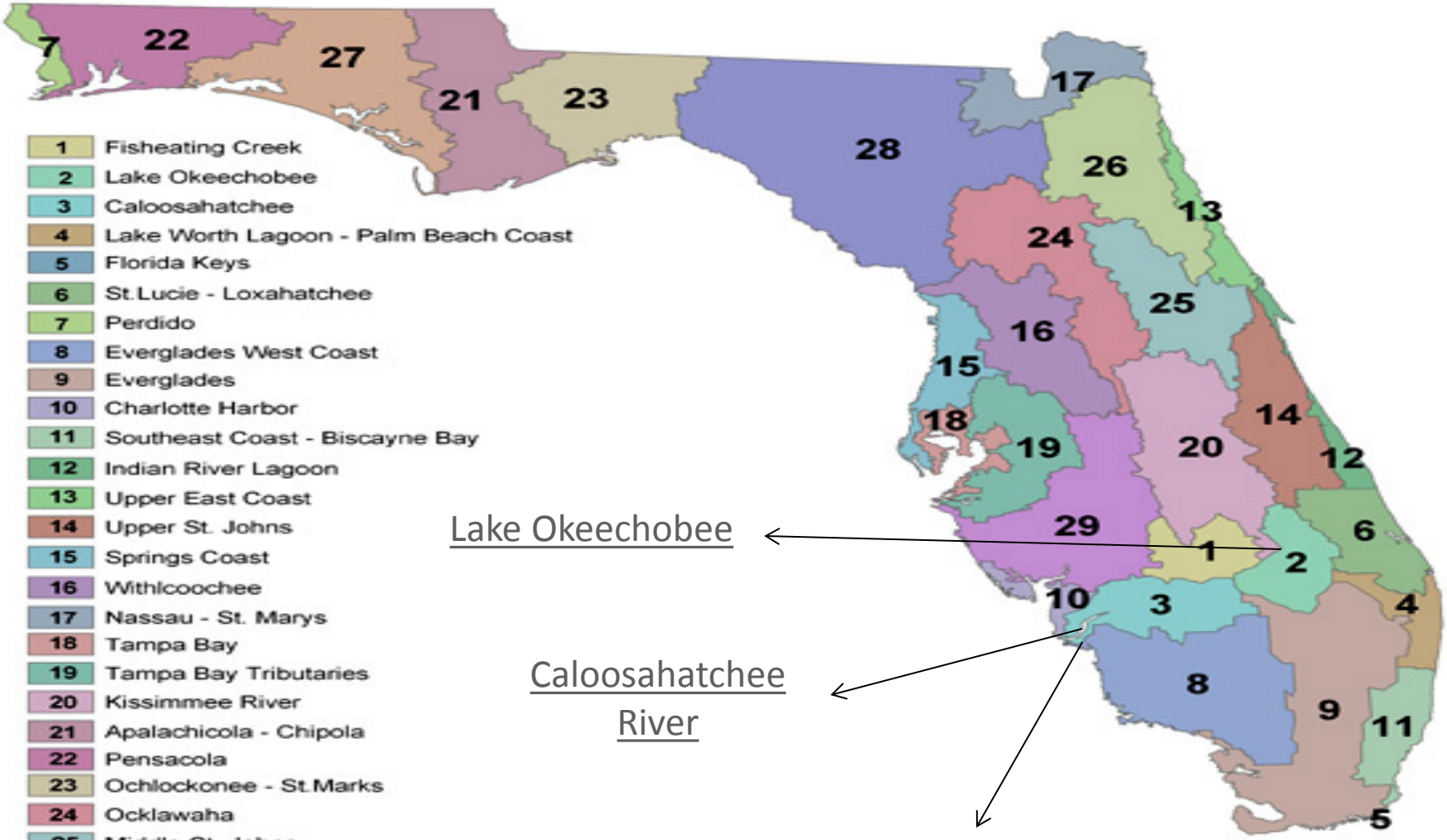
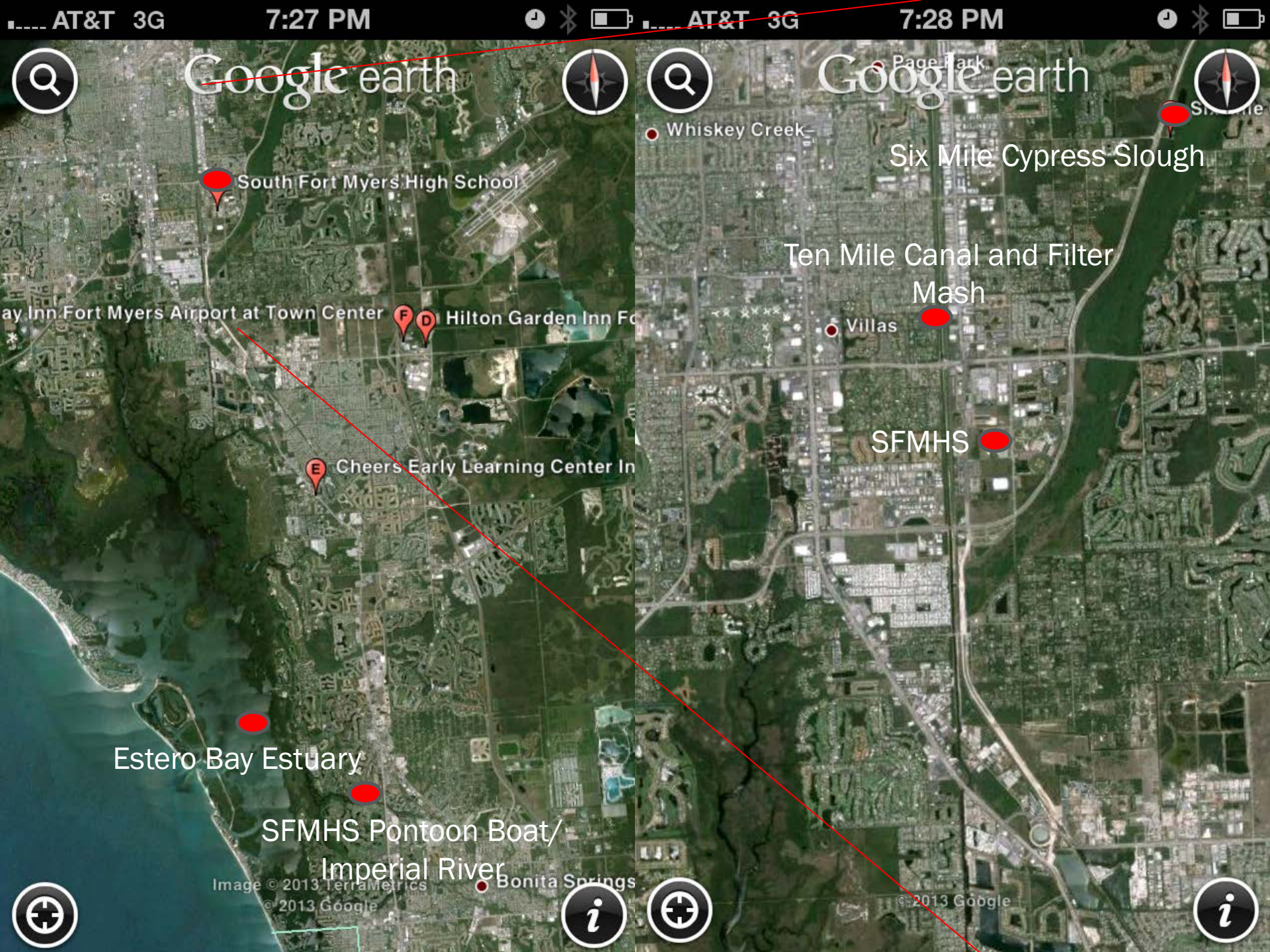
SOUTH FORT MYERS HIGH SCHOOL
LEE COUNTY FLORIDA
WOLF ON THE WATERSHED

