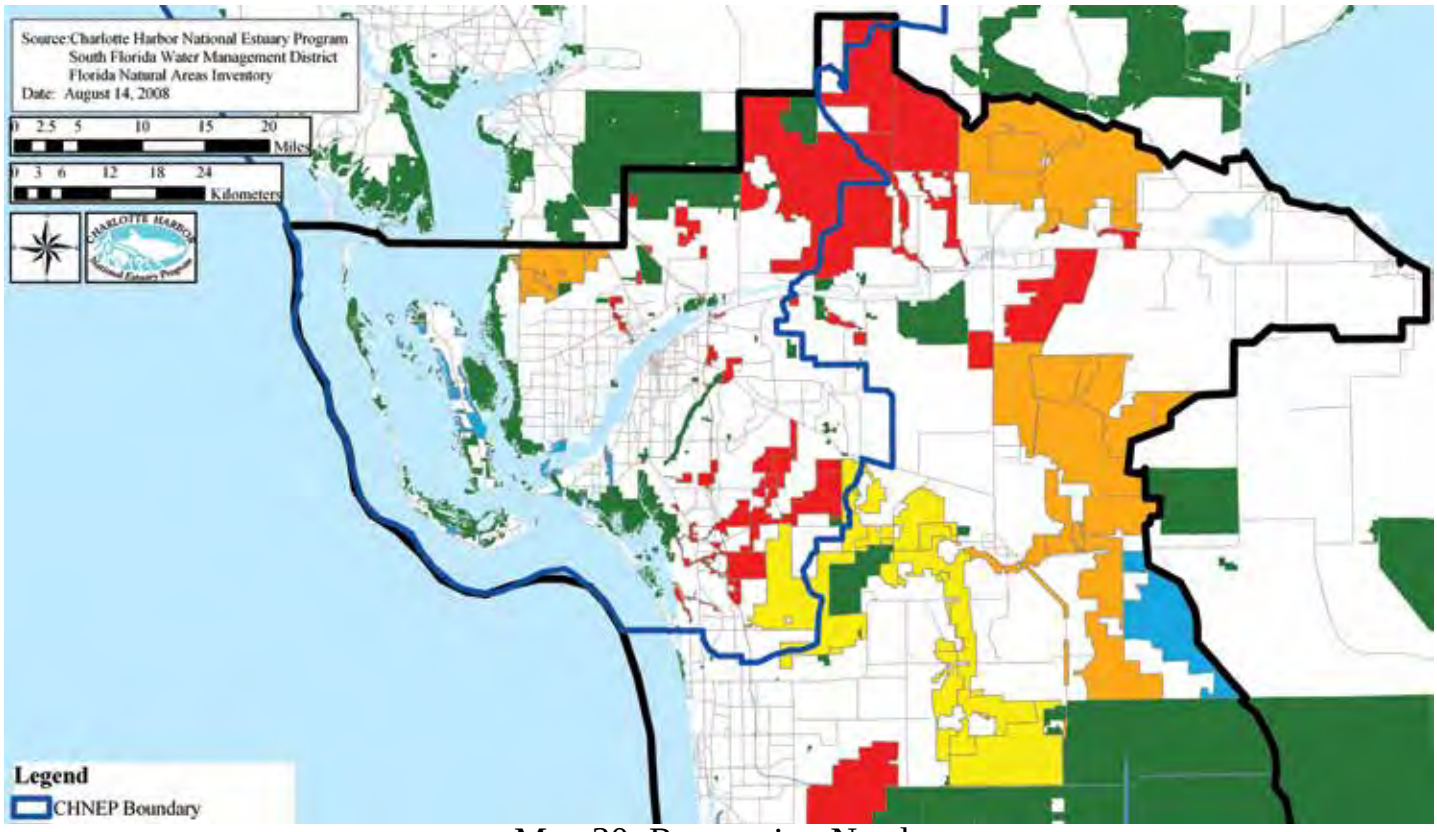
1) Provide that members of the review committees for the U.S. Army Corps of Engineers' C and SF are aware of the concerns in the

2) Include CHNEP partners on the CERP and SWFFS committees to develop, review and evaluate results.
3) Restore seasonal extent of the isohaline (natural seasonality of salinity) in the Caloosahatchee to stabilize valued ecosystem components including wild celery ( ), blue crab, oysters, clams ^ka grsbkfib ªpe+

4) Continue to review proposed Everglades restoration projects, including the C-43 reservoir.

: Implementation of Everglades and related restoration projects.

Target is funding dependent.



Map 30: Restoration Needs

Qeb Plrqe t bpq Cilofa^ @l j mobebkpfsb T^qbopeba Mi^k fabkqfªbp ^ t fab o^kdb lc obpqlo^qflk kbbap+ Qeb CHNEP helped develop the methodology to obtain initial alternatives. Data Source: 2007

HA-G

Reestablish hydrologic w^qbopebap ql `lkqof_rqb «l t p ql qebfo efpqlof` receiving water bodies.

Qebob ^ob obdflkp t ebob proc^`b «l t p kl ilkdbo `lkqof_rqb lo `lkqof_rqb qll j r`e «l t ql qebfo efpqlof` watersheds. In some areas, hydrologic alterations have ^``lrkqba clo pfdkfª`^kq `e^kdbp fk _lqe qeb ^ j lrkq ^ka pb^plk^i `e^o^`qbofpqf`p lc «l t p lc qeb j ^glo tributaries within these watersheds.

Qefp moflofqv ^`qflk ebimp criªii HA-2.

1) Assess and document changes in historic watersheds caused by past and current alterations, including mining, ditching, channelizing, damming and other structural changes.
2) Inventory stormwater systems and facilities so that ^iqbok^qfsbp clo obafob`qfkd «l t p ql efpqlof` t ^qbo bodies can be assessed.
3) Promote projects that address freshwater runoff problems from canal systems, including the Gator Canal System in Lee County, Blackburn Canal in Sarasota County, Curry Canal in Sarasota County and Peace Creek Canal in Polk County.
4) Evaluate plans to establish more natural surface t ^qbo «l t p col j efpqlof` t ^qbopebap+
5) Encourage coordination among stormwater utilities, natural resource managers and transportation planning and projects.
6) Determine and promote 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) Develop a proposal to ensure adequate funding for the Nonmandatory Reclamation Program to fund ob`i^ j ^qflk q^odbqba ^q pmb`fª` t ^qbo obplro`b _bkbªqp) ^p fabkqfªba qeolrde qeb

.

: Net difference between the acreage of subbasins qe^q kl ilkdbo `lkqof_rqb «l t p ql qebfo efpqlof` receiving water bodies and the acreage of subbasins returned to historic receiving water bodies.

No new creation of internally drained or non-contributing lands.

Reduce the acreage of internally drained or non-contributing basins by 25 percent by 2020.

Photo from the

HA-H

Identify natural, existing and target water budgets for each watershed. Use water budgets as tools to improve decision making.

T^qbo «l t e^p _bbk j laf^{a}ba _v er j ^kp pfk`b qebv $^{a}$opq `^ j b ql qeb obdflk ^ka `lkqfkrbp qla^v+ Inadvertent ecological degradation resulted from these j laf$^{a}$`^qflkp+ Ql _^i^k`b qeb ab j ^kap lc mblmib clo drainage, drinking water, navigation and recreation t fqe mobpbos^qflk lc b`lildf`^i eb^iqe) lkb j rpq $^{a}$opq rkabopq^ka t^qbo «l t+ Pfdkf$^{a}$`^kq _bk`e j ^ohp clo pqravfkd slir j b ^ka qf j fkd lc «l t fk`irab k^qro^i «l t p col j ^qf j b _bclob er j ^k fk«rbk`b) «l t ^q qeb present time and a practical estimate of future water _radbqp qe^q t lria j lob t fpbiv _^i^k`b `lk«f`qfkd needs.

Qefp mofl ofqv ^`qflk ebimp cri^{a}ii HA-2.

1) Ab^{a}kb k^qro^i) bufpqfkd ^ka molgb`qba evapotranspiration, precipitation and other input and outputs of a water budget equation for each watershed. Consider the effects of ground water converted to surface water, wastewater reuse, connections between watersheds, impermeable surfaces and constructed conveyances.
2) Determine target water budgets by watershed.
3) Involve stakeholders in the discussion of target water budgets to include planning efforts already expected.
4) Promote changing stormwater design criteria col j qeb o^qb lc «lw to the volume of storage, pre equals post storage, not pre equals post drainage.
5) Determine neg^qfsb evaolildf` j laf$^{a}$`^qflkp that can be improved through restoration. Rank potential projects by geographic areas based lk pfdkf^{a}`^kq j laf$^{a}$`^qflkp ^ka mlqbkqf^i clo remediation.

: Percentage change toward target water budgets. If targets have not been set, percentage change toward natural water budgets where they have been validated.

Targets have not been set for all watersheds.

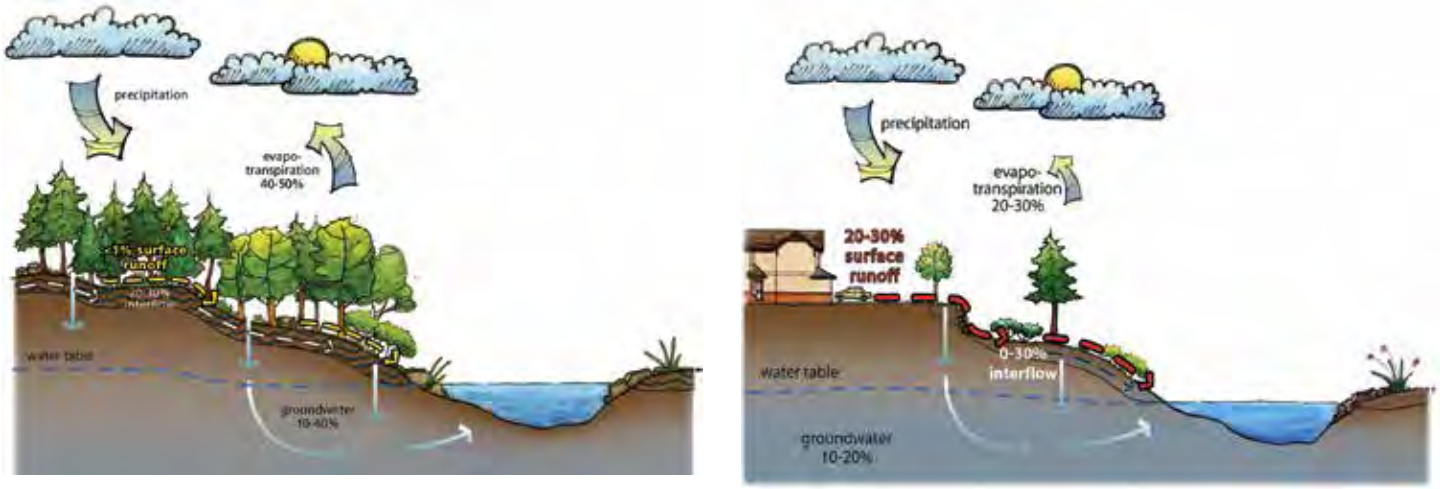


Figure 7: Groundwater Budget

Groundwater resources are dependent on areas inside and outside of the CHNEP study area. Installation of impervious surface has shifted the water budget toward reduced ground water and increased runoff.

Graphics are from produced by the Puget Sound Partnership and WSU Extension. Credit for the diagram goes to AHBL, Inc. Planners.

HA-I

Bs^ir^qb qeb f j m^`qp lc j ^k* j ^ab _^oofbop ql efpqlof` «l t p ^ka j lafcv them to establish more natural hydrologic conditions.

Photo by Bob Howard, EPA, 11/16/05

Efpqlof` «l t m^qqbokp) fk`irafkd qf j fkd ^ka slir j b) are critical needs for the aquatic life in the ecosystem that has evolved and adapted to natural conditions. I^odb ^ka p j ^ii lmmloqrkfqfbp ql obpqlob efpqlof` «l t p are possible if decision-makers are provided with comprehensive information about them.

The alterations with the most dramatic impact have been highway projects, large-scale mining and ao^fk^db t lohp+ T^qbopeba «l t p) slir j bp ^ka timing have been redirected, impeded or accelerated by such projects. Remediation of existing and new construction of roads and drainage works need special attention to ensure that the resources of the CHNEP pqrav ^ob^ ^ob prpq^fkba+ Ob j ^fkfkd k^qro^i «l t t ^vp deserve particular attention for remaining unaltered.

Qefp moflofqv ^`qflk ebimp cri^ii HA-3.

1) Absbilm ^ j ^m lc efpqlof` «l t t ^vp ^ka watershed boundaries. Poll the CHNEP membership to supplement the restoration plan to create a preliminary list of barriers to historic proc^`b ^ka dolrka t ^qbo «l t ^ka prddbpqflkp for additional sources of information. Particular attention should be given to drainage works, mining or roadbeds that change watershed boundaries.
2) Supplement the preliminary list after tracking down additional sources of information.
3) Propose restoration projects for each site using creative but practical ideas. Consider phased projects or small projects as well as comprehensive restorations.
4) Rank the projects using a matrix based on possibility for permitting, relative cost, relative ecological value of the outcomes and other criteria learned from adaptive management during the project effort. Identify the agencies that may be willing to do the project.
5) For top-ranked projects, contact the agencies and private entities that may implement them and identify what additional information they need to fund and execute the projects. Based on feedback, rerank the projects and provide needed information to potential project implementers.
6) Make mitigation of any potential hydrologic alterations a key criterion for evaluation during any new roadway, drainage, mining and construction projects.

: Acres and percent of watershed restored to more natural hydrologic condition as demonstrated by pre and post hydrologic monitoring of implemented projects.

Targets have not been set for hydrologic restoration. Tracking this indicator over time will provide data for targets.

HA-J

Build and restore water conveyances to have shallow, broad, vegetated ^ka pbombkqfkb `l j mlkbkqp qe^q ^ipl obpqlob «llami^fkp+

The history of Florida is replete with drainage improvements that reduced wetlands and made streams straighter and deeper. Channelized waterways offer fewer habitat opportunities for terrestrial and aquatic wildlife, degrade water quality by quickly forcing fresh water into estuaries and reduce the natural beauty of Florida for its human residents. There are abundant opportunities for improvements to qeb ao^fk^db pvpqb j qe^q pqfii ^iil t clo «lla molqb`qflk in cooperation with wetland restoration, recreational opportunities, improved water quality and perhaps even water supply enhancement.

Qefp mofl ofqv ^`qflk ebimp cria ii HA-3.

1) Inventory innovative stormwater treatment and conveyance systems from around the CHNEP study area and other areas.
2) Provide educational opportunities, including workshops, to engineers and planners of environmentally friendly design techniques.
3) Create a large "toolbox" of engineering techniques that improve environmental quality. Make it easy to choose environmentally friendly techniques.
4) Create demonstration projects that combine drainage, environmental and neighborhood concerns. Advertise this information to engineers and others outside the environmental community.
5) Fkfqf^qb afp`rppflkp t fqe pfdkfa`^kq pq^hbeliabop at Blackburn Canal, Gator Slough Canal, Peace Creek Canal and 10-Mile Canal.
6) Apply geomorphology to this effort: build and modify systems so they coincide with how nature would have done it.

: Linear miles of ditches and canals that have _bbk j lafaba ql pil t «l t) fk`irafkd _ol^a) pe^iil t) vegetated and serpentine components.

Improve 100 miles of ditch and canal between 1998 and 2020.

Photo by Lisa Beever, 8/12/03

HA-K

Identify the hydrologic and environmental impacts of surface water reservoirs on estuaries within the watershed. Mimic natural systems in the choice site selection, design and operation of reservoirs.

The hydrologic interactions between reservoirs ^ka a l t kpqob^ j bpqr^ofbp pe l ria _b p`fbkqf ª `^iiv determined. In cases like Lake Okeechobee, j ^fkq^fkfkd pmb`f ª ` t ^qbo ibsbip e^p _bbk dfsbk ^ higher priority than maintaining a relatively natural «l t ql qeb bpqr^ov) afpo r mqfkd k^qro^i _^i^k`bp+ Lk qeb lqebo e^ka) ^ obpbos l fo `^k p j l lqe l rq i^odb «l t variations caused by a disturbed upstream water supply, if that smoothing is made a high priority for the reservoir management. Identifying the relationship between reservoirs and adjacent systems requires j lkfq l ofkd t ^qbo «l t p ^ka p^ifkfqv s^of^qf l kp downstream of the reservoir. A study of these relationships includes an analysis of chemistry and biology of water reaching the estuaries.

Qefp mof l ofqv ^`qf l k ebimp cri ª ii HA-3.

1) Evaluate relationships between reservoirs and downstream water resources, including above- and below-surface reservoirs for water supply, restoration or mining.
2) Examine soil chemistry at proposed reservoir sites, including pesticides and metals.
3) Examine groundwater chemistry at proposed reservoir sites.
4) Monitor water chemistry and biology (esp. algae/ phytoplankton) in and downstream of reservoirs. Possible parameters for monitoring include salts, metals, nutrients and pesticides that may be present in the soil or rock that form the reservoir. Seepage interactions could also change its chemical composition.
5) Ensure that the protection of the estuarine health is a reservoir management priority.
6) Where appropriate, develop education programs to disseminate information that the protection of estuaries is vital to reservoir management priorities.
7) Develop professional presentations for legislators and commissioners.
8) With input from utilities, water supply authorities, local municipalities, industry, agriculture, water management districts, resource managers ^ka qeb mr_if`) absbi l m p`fbkqf ª `^iiv _^pba educational materials and programs to emphasize the interactions between reservoirs and natural resources. Present these materials/programs at events, trade shows and other venues.
9) Encourage federal and state regulations and pq^qrqb `e^kdbp ^p ^mmo l mof^qb _^pba l k p`fbkqf ª ` evaluation described above related to reservoir siting, construction and operations to protect natural resources.

: Increase in downstream abundance and diversity of biota.

C-43 Reservoir: 100 acres of oysters 15 years after construction and 350–500 acres with addition of hard substrate.

From a 10/29/07 presentation by Carol Ann Wehle, SFWMD Executive Director

HA-L

Encourage the use of low-impact development (LID) and green infrastructure techniques in new and old developments.

Low-impact development (LID) is a comprehensive land planning and engineering design approach with a goal of maintaining and restoring the predevelopment hydrologic regime of urban and developing watersheds. It is best applied in redevelopment areas to restore hydrologic regimes and provide water quality treatment rather than simply reduce the impacts of new development. In the CHNEP study area, the water resource is stressed in two ways: (1) altering storage to drainage by extensive stormwater works stresses vegetation pr`e qe^q ^oqfª`f^i foofd^qflk fp kbbaba) which further impacts the water resource ^ka %/& ¦al t kpqob^ j ´ f j m^`q lc «llafkd and drought extreme variations cause estuarine salinity "yo-yo" in short cycles. Implementation of low-impact techniques reduces drainage and impacts stresses by implemented storage and treatment pq^ka^oap+ Obqolªqqfkd liabo absbilm j bkqp utilizing low-impact techniques is particularly effective.

Qefp moflofqv ^`qflk ebimp criªii HA-4.

Figure 8: Residential Low-Impact Development

Low impact development (LID) practices, many of which are shown above, reduce stormwater runoff and reduce the need for large regional stormwater treatment systems.

Graphic from produced by the Puget Sound Partnership and WSU Extension. Credit for the diagram goes to AHBL, Inc. Planners.

1) Promote alternatives to the local and state criteria used by engineers who design stormwater systems and determine relationships with natural systems.
2) Establish land alteration monitoring programs that evaluate the current condition of "impervious surface" by watershed for prioritization for more storage efforts and attenuation BMPs.
3) Prmmloq ^ka bk`lro^db obqolªqqfkd liabo developments with LID technologies. Promote utilization and expansion of existing efforts such as Adopt-A-Pond and Florida Yards & Neighborhoods to reduce impervious surface, increase small-scale water storage, integrate stormwater systems, reduce dependence on septic systems and enhance existing stormwater systems.
4) Advocate LID in new developments through programs such as the SFWMD Southwest Florida Basin Rule, Sarasota County Sustainability program, Lee County Smart Growth LDRs, Charlotte County stem-wall construction rule, transfer of development rights (TDR) ordinance and Puget Sound's LID technical manual.

: Low Impact Development (LID) rules adopted and infrastructure constructed.

Bu^j mib IFA j lafª`^qflkp %oribp ^almqba lo infrastructure constructed) within all CHNEP study urban counties by 2015.

HA-M

Limit big-pulsed release events.

Qefp mofl ofqv ^`qflk ebimp cri ª ii HA-4.

Decades of development, including agriculture, in southwest Florida have altered landscape drainage patterns. In order to drain the landscape quickly and bc ª `fbkqiv) bu`bppfsb afq`efkd e^p lcqbk `fo`r j sbkqba the traditional water retention and water quality treatment function of wetland systems. These alterations have caused increased and excessive wet season discharge to our coastal environment. The excessive discharge volumes contain higher pollutant loads and freshwater pulses that alter and impact estuarine and marine habitat. Additionally, these alterations have resulted in a lower surface groundwater table than existed historically. The lower surface groundwater table alters freshwater wetland hydroperiods and increases the annual need for irrigation. Development pressure, construction techniques and agricultural practices have also resulted in areas where dry season retention and water supply needs for irrigation require holding more fresh water back on the landscape.

