

State of the Southwest Florida Aquatic Preserves *Lemon Bay to Estero Bay*

40-Year Status and Trends, 1970 – 2009

Raymond E. Leary
Charlotte Harbor Aquatic Preserves



Executive Summary

The Charlotte Harbor estuary region extends from Venice south to Bonita Springs, encompassing over 225,000 acres of diverse coastal, estuarine and submerged habitats. The Charlotte Harbor watershed encompasses approximately four million acres; one of the largest watersheds in Florida. The watershed extends from the headwaters of the Peace River in Lake Hancock, and the Franklin Locks on the Caloosahatchee River downstream to the estuary and Gulf of Mexico passes. The estuary is located primarily within three counties: Sarasota, Charlotte and Lee. However, saline waters from the Gulf travel up the Peace River into western De Soto County; and a small portion of the southern Estero Bay estuary is located in northern Collier County. Both were included in this study.

North to south, six Florida Aquatic Preserves (APs) are contained within the Charlotte Harbor estuary: Lemon Bay, Gasparilla Sound-Charlotte Harbor, Cape Haze, Pine Island Sound, Matlacha Pass and Estero Bay. These APs are overseen by the Florida Department of Environmental Protection, Office of Coastal and Aquatic Managed Areas; and are managed by two offices: the Charlotte Harbor Aquatic Preserves (CHAP), located in Punta Gorda; and the Estero Bay Aquatic Preserve (EBAP), located in Fort Myers Beach. Although the Southwest Florida Aquatic Preserves (SWFAP) also includes both Rookery Bay and Cape Romano-Ten Thousand Island Aquatic Preserves, they are not included in this study because they are not contained in the Charlotte Harbor watershed or estuary.

Overall, for the Charlotte Harbor estuary region, water quality has been improving over the last 40 years. Nitrogen, phosphorus and chlorophyll *a* levels have been declining at statistically significant rates, while dissolved oxygen percentages have been increasing at significant rates. These four improving trends are important to the ecological health of the estuary and the economic health of the region. Nitrogen was shown to be the nutrient with the greatest influence on chlorophyll *a* concentrations; this is to be expected since the Peace and Myakka Rivers drain phosphate-rich lands. In addition, temperature and chlorophyll *a* had the greatest influence on dissolved oxygen. Protected waters and those adjacent to protected upland areas had lower concentrations of nitrogen, phosphorus and chlorophyll *a* and higher dissolved oxygen levels. Dissolved oxygen is increasing at statistically significant rates in both protected and unprotected waters; whereas nitrogen, phosphorus and chlorophyll *a* are decreasing at significant rates in unprotected waters, but not at significant rates in protected waters. This may be due to the fact that water in unprotected areas was sampled more heavily.

There were significant increases in dissolved oxygen for the CHAP office. This office also had significant decreasing trends for both nitrogen and phosphorus. Whereas, the EBAP office had significant decreasing levels of phosphorus in its waters. Lemon Bay Aquatic Preserve had significant decreasing trends for nitrogen and phosphorus, and an increasing trend in dissolved oxygen. Nitrogen was also the nutrient with the greatest influence on chlorophyll *a* in this AP. Cape Haze Aquatic Preserve had the highest average dissolved oxygen percentages; and nitrogen was the primary nutrient influencing chlorophyll *a*. Gasparilla Sound-Charlotte Harbor Aquatic Preserve had the highest average chlorophyll *a*, nitrogen and phosphorus concentrations of the six APs. There were no significant trends in this AP, but chlorophyll *a* and temperature had the greatest influence on dissolved oxygen levels. Both nitrogen and phosphorus influenced chlorophyll *a* concentrations in the AP. Pine Island Sound Aquatic Preserve had statistically significant trends for two water quality parameters; increasing for chlorophyll *a*, and decreasing for dissolved oxygen. Although these trends would seem to suggest poor water quality, the AP had the lowest average phosphorus levels and the second lowest averages for both chlorophyll *a* and nitrogen, suggesting otherwise. Matlacha Pass Aquatic Preserve had the lowest average chlorophyll *a* concentrations, as well as the lowest average dissolved oxygen percentage. This AP also had a significant decreasing trend in phosphorus concentrations. Estero Bay Aquatic Preserve had the lowest average nitrogen levels, and the second lowest phosphorus average.

The health of the estuary depends largely on water quality and watershed influences. Human activities within the estuary are important both socially and economically. For example, fishing, boating, and kayaking are pastimes that depend on the health of the estuary and its water quality. Through the efforts of CHAP and EBAP staff, along with the many partnerships they have created, the Charlotte Harbor estuary appears to be ecologically, socially and economically viable for future generations.



13 August, 2010

State of the Southwest Florida Aquatic Preserves –Lemon Bay to Estero Bay

40-Year Status and Trends, 1970-2009

Raymond E. Leary

Special points of interest:

- Protected waters in the region have better water quality than unprotected waters
- Volunteers tracking water quality make a difference in assessing impaired waters
- CHAP staff help Cayo Costa State Park stabilize shoreline
- Pole and Troll zone established near Blind Pass
- Estero Bay establishes NICMZ to offset dredging
- Volunteer bird rookery island monitoring in Estero Bay a success

Background

The intent of this report is to characterize the State of the Southwest Florida Aquatic Preserves (SOSWFAP) for the greater Charlotte Harbor estuary region. This was done by looking at 40 year status and trends in water quality data. Data were provided by 20 public and private agencies from 1970 through 2009. The data were collected within the estuary itself, as well as in the tidal tributaries and near shore Gulf of Mexico. In addition, data were collected from waters that are protected (at the private, local, state and federal levels) as well as from those that do not receive any special protection, in order to determine the success of protection efforts. These data were then screened for errors and outliers. Results are presented for the region as a whole, protected vs. unprotected waters, by Aquatic Preserve (AP) office, and by individual AP. The report is intended to show where we have come from, where we might be going, and to aid in the management of the estuary.



The Charlotte Harbor Estuary

The Charlotte Harbor estuary region extends from Venice south to Bonita Springs, encompassing over 225,000 acres of diverse coastal, estuarine and submerged habitats. The greater Charlotte Harbor watershed is approximately four million acres in size, ranking among the largest watersheds in Florida. The watershed extends from the headwaters of the Peace River in Lake Hancock, and the Franklin Locks on the Caloosahatchee River downstream to the estuary and Gulf of Mexico passes. The estuary is located within three counties: Sarasota, Charlotte and Lee (a small portion of northern Collier County and western De Soto County was included in this study).



Yellow-crowned Night

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Oyster reef in Matlacha

State of the Southwest Florida Aquatic Preserves



Brown Pelican

*Aquatic
Preserves:
“To be
maintained in
their natural or
existing
conditions for
future
generations”*



Sunset on Pine Island Sound

Aquatic Preserves

North to south, six Florida Aquatic Preserves are contained within the Charlotte Harbor estuary: Lemon Bay, Gasparilla Sound-Charlotte Harbor, Cape Haze, Pine Island Sound, Matlacha Pass and Estero Bay (Figure 1). The legislative mission of the AP Program is to preserve Florida's submerged resources in their essentially natural condition for future generations. The primary activities of the Program are resource monitoring and management, and education and outreach. The Program is overseen by the Florida Department of Environmental Protection (FDEP), Office of Coastal and Aquatic Managed Areas (CAMA). The local Aquatic Preserve offices include the Charlotte Harbor Aquatic Preserves (CHAP), located in Punta Gorda; and the Estero Bay Aquatic Preserve (EBAP), located in Fort Myers Beach.

The health of the estuary depends largely on water quality and watershed influences. Human activities within the estuary are important both socially and economically. In addition, fishing, boating, kayaking and nature watching are pastimes that depend on the health of the estuary and its water quality.

Parameters

Chlorophyll *a*: is a green pigment used by plants for photosynthesis and is a useful indicator of algae levels in the water; important because algae form the base of the food chain and help in oxygenating the water, but too much algae can cause oxygen levels to collapse.

Dissolved oxygen (DO): the concentration of oxygen contained in the water; it is influenced by water temperature and salinity (the higher the temperature or salinity, the lower the amount of oxygen that can dissolve in the water); it is necessary for organisms to breathe; at low levels, fish and other animals can become stressed or even die. For this study, DO percent was used. This is the percentage of oxygen in the water compared to saturation levels at the specific temperature and salinity.

Nitrogen: nitrogen, along with phosphorus, is a nutrient necessary for plant growth; at low levels it may limit plant growth but at high levels it can cause excess growth; plants require inorganic forms such as ammonia, nitrites and nitrates. Total nitrogen is a measure all the organic and inorganic forms of nitrogen that are dissolved in the water and was used in this study.

Phosphorus: with nitrogen, phosphorus is a nutrient required by plants; is typically found in low concentrations, but due to southwest Florida's phosphate-rich sediments and soils, is usually found at higher levels in Charlotte Harbor; plants require inorganic forms such as orthophosphate. Total phosphorus is a measure of all organic and inorganic forms dissolved in the water and was used in this study.

Salinity: how salty the water; important because of its influence on DO; it influences where certain aquatic organisms are found (i.e.: in freshwater or salt water); measured in practical salinity units (PSU), 1 PSU = 1 part per thousand (ppt).

Temperature: examined due of its influence on DO.