WOLFPACK

A LITTLE ABOUT OUR WATERSHED…



AT&T 3G 7:24 PM
Google earth
Fort Myers, FL
Cape Coral
Sanibel Island
Caloosahatchee River
Estero Bay Estuary
Imperial River
SFMHS
SFMHS Pontoon Boat
Rookery Bay Research
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2013 Google
Image Landsat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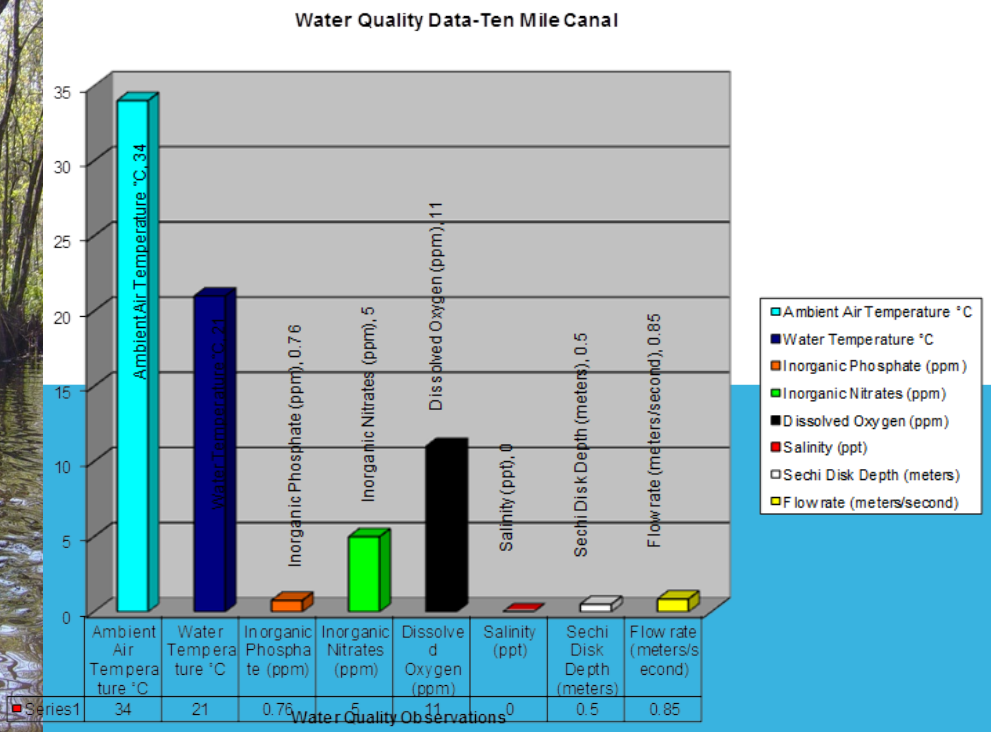
Google earth
South Fort Myers High School
ay Inn Fort Myers Airport at Town Center
Hilton Garden Inn Fo
Cheers Early Learning Center In
Estero Bay Estuary
SFMHS Pontoon Boat/
Imperial River
Image © 2013 TerraMetrics
© 2013 Google
Bonita Springs
AT&T 3G 7:28 PM
Google earth
Page Park
Whiskey Creek
Six Mile Cypress Slough
Ten Mile Canal and Filter
Mash
Villas
SFMHS
© 2013 Google