Balancing water budget needs around the four areas of obpmlkpf_fifqv %k^qro^i pvpqb j p) «l la molqb`qflk) t ^qbo supply and water quality) established by the water management districts reduces development impacts on our natural systems. Drafting comprehensive watershed management plans around these areas of responsibility will identify the water resource requirements for major watersheds and establish goals and objectives that meet the needs of those major watersheds.

The SFWMD has taken an additional step for certain t ^qbo _lafbp fk bpq^_ifpefkd ¦ j ^uf j r j ´ t ^qbo «l t p+ Qebpb ^ob «l t p clo ^kv prpq^fkba mbofl a lo ^k fkqbkpb special event that can be expected to damage either the nr^ifqv lc ob`bfsfkd t ^qbo _lafbp lo) qeolrde «llafkd) economic activities or endangering human health. This approach may be examined for additional water bodies in the future.

Sarasota County and the SWFWMD are developing strategies to limit big-pulsed events in Dona Bay. East (Lee) County Water Control District are implementing projects to reduce such releases to the Orange River.

1) Encourage and support the drafting of comprehensive watershed management plans for major contributing watersheds.
2) Advocate stormwater ordinance revisions so that lcc*pfqb afp`e^odbp j f j f` k^qro^i pvpqb j «l t o^qbp and timing.
3) Bk`lro^db ^ka prmmloq pqlo j t ^qbo obqol ª q molgb`qp ql obpqlob k^qro^i pvpqb j «lw rates and timing.
4) Reevaluate water and consumptive use permits to bring permits in line with actual needs and usage, accounting for on-site storage. On-site storage would allow for adequate residence time, increased recharge and reduction of discharging off-site, which would better mimic natural wetland hydrology.
5) Obevao^qb pro ª `f^i ^nrfcbo ql efpqlof` ibvels by protecting existing wetlands, limiting impervious surfaces and reducing drainage canal depths.

7 Kl efde t ^qbo «l t bsbkqp lsbo qeb Co^khifk Locks (S-79).

2,800 cubic feet per second (cfs) and over.

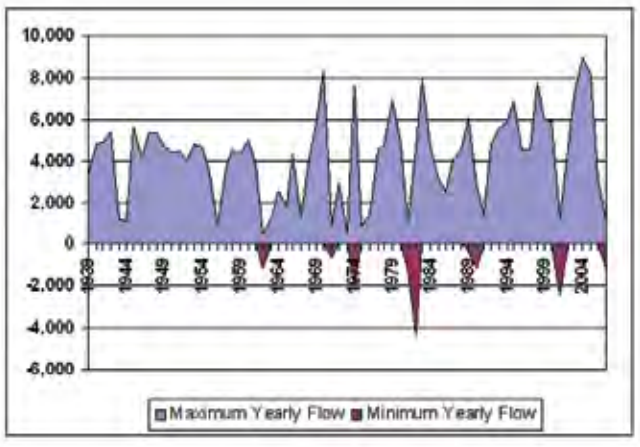


Figure 9: Flow Levels to the Caloosahatchee >cqbo P*44 %J llob E^sbk Il`h& t ^p j laf ª ba fk qeb .63-p) j ^uf j r j «l t p ql qeb @^illp^e^q`ebb increased from 4,500 to 8,000 cubic feet per second.

HA-N

Implement watershed (basin) initiative projects to address hydrologic alterations, loss of water storage and changed hydroperiod, and improve water quality.

Both the Southwest Florida Water Management District and the South Florida Water Management District have developed watershed (basin) initiative strategies. By focusing energy and resources on an overall watershed strategy, projects can yield greater `lpq _bkb^q ql t ^oa obpqlo^qflk+ T^qbopeba fkfqf^qfsbp are a way to build partnerships, leverage funding and address complex problems. Watershed initiatives in the CHNEP study area include the Upper Peace Initiative (SWFWMD), the Myakka River Initiative (SWFWMD), Cow Pen Slough restoration (Sarasota County), the Charlotte Harbor Initiative (SFWMD), the Caloosahatchee Initiative (SFWMD) and the Estero Bay Initiative (SFWMD).

Qefp moflofqv ^`qflk ebimp cri^ii HA-4.

1) Implement projects in the upper Peace River to address alterations and loss of storage to restore j fkf j r j «l t p ^ka ibsbip) ^ka ql molqb`q ^ka improve water quality in the Peace River and Charlotte Harbor.
   a. Reestablish historic surface water connections.
   b. Complete watershed management programs for priority watersheds.
   c. Continue to develop and implement resource recovery projects in the upper Peace River watershed that are consistent with the SWFWMD
   d. Implement alternatives fabkqf^ba fk qeb SWFWMD and in completed watershed management plans.
   e. Implement projects to reduce nonpoint-source loadings of nutrients and other pollutants.
2) Collect the necessary data, develop, and implement water resource projects to restore hydroperiods in the Myakka River watershed.
   a. Develop the technical analysis and modeling tools necessary for assessing management options.
   b. Identify and evaluate BMPs being implemented and that can be implemented.
   c. Implement alternativbp fabkqf^ba fk qeb SWFWMD S and in completed watershed management plans.
   d. Monitor response to implemented projects and adapt management as necessary.
3) Support new watershed initiatives by advocating a watershed approach to addressing problems and pursuing funding.
4) Promote greater participation in the Facilitating Agricultural Resource Management Systems program.
5) Promote greater use of the mobile irrigation laboratory program.
6) Implement SWUCA recovery strategies.
7) Accelerate and secure funding for Upper Peace River/Saddle Creek restoration project.
8) Implement projects in Charlotte Harbor, @^illp^e^q`ebb ^ka Bpqbol ?^v qe^q ^ob ab^kba annually by the SFWMD for lower Charlotte Harbor.

: Acres of habitat hydrologically restored.

Restore 1,000 acres of habitat for hydrology by 2015.

Photo by Lisa Beever, 7/31/07

HA-O

Encourage, expand and develop incentives for the reuse of waters that are protective of water quality and natural hydrology.

Water supplies in southwest Florida are being stressed by the area's rapid growth. Qeb bcªˋfbkq rpb ^ka obrpb lc t^qbo pelria be made a key planning element at the local, regional and state levels. Water reuse programs can be an effective method of reducing pressures on surface and groundwater resources. However, excessive irrigation with reuse water may elevate nutrient loads to adjacent wetlands and water bodies and could contribute to water body impairments.

Qefp moflofqv ^ˋqflk ebimp criªii HA-4, WQ-1 and SG-1.

Photo by Lisa Beever, 5/19/03

1) Develop a regional reuse water policy that considers the consbkqflk^i _bkbªq lc qeb obplroˋb and the potential for nutrient impacts on adjacent wetlands and water bodies.
2) Identify areas where reuse water service has the dob^qbpq mlqbkqf^i clo _bkbªq) bvaluate options for providing such service and study the feasibility of setting up service to areas without reuse water service.
3) Encourage utilities to quantify reuse for large reuse water users. Encourage nutrient management plans for large reuse water users.
4) Encourage utilities to adopt progressive rate structures for all water services (potable and reuse) ql bkˋlro^db bcªˋfbkq rpb lc qeb obplroˋb+
5) Enhance existing education programs designed to inform and promote public awareness of the fj mloq^kˋb lc bcªˋfbkq t^qbo rpb+
6) Evaluate public perceptions concerning the use of reuse w^qbo+ Abqbo j fkb qeb _^oofbop ^ka _bkbªqp surrounding the acceptance of reuse water for recharge and natural system enhancement projects.
7) Use rebates or other incentives to encourage the obqolªqqfkd lc mob*.66/ foofd^qflk pvpqb j p t fqe ^ sensor to interrupt irrigation when rain or moisture is present.
8) Study the effectisbkbpp) _bkbªqp ^ka fj m^ˋqp lc existing reuse water services. Determine if the runoff of reuse water is contributing to impairments of adjacent wetlands and water bodies. Review published reports as benchmarks, such as the WateReuse Research Foundation

in

9) Discourage the disposal of a potential reuse water resource, such as highly treated wastewater, through industrial outfalls or deep well injection.
10) Encourage the use of storm water as a water resource that protects or restores natural hydrology.
11) Determine if wet-weather temporary reservoir as^fi^_fifqv fp ^ pfdkfªˋ^kq _^oofbo ql obrpb t^qbo system development and, if so, develop feasible alternatives.
12) Investigate the use of water from reclaimed mine lakes to recharge aquifer systems.

7 Bc«rbkq col j t^pqb t^qbo qob^q j bkq mi^kqp within the study area that is treated and delivered for reuse.

Pbsbkqv*ªsb mboˋbkq lc qob^qba t^pqb t^qbo fp obrpba by 2018.

HA-P

Support public involvement programs addressing watershed management issues of hydrology, water resources, water conservation and water use.

Evaolildv Æqeb pqrav lc t ^qbo «l t Æfp ^ ifqqib* understood environmental value. The land in the CHNEP study area has little variation in elevation and fp `e^o^`qbofwba _v t ^qbo «l t fkd lsbo i^ka ^p lmmlpba to being dominated by major streams and rivers. In order to conduct agricultural and land development, drainage has been altered. This has resulted in the loss of water storage and an increase in stormwater runoff. Homeowners have the opportunity to reduce these impacts through choices made at home such as water conservation, landscaping best management practices and incorporating water storage features into landscape design.

Qefp moflofqv ^`qflk ebimp cri ª ii HA-1, HA-2, HA-3, HA-4 and SG-1.

1) Promote and support programs and opportunities for citizens to be involved with water conservation and hydrology issues.
2) Promote and support demonstration areas that instruct people on water conservation and hydrology issues.
3) Provide water conservation and hydrology information through local media and other outlets.

Public knowledge of hydrology and water conservation techniques is part of an overall approach ql fj molsb t ^qbo «l t p ^ka obar`b pqobppbp lk t ^qbo resources. Effects may be seen under Priority Action WQ-D.

Photo by Maran Hilgendorf, 5/1/06

Fish and Wildlife Habitat Loss

Protect, enhance and restore native habitats where physically feasible and within natural variability, including

- Submerged aquatic vegetation (SAV);
- Submerged and intertidal unvegetated bottoms;
- Oyster;
- Mangrove;
- Salt marsh;
- Freshwater wetland;
- Native upland;
- Water column.

By 2025, achieve a 100 percent increase in conservation, preservation and stewardship lands within the boundaries of the CHNEP study area. The increase will be based upon 1998 acreage.

By 2020, achieve controllable levels of fks^pfsb bulqf` mi^kqp) ^p ab$^{a}$kba _v qeb Cilofa^ Bulqf` Pest Plant Council, and exotic nuisance animals, as ab^{a}kba _v qeb Cilofa^ Cfpe ^ka Tfiaifcb @lkpbos^qflk Commission, on publicly managed lands. Encourage and support the removal and management of invasive exotic plants and exotic nuisance animals on private lands.

Restore submerged and intertidal habitats (seagrass, oyster and unvegetated bottoms) from the effects of anthropogenic stresses.

Ensure navigation programs protect CHNEP study area habitat resources.

Restore freshwater and estuarine wetland areas, especially those adversely impacted by ditching, rpfkd j bqelap pr`e ^p qeb _^`h^{a}iifkd lc afq`ebp) qeb removal of spoil piles and the elimination of exotic vegetation.

Bke^k`b $^{a}$pe ^ka t fiaifcb e^_fq^q ^ilkd shorelines, including canals, lakes, riverine systems ^ka ^oqf$^{a}$`f^i t ^qbo t ^vp+

Improve canal, pond, lake and river j ^k^db j bkq ^`qfsfqfbp ql _bkb^{a}q ^{a}pe ^ka t fiaifcb+

Restore and protect a balance of native plant and animal communities.

Provide additional support for environmental compliance and enforcement on land and water. Ensure uniform compliance and enforcement of environmental regulations and permitting criteria.

Bring environmentally sensitive land under protection through ownership and/or management and expand conservation areas, reserves and preserves, including undeveloped platted lots.

Advocate land acquisition and conservation easement programs.

Provide information on the economic, social ^ka bksfolk j bkq^i _bkb^{a}qp lc molqb`qba i^ka ^ka environmental restoration, including ecosystem services.

Acquire as much of Babcock Ranch as possible for public stewardship and promote conservation management of the entire ranch.

Where practical, identify and remove areas of heavy invasive exotic vegetation and exotic nuisance animals.

Promote local programs to research and eliminate nuisance exotic animal species.

Provide education programs on the impacts of invasive exotic plants and exotic nuisance animals.

Provide multifaceted environmentally responsible boater education programs.

Support public involvement programs in habitat and wildlife issues.

FW-A

Restore submerged and intertidal habitats (seagrass, oyster and unvegetated bottoms) from the effects of anthropogenic stresses.

On August 17, 2009, the CHNEP approved targets for seagrass acreage. Seagrass acreage is 95 percent of that found in the 1950s. Seagrass extent has expanded 10 percent since the recorded low in 1999. However, severe prop scars and other stresses are taking a toll on the quality of our seagrasses.

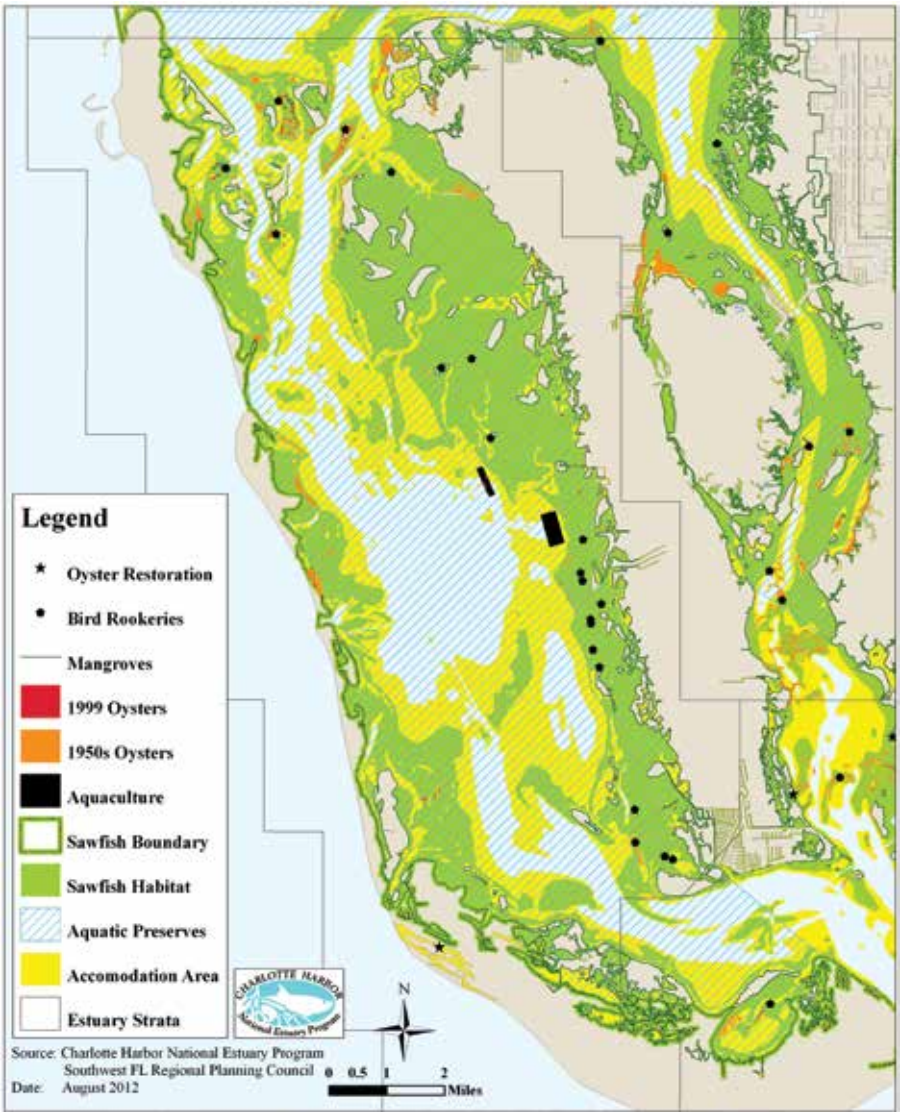
On December 7, 2012, the CHNEP adopted its . The purpose of the plan is to guide implementation of partnership oyster habitat monitoring and restoration projects throughout qeb @EKBM bpqr^ofbp fk ^ob^p fabkqfªba ^p `^m^_ib of supporting sustainable populations. The plan considered unvegetated bottoms, which are critical for bka^kdboba p j ^iiqe l lqe p^ t ªpe %).

Qefp mof lofqv ^`qf lk ebimp criªii FW-1.

1) Develop benthic indices for tidal `obbhp) j ra «^qp) p^ka «^qp ^ka subtidal vegetated bottoms to measure the health of these systems.
2) Provide scientists, decision-makers and the general public with information regarding the abundance and diversity of benthic animals to highlight the value of unvegetated bottoms and other benthic habitats.
3) Restore oyster beds using appropriate substrates in locations of suitable water quality.
4) Promote biennial seagrass mappings that are coordinated between the water management districts.
5) Conduct a decennial seagrass scar mapping project for the CHNEP study area.
6) Gather existing information on methods to prevent or recover seagrass scarring (e.g., sediment restoration and closed areas), craft recommendations and make the information available to decision makers.
7) Encourage rule changes and enforcement of existing rules to protect shallow-water environments from boat impacts.
8) Consider legislative changes that are successful elsewhere.

: Acres of SAV and native oysters by estuary strata.

Maintain and increase the number of acres of SAV and lvpqbop fk b^`e bpqr^ov pqo^q^ _v qeb ^ j lrkq abªkba fk WQ-G and the .



Map 31: Oyster Habitat Restoration Considerations for Pine Island Sound

FW-B

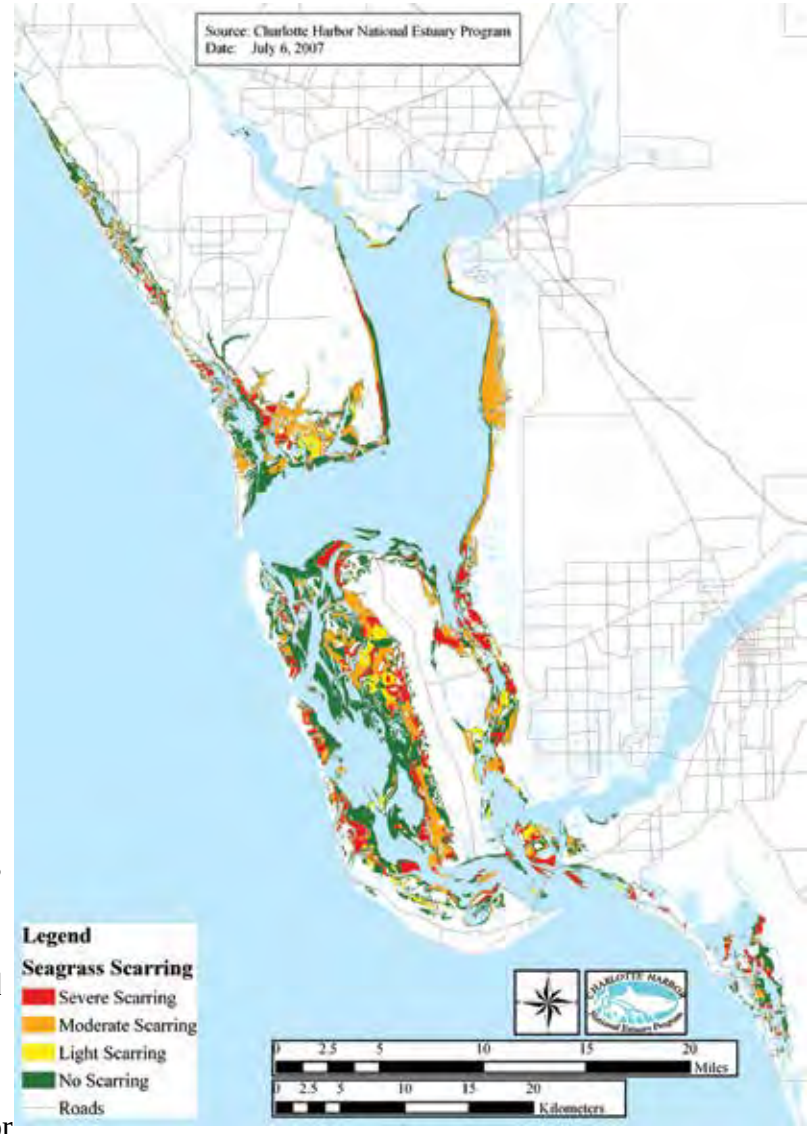
Ensure navigation programs protect CHNEP study area habitat resources.

Charlotte Harbor is a generally shallow-water system. Pressure from development and increased public access to our shallow areas stresses the system. Dredging can reduce or degrade water quality during and after construction. It can also reduce or degrade natural habitat and its functions, adversely ^ccb`qfkd ªpe ^ka t fiaifcb+ Aobadb*^ka*ªii molgb`qp and associated degraded water quality are partially responsible for the precipitous decline of seagrass losses in Florida. New navigation channels can cause changes in hydrodynamics, creating erosion in some areas and building sediment in others. In the long term, dredging usually has to be repeatedly performed to maintain the channel, causing continuing impacts on aquatic life. According to Chapter 18-20.004(2), FAC, new dredging in Florida aquatic preserves must be clearly in the public interest. Taken together, dredging projects often result in adverse cumulative impacts.