Aquatic Preserves within the Greater Charlotte Harbor Estuary Region

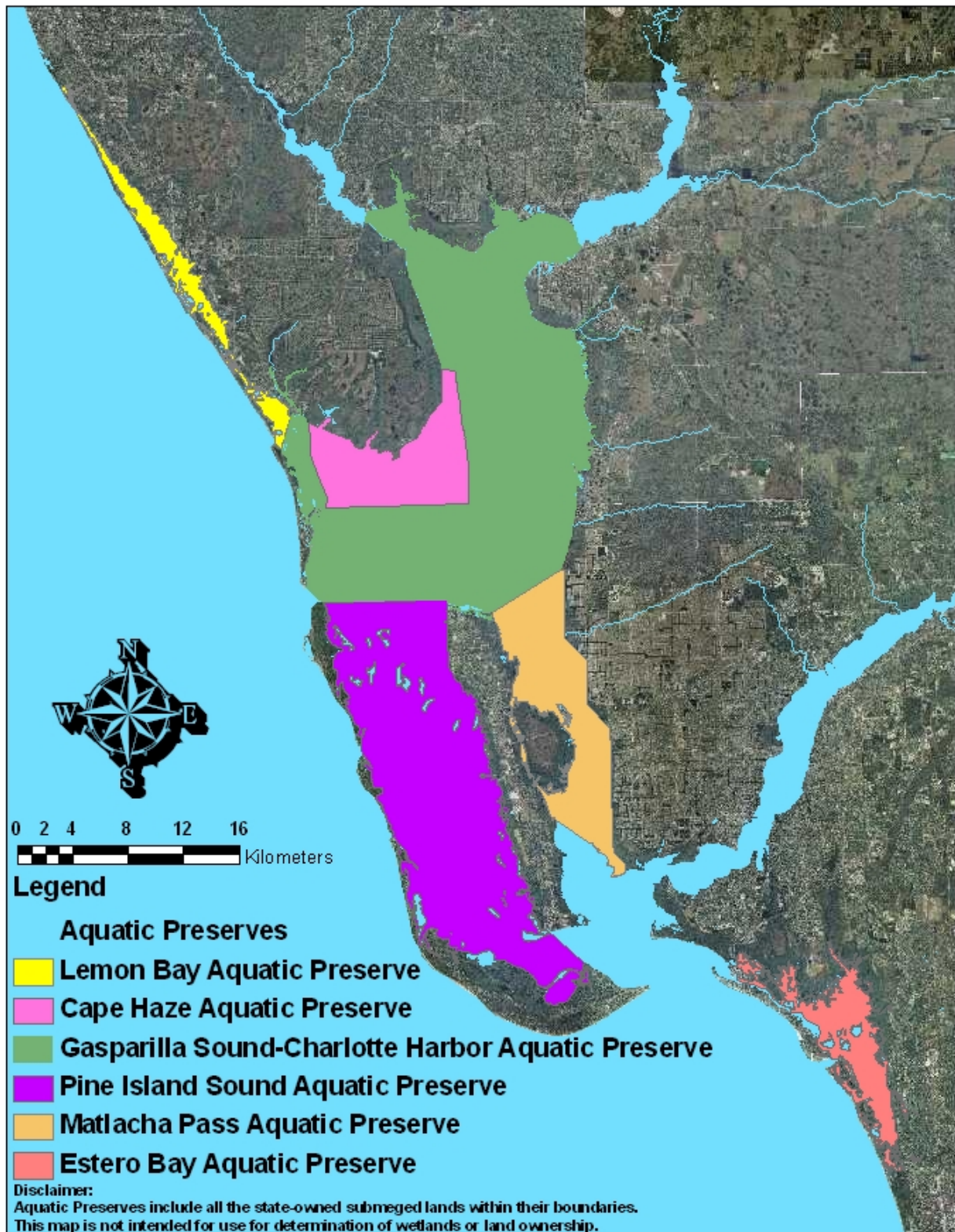


Figure 1. Note: many of the blue areas within the AP boundaries are actually islands, and not open waters.

State of the Southwest Florida Aquatic Preserves



*Yellow-crowned Night
Heron*

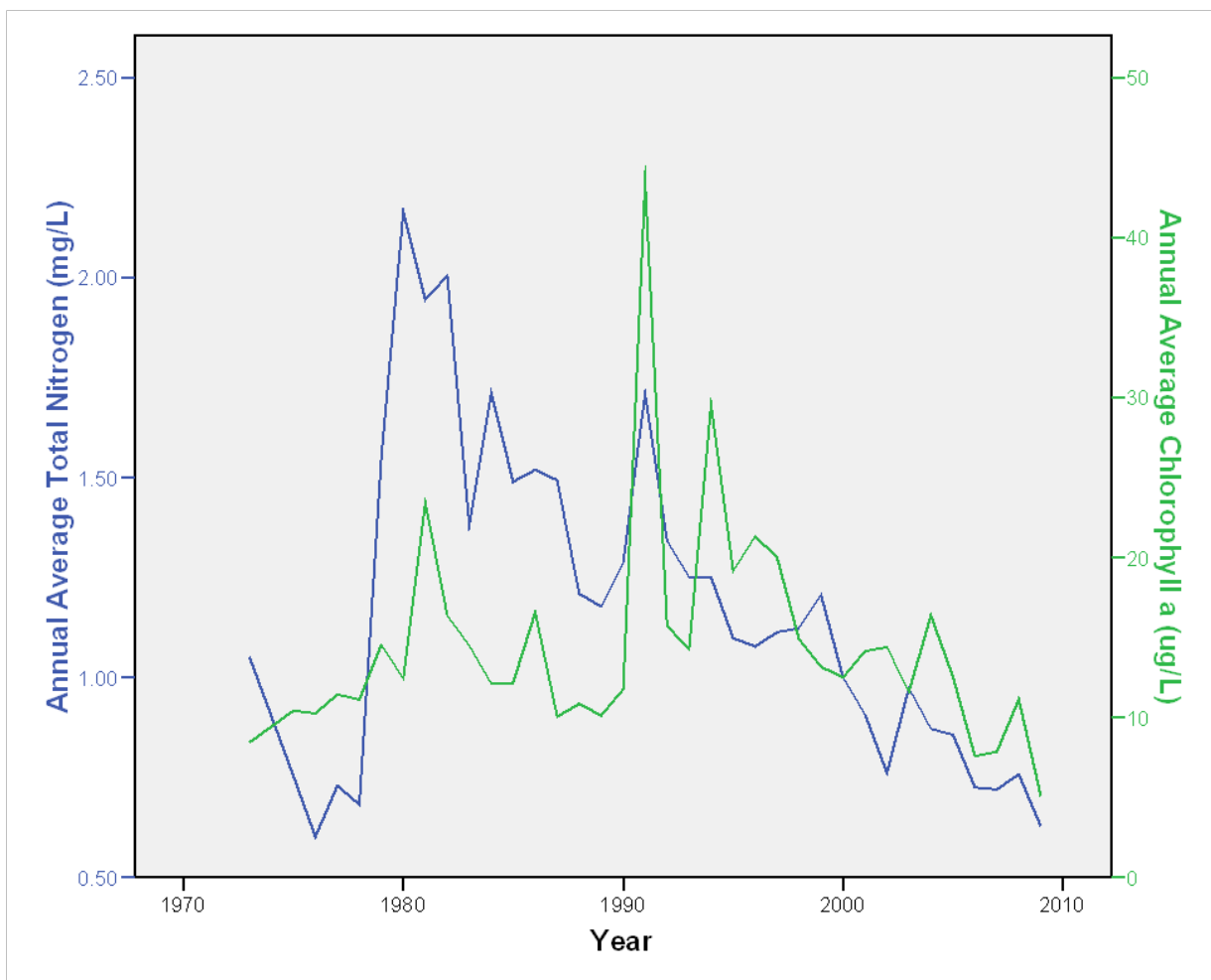


Matlacha Pass

The Charlotte Harbor Region

The Charlotte Harbor estuary is separated from the Gulf of Mexico by a series of barrier islands from Manasota Key south to Little Hickory Island. Water from the Gulf of Mexico enters the estuary through a complex of passes between these islands, from Stump Pass south to Big Hickory Pass. Three major rivers flow into the estuary: the Myakka, Peace and Caloosahatchee Rivers. In addition to the larger rivers, there are numerous smaller tributaries within the estuarine complex. The water exchange between these areas can create variations in water quality conditions around the region.

For the region as a whole, both nitrogen and phosphorus levels have been declining over the last 40 years. Chlorophyll *a* levels have been dropping during this period, as well. Whereas, DO has been increasing at a rate of 0.37% per year. These four trends demonstrate improvements in water quality. However, temperature increased about 2° F over the same period. Both temperature and chlorophyll *a* were shown to have an influence on DO. Nitrogen was the primary nutrient influencing chlorophyll *a* levels within the study. There was no significant trend in salinity, possibly due to natural fluctuations in rain.



SOSWFAP Monitoring Stations within the Greater Charlotte Harbor Estuary Region

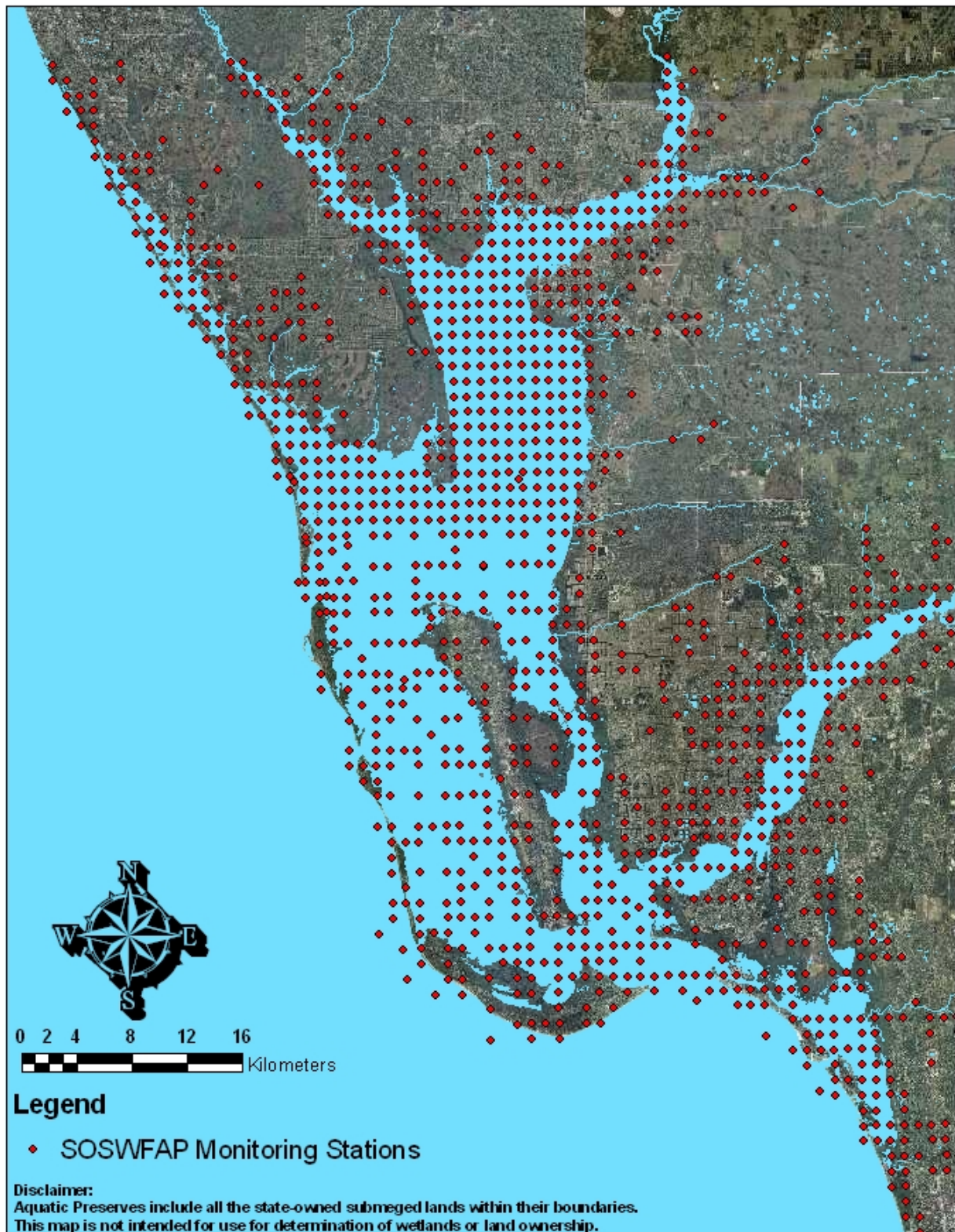
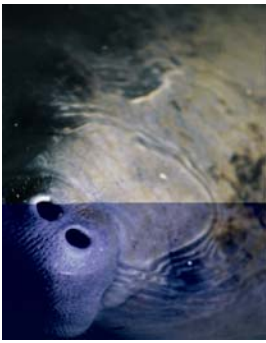