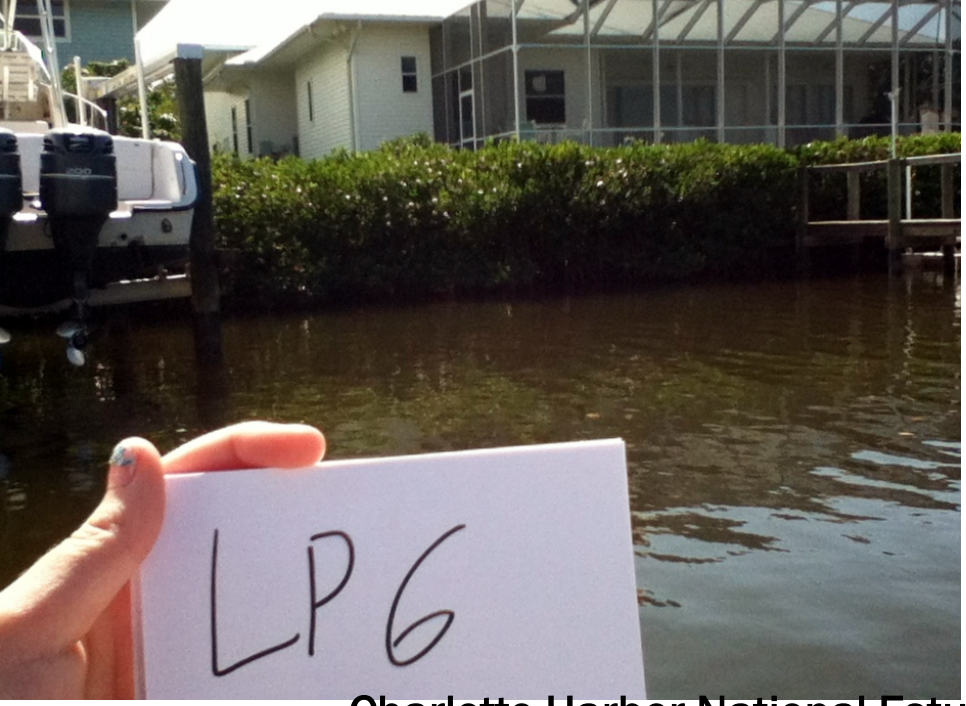
TEN MILE CANAL AND FILTER MARSH

SIX MILE CYPRESS SLOUGH



South Fort Myers High School
Pontoon-Before

South Fort Myers High School
Pontoon-After



Charlotte Harbor National Estuary Program Shoreline Survey

STUDENTS SEE SEA WALLS

CHNEP

CHNEP Program

The Charlotte Harbor National Estuary Program is working to improve the ecological health of the estuaries from Venice to Estero Bay. This partnership gives the citizens, elected officials, resource managers, and commercial and recreational resource users in the 4,400-square-mile study area a voice to address problems. These problems include; diverse resource management concerns, fish and wildlife habitat loss, water quality and water flow. The water areas that are a part of this study is Lee, Charlotte, Sarasota, Manatee, Polk, Hardee and DeSoto counties. The National Estuary Program focuses on improving water quality in an estuary, and also maintaining the integrity of the whole system --its chemical, physical, and biological properties, as well as its economic, recreational, and aesthetic values. This program was established in 1987. The people that are apart of this program work together to identify problems in the estuary, develop specific actions to address those problems, and create and implement a formal management plan to restore and protect the estuary. The program includes the following Gulf of Mexico estuaries: Corpus Christi Bay, Galveston Bay, Barataria-Terrebonne Estuarine Complex, Mobile Bay, Tampa Bay, Sarasota Bay, and Charlotte Harbor.

Ecological Importance of Mangroves

HURRICANE PROTECTION- "Coastal wetlands reduce the damaging effects of hurricanes on coastal communities by absorbing storm energy in ways neither solid land nor open water can. Since marsh plants hold and accumulate sediments, often reduce sediment suspension, and consequently maintain shallow water depths. The preservation of vegetation contributes in two ways: first by actually decreasing surges and waves, and by maintaining the shallow depths that have the same effect" (Costanza et al, 2008).

ERROSION CONTROL-According to Ombrello (2013). "The red mangrove's greatest significance involves its role in nature. Coastlines fringed with red mangroves are quite stable, and protected against the ravages of erosion and storm damage. Long-time Florida coast inhabitants claim that the safest place to be during a hurricane is in a stand of red mangroves. The state of Florida, concerned about the future of its coastline threatened by extensive development, has enacted legislation making it illegal to cut or destroy red mangroves without appropriate approval."

FOOD WEBS-Ombrello (2013) describes the significance of mangroves as a foundation for the marine food web. Red "Mangroves shed over 3 tons of leaves per acre each year. As the leaves decompose, they provide food for crabs, worms, shrimp and others that make up the lower links of a food web. These little creatures are in turn fed on by larger and larger fish and eventually birds and mammals including us. Almost everything is connected back to the Red Mangrove."

HARDENING- There are two types of hardening that we observed in the shoreline survey. Hardening is a way to prevent overgrowth of the mangroves and/or to take place of the mangroves. The first type observed saw was riprap. Riprap is a cover of rock, and is used to provide stability to the shoreline and lower the soil erosion. Many of the observed residential and commercial properties observed either had mangroves blocked off with the riprap or had no mangroves with just riprap (figure 7). Seawalls are a cement wall that takes the place of the natural shoreline. The seawall is not as environmentally friendly as the mangroves and or the riprap. Riprap still allows mangroves to grow within the nooks and crannies between rocks. The nooks and crannies of the rip rap provide habitat for crustaceans, fish, and other invertebrates to survive and be protected.

Where did we survey?