Qefp moflofqv ^`qflk ebimp criªii FW-1.

1) Participate in Aquatic Preserve Management Plan revisions.
2) Participate in the revision of the plan for the Statewide Coastal and Aquatic Managed Areas.
3) Track, review and comment on new dredging in the CHNEP study area.
4) Advocate dredging permits with projected ensfolk j bkq^i _bkbªqp) b+d+) t ^qbo nr^ifqv f j molsb j bkqp arb ql fk`ob^pba «rpefkd lc degraded water bodies.
5) Examine pre- and post-dredging impacts on the environment.
6) Require pre- and post-dredging evaluations as a permit requirement.
7) Provide technical assistance and current p`fbkqfª` pqrav obpriqp ql qeb CABM clo mbo j fq examination.
8) Adopt county and city blue-belting plans (identify appropriate locations for boating access) to sustain and protect Charlotte Harbor area resources.

: Boat propeller scar acreage, severity and location by basin.No net increase in acreage of propeller damage to seagrass beds from the 1999 levels by the year 2018 by basin and seagrass segment. Reduce all severely scarred areas to moderate scarring and reduce 70 percent or more of the moderately scarred areas to light scarring by basin.



Map 32: 1999 Prop Scar Severity

Prop scar severity in the Charlotte Harbor estuaries, 2003–04.

FW-C

Restore freshwater and estuarine wetland areas, especially those advbopbiv f j m^`qba _v afq`efkd) rpfkd j bqelap pr`e ^p qeb _^`hªiifkd of ditches, the removal of spoil piles and the elimination of exotic vegetation.

J ^kv qfa^iiv «llaba t bqi^ka ^ob^p t fqefk qeb `l^pq^i areas of the CHNEP were historically "ditched" to hydrologically alter these habitats to reduce the breeding of salt marsh mosquitoes. Many of these areas have been heavily invaded by exotic vegetation that colonizes spoil piles left by such ditching activities. Currently there are approximately 60,000 acres of mangrove and 12,000 acres of salt marsh in the CHNEP study area.

Many freshwater wetland areas within the watershed of the CHNEP were historically "ditched" to drain wetlands for development, agriculture and industry. These areas have been severely altered with regard to wetland structure and function, resulting in the ilpp lc ªpe ^ka t fiaifcb e^_fq^qp) m^oqf`ri^oiv clo species dependent upon isolated wetlands with short hydroperiods. Many of these ecosystems have been pfdkfª`^kqiv ^iqboba ql qeb mlfkq qe^q qebv ^ob kl longer legally considered wetlands during permitting processes. Currently there are approximately 325,000 acres of freshwater wetlands in the CHNEP study area.

Qefp moflofqv ^`qflk ebimp criªii FW-1.

1) Potential responsible agencies and organizations should develop a plan to identify and restore impacted areas within their communities or jurisdiction.
2) Obªkb dbldo^mef` fkclo j ^qflk pvpqb j %DFP& a^q^ layers of mosquito ditching and other ditches in the CHNEP study area and use this information to prioritize restoration projects.
3) Develop an areawide plan and rank areas for restoration. Use pre-vegetation and historic watershed maps to develop an approach to restore the balance.
4) Implement the prioritized restoration program.

: Mangrove, salt marsh and freshwater wetland acreage.

Maintain and increase the number of mangrove to 60,000 acres, salt marsh to 12,000 acres and freshwater wetlands to 325,000 acres throughout the CHNEP study area.

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Photo by Clay Simmons, Lee County, 8/1/06

FW-D

Bke^k`b ªpe ^ka t fiaifcb e^_fq^q ^ilkd pelobifkbp) fk`irafkd `^k^ip) lakes, risbofkb pvpqb j p ^ka ^oqfª`f^i t ^qbo t ^vp+

In many areas of the CHNEP, natural marine, estuarine and freshwater shorelines have been e^oabkba lo j lafªba arofkd absbilm j bkq+ Moldo^ j p and incentives should be developed to encourage "softening" and increase the habitat structure of qebpb mobsflrpiv j lafªba ^ob^p+ Fk ^aafqflk) pr`e procedures should become standard operation procedures for any future permitted shoreline alterations.

Qefp moflofqv ^`qflk ebimp criªii FW-1.

1) Compile data and study the cumulative impacts of boat docks and hardened shorelines on submerged aquatic vegetation (SAV), oyster bar, intertidal, unvegetated and other habitats.
2) Update shoreline treatment inventories, including hedged mangrove, windowed mangrove, uplifted mangrove, vertical seawall, riprap revetment, lawn, herbaceous wetlands, etc., every three years.
3) Remove hardened shorelines wherever possible and replace with environmentally _bkbª`f^i k^qro^i shorelines.
4) Encourage planting of appropriate native vegetation and allow trimming and maintenance of newly planted vegetation by property owners.
5) Encourage the use lc ^oqfª`f^i obbc structures under docks and along existing seawalls to enhance habitat value.
6) Develop and support incentive programs for private landowners to soften shorelines and plant appropriate native vegetation.
7) Encourage the use of alternatives to vertical bulkheads along developed shorelines through the permitting process.
8) Develop education programs and literature afob`qba ^q obpfabkqp ifsfkd ^ilkd ^oqfª`f^i `^k^ip+

: Condition of shoreline (i.e., percent hedged mangroves, hardened shoreline, and damaged mangroves) by basin.

Obar`b qeb mbo`bkq lc ro_^k ilqp) ^p abªkba _v qeb CHNEP Shoreline Survey, with mangroves to less than 39 percent trimmed and with vegetation to less than 3 percent with invasive exotic vegetation.

Photo by Channing Boswell, 9/4/04

FW-E

Improvb `^k^i) mlka) i^hb ^ka ofsbo j ^k^db j bkq ^`qfsfqfbp ql _bkb^{a}q ^{a}pe and wildlife.

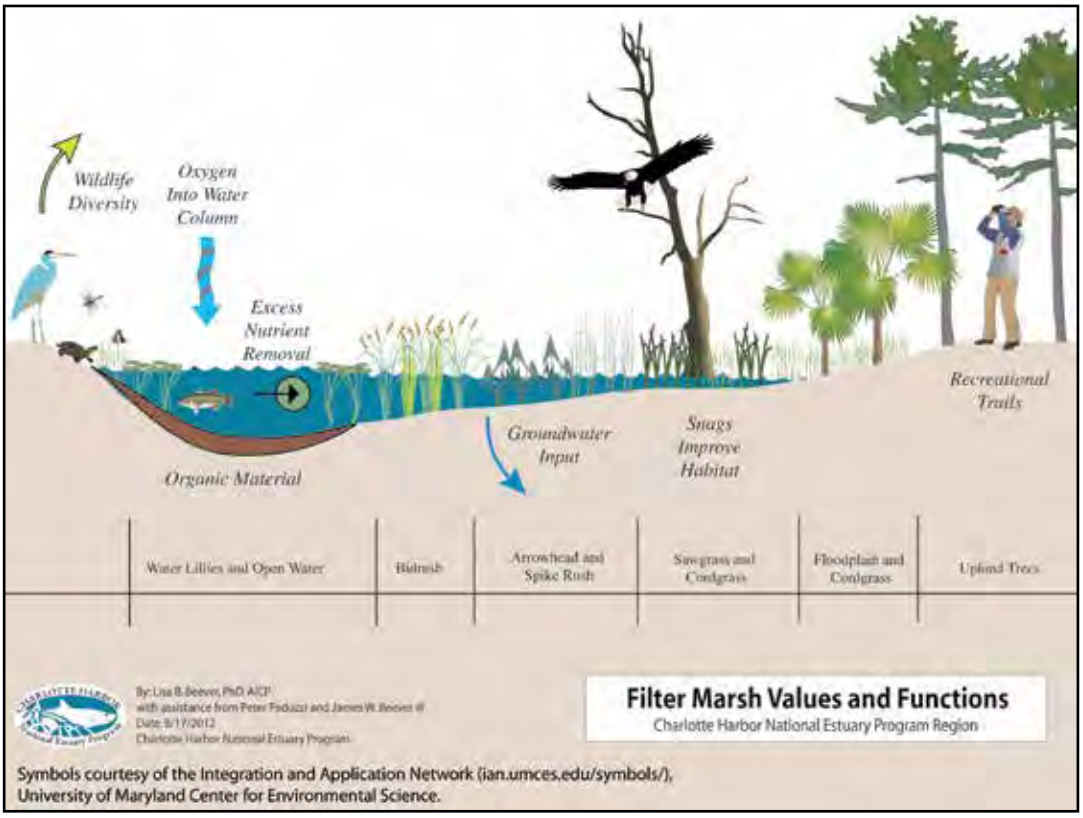
Estuarine habitats are being challenged by anthropogenic changes in salinity. By not following historical gradual changes (aside from catastrophic events, i.e., hurricanes), systems are being consistently stressed with no chance for a recovery period. This includes excess freshwater impacts when upstream pvpqb j p ^ob ql l crii) ^p t bii ^p `bpp^qflk lc «l t fkd water when human use (i.e., mitigation or potable) of the resource is needed. Water elevations are impacted one way or another by this and these level changes ^ipl `e^kdb e^_fq^q clo ^{a}pe ^ka t fiaifcb+

Qefp mofl ofqv ^`qflk ebimp cri^{a}ii C T*.+

1) Study effects of freshwater releases on submerged aquatic vegetation, oysters, icthyoplankton and others in the lower Caloosahatchee, San Carlos Bay, Matlacha, Pine Island Sound, Dona Bay and Roberts Bay.
2) Work with responsible agencies to limit impacts to downstream systems, including better uses of excess water and conservation/other sources when water is needed.
3) Coordinate with LakeWatch in upper watersheds and LE/AD and FLMS on monitoring and data available (vegetation and water quality).
4) Compile from local governments' management activities for lakes and canals; determine gaps and ^{a}ii d^mp+
5) Determine from water management districts and water control districts the rationale for lake levels and releases.
6) @l j mfib ^{a}pe hfii nr^kqfqv ^ka `^rpbp a^q^ lk i^hbp and canals.
7) Determine the impacts of raising the water levels in north Cape Coral freshwater canals.

: Lake, pond and canal water quality and quantity status and trends.

Improved dissolved oxygen, nutrient and copper qobkap fk i^hbp ^ka ^oqf^{a}`f^i t ^qbo _lafbp+



Cfdrob .-7 @lk`bmqr^i Af^do^j lc >oqf$^{a}$`f^i T^qbo ?lav Fj molsb j bkqp

FW-F

Restore and protect a balance of native plant and animal communities.

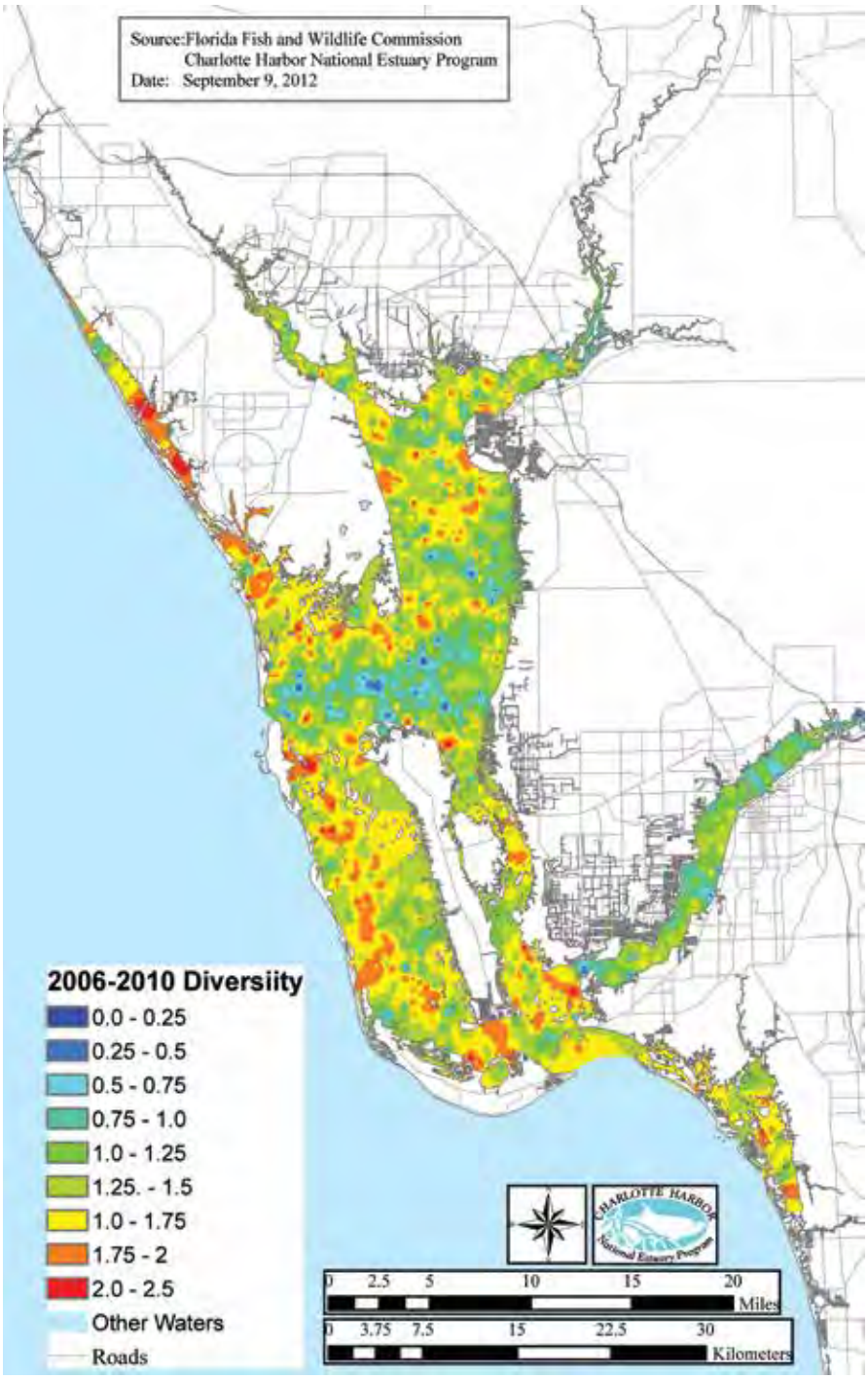
Southwest Florida is comprised of a variety of plant and animal communities. The extent of impact on these communities has been variable depending on their level of regulation, the value placed upon them and their general ability to be developed. For example, a higher mbo`bkq^db lc mfkb «^q t llap e^sb _bbk impacted than freshwater wetlands. Seagrass beds receive more protection than unvegetated bottoms. Communities of note include submerged aquatic vegetation (SAV), mangroves, saltwater marsh habitats, freshwater wetlands systems, oyster bars, native upland communities and the water column.

Qefp mofl ofqv ^`qflk ebimp cri ª ii FW-1.

1) Advocate water quality and habitat restoration projects that will improve the habitat value of native plant and animal communities.
2) Consider balance of rare habitats and habitats that have received a high percentage of impacts in restoration plans, consistent with restoring the balance approaches.
3) Continue and expand independent ª pebofbp$ j lkfqlofkd mo ldo^ j p+

Fish community composition by bay segment.

K l ab`ifkb fk k^qfsb ª pe pmb`fbp afsbopfqv by bay segment.



Map 33: 2006-2010 Fish Diversity

Data from the Fish and Wildlife Research Institute's Fisheries Independent Monitoring were analyzed and mapped by CHNEP staff ql afpmi^v ^ob^p lc efdebpq ª pe pmb`fbp afsbopfqv %fk oba&+

FW-G

Provide additional support for environmental compliance and enforcement on land and water. Ensure uniform compliance and enforcement of environmental regulations and permitting criteria.

Existing laws provide a sound basis for habitat and wildlife protection. However, the environmental law enforcement agencies need increased funding to perform their duties under the existing statutes and regulations. Enforcement of permitting and other environmental regulations should be uniform throughout the CHNEP study area.

This priority action helps cri ª ii FW-1.

Map 34: Lee County Fertilizer Ordinance

Lee County enforces its fertilizer ordinance with investigating complaints ^ka fpprfkd t ^okfkdp ^ka ªkbp+ Qeb j ^m ^_lsb fiirpqo^qbp qeb afpqof_rqflk lc ªkbp clo rkfk`lomlo^qba Ibb @lrkqv fk /-..+ %Plro`b7

)

1) Advocate adequate funding for environmental law enforcement agencies, including an increase in the kr j _bo lc i^t bkclo`b j bkq lcª`bop+
2) Cooperate with regulatory agencies to develop protocol that tracks the effectiveness of permit compliance within the CHNEP study area.
3) Continue conducting workshops to train law enforcement and environmental permitting personnel regarding environmental regulations.

: Compliance with environmental laws.

At least one in-kind project or pollution prevention project implemented in the study area by 2017.

Photo by Maran Hilgendorf, 2/14/2011

FW-H

Bring environmentally sensitive land under protection through ownership and/or management and expand conservation areas, reserves and preserves, including undeveloped platted lots.

Important areas of existing natural habitat are currently threatened with substantial alteration due to rapid rates of development. The CHNEP process encourages, promotes and supports efforts by government and private organizations, as well as private landowners, to increase the protection of these habitats through expanded conservation, reservation, preservation and stewardship programs. These efforts include large, mostly vacant, platted areas.

Qefp moflofqv ^`qflk ebimp criªii FW-2.

1) Gather priorities from existing land acquisition agencies and the CHNEP restoration vision.
2) Create list of priority acquisitions by watershed.
3) Identify key habitats in existing natural areas within each watershed for protection.
4) Promote private stewardship of vital habitats through incentives and technical assistance to landowners, local governments and other parties.
5) Develop and implement public land acquisition programs for critical habitat adjacent to public lands.
6) Develop an acquisition plan and funding strategy for the Peace River watershed through collaboration of local, state and regional conservation land acquisition entities to assure a `lloafk^qba ^ka bnrfq^_ib ^mmol^`e) ^p fabkqfªba through the .
7) Continue to pursue "less-than-fee" simple acquisition programs to acquire critical i^kap clo ªpe ^ka wildlife, as well as water management, water supply and the conservation and protection of water resources.
8) Work with mining companies to develop permanent reserves and preserves from post-mined land.
9) Develop a funding resource and management plan for acquired lands before purchase or acquisition.
10) Support existing and proposed land trusts for the acquisition of wildlife habitat.
11) Conduct a periodic convocation to review the restoration plan and acquisition plan.
12) Track habitats in conservation.
13) Support incentive programs such as the Wildlife Habitat Incentive Program.
14) Support land acquisition agencies' efforts to contact targeted property owners requesting:
    a. Land donation in exchange for income tax write-off.
    b. Exchange for equivalent land in nontargeted areas.
    c. Permanent wildlife easement.
    d. Sale of land to the trust.

: Acreage in conservation status within study area and by basin.

By 2025, increase of coverage for lands in conservation status by 100 percent over 1998 levels to 488,000 acres.

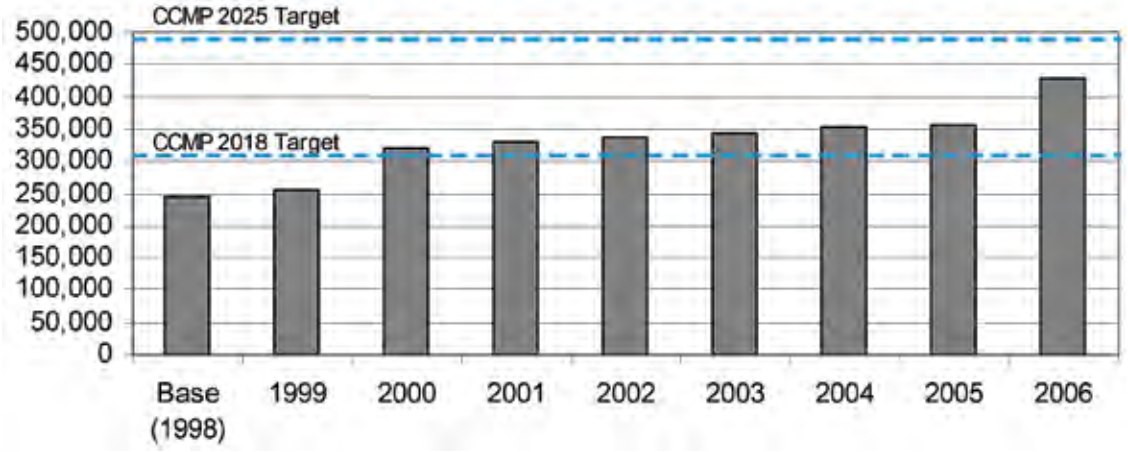


Figure 11: Land Conservation

Land has been placed under stewardship every year within the CHNEP study area after adoption of the CCMP in 1999. An objective of 25 percent more than in 1998 by 2018 was set at the time. By 2000, that objective had been achieved. This update increases the objective to 100 percent more than in 1998 by 2025.

FW-I

Advocate land acquisition and conservation easement programs.

The southwest coast of Florida was once a reticulate necklace of beautiful emerald, blue and amber gems composed of an interlocked complex of bays, lagoons, inlets, sounds and harbors. Decorated with wetlands, submerged aquatic vegetation and coastal rivers, these features supported one of the most biologically afsbopb mi^kq) ªpe ^ka t fiaifcb mlmri^qflkp fk qeb continental United States. This entire system has been fragmented, losing much of its natural productivity due to coastal habitat loss, water quality degradation and hydrologic alterations, attributable to the area's rapid growth. State and federal agencies, local governments, conservation organizations, as well as the general public, overwhelmingly support programs and efforts that focus on the protection of the remaining coastal ecosystems. Such programs achieve these protections through fee simple acquisition and conservation easements.