Figure 2.



Manatee

Nutrients are lower in protected waters and dissolved oxygen levels are higher, as well



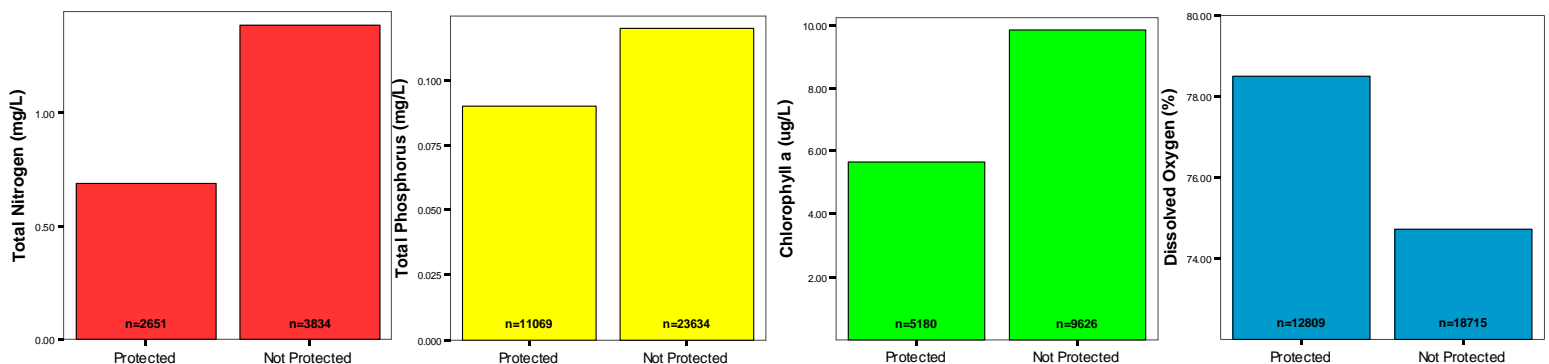
A small creek near the Charlotte Harbor Environmental Center

State of the Southwest Florida Aquatic Preserves

Protected vs. Unprotected Waters in the Region

Within the Charlotte Harbor estuary region, there are many forms of protected waters, as well as protected lands that drain into them. These protected lands are important from a water quality perspective because they act as a buffer from upland inputs. There were two privately owned protected lands adjacent to waters in the study: the Sanibel-Captiva Conservation Foundation's Conservation Lands and the Calusa Land Trust and Nature Preserve of Pine Island. There were many protected areas owned by the local counties: at least three in Sarasota County, eight in Charlotte County, seven in Lee County, and one in Collier County. The State owned at least another 18, as well as other waters that are designated as Outstanding Florida Waters. And, the federal government owns five National Wildlife Refuges within the study area: Island Bay; Caloosahatchee; J.N. "Ding" Darling; Matlacha Pass; and Pine Island. Nearly all of these protected waters are also designated as Outstanding Florida Waters, and the Myakka River is designated as a Florida Wild and Scenic River, as well. Approximately 2/3 of the samples were taken from unprotected waters, even though most of the region's waters are protected. Note: there were many other protected areas nearby that did not fall within or adjacent to the study area, and therefore were not counted.

There were many significant differences between the protected waters and the unprotected waters (Figure 3). The median chlorophyll *a* value for protected waters was 5.65 $\mu\text{g/L}$, whereas in unprotected waters it was 9.87 $\mu\text{g/L}$. Both nitrogen and phosphorus were lower in protected waters, and dissolved oxygen levels were higher in these areas. However, trends in the region seemed to favor the unprotected areas. Chlorophyll *a*, nitrogen and phosphorus were decreasing at statistically significant rates in unprotected areas, but not at a statistically significant rate in protected waters. The trend for DO was increasing in both protected and unprotected at statistically significant rates. Salinity was not examined for protected versus unprotected areas.



Protected vs. Unprotected

Outstanding Florida Waters within the Greater Charlotte Harbor Estuary Region

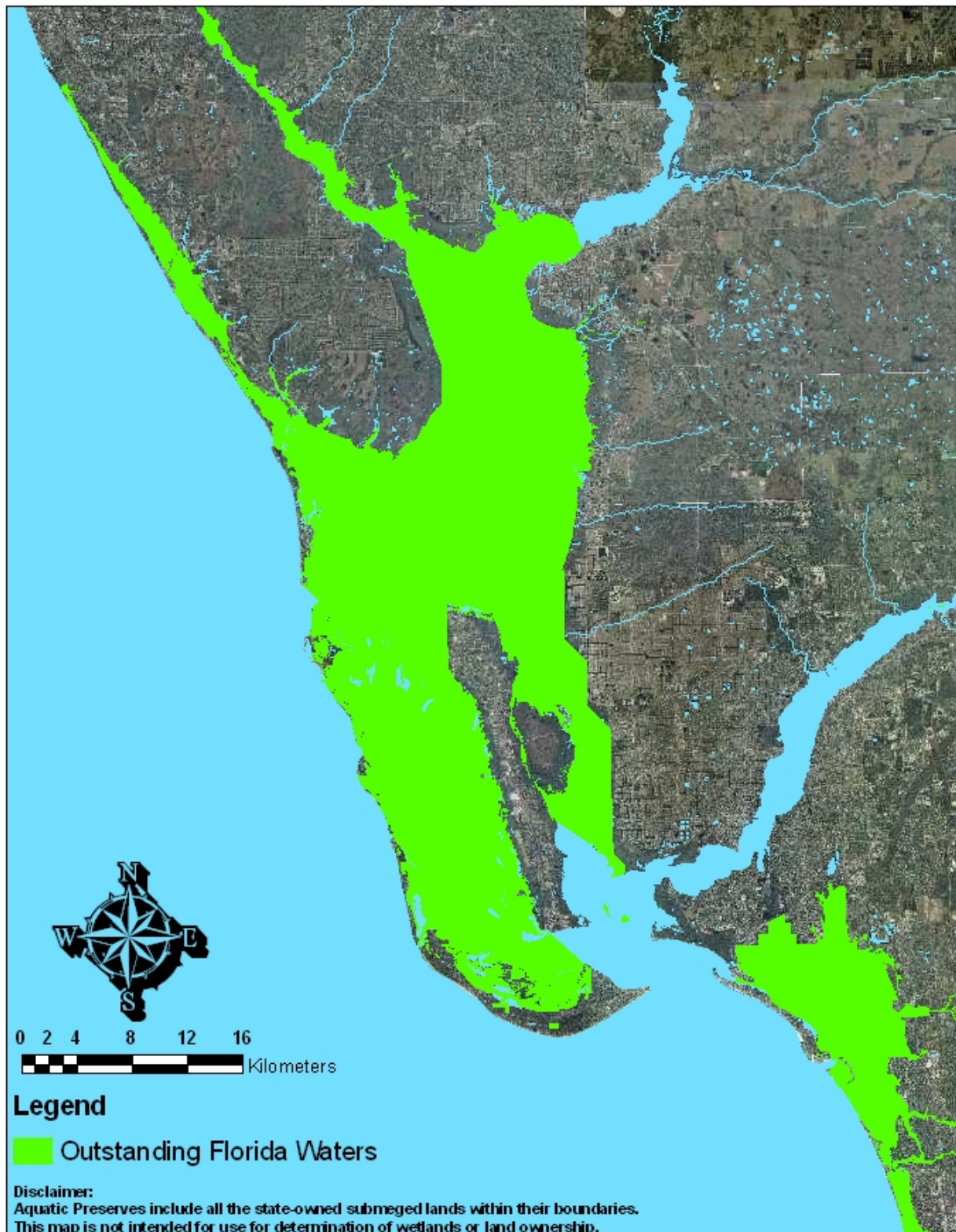


Figure 3. Note: many of the blue areas within the OFW boundaries are actually islands, and not open waters.