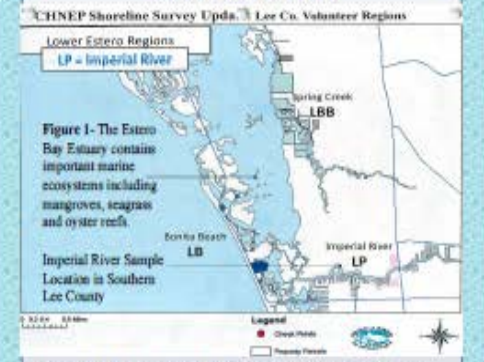


Figure 1- The Estero Bay Estuary contains important marine ecosystems including mangroves, seagrass and oyster reefs.

Imperial River Sample Location in Southern Lee County

The Imperial River, located in Southern Lee County Florida (figure 2), represents the southern most freshwater river flowing in the Estero Bay Estuary. An Estuary is a partly enclosed coastal body of brackish water with one or more rivers or streams flowing into it, and with a free connection to the open sea. Estuaries in particular play an important role as they are habitat and spawning grounds for juvenile fish and invertebrates like oysters, crustaceans and tunicates.

Figure 2-Common species (decorator crab left, polka dot batfish right) of the Estero Estuary System

Figure 3-Imperial river sample sites broken down by individual parcels

Mangrove Observations

Site ID#: _____

(1) Are mangroves present? No Yes <10% Yes >10%?

(2) How tall are the mangroves? <6' 6-10' 10-20' >20'

(3) Are the mangroves trimmed? No Yes: hedged Yes: window Yes: uplift Yes: mixed?

(4) Is hurricane damage evident? No Light Moderate Severe

(5) Are exotics present? No <10% >30%

(5a) Are they Brazilian pepper, Australian pine, seaside mahoe or earleaf acacia?

(6) Is the shoreline hardened? No Yes: <50% Yes: >50%

(6b) Is it hardened with seawall, riprap, both or other? (6c) Are oysters present? Yes or No

Figure 4-Data collected in the field in the above data table was transferred digitally to the Charlotte Harbor Water Atlas Database: http://www.chnep.wateratlas.usf.edu/new/

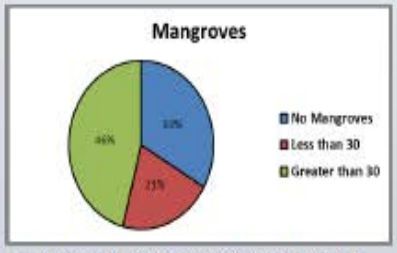


Figure 5-Coastal development has resulted in less than 50% of all properties having 30% mangrove coverage along Imperial River

Figure 6-Most people that have mangroves on their property DO NOT trim the mangroves. A little more than half of the mangroves were found

Figure 7-Trimmed Mangroves (above) on developed parcel. Untrimmed mangroves (below) on an undeveloped parcel.

Hardening Observations

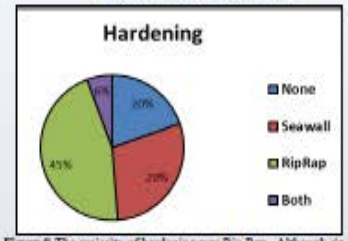


Figure 8-The majority of hardening was Rip Rap. Although rip rap may replace existing mangroves it does provide more complex habitat for marine organisms and may actually allow new mangroves to grow.

Figure 9-Examples of common hardening along the Imperial River. Sea wall (above) lacks the nooks and crannies that rip rap (below) contains as a more complex habitat.

Figure 10-Common exotic species in South West Florida. Top-Brazilian Pepper Middle-Australian Pine Bottom-Seaside Mahoe

Exotic Species

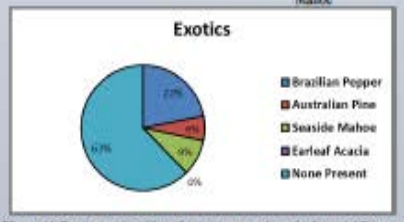
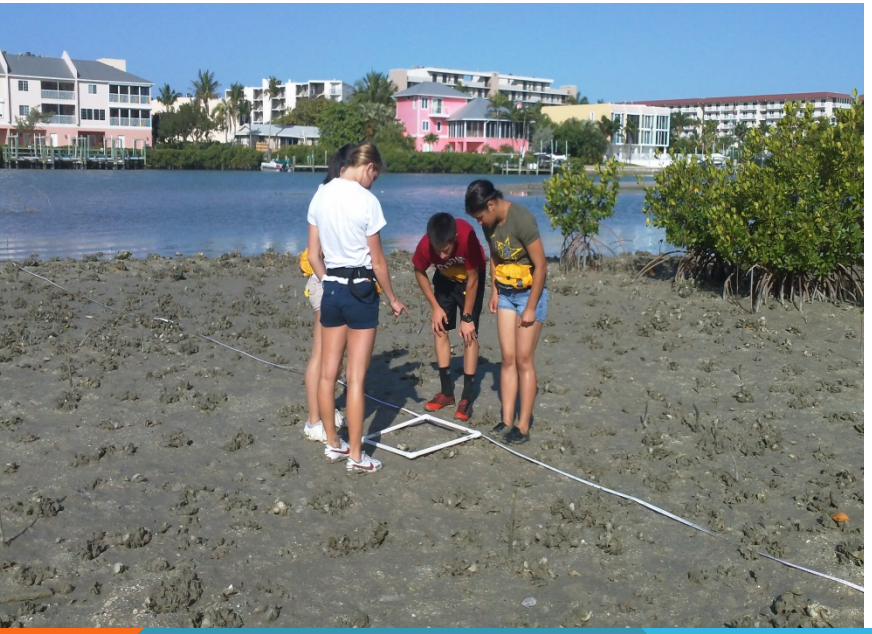