A conservation easement is a legal agreement voluntarily entered into between a property owner and ^ nr^ifªba `lkpbos^qflk lod^kfw^qflk) pr`e ^p ^ i^ka trust or government agency. The easement contains permanent restrictions on the use or development of land in order to protect its conservation values. These easement restrictions vary greatly for each agency or organization, as do landowner motivations to offer conservation easements. There are many advantages to conservation easements: property remains in private l t kbopefm ^ka `lkqof_rqbp ql qeb q^u _^pb) «buf_fifqv) permanency, property tax reductions, charitable tax deductions and estate tax reductions.

Qefp mofl ofqv ^`qflk ebimp criªii FW-2.

1) Support existing federal, state, water management district and local conservation land acquisition programs, such as Florida Forever, Florida Communities Trust, Save our Rivers and private land acquisition organization projects. Support activities may include letter writing and contact with legislators and other decision-makers to ^rqelofwb ^ka fk`ob^pb crkafkd) ^mmolsb pmb`fª` project allocations and management funds, contact prospective sellers and make introductions. Such efforts may include coordination of Coastal Conservation Corridor Plan activities, facilitating regional land acquisition forums, assistance with the formation and maintenance of local land trusts and providing information and education on behalf of local conservation efforts, including funding initiatives.
2) Inventory government land acquisition programs and private land trusts. Include information such as program requirements, processes and area limitations.
3) Evaluate and prioritize restoration projects and refer to likely funding programs.
4) Assist land trusts and funding agencies to send letters of inquiry and appropriate materials to targeted property owners.
5) Revise, update and secure funding for the Integrated Habitat Network and accelerate «llami^fk j ^mmfkd j labokfw^qflk+

Advocating land acquisition and conservation easements is part of an overall approach to place lands in conservation management. Effects may be seen under Priority Action FW-H.

FW-J

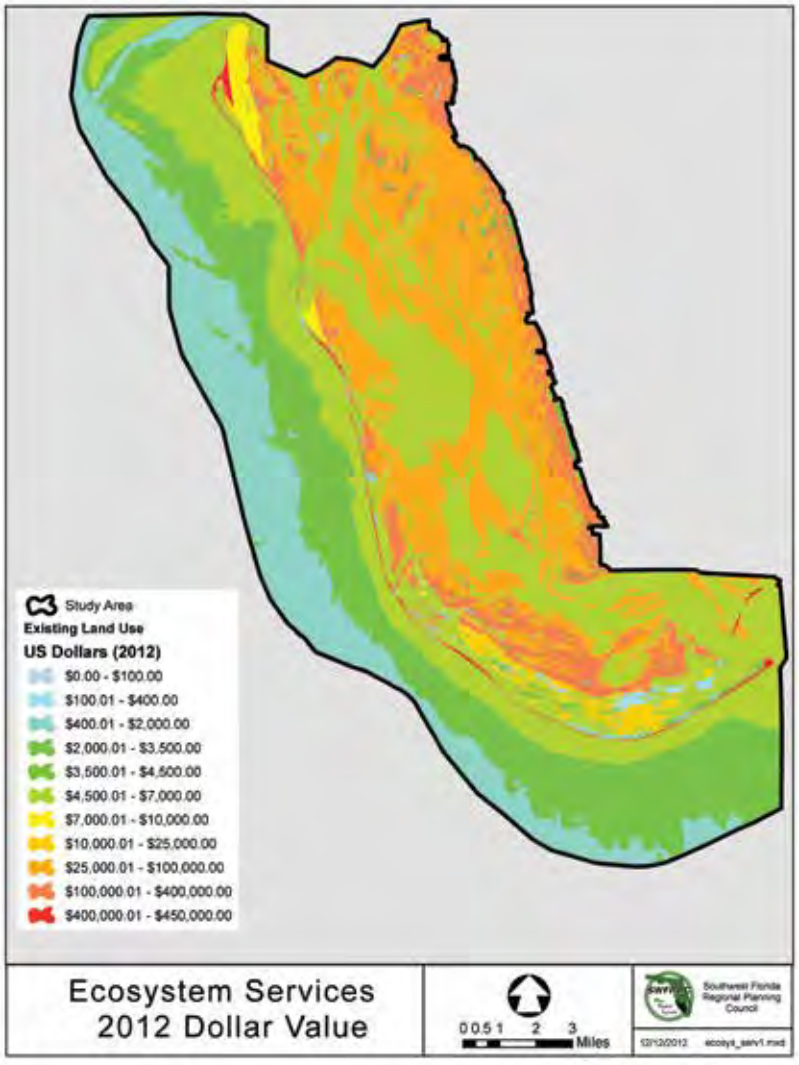
Molsfab fkclo j ^qflk lk qeb b`lkl j f`) pl`f^i ^ka bksfolk j bkq^i _bkb^{a}qp of protected land and environmental restoration, including ecosystem services.

The protection of land for conservation purposes molsfabp pfdkf^{a}`^kq b`lkl j f`) pl`f^i ^ka bksfolk j bkq^i _bkb^{a}qp ql qeb il`^i ^ka obdflk^i ^ob^+ Those local areas in Florida containing the most expansive areas of conservation lands tend to have both increased quality of life and enhanced tax base of the remaining adjacent private lands. The presence of conservation lands can reduce infrastructure needs, including transportation, health care, public safety and utility services, saving local governments and taxpayers millions of dollars in capital improvements and operating costs. Conservation and agricultural lands generate more revenue than services required through associated taxes, cbbp ^ka qlrofpj prmmloq+ Erkqfkd) ^{a}pefkd ^ka nonconsumptive outdoor recreational activities are a major contributor to the southwest Florida tourist industry.

Qefp moflofqv ^`qflk ebimp cri^{a}ii FW-2.

1) Document existing studies that hasb ab^{a}kba _bkb^{a}qp lc molqb`qba i^ka fk Cilofa^ t fqe emphasis in the CHNEP study area.
2) Gather data on recreational use of protected lands and compile the results for a summary report to the public and decision-makers.
3) Bpqf j ^qb qeb b`lkl j f` _bkb^{a}qp lc fabkqf^{a}ba i^ka ^`nrfpfqflk molgb`qp ^ka el t infrastructure and operating costs will be reduced, user fees and tourist revenue will be increased and how quality of life will be fj molsba+ @lkpfabo pr`e fpprbp ^p qo^c$^{a}$` congestion and mortality, air pollution, school crowding, crime and taxes.
4) Use models to assess future pollutant loading as a result of preserved land not being developed.
5) Utilize appropriate metropolitan planning organization and regional planning council build-out models for urban service area and platted lands throughout the CHNEP watershed to assess alternatives that reduce infrastructure costs.
6) Encourage economic research to bolster the fundamentals of ecosystem services valuations and suggest innovative funding mechanisms for CCMP actions.

Providing information on the economic, social and bksfolk j bkq^i _bkb^{a}qp lc molqb`qba i^ka fp m^oq lc an overall approach to place lands in conservation management. Effects may be seen under Priority Action FW-H.



Map 35: Ecosystem Services Values

In 2013, Southwest Florida Regional Planning Council and Sanibel-Captiva Conservation Foundation assessed ecosystem services values for an area associated with Pine Island Sound by land use.

FW-K

Acquire as much of Babcock Ranch as possible for public stewardship and promote conservation management of the entire ranch.

Babcock Ranch lies immediately east of the Babcock-Webb Wildlife Management Area and is situated in Charlotte and Lee counties, within the Telegraph Swamp watershed. The property has been managed for nearly 100 years as a working ranch and timber operation. However, mining, sod farming, truck farming and hunting currently take place also.

Babcock Ranch is recognized as a critical link in the regional wildlife habitat landscape of southwest Florida. It adjoins the Babcock-Webb Wildlife Management Area to the Fisheating Creek core conservation and conservation easement lands and the Caloosahatchee State Recreation Area. It is on the current Florida Department of Environmental Protection Florida Forever acquisition list and the Florida Fish and Wildlife Conservation Commission Additions and Inholdings acquisition list.

The Babcock Ranch is the largest freshwater landscape that drains into the CHNEP estuarine system.

The state has been pursuing acquisition of the Babcock Ranch since 2002. In 2005, the FDEP in partnership with Lee County reached an agreement to purchase approximately 80 percent (73,476 acres) of the Babcock Ranch out of the total 91,682 acres. The state will develop a management plan that provides for the conservation and stewardship of the property that will include continued operation of certain activities of the ranch.

Qefp moflofqv ^`qflk ebimp criªii FW-2.

1) Continue to advocate the acquisition of Babcock Ranch for public stewardship through the state, cbabo^i) il`^i ^ka klkmolªq bkqfqv mol`bppbp+ Identify viable alternative acquisition scenarios and advocate the most protective methods.
2) Participate in the designation of additional conservation areas within the development area of the Babcock Ranch community including fee-simple and less-than-fee-simple acquisition preservation of the Curry Lake wildlife corridor, the Trout Creek riparian ecosystem, the Florida scrub jay habitats and the Telegraph Creek Canal buffer. Promote conservation practices on all Babcock Ranch property.
3) Support acquisition within the development area footprint of lands using Florida Forever, Florida Communities Trust, Conservation 20/20 or other public or private land acquisition programs.
4) Assist the management entities, including the CT@) CABM ^ka qeb klkmolªq `lomlo^qflk) fk development of the State Management Plan and in environmental interpretation and education on the Babcock Ranch.
5) Seek CHNEP representation on the Babcock Ranch Management Partnership.

Acquiring additional components of the Babcock Ranch is part of an overall approach to place lands in conservation management. Effects may be seen under Priority Action FW-H.

FW-L

Where practical, identify and remove areas of heavy invasive exotic vegetation and exotic nuisance animals.

Pfdkf^a`^kq t fiaifcb e^_fq^q fk qeb @EKBM pqrav ^ob^ has been extensively invaded and altered by invasive exotic vegetation and exotic nuisance animals. Existing programs and incentives need to be continued and enhanced to reduce and control both the extent and spread of such invasive exotic species.

Qefp moflofqv ^`qflk ebimp cri^{a}ii FW-3.

1) Identify areas of heavy invasive exotic vegetation and exotic nuisance animals.
2) Conduct a biogeographic analysis of aquatic and terrestrial exotics and assess the threats.
3) Examine existing exotic pest plan and nuisance exotic animal lists and recommend additions as necessary.
4) Develop a ranking matrix for public lands and waters.
5) Develop and encourage county and community-based programs for the removal of exotics and the maintenance of native vegetation on private lands.
6) Develop plans to reduce occurrence of exotics in areas `lkq^fkfkd lo ifkhfkd pfdkf$^a$`^kq e^_fq^qp fabkqf^{a}ba fk qeb obdflk^i restoration coordination plans.
7) Work with regulatory agencies to require exotic removal and maintenance as a condition of all new permits (dock, surface water, land clearing, etc.) for development.
8) Develop and implement incentive (rebate) programs to encourage removal of exotics and the maintenance of native vegetation on private lands.
9) Work with regulatory agencies to alter permitting regulations to encourage landowners to remove exotic vegetation prior to land development and to plant native vegetation.
10) Work with regulatory agencies to institute ordinances for the removal of nuisance vegetation and exotic nuisance animals.
11) Work with regulatory and planning agencies to modify comprehensive plans to include exotic nuisance animal and exotic pest plant mapping and management strategies.
12) Advocate legislation that restricts ownership of exotic nuisance animals and continued funding at the federal and state level to identify, research and release additional biocontrol agents for existing invasive plant species.

The most complete and consistently derived information on exotic vegetation is from the CHNEP shoreline conditions monitoring. Effects may be seen under Priority Action FW-D.

Photo by Catherine Corbett, 7/29/05

Hymenachne amplexicaulis

FW-M

Promote local programs to research and eliminate nuisance exotic animal species.

Since European colonization, hundreds of animal species have been introduced to Florida. In recent times, many of these avian, aquatic and terrestrial wildlife species and insects have become a threat to the survival of native plant and animal species and/or their habitats.

Qefp moflofqv ^`qflk ebimp criªii FW-3.

1) Research the extent of invasive animal imports/ introductions.
2) Using the Internet, USFWS, USDA, FDACS, pet trade associations, hobby groups, pet shops, shows and pet supply stores, ascertain the extent of importation of dangerous and potentially invasive t fiaifcb pmb`fbp) fk`irafkd _foap) obmqfibp) ªpe) invertebrates, mammals and amphibians.
3) Where appropriate, develop education programs to disseminate information about harmful invasive species, advocate control programs and introduction, possession and/or release of harmful exotic animal species.
4) Develop professional presentations for legislators and commissioners.
5) With input from pet trade, hobby groups, wildlife biologists and the public, develop educational materials and programs to emphasize the problem of wildlife introductions and releases, as well as the related laws. Present these materials/programs at exotic pet shows, trade shows and other venues.
6) Encourage federal and state regulations and statute changes to restrict or prohibit introduction and release of nonnative wildlife species.
7) Encourage the development of “humane” rescue groups to take unwanted pets (rather than have them “dumped”).

Local programs to eliminate invasive exotic plants and exotic nuisance animals is part of an overall approach to reduce the impacts of exotic plants and animals. Effects may be seen under Priority Action FW-L.

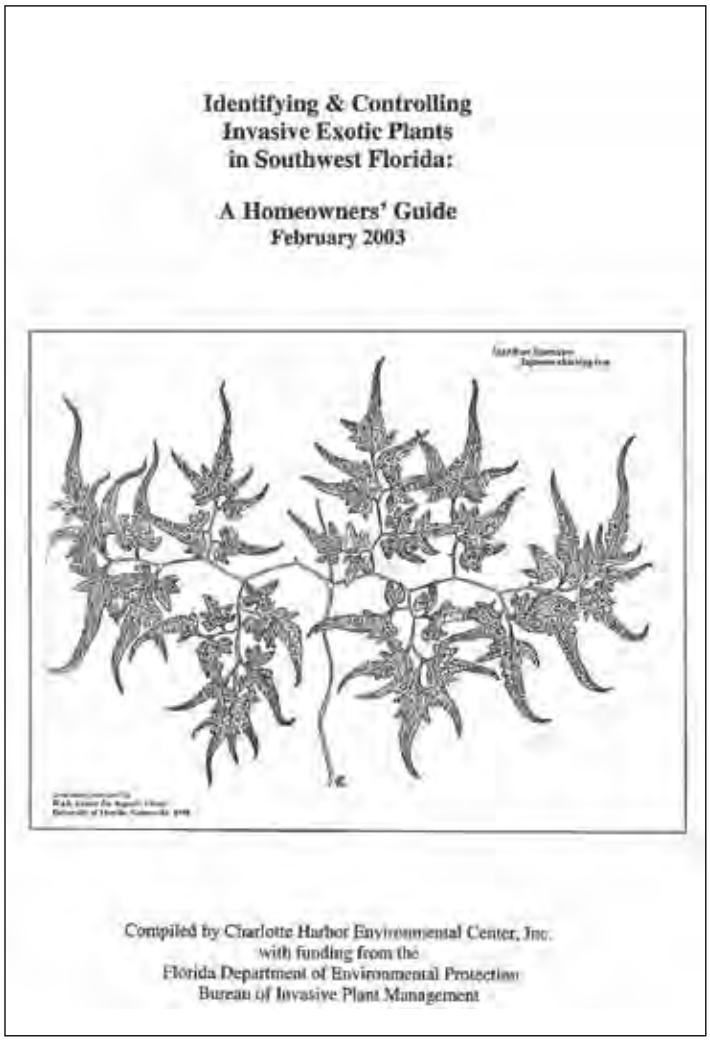
Photo by Todd Campbell, 2003

Varanus niloticus

FW-N

Provide education programs on the impacts of invasive exotic plants and exotic nuisance animals.

The problem of invasive exotic pest plants and invasive, exotic and nuisance animals is not well understood by the public in general. The unprecedented growth and development rates within the greater Charlotte Harbor area are expected to continue. While many new residents have been coming to Florida for years as seasonal residents and may be familiar with state, regional and local environmental issues and problems, many more lack an understanding of Florida ecology and resource management. Effective exotic control, exotic removal and eradication programs require that our Charlotte Harbor communities understand the severity of the problems resulting from invasive, exotic plants and animals, share a vision of healthy environmental future and join together in providing public support for that vision.



Qefp mofl ofqv ^`qflk ebimp cri ª ii FW-3 and SG-1.

1) Offer programs to the general public that match the community with the exotic problems, including “hands-on” control measures and directives with respect to follow-up maintenance and prevention.
2) Develop up-to-date materials concerning the problems and resource management of invasive exotic plants and animals.

Public knowledge of regarding the impacts of invasive exotic plants and exotic nuisance animals is part of an overall approach to reduce the impacts of exotic plants and animals. Effects may be seen under Priority Action FW-L.

FW-O

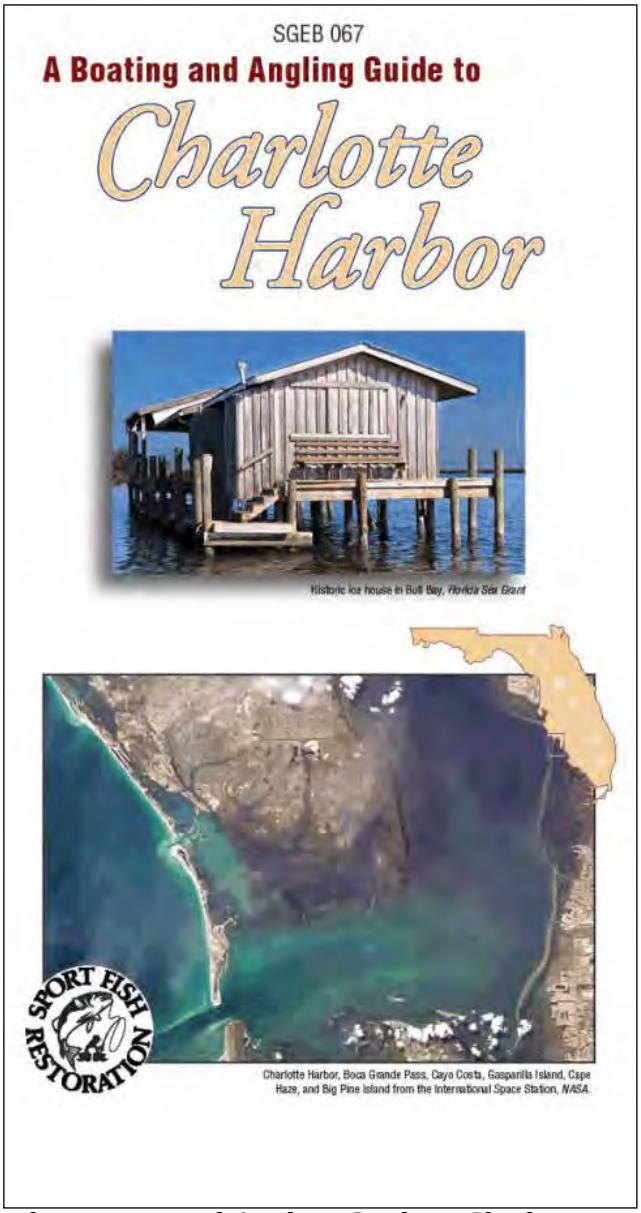
Provide multifaceted environmentally responsible boater education programs.

Boating activity frequently has negative consequences on the environment. Prop scar severity and extent, water quality degradation and marine mammal injuries have increased in the CHNEP study area during the last decade. Because of the nature of our estuaries, most of the estuarine extent is shallow. Shallow-water boating requires special knowledge. There are many organizations that help educate the increasing number of boaters on these special concerns.

Qefp moflofqv ^`qflk ebimp criªii FW-1 and SG-1.

1) Develop 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) Produce and distribute materials on environmentally responsible boating practices, including the continuing development of boater guides. Possible means of providing watercraft users with this information can include Coast Guard auxiliaries, marine dealers, watercraft rental businesses, marinas, tackle shops, sporting goods stores; local civic and business groups, local p`ellip ^ka _l^qfkd ^ka ªpefkd ^ppl`f^qflkp ^p well as in boat registration packages.
3) Consider extending enforcement of marine sanctuaries to aquatic preserves, or at least around all existing state parks, taking into account the cost of maintenance and upkeep for regulatory markers, which must be within 500 feet of one another.
4) Involve boater groups, including guide associations, marine trade associations and West Coast Inland Navigation District, to help generate solutions to seagrass scarring and other environmental problems.
5) Work with boat motor dealers to recommend lower horsepower and to provide information that jet boats can cause “blowouts.”
6) Evaluate areas that could use additional navigational signage, such as Matlacha Pass.

Responsible boater education programs are part of an overall approach to improve benthic resources. Effects may be seen under Priority Actions FW-A and FW-B.



The Boating and Angling Guide to Charlotte Harbor

FW-P

Support public involvement programs in habitat and wildlife issues.

Habitat protection is the cornerstone of water quality and quantity restoration. People are most passionate about habitat protection and wildlife issues in and around their own neighborhoods. This can be used as a springboard into broader estuarine and watershed protection activities. Without public involvement, plirqflkp ql qeb molqb`qflk lc ªpe ^ka t fiaifcb e^_fq^q cannot be successful.