State of the Southwest Florida Aquatic Preserves



CHAP staff conducting "Mucking About" in Pine Island Sound public wading trip

Combined, the two Aquatic Preserves offices manage nearly 200,000 acres of vital estuarine habitat

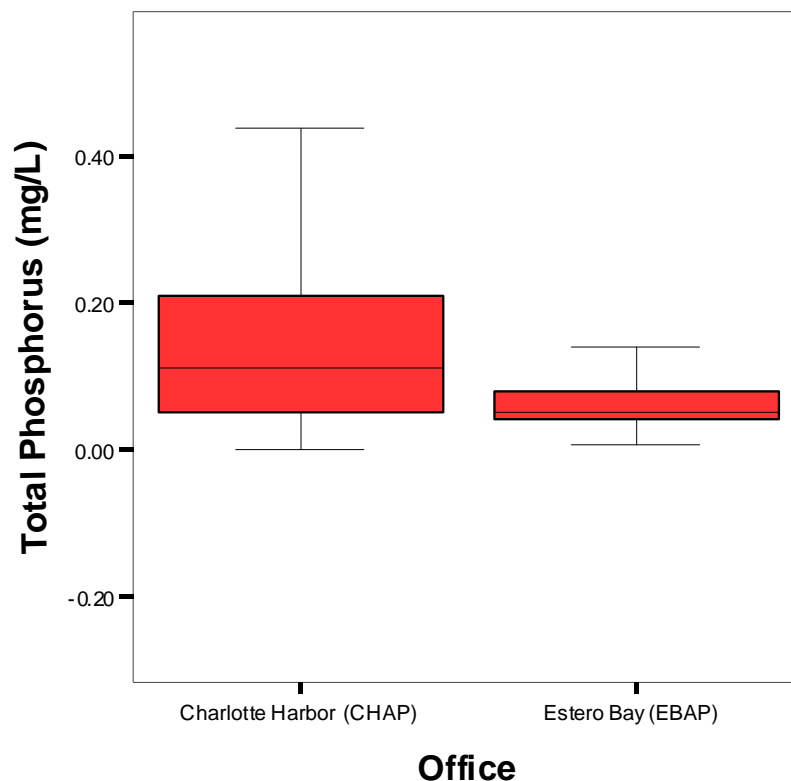


EBAP staff conducting bird rookery monitoring in Estero Bay

Aquatic Preserve Offices

The Charlotte Harbor Aquatic Preserves (CHAP) office, located in Punta Gorda, manages the five northern APs in the area: Lemon Bay, Gasparilla Sound-Charlotte Harbor, Cape Haze, Matlacha Pass and Pine Island Sound. The Estero Bay Aquatic Preserve (EBAP) office, located in Fort Myers Beach, manages Estero Bay.

Generally, both offices showed good water quality, with statistically significant improving trends. The CHAP office had DO increasing at a rate of 0.308% per year. It also had significant decreasing trends for both nitrogen and phosphorus. However, there was no significant trend for chlorophyll *a*, although it had an average value of 8.69 µg/L, well below the state maximum criteria for impairment of 11 µg/L. Nitrogen was found to be the most significant nutrient affecting chlorophyll *a* production within this office's region. Whereas, the EBAP office had a statistically significant decreasing trend for phosphorus, but there were no statistically significant trends for either DO or chlorophyll *a* in the Estero Bay area. Results for both regions were fairly similar, with one exception: phosphorus. Phosphorus levels were much higher for the Charlotte Harbor office than the Estero Bay office. This is due most likely to the fact that the Peace and Myakka Rivers drain phosphate rich lands and empty into CHAP, whereas EBAP has no tributaries draining lands rich in phosphate.



State of the Southwest Florida Aquatic Preserves

CHEVWQMN Case Study by Melynda Brown

It is not often that volunteer data are used for scientific and regulatory purposes, but volunteers from the Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN) have been providing invaluable and reliable water quality data for more than 15 years. This program originally began in 1994 in the Lemon Bay Aquatic Preserve as Three Creek Watch under the Lemon Bay Conservancy, and later expanded to the Gasparilla Sound-Charlotte Harbor Aquatic Preserve in 1996 as the CHEVWQMN. By 1998, all 6 aquatic preserves managed by Charlotte Harbor and Estero Bay Aquatic Preserve offices were included, as well as San Carlos Bay. The program has had more than 400 volunteers who have recorded more than 8000 sampling events at 67 sites. Currently there are 45 sites monitored every month by more than 80 volunteers. Fourteen field and 6 lab parameters are collected each month.

This program follows a strict quality assurance plan to validate the data for the purpose of uploading into a federal water quality database (STORET). To ensure data are reliable, the volunteers are trained how to use the water quality instruments and on collection methods and must attend two quality assurance sessions each year. The data are used to establish baseline water quality conditions, determine status and trends, and determine areas of concern. Because this program's data are uploaded into STORET, the information is used to help determine water-body impairments. Once a water-body is confirmed to be impaired, or not meeting its designated use, then local stakeholders develop a basin management action plan to improve the water quality. Along with this regulatory use, the data are also provided for other educational and scientific purposes, and have been published in Florida Scientist and as a status and trends report (<http://www.chnep.org/info/CHEVWQMN2007.pdf>). A citizen's report in summary form is also available (<http://www.chnep.org/info/CHEVWQMNCitizenSummary98-05.pdf>).

This program involves close coordination with many local citizens and supporting organizations (Charlotte Harbor Environmental Center and Charlotte Harbor National Estuary Program) who make this program a success. CAMA's initiation and continued coordination of this program has been a leading example for the area and across the state for collecting water quality data employing the use of volunteers. By involving the help of volunteers, a snapshot of water quality across the 6 aquatic preserves is able to occur while saving the State thousands of dollars a month in gas, wages, and time. The volunteers develop a sense of stewardship while monitoring the health of their local estuaries and the data are used to help inform citizens and elected officials and direct resource management activities.



Volunteer water quality monitor

Volunteers' data help to set Fecal Bacteria Total Maximum Daily Load levels for Gottfried Creek in Lemon Bay



Volunteers sampling



Program coordinators and volunteers receiving the Gulf Guardian Award in 2007



Volunteer Quality Assurance training

No Internal Combustion Motor Zones within the Greater Charlotte Harbor Estuary Region

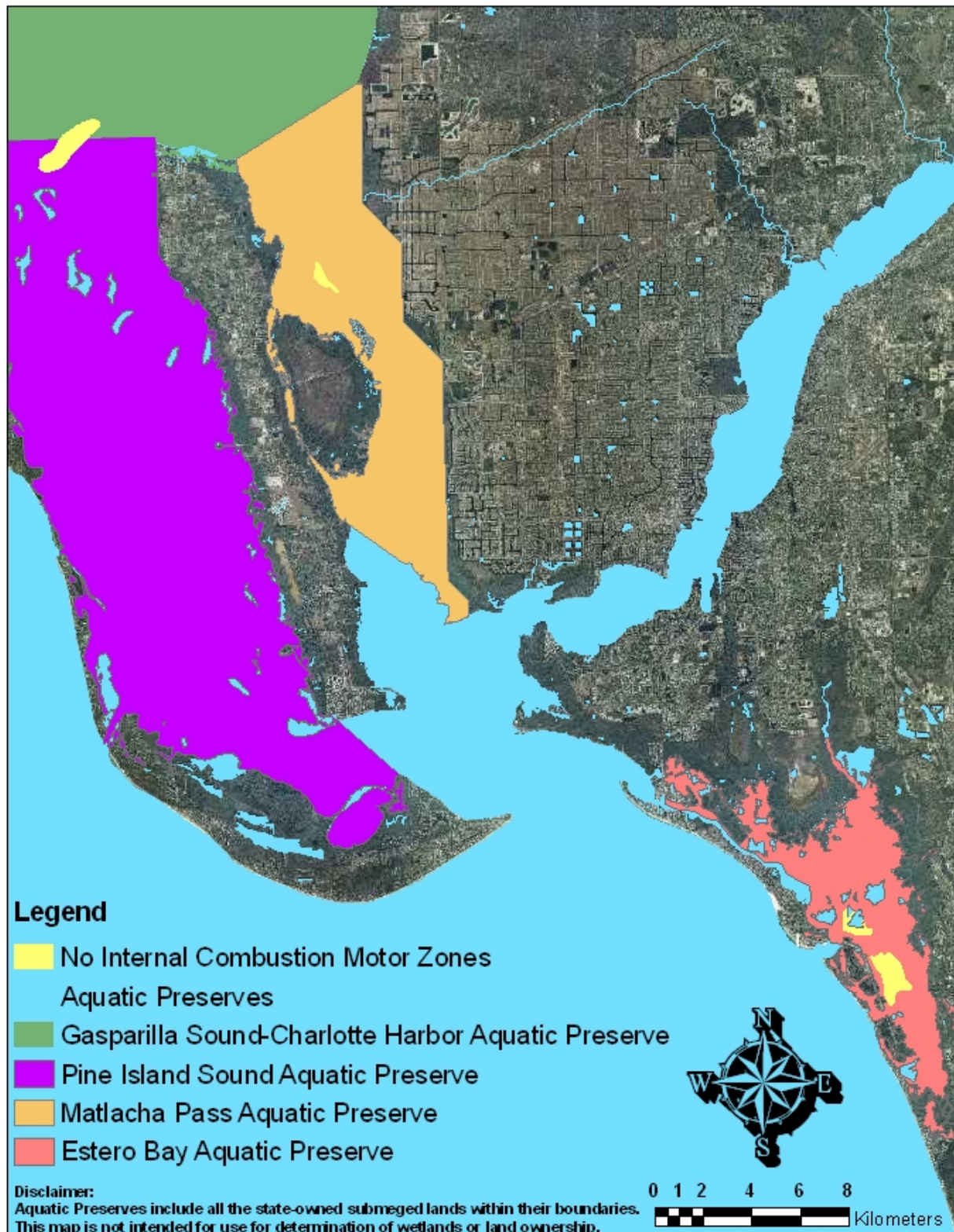


Figure 4. No Internal Combustion Motor Zones (NICMZ).

Note: many of the blue areas within the AP boundaries are actually islands, and not open waters.

State of the Southwest Florida Aquatic Preserves

Channel Dredging & Seagrass Protection in Estero Bay, Pine Island Sound & Matlacha Pass Aquatic Preserves Case Study By Heather Stafford

February, 2010 marked the successful culmination of a 7-year multi-agency process resulting in the improvement of access to public waterways and protection of seagrass beds in Lee County. Early in 2003, the West Coast Inland Navigation District (WCIND), DEP's Environmental Resources Permitting Program and the Estero Bay and Charlotte Harbor Aquatic Preserves, Lee County Natural Resources Department and Florida Sea Grant began discussions about a proposed Noticed General Permit (NGP), Rule 62-341.494, Florida Administrative Code (F.A.C.) for WCIND to dredge public channels in Lee County waterways. The dredging concept is based on detailed studies of boat traffic patterns, existing boat drafts and numbers, and a determination of the dredging needed to maintain existing boating use in a manner that minimizes adverse environmental impacts – a Regional Waterway Management System. There were 69 “trafficheds” and 13 secondary channel systems identified. After detailed channel segment by segment review by all partners, 35 trafficheds, (20 in aquatic preserves) and all 13 secondary channel segments (8 in aquatic preserves) were ultimately included within the NGP. Many of these have no history of previous dredging and there are some where there would be impacts to seagrass even with minimized “spot” dredging. How to mitigate these impacts and fulfill the public interest requirements of the Aquatic Preserve Rule, Chapter 18-20, F.A.C. required further coordination between the partners, and ultimately, the Florida Fish and Wildlife Conservation Commission's Counsel and Lee County Sheriff as well.