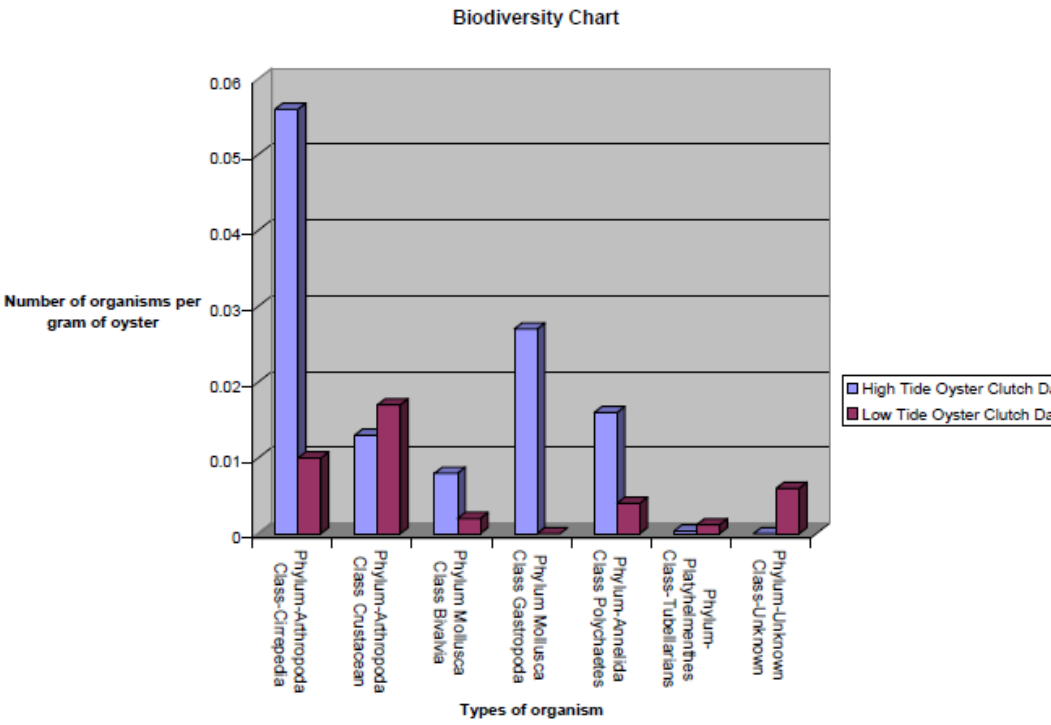
Figure 11-Exotic species although not common along the Imperial River can wreak havoc on natural systems as they crowd out native vegetation and reduce biodiversity.

Works Cited

- Moretzsohn, F., J. A. Sánchez Chávez, and J. W. Tunnell, Jr. GulfBase - Charlotte Harbor National Estuary Program. June 2004. Web. 09 Apr. 2013. <http://www.gulfbase.org/organization/view.php/oid=chnep>.



Data Analysis:



Conclusion: For this research we calculated the amount of organisms that dwelled within the oyster clutches in both low and high tide. While in both low and high tide the amount of organisms stayed relatively equal, there were some differences between the types of organisms present. For example, during high tide phylum arthropoda class cirrepedia was present more times than any other organism, yet during low tide phylum arthropoda class crustacean were the most common organism. While the amount of organisms altered during the change of low to high tide, the overall amount of organisms remained relatively equal. Possible errors that could have occurred would be how the data was taken. Some organisms could have been missed which would result in different data. Some organisms could have been miscalculated, again, resulting in different data.