Qefp mofl ofqv ^`qflk ebimp criªii CT*.) CT*/ ^ka SG-1.

1) Promote programs and opportunities for citizens ql m^oqf`fm^qb t fqe klkmolªq `lkpbos^qflk organizations, environmental agencies and policy-making bodies.
2) Promote and support programs and opportunities for citizens to be involved with habitat and wildlife issues.
3) Promote and support demonstration areas that instruct people on habitat and wildlife issues.
4) Provide habitat and wildlife information through local media and other outlets.

Public knowledge of habitat and wildlife issues is part of an overall approach to improve conservation of ªpe ^ka t fiaifcb e^_fq^q+ Bccb`qp j ^v _b pbbk rkabo Priority Actions FW-A through FW-H.

Photo by Catherine Corbett, 5/12/03

Stewardship Gaps

By 2025, a minimum of 75 percent of all residents will have recalled attending a watershed event, reading watershed material or hearing watershed/estuary information on radio or TV. A minimum of 50 percent of all residents in the CHNEP study area can recognize estuaries and watersheds. A minimum of 10 percent of all residents will be able to claim personal actions that protect the estuaries and watersheds.

By 2020, the CHNEP will expand its role as a ob`ldkfwba obplro`b ql bib`qba lcª`f^ip lo qebfo ^dbkqp from local, state and federal government for policy advice.

Through 2020, the CHNEP long-term monitoring strategy and data management strategy will continue and be enhanced. The resulting Internet-based Water Atlas will be maintained systematically.

Qeolrde /-/-) hbv dbldo^mef` ^ka p`fbkqfª` information will be presented in ways that are meaningful to the majority of people.

Gauge public involvement.

Provide people with opportunities to be involved in research, monitoring and restoration activities.

Identify underrepresented populations and develop methods to include them in estuary and watershed protection.

Produce watershed and estuary communication tools.

Offer grants to broaden participation of individuals and groups in implementing the CCMP.

Provide events that involve people in the stewardship of their local natural resources and opportunities to connect them to their watershed.

Implement target audience programs.

Incorporate estuary and watershed protection in educational curricula.

Conduct new resident programs to inform and encourage environmental stewardship.

Identify and showcase accomplishments and bu`biibkq bu^ j mibp lc obpb^o`e ªkafkdp) obpqlo^qflk) legislative changes and outreach successes using a variety of methods.

Mobpbkq p`fbkqfª` fkclo j ^qflk fk ^ clo j ob^afiv understood by the majority of people.

Implement

Vigorously pursue the

and funding mechanisms to implement watershed and estuary protection.

Update comprehensive inventories of research, restoration, legislative and outreach needs.

Create incentives to protect desired ecosystem resources.

Incorporate into federal, state and local permits, and public works improved standard practices that better protect estuaries and watersheds.

: Build capacity for communities and their local leadership to mitigate and adapt to the effects of climate change through joint efforts.

: Track and present monitoring data according to CHNEP-adopted environmental indicator targets.

Post raw data, geographic information system (GIS) and technical analysis on the Internet under the data management strategy.

Implement conservation landscaping plant programs, including the Florida Yards & Neighborhoods program, throughout the CHNEP study area.

Increase the use of personal and home best management practices by residents and visitors throughout the watershed to reduce nonpoint-source pollution.

Support public involvement programs addressing water quality issues.

Support public involvement programs addressing watershed management issues of hydrology, water resources, water conservation and water use.

Bring environmentally sensitive land under protection through ownership and/or management and expand conservation areas, reserves and preserves, including undeveloped platted lots.

Advocate land acquisition and conservation easement programs.

Provide information on the economic, social ^ka bksfolk j bkq^i _bkbªqp lc molqb`qba i^ka ^ka environmental restoration, including ecosystem services.

Acquire as much of Babcock Ranch as possible for public stewardship and promote conservation management of the entire ranch.

Provide education programs on the impacts of invasive exotic plants and exotic nuisance animals.

Provide multifaceted environmentally responsible boater education programs.

Support public involvement programs in habitat and wildlife issues.

SG-A

Gauge public involvement.

Mr_if` lrqob^`e bccb`qfsbkbpp fp afcª`riq ql ^p`boq^fk without the use of surveys and other methods. The CHNEP is a science-based organization and similar standards should be used with social research. It is in the best interest of the program to measure the present conditions regarding the level of public awareness, understanding, attitude and actions toward environmental conditions in the CHNEP study area.

The CHNEP and its partners have been successful in establishing monitoring, restoration, research and outreach programs in the CHNEP study area. However, social indicators that link the sound science performed by these programs and the effect on the population, or vice versa, have not been routinely evaluated. These environmental-social indicators should be conducted regularly to determine the effectiveness of the activities conducted or sponsored by the program.

We are committed to establishing a base line and to tracking changes in citizen awareness, knowledge, behaviors and advocacy through time. We are committed to measuring the effectiveness of our priority actions related to education and outreach. An active outreach program must have measurable results. A study/survey tool will identify educational gaps bk`lrkqboba qeolrde ^p`fbkqfª` bs^ir^qflk lc lro community. The study will provide a framework to guide our efforts in closing gaps in stewardship.

So how do we achieve our vision of stewardship together? First, we use survey tools to establish an environmental awareness base line. The base line tells us where we are. We already have a vision of where we want to be. Then we devise a plan to get there—a plan that closes the gap between where we are and where we want to go. How will we know when we have succeeded as good stewards of our watershed? Pbq rm nr^kqfª^_ib ^ka ^`efbs^_ib l_gb`qfsbp qe^q tb can measure over time.

Qefp moflofqv ^`qflk ebimp criªii SG-1.

1) Establish base line information on familiarity and actions regarding estuaries and watersheds by conducting random sample surveys. Determine the awareness of the program, understand the differences between an estuary and watershed and identify behavior programs associated with protecting our estuaries and watersheds.
2) Verify results using a variety of methods, such as interviews and focus groups.
3) Analyze the results of the surveys and compare with other partners' surveys.
4) Continue to assess delivered CHNEP programs for future improvements.
5) Develop mechanisms to assess changes in awareness, understanding and behavior.

75 percent of all residents recall watershed or estuary information. 50 percent of all residents recognize estuaries and watersheds. 10 percent of all residents will be able to claim personal actions that protect the estuaries and watersheds.

SG-B

Provide people with opportunities to be involved in research, monitoring and restoration activities.

Qeb @EKBM e^p fabkqfªba ^ kbba clo ^k fk`ob^pb fk public awareness and public responsibility of natural resources. Participation in research, monitoring and restoration activities provides opportunities for hands-on stewardship, educational outreach and promotion of the CHNEP and its partners' continued efforts in the community. Examples of public volunteer opportunities include citizen removal of invasive exotic plants, conservation landscaping demonstration garden planting, oyster reef building, water quality monitoring and amphibian monitoring.

Qefp moflofqv ^`qflk ebimp criªii SG-1.

1) Encourage use of volunteers in research, monitoring and restoration such as invasive exotic removal, marsh plantings, upland plantings and maintenance and volunteer water quality monitoring.
2) Network and build partnerships with schools and environmental and volunteer organizations to create, coordinate and promote opportunities.
3) Promote general public events such as coastal cleanups and estuary cleanups.
4) Offer grants and letters of support for citizen-driven research, monitoring and restoration activities.

Five citizen restoration activities per year. Two major citizen monitoring networks per year.

Photo by Charlotte Harbor Aquatic Preserves

SG-C

Identify underrepresented populations and develop methods to include them in estuary and watershed protection.

Underrepresented segments of the population are afc`riq ql ^``bpp+ J ^kv lc qebpb pbd j bkqp ^ob constrained by low income, language barriers and cultural differences. Major health problems from industrial pollution and disproportionate hardship from infrastructure development among these groups resulted in environmental justice concerns. Everyone pelria ob`bfsb qebfo pe^ob lc _bkb`qp col j qeb National Estuary Program and partner programs.

Qefp mofl ofqv ^`qflk ebimp cri`ii SG-1.

1) Identify segments of the population that are not `roobkqiv _bkb`qfkd col j qeb @EKBM.
2) Maximize reach to underrepresented groups by using existing networks such as rural and minority area parks, churches, community centers and recreational clubs.
3) Develop multilanguage materials and programs.
4) Support community environmental projects.
5) Actively work to involve leaders of underrepresented populations with the CHNEP.

Three projects targeted at underrepresented populations per year.

Photo by Dennis Guenther, 5/6/02

SG-D

Produce watershed and estuary communication tools.

Communication tools, such as websites and magazines, can be effective in increasing knowledge and awareness of CHNEP issues throughout the CHNEP study area. In addition, these tools can be used to further the average person's understanding of terms such as and and the effect human activities have on them. They can also be used to provide p`fbkqf$^{a}$` fkclo j ^qfl k on water quality degradation, hydrologic alterations, habitat loss and stewardship gaps, which are often not meaningful to the average person.

This priority action ebimp cri^{a}ii SG-1 and SG-4.

1) Maintain a user-friendly website, with links to partners' websites, that is meaningful and relevant to the average person.
2) Publish magazine and increase its accessibility.
3) Measure the success of the communication tools used, including the website and magazine, through surveys.

Quarterly publication of magazine, supplemented by annual calendar.

Complete website update by 2013.

www.CHNEP.org
Harbor Happenings

SG-E

Offer grants to broaden participation of individuals and groups in implementing the CCMP.

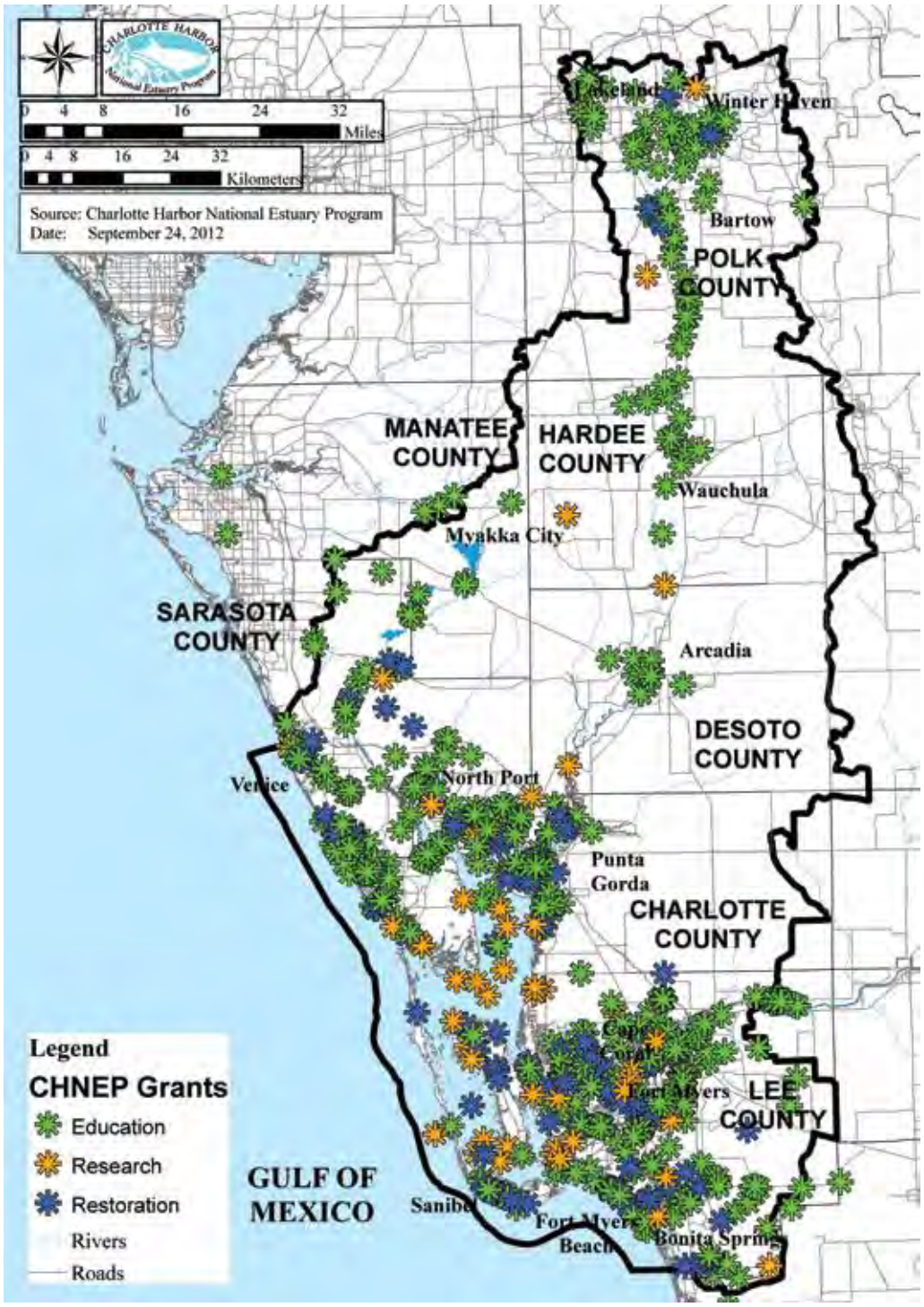
There are many talented and imaginative individuals and groups who are capable of developing projects that implement the CCMP. Additional funding may make the difference whether these groups are able to make their ideas reality. Grants also help increase understanding of the CCMP.

Qefp mofl ofqv ^`qflk ebimp cri ii SG-1.

1) Develop grant programs through the CHNEP budgeting process.
2) Increase awareness of available grants offered by the CHNEP and partners to those who could help implement the CCMP.
3) Provide assistance to those who request grant-writing guidance and letters of support.

Grants that implement the plan completed annually.

Implement 50 grants annually.



Map 36: Grant Awards

Distribution of CHNEP grants geared to public information and education, research and restoration from 1996–2012.

SG-F

Provide events that involve people in the stewardship of their local natural resources and opportunities to connect them to their watershed.

Events provide specialized family-friendly, fun and hands-on learning experiences. They connect the public to a concentration of resources and groups. A well-publicized event is effective at providing information and at showcasing partners' programs. Conferences help communities solve local problems ^ka p`fbkqfpqp `l j j rkf`^qb qebfo ob`bkq ªkafkdp+ Professional development workshops sponsored by the CHNEP help its partners in their efforts ql molqb`q qeb k^qro^i bksfolk j bkq ^ka criªii qeb program management plan. Opportunities for people to experience the natural environment are critical to connect them to their watershed and highlight the importance of these resources.

Qefp moflofqv ^`qflk ebimp criªii SG-1.

1) Partner with select festivals and events.
2) Participate in continuing education outlets such as the Charlotte County Cultural Center.
3) Host professional development and public workshops, seminars, summits and conferences.
4) Financially support hands-on education.
5) Offer multiple opportunities throughout the year to celebrate National Estuaries Days and other designated days.
6) Determine effectiveness of events using tools such as exit surveys, interviews and other means.
7) Offer multiple and varied opportunities for people to experience the study area's ecosystems.

Number of events hosted by CHNEP and its partners annually.

Complete 30 events annually.

Photo by Lisa Beever,

SG-G

Implement target audience programs.

Not everyone can be reached using a one-message-ªqp*^ii ^mmol^`e) obnrfofkd pmb`fª` bcc1oqp ql ob^`e targeted audiences with a message delivered in a way that is appropriate for that audience. The CHNEP Education Strategy, developed in 1999, listed the following as targets for individualized treatment:

- Business and Industry: Mining, Agriculture, Developers and Real Estate Professionals, Hotel and Tourism, Marine Trades/Fisheries, Recreation and Transportation
- Govbok j bkq >dbk`fbp ^ka Bib`qba Lcª`f^ip
- Education
- Clubs, Organizations and Associations
- Media

In 2011, the CHNEP adopted a Strategic Communication Plan.

1) Survey Management Conference on strategic target audiences.
2) Determine strategic target audiences that will provide the greatest value in implementing our CCMP.
3) Identify leaders within or affecting the strategic target audiences.
4) Abªkb qeb mromlpb lc ob^`efkd qe^q q^odbq audience, such as change behavior, increase understanding or provide information to others.
5) Develop, implement and evaluate plans to reach strategic target audiences.
6) Develop mechanisms to reach strategic target audiences in a cost-effective way.

Qefp moflofqv ^`qflk ebimp criªii SG-1.

Number of target audiences identified and addressed annually.

Reach at least five new audiences annually.

Photo by Maran Hilgendorf, 12/10/04

SG-H

Incorporate estuary and watershed protection in educational curricula.

The region is rich in programs that provide informal and formal education. Informal education is provided by many, including:

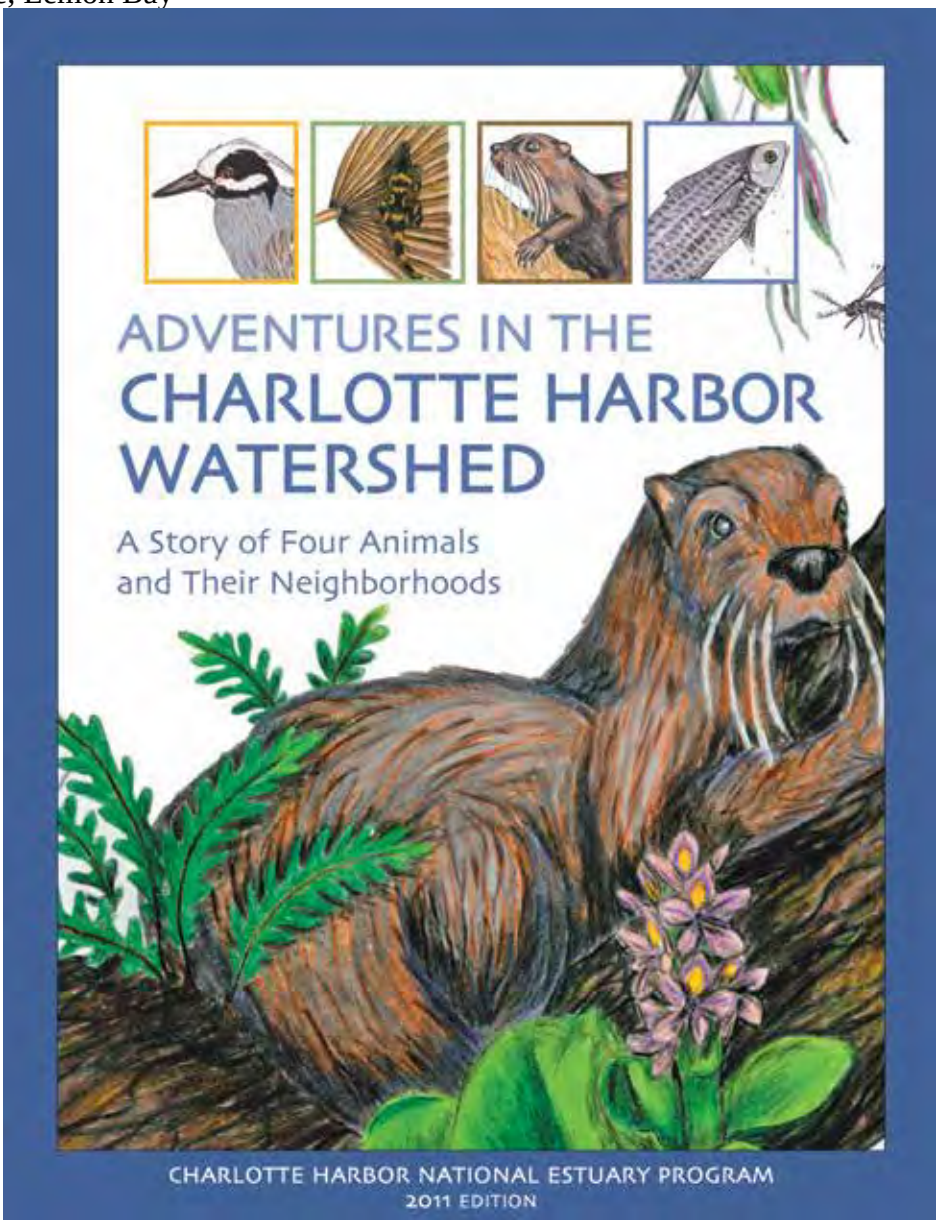
- Pfqb*_^pba klkmol^{a}q lodanizations found throughout the region, such as Explorations V.
- Citizens organizations, such as Estero Bay Buddies.
- Government agencies, including parks such as Paynes Creek State Historic Site, Lemon Bay Park and Cape Coral Rotary Park.

Formal education is just as diverse. For students in K–12, each county and a Virtual School have their own school district that implements academic plans based on Next Generation Sunshine State Standards and grade level expectations, with guidance provided by the Florida Department of Education. As of the 2004–5 school year, there were approximately 170,000 students in 170 K–12 public schools, and 31,000 students in 200 private schools in the CHNEP study area. Statewide, more than 50,000 students are homeschooled. State-assisted colleges based in the region include New College of Florida, Florida Gulf Coast University, Edison College, Manatee College, Polk State College and South Florida State College. Many private colleges are also based in the region.
Qefp mofl ofqv ^`qflk ebimp cri^{a}ii SG-1.

1) Inventory and evaluate estuary and watershed protection educational curricula offered.
2) Identify problems in existing curricula and recommend improsb j bkqp) fk`irafkd ^{a}iifkd gaps.
3) Enhance programs by supplying materials (posters, videos, curricula) and offering grants.
4) Promote educational programs to increase participation.