Charlotte Harbor

The result is a requirement of the NGP for WCIND to establish, mark and monitor four enforceable No-Internal-Combustion-Motor-Zones (NICMZs) in shallow seagrass beds that show evidence of, or are at risk for damage by prop dredging. Access to these areas will be restricted to electric trolling motors, poling (with engine tilted up) or paddling. This will allow for natural restoration of seagrass and other submerged resources. The four NICMZs are located within Central Estero Bay, near Big Carlos Pass, at the Jug Creek Shoals at the north end of Pine Island Sound, and in Matlacha Pass north of Pine Island Road – all locations within aquatic preserves. No dredging in these aquatic preserves will occur until the associated NICMZ is marked. The required monitoring of the NICMZs is detailed in the Rule and is essential for the long term management of these aquatic preserves, but also because success of NICMZs must be demonstrated before their further use is considered by DEP. WCIND is expected to pursue a similar NGP in Charlotte County.

Public educational materials incorporating information from the Rule include additions to the *Lee County Boater's Guide*, and a brochure EBAP staff worked on with Fish Tale Marina, the Fort Myers Beach Marine Resources Task Force and Florida Sea Grant. These materials are expected to encourage potential waterfront home and lot purchasers, and boaters in general, to consider the water access limitations and to avoid inadvertent prop dredging of shallow seagrass beds. By providing marked channels with a specified service level, the Rule is expected to effectively encourage boaters to use the waters of the aquatic preserves appropriately.

Although this has been a long process, it has been methodical, and necessarily so. Working together, we were able to address each step in the process – whether the NGP should apply in aquatic preserves at all, reviewing Sea Grant's research, determining which channel segments were public, what the dredge depth would be for each segment, what percentage of which draft boats in each traffiched would be provided for with the dredging, and which channel segments would not be included due to resources, shallow depths and usage. We crafted the NGP Rule language, ground-truthed all NICMZs, took the time to work out the NICMZ marking issue with FWC, encouraged and addressed public input and responded to the Joint Administrative Procedures Committee. We were able to overcome each hurdle as they arose and come to agreement. We are looking forward to working on the design and implementation of the 10-year monitoring plan, educational initiatives and analysis of success of the NICMZs.

State of the Southwest Florida Aquatic Preserves



*Seagrass meadow
with mangrove fringe*

*Founded in 1986,
Lemon Bay is the
smallest and
youngest of the
Aquatic Preserves
in the area*

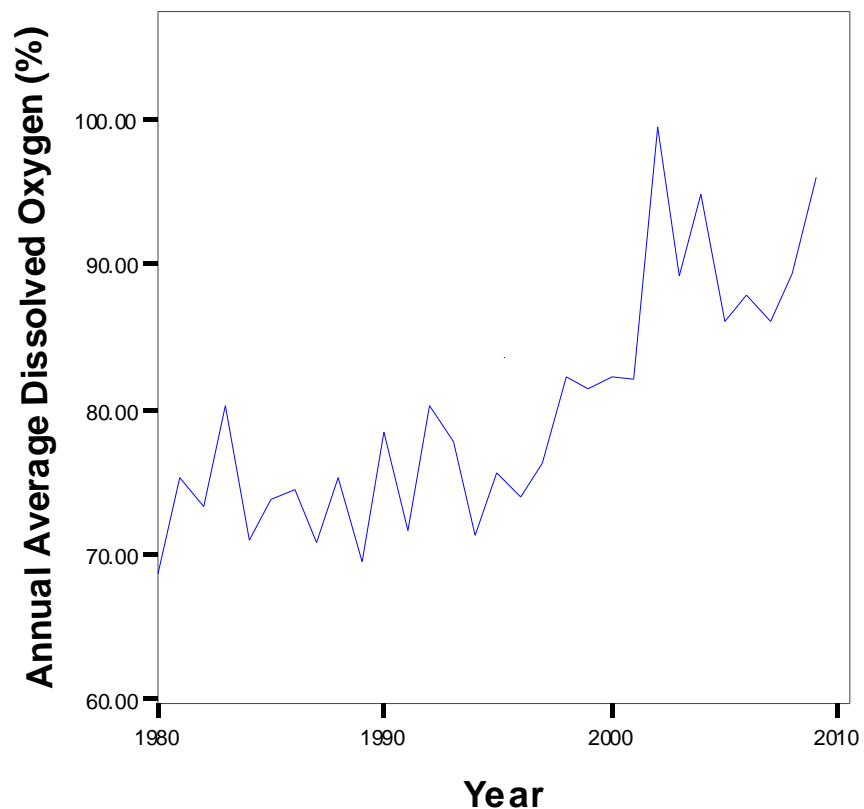


Stump Pass, Lemon Bay

Lemon Bay Aquatic Preserve

The Lemon Bay Aquatic Preserve was designated in 1986, and is the youngest AP in the region. It is the smallest of the five APs managed by the CHAP office, and is the smallest in the region, only about 6,700 acres. It is the farthest north of the APs in the area and stretches from South Venice in the north, to Gasparilla Pass in the south. It is a long, narrow and shallow estuary bordered by many barrier islands. There are several small creeks that feed into the estuary, including Gottfried, Forked and Oyster Creeks. The bay contains vast seagrass meadows.

Lemon Bay had no significant trend in chlorophyll *a* during the study period, but both nitrogen and phosphorus were declining at statistically significant rates. In addition, nitrogen was found to be the primary nutrient driving chlorophyll *a* production. Lemon Bay was also the only AP in the study area that had a statistically significant increase in DO; 0.54% per year. However, none of the parameters were shown to have a statistically significant effect on DO levels. Other significant trends for the bay showed that the water temperature and salinity are increasing, possibly due to the dredging of gulf passes.



State of the Southwest Florida Aquatic Preserves

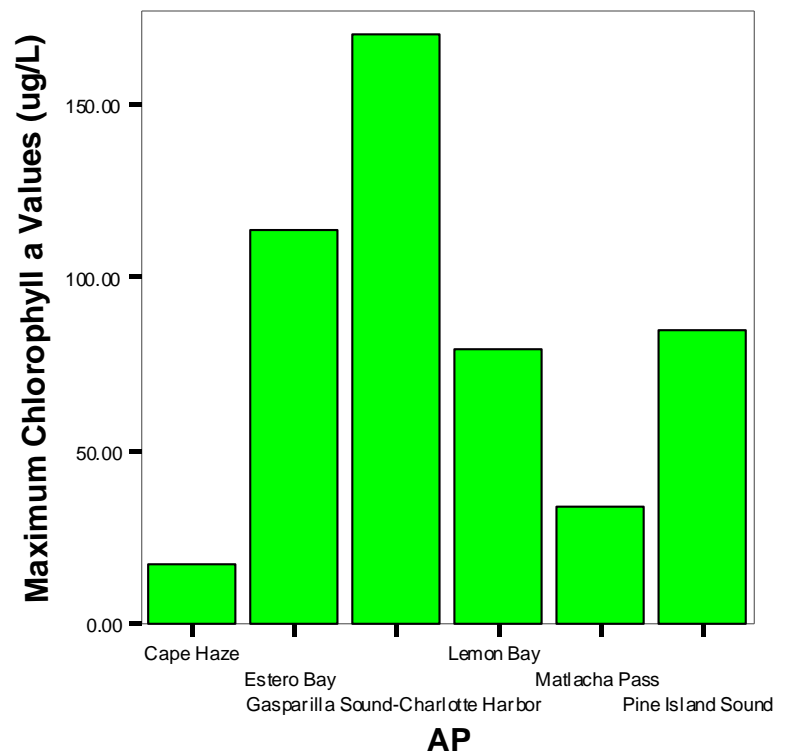
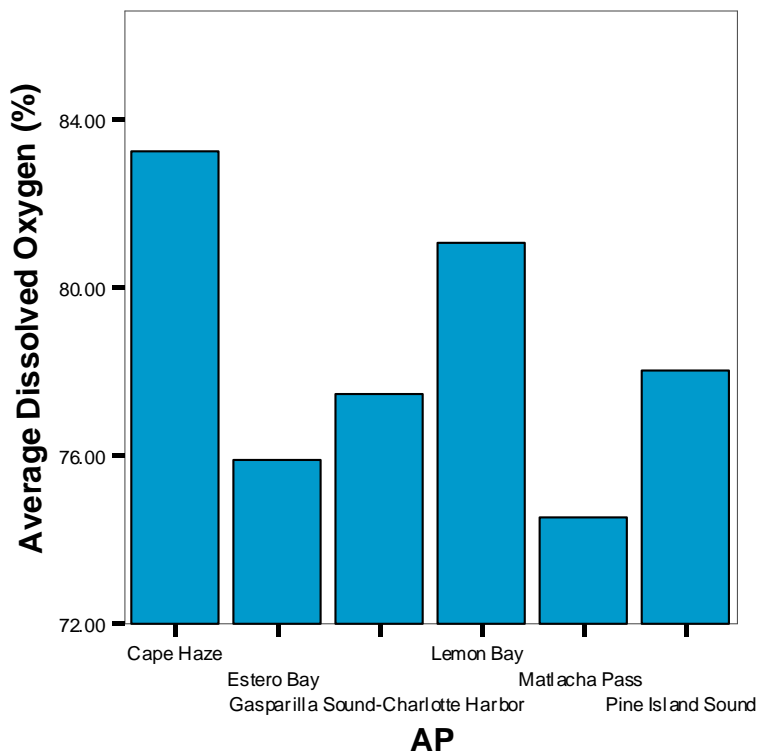
Cape Haze Aquatic Preserve

Cape Haze Aquatic Preserve surrounds the Cape Haze Peninsula, north of Charlotte Harbor and east of Gasparilla Sound, and is more than 15,000 acres in size. The AP was established in 1978. It contains a myriad of small islands within a complex network of shallow passes. The multitude of mangrove forests and seagrass meadows in the AP provide critical habitat for many wading birds, shellfish and finfish. This region supports thriving commercial and recreational fisheries, which contribute to the local economy.