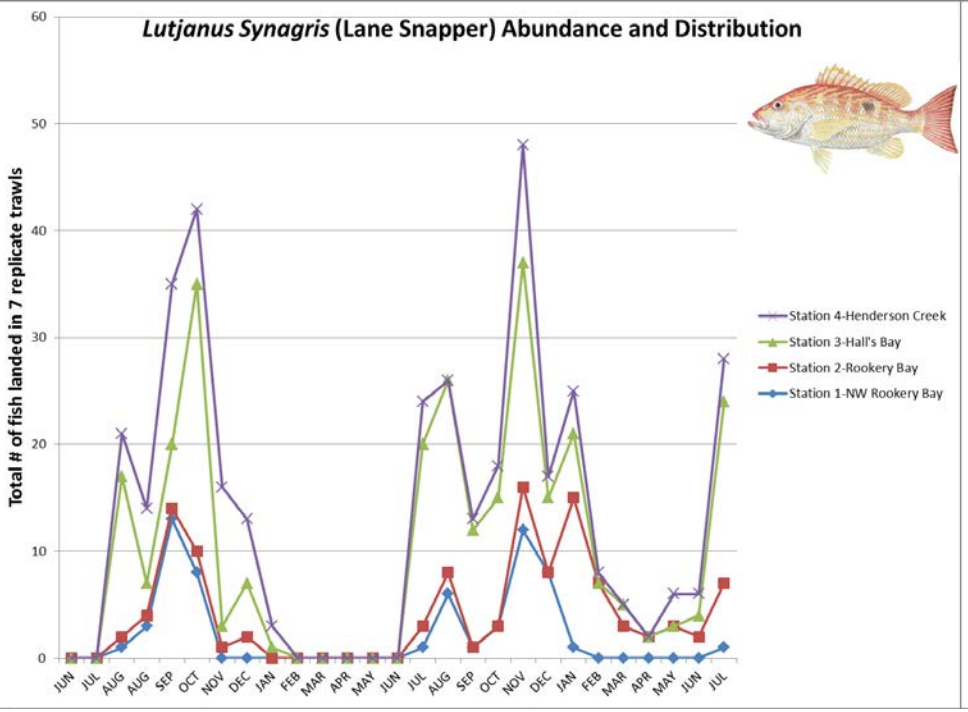
OYSTER REEF RESTORATION

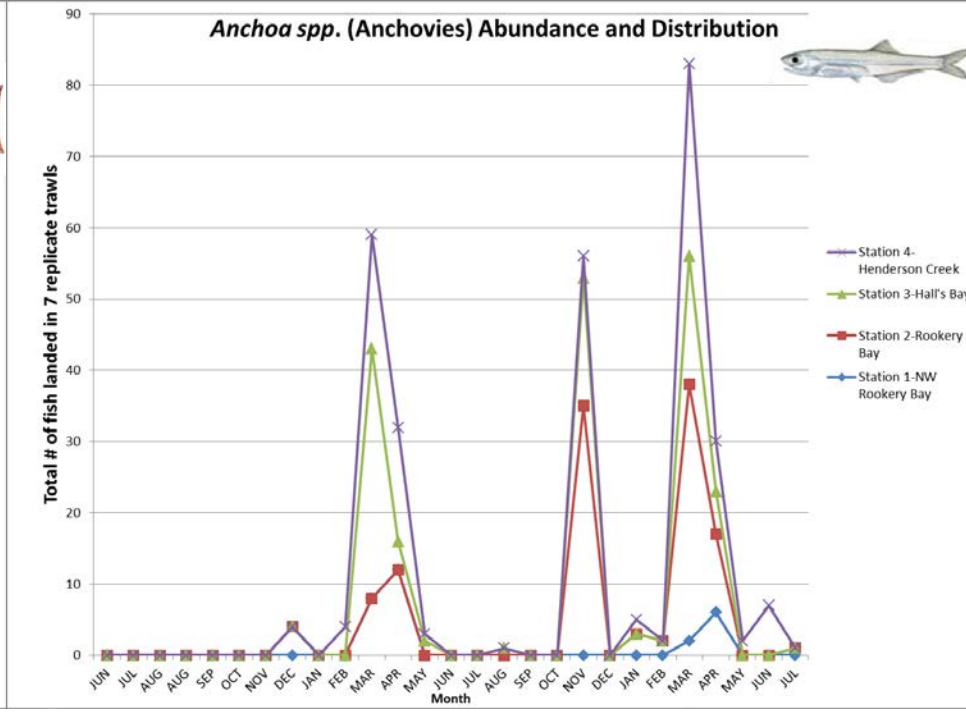
Students teamed up with the Sanibel Captiva Conservation Foundation to increase their restoration efforts in Clam Bayou on Sanibel Island. Students bagged and placed over 200 “oyster spat bags”.