Number of curricula where estuary and watershed topics are included.

Complete two new curricula enhancements annually.



Adventures in the Charlotte Harbor Watershed: A Story of Four Animals and Their Neighborhoods

SG-I

Conduct new resident programs to inform and encourage environmental stewardship.

As the population of the CHNEP study area continues to grow, it is increasingly important to educate residents about the fragility of their new natural environment and promote a sense of stewardship. By focusing on new residents, materials presented will be meaningful to all residents.

New resident packages have been developed by those partners that include printed material available from those concerned with the health of the natural environment. The CHNEP provided support of these packets and developed a new resident guide that summarizes information in many publications by numerous sources.

Qefp mofloqv ^`qflk ebimp criªii SG-1.

Photo by Maran Hilgendorf, 4/26/04

1) Review existing new resident packets and citizens guides for continued relevance.
2) Make new resident materials and programs available in a variety of ways. Distribution locations may include utilities, libraries, parks, chambers of commerce, county extension, government ^a j fkfpqo^qfsb lcª`bp) `^o ^ka boat registration departments and local civic and business organizations.
3) Increase public awareness regarding environmental laws, violations and impacts to resources.

Number of new resident programs offered annually.

Complete new resident programs in each county annually.

SG-J

Identify and showcase accomplishments and excellent examples of obpb^o`e ªkafkdp) obpqlo^qflk) ibdfpi^qfsb `e^kdbp ^ka lrqob^`e pr``bppbp using a variety of methods.

The vision of the CCMP is rooted in sound science and measured results. Implementation of the CCMP is only successful if results are clearly `l j j rkf`^qba ^ka mrq ql rpb _v mr_if` lcª`f^ip) bar`^qlop ^ka mofs^qb `fqfwbkp+ P`fbkqfª` ªkafkdp ib^a to sound decision making by legislators and other mr_if` lcª`f^ip+ Pe^ofkd bccb`qfsb mr_if` lrqob^`e methods increases environmental knowledge and awareness exponentially across partner networks. Showcasing the CHNEP project results is essential for continued legislative and public support of the CHNEP and highlights excellent examples for partner consideration.

Qefp moflofqv ^`qflk ebimp criªii SG-1 and SG-2.

1) Network with other National Estuary Programs and partners for effective ways to represent accomplishments.
2) Abpfdk `roobkq ^ka «rfa ¦^``l j mifpe j bkq brochures" or "talking points" for legislators and bib`qba lcª`f^ip+
3) Interview legislative staffers for the most effective way to communicate with them.
4) Produce videos, posters, publications, displays and other appropriate tools.
5) Showcase research, restoration and outreach results to the media with press releases and special publications.
6) Maintain databases of successes.

Number of accomplishments showcased.

Showcase eight examples annually.

Photo by Maran Hilgendorf, 6/10/04

SG-K

Mobpbkq p`fbkqf$^{a}$` fkclo j ^qflk fk ^ clo j ob^afiv rkabopqlla _v qeb majority of people.

P`fbkqf$^{a}$` fkclo j ^qflk fp lcqbk e^oa ql ^``bpp ^ka afc^{a}`riq ql rkabopq^ka+ Fq fp f j mbo^qfsb qe^q p`fbkqf^{a}` information be presented in ways meaningful to the majority of people, including decision-makers.

Qefp mofl ofqv ^`qflk ebimp cri^{a}ii SG-4.

1) Continue using CAC members to review scopes of t loh ^ka ^{a}kafkdp lc obpb^o`e molgb`qp ql bkprob clarity and applicability to the majority of people.
2) Assist scientists on methods to present their ^{a}kafkdp fk ^ j b^kfkdcri t ^v ql qeb mr_if`) pr`e ^p providing published guides and hosting workshops and presentations.
3) Use a variety of communication tools such as conceptual diagrams and models.
4) Through surveys, measure the success of this effort ql molsfab j b^kfkdcri p`fbkqf$^{a}$` fkclo j ^qflk ql qeb public.

The majority of people who receive CHNEP information understand scientific information presented by the CHNEP.

Additional communication tools are developed as needed so all CHNEP scientific information is understood.

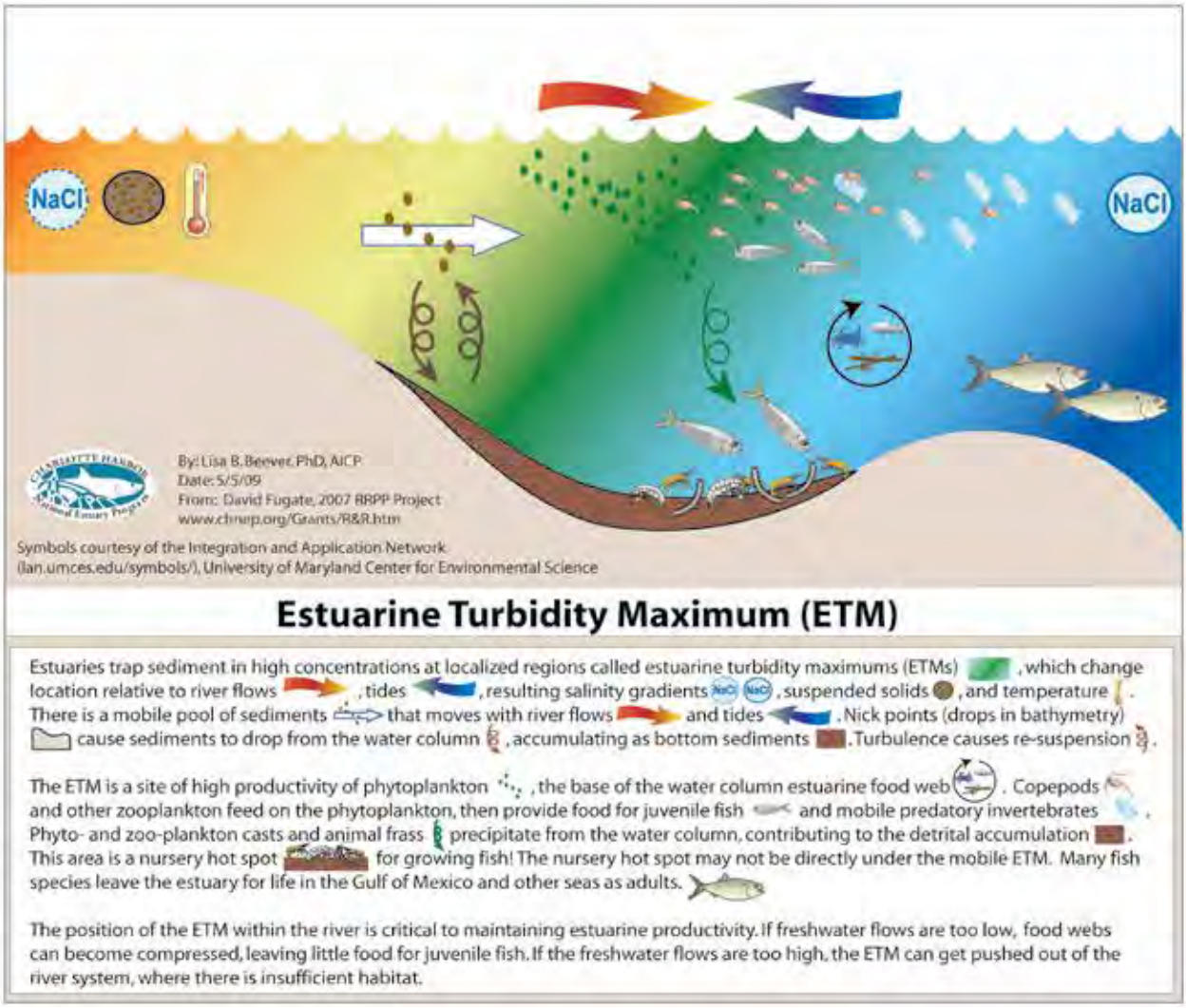


Figure 12: Estuarine Turbidity Maximum (ETM)

The conceptual diagram was prepared to describe the Estuarine Turbidity Maximum (ETM) to augment presentation of research conducted under CHNEP's Research and Restoration Partners Program.

SG-L Implement the

On December 7, 2001, the CHNEP Policy Committee unanimously adopted the motion to "become a spokesman for the Harbor and the water bodies in the natural system in the forums where decisions are being made and implementations are being undertaken." Although special reference was made to j fkf j r j «l t p ^ka ibsbip % J C I p&) q l q^i j ^uf j r j daily loads (TMDLs) and the Comprehensive Everglades Restoration Plan (CERP) and its implications for the Caloosahatchee River, the overall goal was for "the CHNEP to assume the lead role in being the advocate for the Charlotte Harbor Ecosystem Complex and its watersheds." The position further suggested that the Florida Department of Environmental Protection, the South Florida Water Management District and the Southwest Florida Water Management District "look to the CHNEP for guidance in setting goals for the CHNEP study area for their various programs currently under way." With this guidance, the CHNEP adopted its on February 21, 2003. The aims of the CHNEP advocacy stance are:

- To implement the quantitative objectives and priority actions of the adopted (CCMP).
- To provide policymakers with a source of review and comment from an organization that represents the considered opinions of diverse interests.
- To provide a voice for natural systems within the CHNEP study area watersheds based on qeb _bpq p`fbkqfª` fkclo j ^qflk ^s^fi^_ib+
- To facilitate citizen entry into the CHNEP Management Conference process.

It is important that the CHNEP be recognized as ^obplro`b ql bib`qba lcª`f^ip+ Tfqelrq fkpfdeqcri ordinances and sound legislation, no environmental initiative can succeed. A key component of effective communication must be advocacy. We must bring issues of relevance backed by sound science to the political fore. With informed leadership, our communities can be clean, safe and compatible for humans and the wildlife that make Florida the home sought by so many.

We are succeeding in closing stewardship gaps if we are building strong citizen advocates. We are pr``bbafkd fc lro bib`qba lcª`f^ip illh ql qeb @EKBM as a resource.

Qefp moflofqv ^`qflk ebimp criªii SG-2.

1) Utilize all CHNEP committees and subcommittees as a vehicle to identify issues requiring the attention of the Management Conference.
2) Provide opportunities to reveal all aspects of an issue in the context of the best available science.
3) Craft correspondence and presentations pursuant to the procedures.
4) Amend the procedures as needed to serve the Management Conference.
5) Review pending 404 permit applications, policies and rule making regarding development of headwater tributaries.
6) Recognize water reservations as a tool to protect ªpe ^ka t fiaifcbß mol j lqb qefp qlliql ab`fpflk* makers, their staff and public.
7) Advocate the continued ability to set water reservations under state statutes.
8) Establish water reservations for the Caloosahatchee estuary and Estero Bay. Include the Caloosahatchee estuary and Estero Bay as a legal source user for environmental purposes.

Changes in public policy based on communications from the CHNEP.

Eighty percent success rate, annually.

SG-M

Vigorously pursue the and funding mechanisms to implement watershed and estuary protection.

Pfu qeb j bp t bob fabkqfᵃba fk qeb /--- @@ J M ql direct funding toward its implementation:

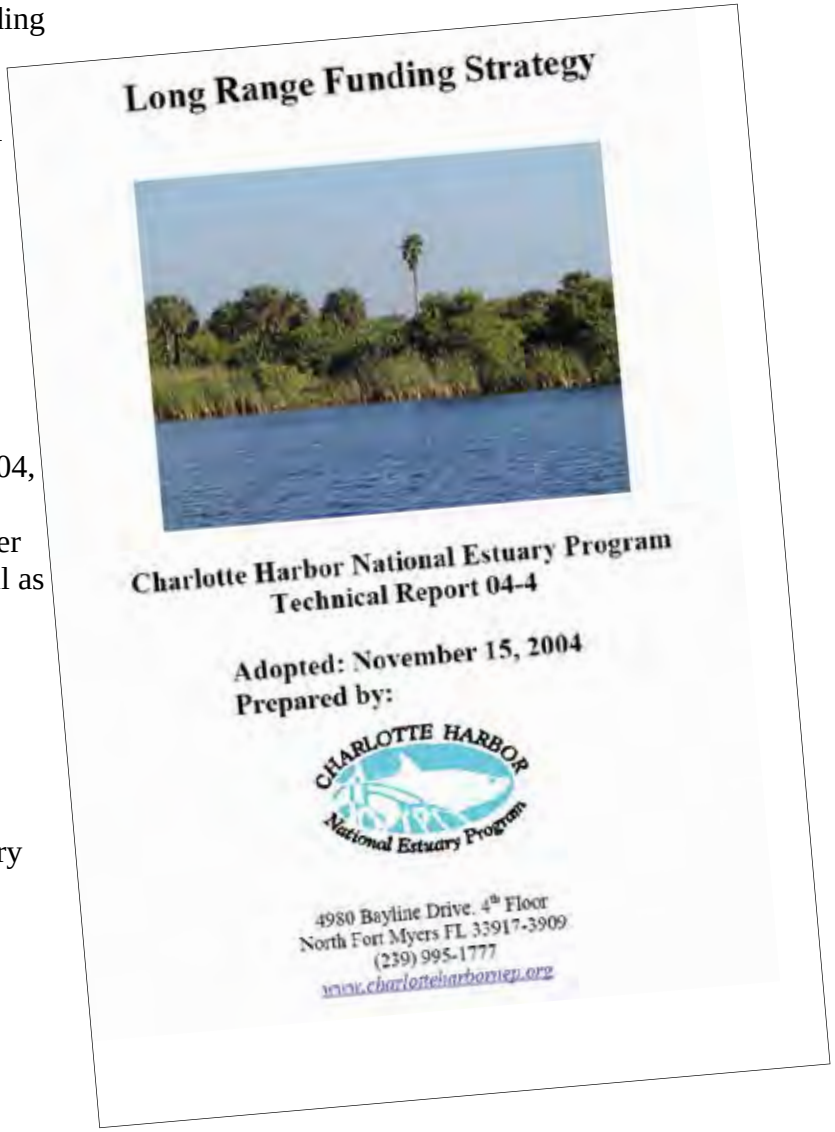
- Maintain existing levels of expenditures for programs making cost-effective contributions to restoration goals.
- Evaluate programs that fall short of these aims and investigate opportunities to redirect resources to accomplish more with public dollars.
- Aggressively pursue state and federal funding assistance for watershed management.
- Promote public-private partnerships with the potential for real economic and natural obplro`b _bkbᵃqp+
- Support local option taxes, when deemed essential for the implementation of action plans.
- Pursue new funding sources beyond those described above only if strategies fail to achieve adequate progress toward management and implementation.

The , adopted in 2004, lrqifkbp qeb pq^qrp lc qeb pfu qeb j bp ^ka fabkqfᵃbp core services provided through the CHNEP, partner commitments, funding and resource needs, as well as funding strategies.

Qefp mofl ofqv ^`qflk ebimp criᵃii SG-2.

1) Implement the .
2) Enter into an agreement with CHNEP signatory partners that outlines general implementation commitments, funding goals and funding commitments. Consider equitable allocations among partners.
3) Identify top-priority needs to pursue for each CHNEP study area watershed.
4) Investigate new funding sources to fund environmental projects.
5) Facilitate discussions of funding mechanisms to implement CCMP actions.
6) Advocate the creation of competitive grant programs for CCMP action.

Continued annual funding of the CHNEP, sufficient to make progress toward implementing the CCMP.



Long Range Funding Strategy

SG-N

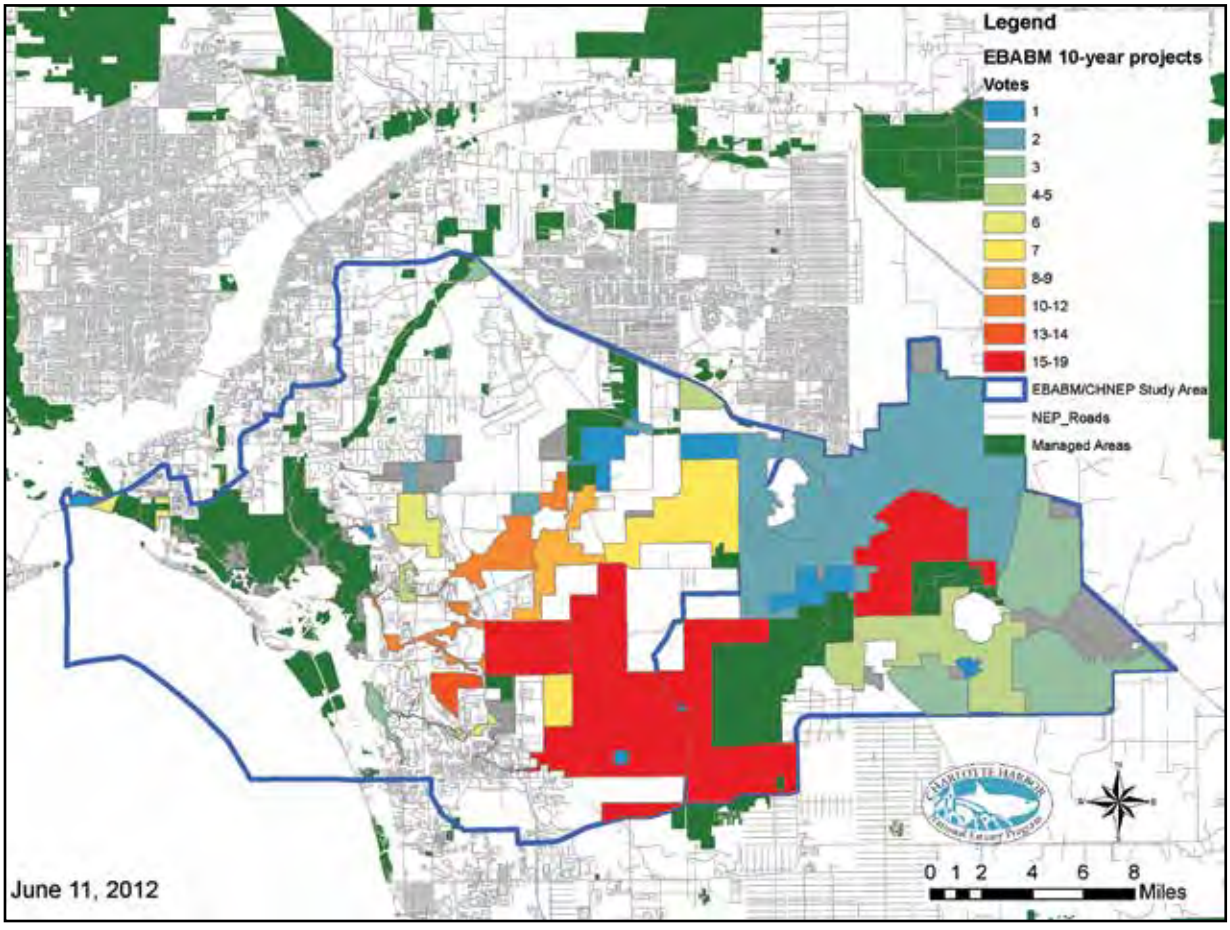
Update comprehensive inventories of research, restoration, legislative and outreach needs.

In order to implement the adopted in 2000, the CHNEP developed a database to track research, restoration, legislative and outreach needs and implemented projects. By highlighting and prioritizing these needs, Management Conference-wide attention resulted in cost-effective implementation of many of the most critical watershed and estuary needs. This mechanism has become a core implementation action ql ^`efbsb ^ii nr^kqfª^_ib l_gb`qfsbp+

Qefp moflofqv ^`qflk ebimp criªii SG-2.

1) Participate in the development of watershed plan development such as the Southwest Florida Regional Restoration Plan, Estero Bay 10-year Restoration Plan and the Peace Creek Basin Area Management Plan. These efforts will serve to use local stakeholders to identify and prioritize restoration needs.
2) Publish restoration needs and other geographic information to the Internet.
3) Publish database information to the Internet.
4) Publish needs in the form of technical reports for the purposes of disseminating the information.

Update of restoration and research needs inventories by 2018.



Map 37: Estero Bay Watershed Restoration Projects

CHNEP assisted the Estero Bay Agency on Bay Management to update and prioritize projects within its 10-year restoration plan. The highest priority projects are in red.

SG-O

Create incentives to protect desired ecosystem resources.

It has been argued that the traditional regulatory approaches have failed to protect desired ecosystem resources. In response, there has been a call for the use of incentives to complement this regulatory approach. Conservation policy for private lands could be improved by relying on a combination of incentives, fk`irafkd ªk^k`f^i fk`bkqfsbp ^ka ^ppro^k`bp) o^qebo than exclusively on regulation. Trade-offs may include incentives for increased densities and the addition of other uses that may require zoning changes to protect ecosystems of higher value.