During the 40 year study period, Cape Haze AP never recorded chlorophyll *a* levels above 17.71 $\mu\text{g/L}$, the lowest maximum for all the APs in the area. Nitrogen was shown to be the primary driver of chlorophyll *a* levels in the region. The AP had the highest average dissolved oxygen levels of all the APs, 83.26%. No parameters were determined to have a statistically significant influence on DO. The AP had significantly increasing trends for temperature and salinity, as well. Due to the nature and location of this AP, it was one of the least sampled of all the APs and this may be why so many results were inconclusive.



*Fish House in
Turtle Bay*



State of the Southwest Florida Aquatic Preserves



Sunset near Burnt Store,
Charlotte Harbor

Gasparilla Sound-Charlotte Harbor Aquatic Preserve

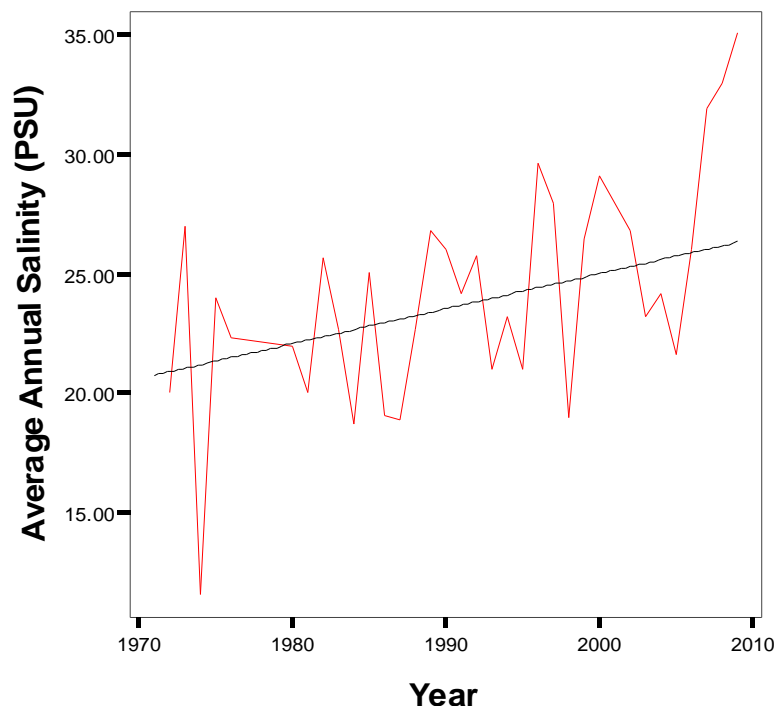
Gasparilla Sound-Charlotte Harbor Aquatic Preserve, established in 1975, is the largest (more than 84,000 acres) and the deepest AP in the area. It represents approximately 44% of the total AP acreage in the Charlotte Harbor estuary. This AP varies greatly over its extent, from the very low salinity mouths of the Peace and Myakka Rivers to the nearly seawater strength Boca Grande Pass. Depths in this AP can reach 50 feet near Boca Grande Pass, although this is the exception. Most of the shoreline is managed and preserved by the Charlotte Harbor Preserve State Park. The primary urban areas adjacent to the AP are Punta Gorda and Port Charlotte. Due to the extent of the AP, there are many habitat types, including mangroves, seagrasses, salt marshes, and mud flats.

Gasparilla Sound-Charlotte Harbor AP had the highest maximum chlorophyll *a* levels in the APs, 170 µg/L. It also had the highest average chlorophyll *a* concentration, 9.75 µg/L. The AP had the highest average phosphorus and nitrogen levels (0.19 and 0.85 mg/L, respectively), as well. Both nitrogen and phosphorus were responsible for shifts in chlorophyll *a*. In addition, chlorophyll *a* and temperature were shown to have the greatest influence on DO percentages. The only statistically significant trends in the AP were for temperature and salinity, both increasing. Salinity may be increasing due to water withdrawals from the Peace and Myakka Rivers.

*Gasparilla Sound/
Charlotte Harbor
Aquatic Preserve
saw the greatest
amount of
variation in the
study, due to
freshwater and
gulf-water
influences.*



CHAP staff assist with the Boca
Grande Pass clean-up



State of the Southwest Florida Aquatic Preserves

Cayo Costa Case Study by Melynda Brown

Charlotte Harbor Aquatic Preserves staff work closely with their FDEP counterpart the Division of Recreation and Parks on projects concerning coordination between the land and the water. In early 2009, the Cayo Costa State Park manager approached CHAP staff regarding the funding they provided to study sediment accretion at their boat basin and possible solutions. When Hurricane Charley came through the north tip of this park in August 2004, the mangroves were severely damaged. Since then, the sediment once held by the mangroves had been slowly transported and deposited north of the boat basin which gradually filled in the basin over the years. The basin was dredged in 2007, but quickly filled in, so dredging occurred again in 2009. Pine Island Sound Aquatic Preserve is directly adjacent to the park so CHAP staff became involved in the process of finding a solution that would benefit both the Park and Preserve. A terminal groin was offered as a solution to stop the sediment, but CHAP staff were concerned about the long term effects of the sediment transport to abundant seagrass beds in the proposed groin placement area. Parks and CHAP staff conducted a site inspection, reviewed the reports, and shared thoughts on what would be the best option. In the end, they all agreed to restore the shoreline where the sediment had been eroding by planting native marsh grasses, to stabilize the sediment, which will in turn assist with the mangroves' recovery. Once the mangroves and their natural function are restored, the sediment will be monitored with hopes that dredging will no longer be required. CAMA's dedication to restoring natural habitat function as a tool to help slow and end the sediment transport problem will benefit the Parks and Aquatic Preserve resources. Continued coordination within FDEP is vital, and by working together to come to a solution the state saves time and money.



Aerial view of the harbor

*CHAP staff assist
Cayo Costa State
Park with
shoreline
stabilization*



2008 basin accretion



1998 conditions

2008 accretion of the basin

State of the Southwest Florida Aquatic Preserves



Staff from EBAP, CHAP and FDEP Environmental Resource Permitting Program during a mean high water line determination training session

Pine Island Sound Aquatic Preserve

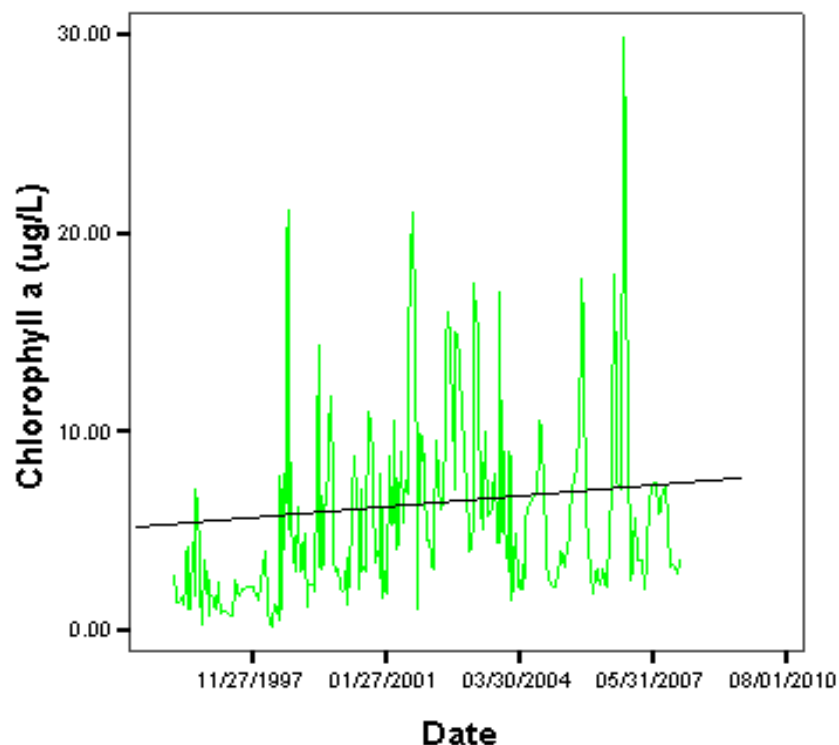
Pine Island Sound Aquatic Preserve is located in Lee County and extends from Boca Grande Pass south to Sanibel Island. It is bordered on the east by Pine Island, and on the west by four barrier islands. The AP is the second largest in the area (more than 56,000 acres) and is the oldest managed by the CHAP office (established in 1970). The primary tributary for Pine Island Sound is the Caloosahatchee River and four passes connect it to the Gulf of Mexico. Much of the shoreline is managed by the Charlotte Harbor Preserve State Park, the Calusa Land Trust and the J. N. "Ding" Darling National Wildlife Refuge. The estuary is home to many bird rookery islands.

Pine Island Sound AP typically had better than average water quality. The average value for chlorophyll *a* was 6.24 µg/L, the second lowest of all the APs. However, it was the only AP in the study area to show a statistically significant increase in chlorophyll *a*. The AP had the second lowest average nitrogen (0.67 mg/L) and the lowest phosphorus (0.06 mg/L) concentrations in the study. There was a decreasing trend in DO during the study period (about -0.76% per year). There were no other significant trends for the AP, nor were there any significant parameters influencing chlorophyll *a* or DO. The AP had the highest average salinity, 31.25 PSU, probably due to the limited amount of freshwater inflow to the estuary.