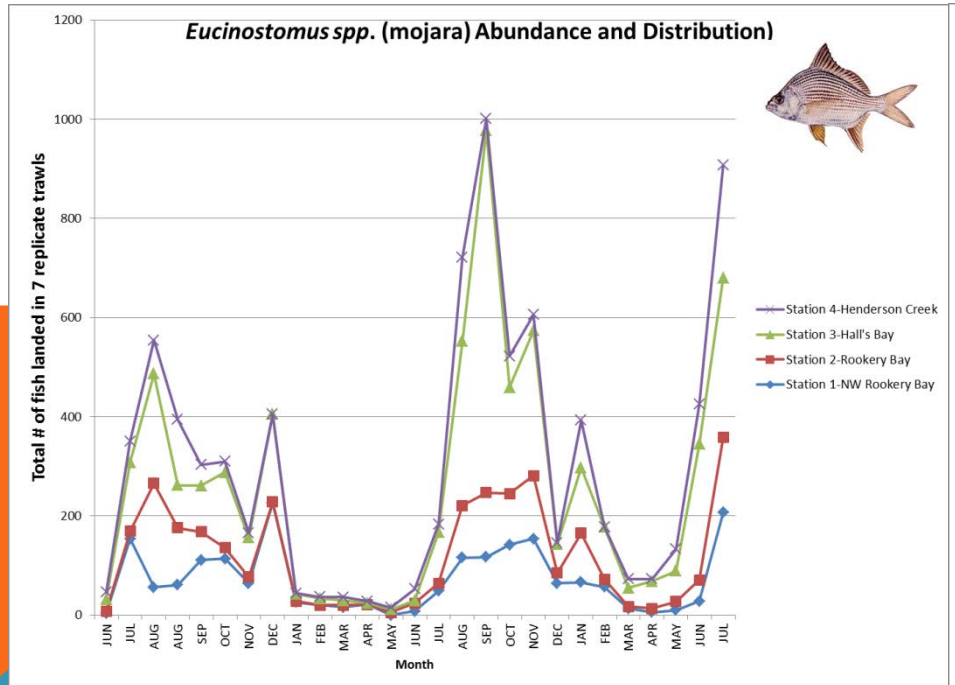
Wolfpack

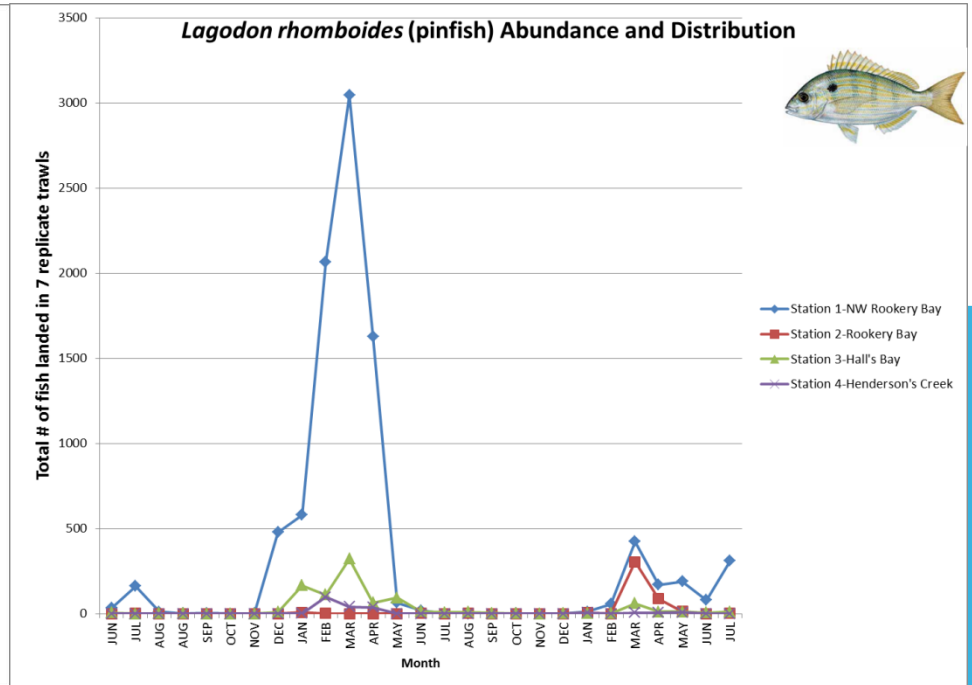
Established by the 1972 coastal zone management act National Estuarine Research Reserves (NERR) are a network of 28 coastal preserves formed by partnerships with the National Oceanic and Atmospheric Administration (NOAA) and the coastal states in which they reside.

NERR's emphasize coastal stewardship, long term research, water quality monitoring and education.


Lutjanus Synagris (Lane Snapper) Abundance and Distribution
Total # of fish landed in 7 replicate trawls
Station 4-Henderson Creek
Station 3-Hall's Bay
Station 2-Rookery Bay
Station 1-NW Rookery Bay


Anchoa spp. (Anchovies) Abundance and Distribution
Total # of fish landed in 7 replicate trawls
Station 4-Henderson Creek
Station 3-Hall's Bay
Station 2-Rookery Bay
Station 1-NW Rookery Bay
Month


Eucinostomus spp. (mojara) Abundance and Distribution)
Total # of fish landed in 7 replicate trawls
Station 4-Henderson Creek
Station 3-Hall's Bay
Station 2-Rookery Bay
Station 1-NW Rookery Bay
Month


Lagodon rhomboides (pinfish) Abundance and Distribution
Total # of fish landed in 7 replicate trawls
Station 1-NW Rookery Bay
Station 2-Rookery Bay
Station 3-Hall's Bay
Station 4-Henderson's Creek
Month

EFFECTS OF ALTERED FRESHWATER INFLOW ON FISH, SHRIMP AND CRABS OF THE 10,000 ISLANDS ESTUARY OF SOUTHWEST FLORIDA

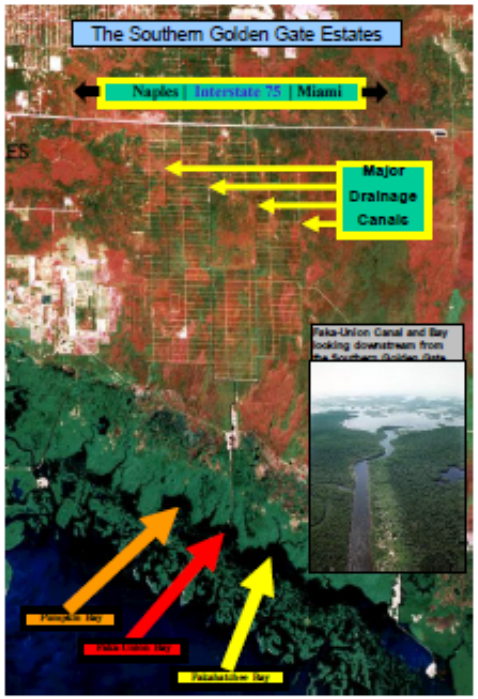
Patrick O'Donnell[1], Todd E. Hopkins[2], Michael Shirley[1]

[1]Rookery Bay National Estuarine Research Reserve - Florida Department of Environmental Protection

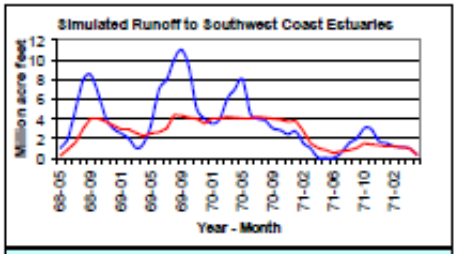
[2]Comprehensive Everglades Restoration Project – US Fish and Wildlife Service

Abstract / Introduction

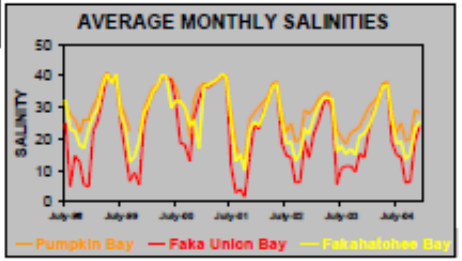
Pumpkin Bay, Faka Union Bay and Fakahatchee Bay lie downstream of the Southern Golden Gate Estates, a failed development which built 813 miles of roads and 138 miles of canals during the 1960's to drain the swamps of Collier County in SW Florida. Over-drainage through the Faka Union Canal has resulted in a significant decrease in Faka Union Bay compared to adjacent Pumpkin and Fakahatchee Bays. Canals and roads in the Southern Golden Gate Estates, will be removed in 2008 which will provide a more even distribution of water to the three bays. In July 1998, we began a stratified, random, fisheries-independent trawling program to establish current baseline distributions and relative abundances of fish and invertebrates prior to the restoration. The planned hydrologic restoration will reduce the flow out of the Faka-Union Canal dramatically and provide a more even distribution(sheet flow) of water to the coastal wetlands and bays of the 10,000 Islands.