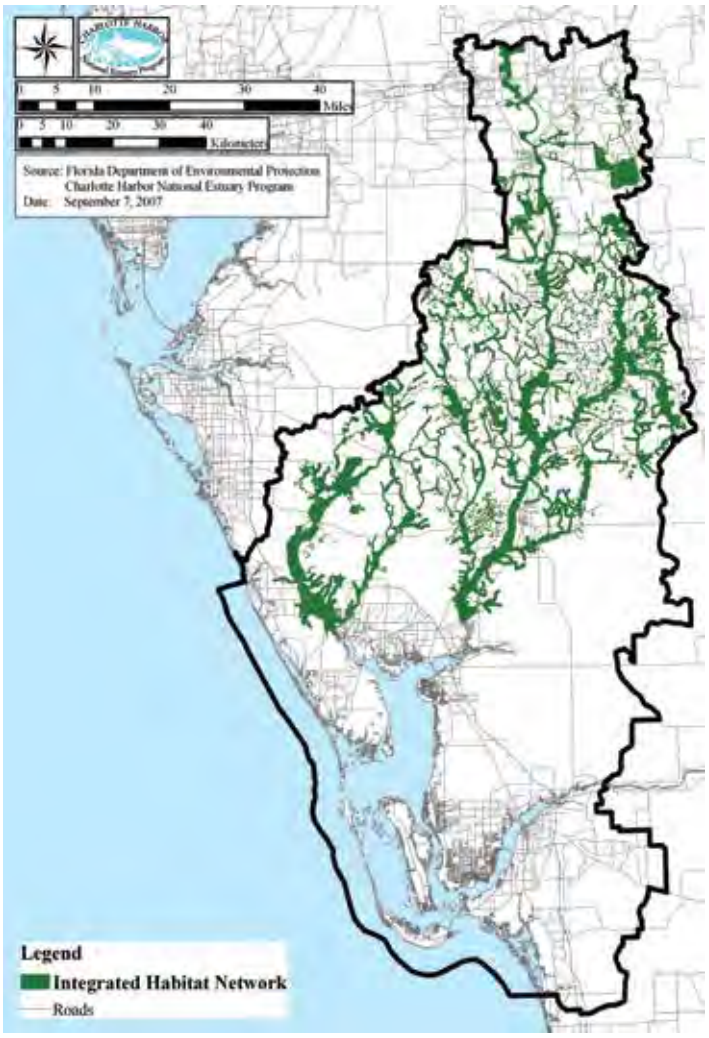
Qefp moflofqv ^`qflk ebimp criªii SG-2.

1) Prepare a business-oriented presentation and pamphlet to offer to chambers of commerce that catalog ways in which protection of natural resources can make them money. Use and the journal as resources.
2) Inventory alternative incentives that have been used by governments to protect desired ecosystem resources and post at .
3) Provide incentives to direct development away col j qeb .--*vb^o «llami^fk) obsfbt Cilofa^$p Uniform Mitigation Assessment Methodology (wetlands) to determine whether preservation lc qeb «llami^fk tlria pbosb ^p ^mmolmof^qb mitigation offset for development activities, ^p fabkqfªba fk qeb .
4) Identify situations where sensitive habitats are not protected by the existing zoning and subdivision laws and consider implementing incentives for activities that protect these areas. For example, maintenance of allowable density on a parcel where a developer agrees to preserve a vegetated shoreline buffer that exceeds the legal requirement. The process may begin by reviewing the criteria and checklist accounting system developed by the American Planning Association.

List incentives that have been implemented annually.

.

Data Source: 1992



Map 38: Integrated Habitat Network

The Florida Department of Environmental Protection's features an Integrated Habitat Net- tloh %FEK&+ Qeb Mb^`b Ofsbo .--*vb^o «llami^fk fp ^ part of the IHN.

SG-P

Incorporate into federal, state and local permits, and public works improved standard practices that better protect estuaries and watersheds.

State and local permitting activities, such as the Environmental Resource Permitting Program and the federal Section 404 of the Clean Water Act, require mbo j fqp clo pmb`fª` ^`qfsfqfbp l``roofkd fk t bqi^kap and other waters. In many areas there are also local permitting requirements for development and other activities. There are many standard practices that are incorporated into land development and infrastructure designs that have negative effects on the estuaries and their watersheds. A review of these practices is needed and could improve the effects of these activities.

Qefp moflofqv ^`qflk ebimp criªii SG-2.

1) Identify types of activities and regional trends with permitted actions.
2) Determine effectiveness of permitting process (e.g., how well are the actions following 404(b)(1) guidelines of avoidance, minimization, etc.).
3) Determine areas for improvement based on current ibdfpi^qflk ^ka pfqb*pmb`fª` il`^qflkp,kbbap+
4) Evaluate environmental resource permitting to determine whether enhanced permitting criteria, special watershed (basin) rules or other regulatory strategies should be implemented to minimize `r j ri^qfsb f j m^`qp j lob bccb`qfsbiv) ^p fabkqfªba in the .
5) Evaluate combining Environmental Resource Permit and Conceptual Reclamation Plan approval into single phosphate mining authorization, as fabkqfªba qeolrde qeb .
6) Identify local and regional activities (i.e., ordinances, best management practices, etc.) that could support federal and state programs.
7) Fabkqfcv pmb`fª` mo^`qf`bp clo b^`e dbkbo^i qvmb lc permit activity that could protect the estuaries and watershed.
8) Develop standard practices that could be incorporated into land development and infrastructure design, leading to better local environmental results.
9) Pursuant to EPA's

- Encourage development in strategic areas to ensure that preservation areas and development areas sustain the estuary. Redevelopment is a priority over development in new areas. Tie analyses to cumulative and secondary assessments.
- Modify regulations from process-driven to outcome-driven, link water (including water for the environment) to growth and tie performance approvals to needs at build-out.
- Regarding site planning, emphasize water storage over water discharge, green infrastructure over constructs, off-site mitigation for redevelopment and on-site mitigation for new development, and encourage mitigation projects to also be remediation projects.
- Maximize the use of existing impervious surface and encourage 15 percent or less impervious surface for new development.
- Encourage adoption of local ordinances for stormwater management and quality, water conservation, conservation landscaping and waterway protection.
- Coordinate funding strategies among state, regional and local levels to promote concentrated urban areas, recognize full environmental mitigation as a public works cost, and update funding sources as the need for complexity of infrastructure increases.
- Incorporate watershed and green models into molcbppflk^i `boqfª`^qflk ^ka molvide examples/ j labip lc dlla absbilm j bkq) `labp) ªk^k`fkd strategies, etc.

Adoption of new standards in permits and standard practices.

One adopted improvement annually.

SG-Q

Build capacity for communities and their local leadership to mitigate and adapt to the effects of climate change through joint efforts.

The climate is changing. It has been changing since the formation of the atmosphere and the presence of water as vapor, liquid and ice on the surface of the Earth. In the past 100 years, average air temperatures have increased, the number of days in the year over 90°F have increased, rainfall delivered in the rainy season has increased, rainfall delivered in the dry season has decreased and sea level has risen about 8 inches. Since 1965, sea level has risen at the Fort Myers gage by one inch per decade. In addition, salt marshes and seagrass beds have migrated landward by approximately 100 yards since 1950.

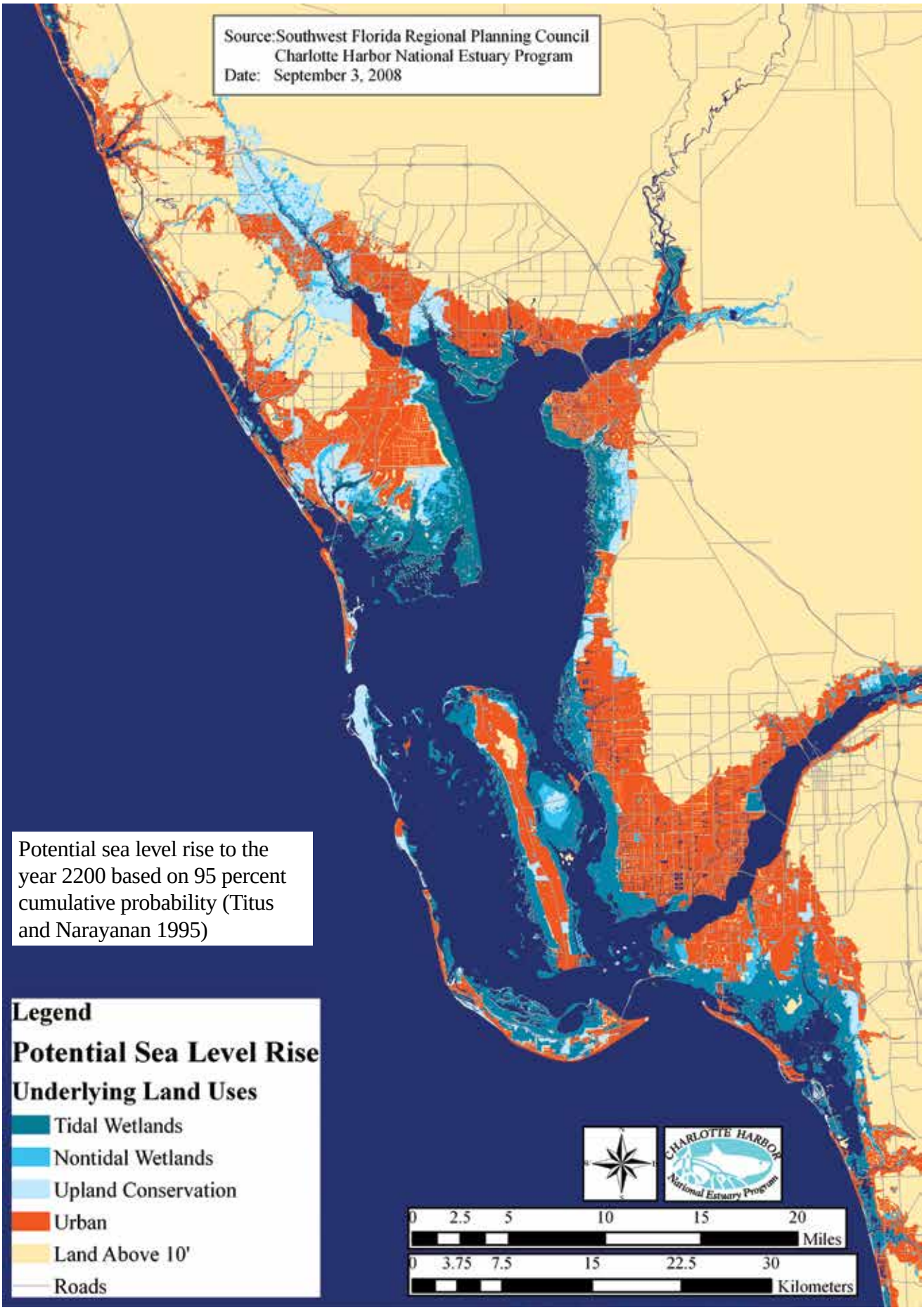
Charlotte Harbor was one of six original programs under EPA's Climate Ready Estuary (CRE) program. Working with its host agency, the Southwest Florida Regional Planning Council, the CHNEP has pioneered development of citywide climate change adaptation plans based on public participation and developed other climate change planning tools pursuant to the 2008 CCMP.

Qefp moflofqv ^`qflk ebimp criªii SG-2.

1) Continue providing assistance to communities to develop coastal ecosystem resiliency and adaptation plans.
2) Continue to assess ecosystem changes as a result of climate change and develop methods to assist natural systems respond to the changes.
3) Seek assistance from EPA$p Lcª`b lc >q j lpmebof` Programs (OAP), Climate Change Division (CCD), to assess vulnerabilities to climate changes and integrating information on climate science, impacts and adaptation. CCD is looking to support application of those tools, particularly in coastal communities.
4) Continue enhancements to the CHNEP Climate Ready Estuary program to educate, communicate and mitigate climate change and air pollution.
5) Work with partners to implement the following methods to improve coastal ecosystem resilience:
   a. Maintain the existing habitat migration corridors that have been established on Cape Haze, Eastern Charlotte Harbor shoreline, and Estero Bay Buffer.
   b. Identify the highest priority habitat migration corridors so they can protect these areas from future development, followed by acquisition of inland buffer zones to provide an opportunity for habitats and wildlife to migrate inland.
   c. Support restoration of existing coastal habitats by removal of exotic vegetation, removal of barriers to tidal connection and degradation of exotic dominated adjacent uplands .
   d. Discourage or stop shoreline hardening, including seawalls, bulkheads, riprap, and "living shorelines" backed by riprap.
   e. Reengineer existing vertical shoreline infrastructure to a sloped soil-based shoreline with GeoWeb or other permeable stabilization.
   f. Obpqlob f j m^foba t ^qbo «lws to enhance sediment supply for coastal wetland deposition.
   g. Elevate roadway berms by bridging and culverting or abandon coastal road corridors with associated beamed roadbeds.
   h. ?^`hªii j lpnrfql `lkqoli afq`ebp ql obar`b depth and sediment loss.
   i. ?^`hªii _lool t mfqp) ^dof`riqro^i mfqp ^ka spreader waterways to allow coastal wetland establishment and migration corridors.
   j. Sediment-slurry addition to assist in marsh building processes.
6) Follow the suggestions from including increasing conference calls, video conferencing and other remote participation methods when available.
7) Work with hotel industry to gain green lodging `boqfª`^qflk %) by the state of Florida.

: Mangrove, salt marsh and freshwater wetland acreage.

60,000 acres of mangrove, 12,000 acres of salt marsh and 325,000 acres of freshwater wetland.



Map 39: Potential Sea Level Rise and Underlying Land Uses

SG-R

Track and present monitoring data according to CHNEP-adopted environmental indicator targets

Subsequent to the 1993 U.S. Government Performance and Results Act (GPRA), government agencies are required to develop performance reports that measure management success using indicators and goals. According to U.S. Environmental Protection Agency 2000 Evaluation Guidelines for Ecological Indicators, 15 evaluation guidelines for developing environmental indicators include the following:

- Relevance to the assessment.
- Temporal variability across years.
- Discriminatory ability.
- Linkage to management action.

Examples of indicators of ecological condition include direct measurements (e.g., total nitrogen concentration), indices (e.g., macroinvertebrate `lkafqflk fkabu& ^ka j riqf j bqof`p %b+d+) ªpe assemblage).

The CHNEP developed a series of environmental indicators and targets that was approved by the Management Conference in 2005. Knowledge, monitoring and reporting gaps regarding the approved fkaf`^qlop t bob fabkqfªba ^ka t fii kbba ql _b addressed so that the CHNEP can track environmental changes and success and failures regarding management practices and land-use changes. These fkaf`^qlop ^ka q^obqp t fii ^ipl kbba obªkb j bkq ^p qeb pq^qb lc p`fbk`b ^as^k`bp ^ka hkl t ibadb d^mp ^ob ªiiba+

Qefp moflofqv ^`qflk ebimp criªii SG-3.

1) Update the
   by 2015.
2) Maintain and enhance the CHNEP Water Atlas at
   .
3) Work with both water management districts to conduct uniform biennial seagrass mapping.
4) Improve the Sarasota County predevelopment vegetation map to conform with improved methods applied in the Peace River basin and by CHNEP.
5) Develop improved mapping of mangrove systems by type, similar to salt marsh mapping conducted in 2012.
6) Update prop scar maps every 10 years.

Monitoring programs including water quality testing, flow gaging and mapping.

Maintain existing routine programs and enhance public accessibility of analysis.

Photo by Judy Ott, FDEP

SG-S

Post raw data, geographic information system (GIS) and technical analysis on the Internet under the data management strategy

A data management strategy is a required element of each National Estuary Program. The purpose of these activities is to provide technical information that is available, facilitate the exchange of information among different organizations and support efforts for qeb ^k^ivpfp lc p`fbkqfª` fkclo j ^qflk+ Qeb fkqbobpqba 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 ªiifkd fk a^q^ d^mp t fqelrq pfdkfª`^kqiv fk`ob^pfkd 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.

Qefp moflofqv ^`qflk ebimp criªii SG-3.

1) Maintain and enhance data, analysis, mapping and other information capabilities on the CHNEP Water Atlas.
2) Develop automated water quality status and trends analysis capabilities. Post a triennial assessment of water quality status and trends so that partners may have citation abilities.
3) Create pages for each volunteer monitoring program, similar to the Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN) and Cape Coral Canalwatch.
4) Post all CHNEP-created geographic information pvpqb j %DFP& ªibp lk qeb T^qbo >qi^p clo `fqfwbk mapping and technician download.
5) Work with partners to ensure that all suitable water quality data are posted to the state's water quality database, named STORET, in a timely fashion.

Data on the Water Atlas are as current as available.

Partners data uploaded to STORET at least annually. Additional volunteer data uploaded to the water atlas at least quarterly.

www.chnep.wateratlas.usf.edu.

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Glossary

–a group of small aquatic plants; occur as one-`biiba) ªi^ j bkqp lo `lilkf^iß e^sfkd kl qorb ollq) pqb j or leaf; the base of the aquatic food chain.

–a heavy growth of algae in a body of water; blooms commonly caused by high concentrations of nutrients in the water column.

–a condition of no oxygen in a water body or in soil.

–resulting from human activities.

–a water-storing underground geologic formation.

–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.

–the process of pumping sand onto eroded beaches; material for this process commonly taken from channels and offshore resources.

–an industrial process to transform phosphate pebble (rock) into commercially marketable phosphate; the process is an energy-intensive activity.

–referring to the bottom of a body of water.

–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.

)–the quantity of oxygen demand present in a sample as measured _v ^ pmb`fª` qbpqß ^ j ^glo l_gb`qfsb lc `lksbkqflk^i wastewater treatment is to reduce the BOD so the oxygen content of the water body will not be pfdkfª`^kqiv obar`baß ^iqelrde ?LA fp klq ^ pmb`fª` `l j mlrka) fq fp abªkba ^p ^ `lksbkqflk^i mliirq^kq under the federal Clean Water Act.

–a network of composition, structure and function of a given system that encompasses the natural biological wealth of organisms.

–water with salinity common to estuaries; this condition has a salinity concentration between fresh and marine.

¬«bpe*b^qfkd lod^kfp j +

–a type of bacterium that in high concentrations indicates a polluted water body; this type occurs in animal feces.

–a process whereby a liquid, usually treated water or wastewater, is pumped underground.

–small particles of rock, sand and/or dead organic and disintegrating vegetation.

–residential, commercial, industrial and agricultural land uses.

–sand and/or mud removed from the bottom of a water body after dredging.

–a system formed by the interaction of a community of organisms with their environment.

–water released into the environment; commonly from wastewater treatment processes or industrial processing.

–a plant growing on, but not parasitic on, another organism; epiphytes are a general `i^ppfª`^qflk lc ^id^b `l j j lkiv ^qq^`eba ql seagrasses.

¬^ qfa^iiv fk«rbk`ba b`lildf`^i pvpqb j t ebob rivers meet the sea and fresh water mixes with salt water.

¬^ t^qbo nr^ifqv `lkafqflk qvmfªba _v high productivity and nutrient inputs, with periods lc luvdbk abª`fbk`v col j ^id^b ab`l j mlpfqflkß qefp condition can be accelerated by pollution.

–a plant or animal species not native to an ecosystem.

–animals of a region.

–plants of a region.

–water stored in underground geologic clo j ^qflkpß obmibkfpeba col j proc^`b fkªiqo^qflk+

¬qeb pmb`fª` mi^`b lo bksfolk j bkq t ebob ^ particular plant or animal lives; an organism habitat must provide all the basic requirements for life and should be free of harmful contaminants.

–a condition of low dissolved oxygen in the water; hypoxia typically indicates less than or equal to two milligrams of oxygen per liter.

a short, narrow waterway connecting a bay or lagoon with the sea.

–the area of bay bottom and adjacent wetlands that is alternately covered with water and then exposed due to the rise and fall of tide waters.

–the parallel movement of suspended sand along the beach that is caused by longshore currents.

–a salt-tolerant, subtropical tree found in estuarine and marine environments; mangrove leaves are an integral part of the food web.

–pollution from no pmb`fª` plro`bß qefp qvmb lc mliirqflk fp dbkbo^iiv from surface water, ground water or rainwater 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 systems; qefp plro`b lc mliirqflk fp afcª`riq ql j b^prob+

–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.

–the synthesis of organic matter from inorganic substrates using light as a source of energy.

¬m^ppfsbiv «l^qfkd lo t b^hiv j lqfib microscopic plant and animal life; refers to various species of plants and animals at or near the base of the aquatic food chain.

–a map, drawn to scale, showing the divisions of a piece of land. The act of platting divides land areas under a single ownership in order to sell it to different owners.

¬mliirqflk col j ^ pmb`fª` source such as a stormwater pipe, wastewater plant discharge or industrial discharge; easier to quantify this source.

–characterized by an above-average concentration of the toxic phytoplankton ßoba qfab `^rpbp ªpe ^ka j^k^qbb j loq^ifqv ^ka pebiiªpe `lkq^j fk^qflkß mol`bpp qelrdeq ql _b ifkhba ql efde cobpe t^qbo «l t p ^ka krqofbkqp fk j ^ofkb waters.

–the breeding or nursery ground of birds or mammals.

–the portion of precipitation on the land that reaches a water body.

–a measure of the dissolved salts in a water body, especially of sodium, magnesium and potassium.

–a tidal area where seawater evaporates and salt concentrates.

–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.

–a process of high salinity ground water moving inland and mixing with low salinity ground water; intrusion commonly results from overpumping groundwater resources.

–abbreviation for “submerged aquatic vegetation,” including seagrasses and other submerged aquatic vegetation.

¬buqob j biv molar`qfsb «l t bofkd s^p`ri^o marine plants found in estuaries and shallow open shelves off the coast; seagrass provides habitat for krj bolrp ªpebp ^ka fksboqb_o^qbpß qroqib do^pp) manatee grass and shoal grass are three common species existing in Florida.

–a wall or embankment constructed along a shore to reduce erosion from wave action; the structure greatly reduces tidal habitat.

–a system of tanks and porous pipes in which wastewater is treated by aerobic and anaerobic bacterial decomposition in the surrounding soil; septic systems are a common source of pollution to surface and ground water if not functioning properly.