Pine Island Sound Aquatic Preserve had the lowest average levels of phosphorus of all the APs in the study



Sunset over Pine Island Sound



State of the Southwest Florida Aquatic Preserves

Blind Pass Case Study by Melynda Brown

Blind Pass is located between the islands of Sanibel and Captiva and has a long and dynamic history of opening and closing. This pass became unstable after the opening of Redfish Pass in 1921 and by early 2000 the pass had closed completely. It was then dredged open on the Gulf side in 2001 but refilled after a few weeks. Local stakeholders including: the Captiva Erosion Prevention District, Lee County, City of Sanibel, and USFWS J.N. Ding Darling National Wildlife Refuge worked closely with DEP Beaches and Coastal Systems and CAMA's CHAP office in the effort to reopen the pass in July 2009. To reopen the pass from the Gulf to the Pine Island Sound Aquatic Preserve, dredging activities would directly impact 1.3 acres of sandy beach, 0.16 acre of mangroves and 0.72 acre of shoal grass. Seagrass was present as a Resource Protection Area 1, the highest category of protection, within the dredge footprint. Several joint site inspections and meetings were held in order to determine impacts to the natural resources and discuss potential mitigation projects and public interest requirements. Because this project was considered to be new dredging in the aquatic preserve, the benefits had to outweigh the costs (Florida Administrative Code 18-20).

To address both mitigation and public interest, a shared decision was reached to designate 474 acres of submerged land adjacent to the project as a Pole and Troll Zone where the use of combustion engines would not be allowed, but trolling motors and poles/paddles would be. This Pole and Troll Zone has severe propeller scarring in the seagrass beds, so by closing it off to combustion motors, the scarred seagrass beds have greater potential for recovery. The recovery of the seagrass beds in this zone will allow the seagrass beds to provide benefits to the estuary, its inhabitants, and consumers. CAMA staff participated in four local public meetings in conjunction with Lee County and Ding Darling staff to address the public concerns of this project and the associated Pole and Troll Zone. The reopening of Blind Pass was a major project within the pristine aquatic preserve, and CAMA played an instrumental role in the permitting process of this project by providing expertise in sovereign submerged land rules and resource protection. CAMA staff facilitated the opening of the pass while protecting the resources of the Aquatic Preserve. The new approach of applying the Pole and Troll Zone concept to protect severely scarred seagrass beds can serve as a model for resource management practices across the state to ensure the health of the estuaries and their resources, and to promote commercial and recreational fishing and paddling opportunities.



Combustion Motors Prohibited sign near Blind Pass

CHAP staff aid in the establishment of a Pole and Troll zone near Blind Pass to offset the effects of dredging



View from Pine Island Sound AP to Gulf, before dredging



View after dredging and just prior to removal of the retaining wall



Seagrass monitoring

State of the Southwest Florida Aquatic Preserves



CHAP and Charlotte Harbor Preserve State Park staff participating in International Coastal Clean-up Day



Oyster bar in Matlacha Pass

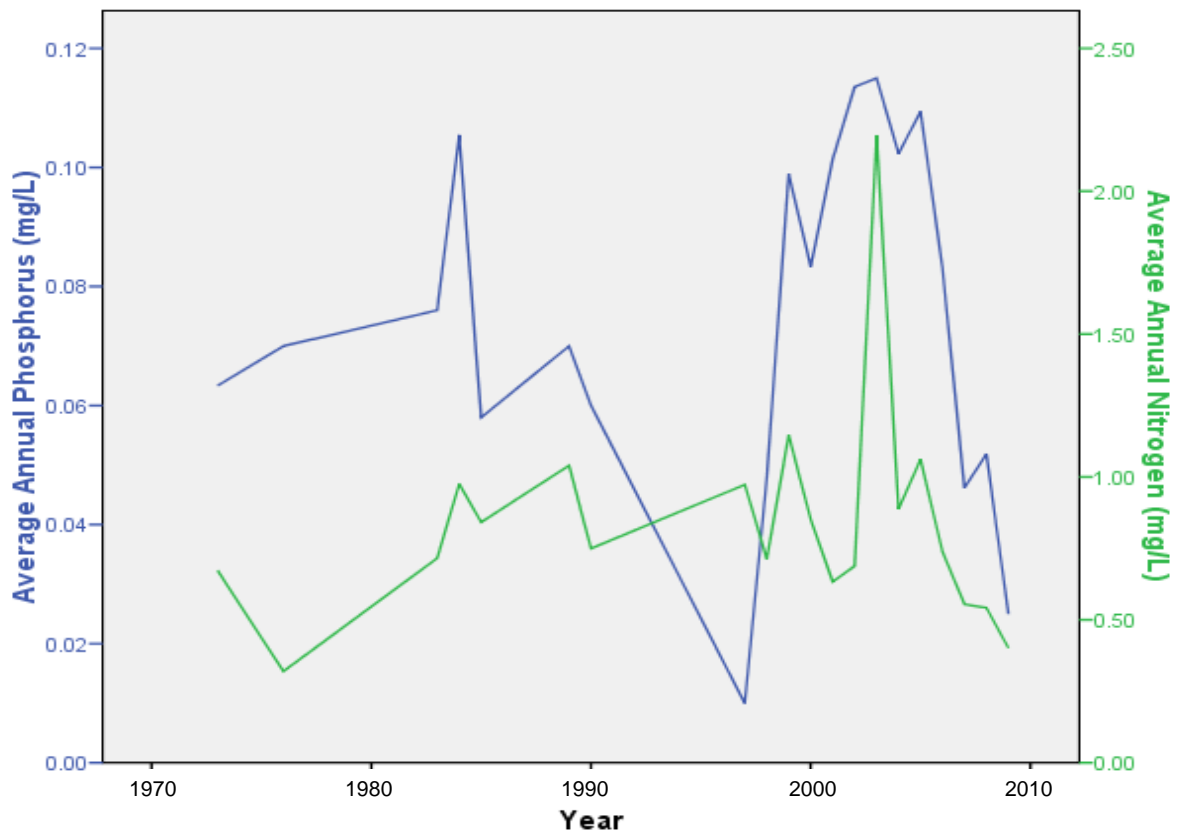
Matlacha Pass Aquatic Preserve

Established in 1972, Matlacha Pass Aquatic Preserve is located in Lee County between Pine Island and Cape Coral. It encompasses more than 19,000 acres of seagrass meadows, mangrove fringe, and sand and mud flats, as well as large oyster bars. Its primary tributary is the Caloosahatchee River to the south. The AP's primary adjacent urban area is Cape Coral. The pass is home to many colonial wading bird rookery islands, composed primarily of mangroves.

Matlacha Pass AP had the lowest average chlorophyll *a* value of the APs, 5.51 µg/L, as well as the lowest average salinity (23.72 PSU) and percent DO (about 75%). There was only one significant trend in the AP; phosphorus is decreasing at a rate of 0.005 mg/L per year. However, both nitrogen and phosphorus tracked well together during the study period suggesting a possible terrestrial source. Results for parameters influencing DO and chlorophyll *a* within the AP were inconclusive, possibly due to the varying sources of water for the estuary (stormwater runoff from Cape Coral, influxes of Gulf waters through Charlotte Harbor and San Carlos Bay, and freshwater pulses from the Caloosahatchee River).



CHAP, EBAP and FDEP Division of Environmental Assessment and Restoration staff conducting seagrass monitoring training



State of the Southwest Florida Aquatic Preserves

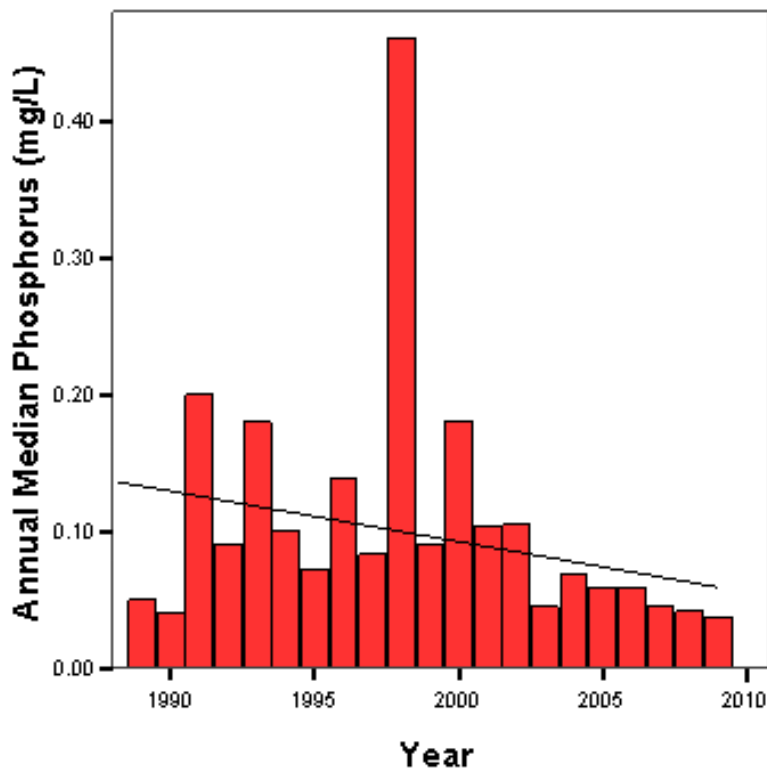
Estero Bay Aquatic Preserve

Estero Bay Aquatic Preserve was the first AP to be established in the state of Florida, in 1966. It is the second smallest (nearly 11,000 acres) and the shallowest AP in the region (approximately 3.5 feet on average). The AP is the only one in the region to be managed out of the EBAP office. Estero Bay is the southernmost of the APs in the Charlotte Harbor Estuary. It is located adjacent to many urban areas, including Fort Myers, Fort Myers Beach and Bonita Springs. Although it indirectly receives freshwater from the Caloosahatchee River, it is fed by five smaller tributaries; Hendry, Mullock and Spring Creeks, and the Estero and Imperial Rivers. The AP contains approximately 2,500 acres of seagrass meadows.

The average nitrogen concentration for Estero Bay AP was 0.63 mg/L, the lowest in the region. It also had the second lowest average phosphorus concentration, 0.08 mg/L. In addition, phosphorus levels in the bay have been declining at a significant rate. Salinity was the only parameter that appeared to have a significant effect on DO levels. There were no other significant trends or influences in Estero Bay.



*Double-crested Cormorant
in Estero Bay*



*Estero Bay
Aquatic Preserve
was established
in 1966; Florida's
first Aquatic
Preserve*



Mangroves in Estero Bay

Note: 1998 had the highest levels of runoff recorded by the USGS in the last 40 years, and this may be the reason for the large phosphorus spike.