–water from rain, often carrying oils, nutrients, sediments, trash, dissolved metals and other pollutants; storm water is a major source of pollution to rivers, lakes and estuarine waters.

–periodic rising and falling of the oceans resulting from lunar and solar forces acting upon the rotating b^oqeß qfab ^`qflk pqolkdiv fk«rbk`bp j ^ofkb ^ka bpqr^ofkb mi^kqp) ^kf j ^ip ^ka _lqql j `lkªdro^qflk+

–a body of water that empties into a larger body of water.

–the nutritional status of a particular

body of water; nitrogen and phosphorus, the principal t^qbo_lokb krqofbkqp) `l j j lkiv fk«rbk`b qeb qolmef` state.

–a measurement of water clarity; caused by a prpmbkpflk lc ªkb plifap ^ka j f`olp`lmf` lod^kfp j p) particularly algae.

qboobpqof^i ^ob^p ^_lsb qeb fk«rbk`b lc qfab waters.

–residential, commercial and industrial land uses that can be characterized as classically urban and suburban densities.

–the conversion of low-density open spaces to high-density human development such as houses or shopping malls; process decreases the slir j b lc dolrka t^qbo fkªiqo^qflk ^ka fk`ob^pbp stormwater runoff.

–a drainage area or basin in which all surface waters resulting from precipitation or ground water drains toward a central collector such as a stream, river or lake at a lower elevation.

¬^k b`lpvpqb j abªkba _v pmb`fª` mi^kq) plfi and hydrologic characteristics; plants in wetlands are adapted to tolerate wet conditions.

¬j f`olp`lmf` ^kf j ^ip qe^q «l^q cobbiv fk water, graze on detritus particles, bacteria and algae, ^ka j ^v _b `lkpr j ba _v ªpe+

List of Abbreviations

ACOE	U.S. Army Corps of Engineers
BMAP	Basin Management Action Plan
CAC	Citizens Advisory Committee
CCHMN	Coastal Charlotte Harbor Monitoring Network
CCMP	
CH RAMP	Charlotte Harbor Regional Ambient Monitoring Program
CHEVWQMN	Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
CHNEP	Charlotte Harbor National Estuary Program
DOT	Department of Transportation, Florida or United States
EPA	U.S. Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Administration
FLUCCS	Florida Land Use Code and @i^ppfª`^qflk Pvpqb j
FWC	Florida Fish and Wildlife Conservation Commission
HAS	Hydrologic Alterations Subcommittee
HCS	Habitat Conservation Subcommittee
HUD	Housing and Urban Development
NEP	National Estuary Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Loads
TSI	Trophic State Index
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
WQQOS	T^qbo Nr^ifqv Nr^kqfª^_ib L_gb`qfves Subcommittee

Management Conference Members: 1996–2012

A list of members with committee details is available at

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CHNEP CAC; Stefan Katzaras, CF Industries; Kris Kaufman, Southwest Florida Water Management District; Clarke Keller; Jim Kelly, The Herald-Advocate; Keith Kibbey, Lee County Environmental Lab; Al King, City of Venice; Mike Kirby, Bonita Springs Community Development; George Kish, US Geological Survey; Robert Kollinger, Polk County Natural Resources; Joe Kosinski, Town of Fort Myers Beach; Charles Kovach, Florida Department of Environmental Protection; Lou Kovach, Sarasota County Resident; Molly Krival, "Ding" Darling Wildlife Society; Keith Laakkonen, Town of Fort Myers Beach; Sarah Larsen, Florida Gulf Coast University student/Estero River Conservancy/CHNEP CAC; Randee LaSalle, Rotonda Lakes Environmental Resource Committee; Ernesto Lasso de la Vega, Lee County Hyacinth Control District; Leah Lauderdale, Farmland Hydro; Rufus Lazzell, Southwest Florida Water Management District Peace Basin Board; Joe Lee, South Gulf Cove Homeowners Association; Carol Leonard, Coastal Wildlife Club; Dan Leonard, Clam Farmer; Jay Leverone, Mote Marine Laboratory; Linda Lindstrom, South Florida Water Management District; Larry Linn, @e^oilqqb @lrkqv8 Ol_boq Il«fk) @fqv lc P^kf_bi K^qro^i Obplro`bp8 @^qev Ilvli^) @fqv lc @^mb @lo^i8 Iilva Lueptow, Charlotte County; Ken Lund, Myakka River area resident; J.P. Machek, Mosaic; Ann L. Madden; Robert E. Madden; Carol Mahler; Alan Mandel, Town of Fort Myers Beach; A.J. Martignette, Sanibel-Captiva Conservation Foundation; Chakesha Martin, USDA NRCS; Greg Martin, Charlotte Sun; Mac Martin; Patrick Martin, F&W Ding Darling NWR; Nell W. McCauley, Peace River Electric Cooperative (PRECO); Don McCormick, SWFRPC/City of Punta Gorda; Randy McCormick, Peace River Audubon; Ian McDonald, Southwest Florida Water Management District; Stephen McIntosh, City of Bonita Springs; Katy McKenney, Lee County resident; Tom McLaulin; Sally McPherson, South Florida Water Management District; Molly Meadows, South Florida Water Management District; Scott Mears, Cargill Fertilizer; Percy Medintz; Sam Mercer, DeSoto County; Jack Merriam, Sarasota County; Michael Messina, CF Industries; Eric Milbrandt, Sanibel-Captiva Conservation Foundation; Kaley Miller, Mosaic Fertilizer; Kenny Miller, CF Industries, Inc.; Matthew Miller, Southwest Florida Water Management District; Steven Minnis, Southwest Florida Water Management District; Geri Morgan, El Jobean League; Peggy Morgan, Florida Department of Environmental Protection SWD; Lisann Morris, Southwest Florida Water Management District; John Morrison, Sarasota County resident; Jackson Mosley, Paynes Creek Historic State Park; Doug Mundrick, USEPA Region 4; Carolyn Murphey, Florida Native Plant Society; Becky Musser, Mosaic Fertilizer; Tom Myers, Cargill Fertilizer; Misty Nabers Nichols, Gasparilla Island Conservation Island Association; Keith Nadaskay, Mosaic; Ruth Nash, Harbour Heights Waterways/PR Audubon; Heather Nedley, Mosaic; Kayton Nedza, Hardee County Outdoor Classroom/CHNEP @>@8 Gbkkfcbo Kbiplk) Cilofa^ Abm^oq j bkq lc Bksfolk j bkq^i Molqb`qflk Plrqe Afpqof`q Lcª`b8 >kav Kbrelcbo) Farm Bureau Federation; Rich Novak, Charlotte County Sea Grant Extension; Faith Opatrny, Cape Coral ERD; Joe Ortolona, City of Fort Myers Public Works Dept.; Jean Ost, Myakka River Management Coordinating Council; Bud Othoson, Lakes Education-Action Drive; Judy Ott, Florida Department of Environmental Protection Charlotte Harbor Aquatic Preserves; Roland Ottolini, Lee County; Cynthia Ovdenk, US Army Corps of Engineers; West Palmer, Hardee County Mining Department; Clifford J. Parhev, Lee FYN Master Gardener; Don Parsons; Mary Ann Parsons, Lee FYN; Phil Parsons; Joy Peavy, U.S. Agri-Chemicals; Jon Perry, Sarasota County; Ellen Peterson, Sierra Club and Estero Bay ABM; Harry Phillips, Cape Coral ERD; John G. Phillips, Florida Master Naturalist Program; Ray Pilon, Peace River-Manasota Regional Water Supply Authority; Brian Pohl, Hardee County Mining Department; Laraine Pollock, Environmental Confederation of Southwest Florida/ A@>M8 >kdbi^ Mlil) P^o^plq^* J ^k^qbb*@e^oilqqb CVK8 @roqfp Mloqboªbia) Mlih @lrkqv8 >i^k Mo^qq) @C Industries, Inc.; Mike Price, Lemon Bay League; W.M. Protheroe, South Gulf Cove Homeowners Association; Santino Provenzano, Mosaic; Pete Quasius, Lee County resident; Kathi Rader-Gibson, Lemon Bay Park; Lorna

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Notes

: Maintain or improve water quality from year 2000 levels. By 2018, bring all into a watershed management program such as reasonable assurance or basin management action plan. By 2015, remove at least two water bodies from the impaired list by improving water quality.	By 2020, develop and meet that are protective of living resources for dissolved oxygen, nutrients, chlorophyll , turbidity, salinity and other constituents.	By 2025, reduce severity, extent, duration and frequency of (HABs), including macroalgae, phytoplankton and periphyton, through qeb fabkqf^`^qflk ^ka obar`qflk lc ^kqeolmldbkf` fk«rbk`bp+	By 2025, meet standards year round for the Myakka River conditionally restricted area and the conditionally approved areas of Lemon Bay, Gasparilla Sound, Myakka River, Pine Island Sound.
: Participate in the development and implementation of coordinated watershed management programs that accommodate the variable missions and funding priorities of program participants. Encourage the ^mmif`^qflk lc «buf_ib) dl^i*lofbkqba ^mmol^`ebp fk reasonable assurance plans, basin management action plans (BMAPs), s and nutrient reduction plans. : Continue collecting consistent water quality data from throughout the study area used to assess impairments, determine TMDL limits and develop BMAPs. Support key programs such as the CCHMN, partners' long-term ^uba pq^qflkp ^ka slirkqbbo s. : Use such as geographic information systems, integrated ground and surface water quality models and pollutant loading models to identify water quality problems and select less polluting alternatives. : Reduce nonpoint-source pollutants associated with pqlo j t ^qbo orklcc+ Fkpq^ii lo obqol^q to maintain or fj molsb t ^qbo nr^ifqv ^ka «l t p+ : Implement water quality to offset anthropogenic impacts. : Promote water conservation, stormwater treatment and intergovernmental coordination within and codes to prevent the impacts of increasing levels of fj mbosflrp proc^`b ^ka ^ii ql ^`efbsb fj molsb j bkqp ql water quality and groundwater and surface water storage. : Implement plant programs, including the Florida Yards & Neighborhoods program, throughout the CHNEP study area. : Increase the use of personal and by residents and visitors throughout the watershed to reduce nonpoint-source pollution. : Support addressing water quality issues.	Develop and implement that are protective of living resources for dissolved oxygen, nutrients, chlorophyl turbidity, salinity and other constituents as applicable. Assess the bacteria, nutrient il^a ^ka _^pb «l t fj m^`qp lc systems, wastewater treatment plants and reuse water. Recommend effective corrective action. Support addressing water quality issues.	Determine the relationship between macro- and micro . Support measures to reduce phytoplankton/ algal blooms where relationships have been determined. : Support addressing water quality issues.	Assess the bacteria, nutrient load ^ka _^pb «l t fj m^`qp lc systems, wastewater treatment plants and reuse water. Recommend effective corrective action. Provide c to developed areas within 900 feet of waters such as estuarine shorelines, rivers, creeks, canals and lakes. : Support addressing water quality issues.)

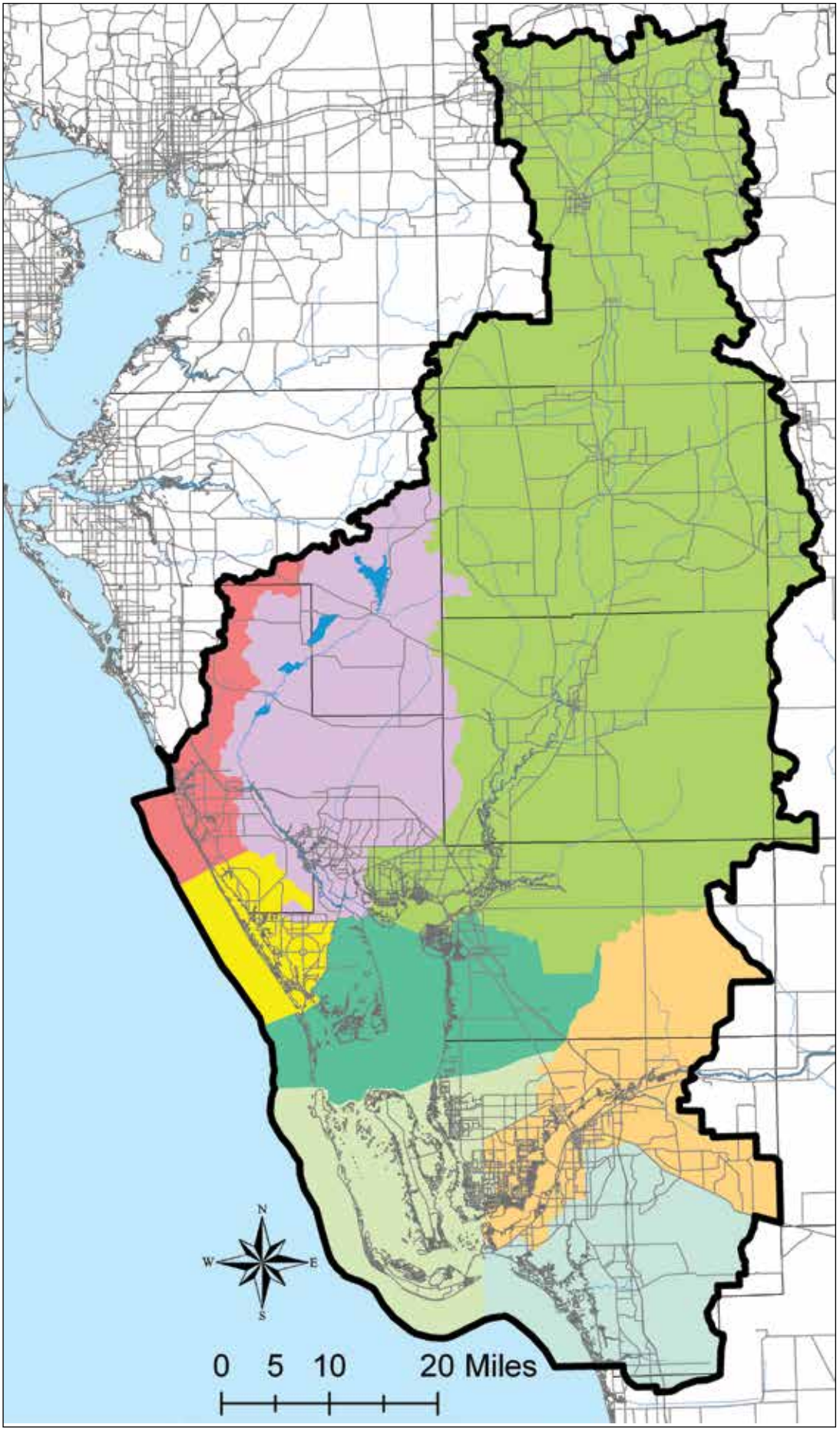
Objectives and Actions Summary

Protect, enhance and restore where physically feasible and within natural variability, including submerged aquatic vegetation (SAV), submerged and intertidal unvegetated bottoms, oyster, mangrove, salt marsh, freshwater wetland, native upland and water column.	By 2020, achieve a 100 percent increase in conservation, preservation and within the boundaries of the CHNEP study area. The increase will be based upon 1998 acreage.	By 2020, achieve controllable levels of ^p ab^kba _v qeb Cilofa^ Bulqf` Mbpq Mi^kq @lrk`fi) and) ^p ab^kba _v qeb Cilofa^ Cfpe and Wildlife Conservation Commission, on publicly managed lands. Encourage and support the removal and management of invasive exotic plants and exotic nuisance animals on private lands.
Restore (seagrass, oyster and unvegetated bottoms) from the effects of anthropogenic stresses. Ensure protect CHNEP study area habitat resources. Restore freshwater and estuarine , especially those adversely impacted by ditching, using j bqelap pr`e ^p qeb _^`h^iifkd lc afq`ebp) qeb ob j ls^i of spoil piles and the elimination of exotic vegetation. Bke^k`b ^pe ^ka tfiaifcb e^_fq^q ^ilkd , fk`irafkd `^k^ip) i^hbp) ofsbofkb pvpqb j p ^ka ^oqf^`f^i waterways. Improve canal, ^`qfsfqfbp ql _bkb^q ^pe ^ka tfiaifcb+ Restore and protect a of native plant and animal communities. Provide additional support for environmental on land and water. Ensure uniform compliance and enforcement of environmental regulations and permitting criteria. Provide multifaceted environmentally responsible programs. Support in habitat and wildlife issues.	Bring environmentally under protection through ownership and/or management and expand conservation areas, reserves and preserves, including undeveloped platted lots. and conservation easement programs. Provide information on the economic, social and environmental and environmental restoration, including ecosystem services. Acquire as much of Babcock Ranch as possible for public stewardship and promote conservation management of the entire ranch. Support in habitat and wildlife issues.	Where practical, identify and remove areas of heavy and exotic nuisance animals. Promote local programs to research and eliminate species. Provide on the impacts of invasive exotic plants and exotic nuisance animals.

By 2020, identify, establish and maintain a more (annual evaoldo^me& fk cobpe t ^qbo «l t p clo7 • Caloosahatchee River. • Peace River and its tributaries. • Myakka River, with special attention to Flatford Swamp and Tatum Sawgrass. • Estero Bay and its tributaries.	By 2020, restore, enhance and improve where practical and natural hydrology for watersheds within the CHNEP study area, with special attention to Outstanding Florida Waters and Class I water bodies.	By 2020, enhance and improve to more natural hydrologic conditions water bodies affected by throughout the CHNEP study area. Reduce negative evaolildf` bccb`qp lc ^oqfª`f^iiv `ob^qba structures such as weirs, causeways, dams, clay settling areas and new reservoirs.	By 2020, for each watershed, identify and recommend additional reforms to improve linkages between local, water management district, state and federal government affecting water storage, «lla `lkqoli^ka t^qbo nr^ifqv+ ?v /-/2) implement the additional reforms.
Utilize historic, current and future scenario estuarine , focusing on salinity and indicator species for better evaluation of proposed capital and operations projects. Utilize i to improve decision making, addressing ecosystem needs in the context of population growth, development, agriculture and mining water demands. Protect from elimination and restore these tributary courses ^ka qebfo «llami^fkp t ebob lmmloqrkfqfbp bufpq+ Set and achieve . Reduce the rate of saltwater intrusion in the Floridan aquifer. Meet established (MFLs). Establish and meet Estero Bay and major tributary MFLs. Participate in and related planning and restoration efforts. Support addressing watershed management issues of hydrology, water resources, water conservation and water use.	Participate in and related planning and restoration efforts. Reestablish hydrologic t^qbopebap ql `lkqof_rqb «l t p to their . Identify natural, existing and target for each watershed. Use water budgets as tools to improve decision making. Support p addressing watershed management issues of hydrology, water resources, water conservation and water use.	Participate in and related planning and restoration efforts. Evaluate the impacts of ql efpqlof` «l t p ^ka j lafcv them to establish more natural hydrologic conditions. Build and restore water conveyances to have and serpentine components that also obpqlob «llami^fkp+ Identify the hydrologic and environmental interactions on surface on estuaries within the watershed. Mimic natural systems in the choice site selection, design and operation of reservoirs. Support addressing watershed management issues of hydrology, water resources, water conservation and water use.	Encourage the use of (LID) and green infrastructure techniques in new and old developments. Limit events. Implement to address hydrologic alterations, loss of water storage and changed hydroperiod, and improve water quality. Encourage, expand and develop incentives for the that are protective of water quality and natural hydrology Support addressing watershed management issues of hydrology, water resources, water conservation and water use.

By 2025, a minimum of 75 percent of all residents will have recalled attending a watershed event, reading watershed material or hearing watershed/estuary information on radio or TV. A minimum of 50 percent of all residents in the CHNEP study area can . A minimum of 10 percent of all residents will be able to claim personal actions that protect the estuaries and watersheds.	By 2020, the CHNEP will expand its role as a recognized resource to elected lcª`f^ip lo qebfo ^dbkqp col j il`^i) pq^qb and federal government for .	Through 2020, the CHNEP long-term will continue and be enhanced. The resulting Internet-based Water Atlas will be maintained systematically	Though 2020, key dbldo^mef` ^ka p`fbkqfª` information will be presented in ways that are to the majority of people.
public involvement. Provide people with in research, monitoring and restoration activities. Identify and develop methods to include them in estuary and watershed protection. Produce watershed and estuary . Offer to broaden participation of individuals and groups in implementing the CCMP. Provide events that involve people in the stewardship of their local natural resources and them to their watershed. Implement programs. Incorporate estuary and watershed protection in educational . Conduct to inform and encourage environmental stewardship. Identify and and excellent bu^ j mibp lc obpb^o`e ªkafkdp) obpqlo^qflk) ibdfpi^qfsb `e^kdbp and outreach successes using a variety of methods.	Identify and accomplishments and excellent examples of research ªkafkdp) obpqlo^qflk) ibdfpi^qfsb `e^kdbp and outreach successes using a variety of methods. Implement Vigorously pursue the and to implement watershed and estuary protection. Update of research, restoration, legislative and outreach needs. Create to protect desired ecosystem resources. Incorporate into federal, state and local permits, and public works that better protect estuaries and watersheds. : Build capacity for communities and their local leadership to mitigate and adapt to the effects of through joint efforts.	: Track and present according to CHNEP-adopted environmental indicator targets. Post raw data, geographic information system (GIS) and technical analysis on the Internet under the .	Produce watershed and estuary . Mobpbkq p`fbkqfª` information in a form by the majority of people.

Notes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