State of the Southwest Florida Aquatic Preserves



Juvenile Brown Pelicans

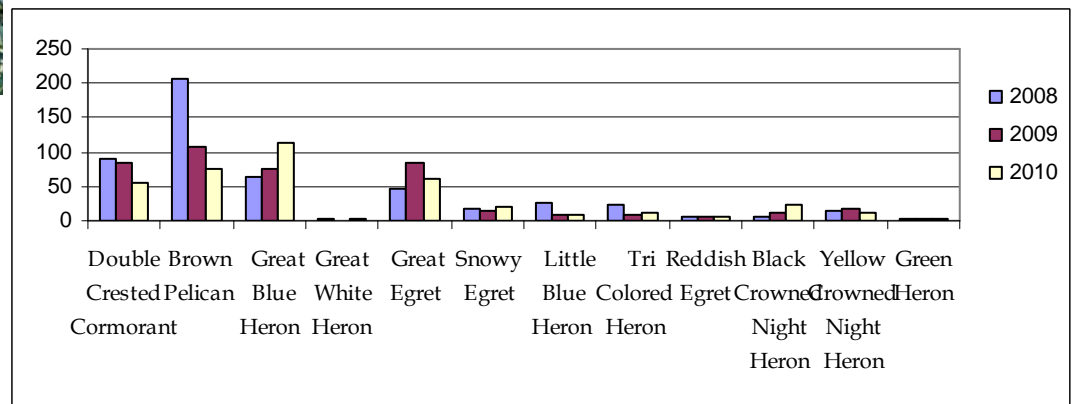
Estero Bay Rookery Study By Cheryl Parrot Clark

Estero Bay Aquatic Preserve (EBAP) began their Bird Rookery Monitoring Program in May of 1977. Brown Pelicans were the only species surveyed at that time and annual surveys were conducted through 1982. Monitoring of all nesting wading birds began in 1983 and annual counts continued through 2007 with some data gaps. In 2008 the Rookery Monitoring and Protection Program was again expanded and monthly nest count surveys were conducted throughout the nesting season (February-September).

Monthly surveys record the number of active nests by species and stage of nesting. The data collected allows us to look at peak nesting numbers and population trends by species (below) and by island. Monthly surveys also allow us to monitor the peak nesting time for each species (below). The data are compiled annually for publication in the South Florida Wading Bird Report which is produced by the South Florida Water Management District. The continuation of this program is very important due to the long term data set that it provides; this data will assist EBAP, as well as our partners Estero Bay Preserve State Park, Fort Myers Beach and Lee County in making better management decisions. The data are also utilized by individuals and agencies across the state to look at state wide population trends.



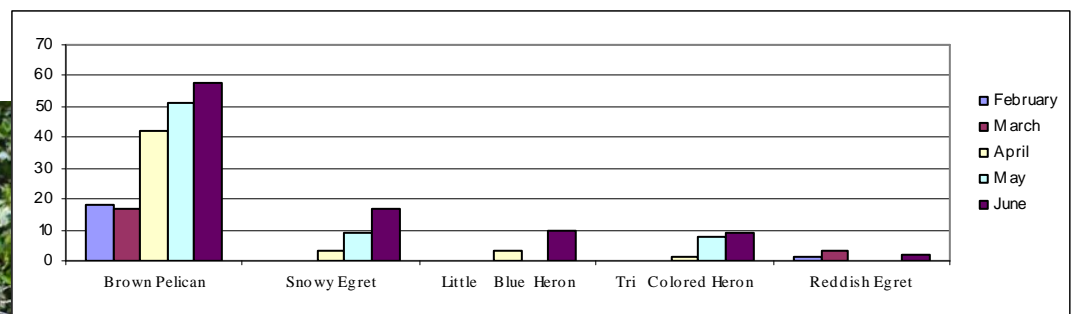
Juvenile Reddish Egrets



Peak number of active nests, by species, documented in EBAP between March and July of 2008 to 2010



Great Blue Heron Chicks on the Nest



Monthly counts of active nests, February to June of 2010, for five Florida state listed species of special concern nesting in EBAP

State of the Southwest Florida Aquatic Preserves

Estero Bay Rookery Study Continued from page 22

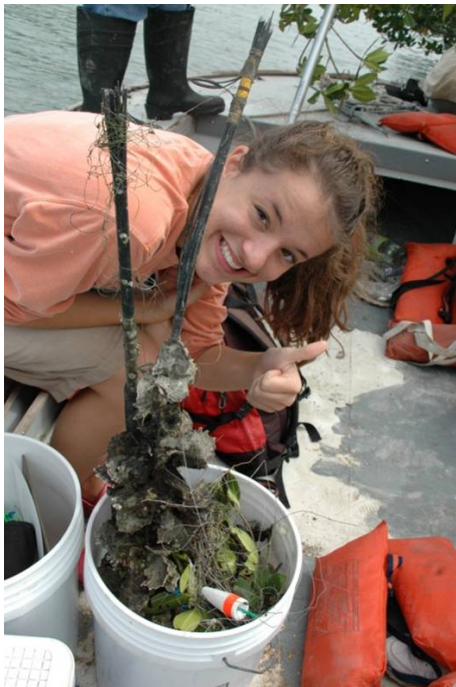
Data documenting bird fatalities caused by entanglement in fishing line are also collected; documenting human related bird mortality allows us to identify islands that may need more protection. Thirty deaths from entanglement were recorded between February and July 2009; fatalities only occurred on seven of the 16 monitored islands with over 65 % of the deaths occurring on only two of these seven. Fatality data is reported annually to Florida Fish and Wildlife Conservation Commission to assist in documenting areas of concern.

In 2008 EBAP staff started training volunteers to assist with the program. Annual training teaches volunteers how to identify wading birds, how to conduct surveys and how to record data. In 2008 volunteers provided 123.5 hours of service to the Program, and in 2009 volunteer participation increased to 208.5 hours of service. Volunteers assist with monitoring as well as bi-annual fishing line and trash removal events on the rookery islands in an effort to reduce the number of bird fatalities. The City of Fort Myers Beach and the Estero Bay Preserve State Park have also participated in the bi-annual cleanup events providing boats and personnel.

The communities surrounding Estero Bay have come together to make this program a success. In an effort to better protect the bird species that live and breed in EBAP, and to enhance the economically important bird watching opportunities, we look forward to training new volunteers and expanding the program in future years.



Roseate Spoonbill and Great Blue Heron



February 20, 2008 Rookery Island Cleanup



March 17, 2009 Rookery Monitoring and Protection Volunteer Training

Florida Department of Environmental Protection

Charlotte Harbor Aquatic Preserves
12301 Burnt Store Road
Punta Gorda, Florida
33955
Phone: 941-575-5861
Fax: 941-575-5863

Estero Bay Aquatic Preserve
700-I Fisherman's Wharf
Fort Myers Beach, Florida
33931
Phone: 239-463-3240
Fax: 239-463-3634



Great Egret

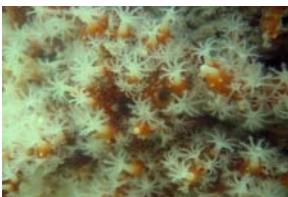
Aquatic Preserves: "To be maintained in their natural or existing conditions for future generations"

Summary

Overall, for the Charlotte Harbor estuary region, water quality has been improving over the last 40 years. However, protected areas, such as the aquatic preserves, show greater water quality than surrounding unprotected waters. There have been significant increases in dissolved oxygen for the CHAP office. Whereas, the EBAP office has seen decreasing levels of the nutrient phosphorus in its waters. Matlacha Pass Aquatic Preserve had the lowest average chlorophyll *a* concentrations; while Estero Bay Aquatic Preserve had the lowest average nitrogen levels; and Pine Island Sound Aquatic Preserve, on average, had the lowest phosphorus values. Cape Haze Aquatic Preserve had the highest average dissolved oxygen percentages. Through the efforts of CHAP and EBAP staff, along with the many partnerships they have created, the Charlotte Harbor estuary appears to be in good hands for future generations.



9-armed sea star



Encrusting organisms on the Phosphate dock near Boca Grande Pass

Data-Contributing Agency	# of sampling events	From	To
U.S.E.P.A.	3,570	11-Nov-1973	13-Feb-1990
U.S.G.S.	7,127	11-Apr-1962	18-Feb-2009
Florida Department of Environmental Protection (FDEP)	20,054	07-May-1933	02-Sep-1998
Biological Research Associates	57	20-Jun-2007	13-Jun-2008
Charlotte Harbor and Estero Bay Aquatic Preserves	5,703	04-Nov-1996	24-Nov-2009
Florida Department of Agriculture and Consumer Services	6,536	14-Feb-1979	05-Jun-2003
Lee County Department of Natural Resources	8,812	12-Sep-1990	30-Mar-2009
FWC Fish and Wildlife Research Institute	225	02-Aug-2000	05-Jul-2006
FDEP South District	1,972	19-Apr-1999	18-Jun-2009
FDEP Ground Water Section	158	27-Jan-1998	30-Oct-2006
Lakewatch	3,981	16-Jun-1989	20-Jan-2006
Lee County Hyacinth Control District	698	09-Jan-1995	10-Dec-2001
Sarasota County Water Resources	8,092	03-Jan-1989	02-Sep-2009
Sanibel-Captiva Conservation Foundation	1,414	06-Jan-2000	23-May-2002
FDEP Shellfish Evaluation and Assessment Section	31,181	14-Feb-1979	20-Jun-2007
South Florida Water Management District	5,502	17-Jan-1979	16-Mar-2009
Save the Bay Association	190	26-Apr-1993	12-Nov-1998
Southwest Florida Water Management District (SWFWMD)	1,678	13-Jan-1992	19-Oct-2005
FDEP Southwest District	1	07-Jul-1999	07-Jul-1999
FDEP Water Quality Standards and Special Projects Section	164	31-Mar-2005	31-May-2006
Cape Coral Environmental Resources Division	18,865	17-Mar-1986	20-Mar-2008
Charlotte Harbor National Estuary Program	8,401	10-May-2001	11-Mar-2009
City of Punta Gorda	13,442	14-Feb-1991	04-Dec-2007
Peace River/Manasota Regional Water Supply Authority	25,072	14-Feb-1991	20-Dec-2007
SWFWMD/FDEP	662	22-Jan-1998	13-Dec-2000
Total	173,557	07-May-1933	24-Nov-2009