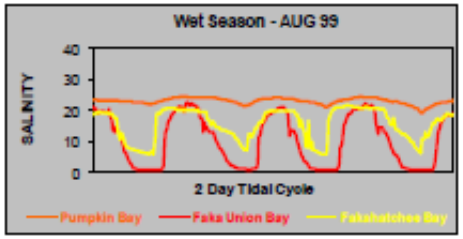


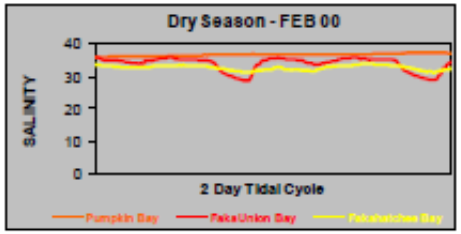
What We Know About Freshwater Flow



- Runoff from natural watersheds (without canals ----) is less variable and more sustained than flow from channelized wetlands (with canals ----) like the Southern Golden Gate Estates.
- Channelized flow creates extreme and abrupt salinity changes







Protocols

Materials and Methods

- Sites selected randomly in grids positioned downstream of the freshwater sources
- Five minute bottom trawls using a 20ft. trawl with 1/8" mesh at each site covering approximately 0.1 nm
- All fish are identified and measured (SL) as are pink shrimp(CL), blue crabs and stone crabs (CW)
- Protocols are based upon the Florida Marine Research Institutes Fisheries Independent Monitoring Program
- VOLUNTEERS are trained in fish identification and trawling protocols and are essential to this projects success

Differences Between Bays

Multi-Dimensional Scaling Technique

These figures represent the results of a multi-dimensional scaling(MDS) analyses of the data (numbers of fish caught for each species) collected during trawls. This statistical procedure first constructs similarity values that describe the relationship of the species composition of the catch data between each sampling site and season. The resulting matrix of similarity values for these data are then displayed on a graph with the relative position of the symbols representing the amount of similarity (closer together) or difference (further apart) in the species composition of the catch.

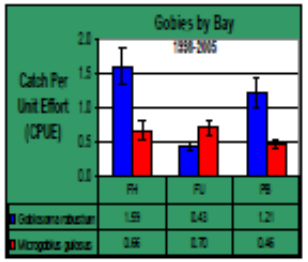
Possible Indicator Species:

- **Gobiosoma robustum** (code goby) prefers higher salinities, seagrass beds and algal mats (Robins, 1986)

Fakahatchee Bay and Pumpkin Bay exhibit higher salinities with more algal bycatch

- **Microgobius gulosus** (clown goby) prefer muddy bottom types (Robins, 1986)

Faka Union Bay exhibits lower salinities with little submerged vegetation and fine, silty mud

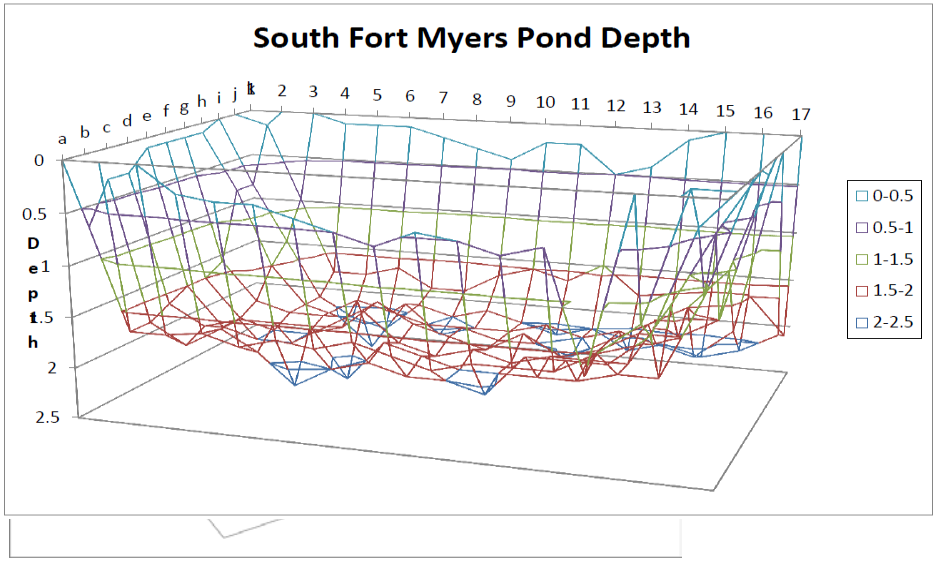


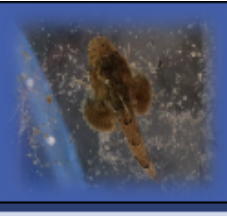
Conclusions

- All three bays exhibit significantly different daily, seasonal and annual salinity regimes
- Similarities in species composition using a multi-dimensional scaling technique indicate patterns related to season and location
- Relative abundance of two gobies appear to reflect environmental conditions in each bay
- Data presented here will generate performance measures to gauge impact of hydrologic restoration of the SGGE system

Acknowledgements

- Many thanks go to the multitudes of volunteers who have graciously donated their time and efforts over the years
- Rookery Bay NERR staff in Administration, Education, Research, Resource Management and Maintenance departments


South Fort Myers Pond Depth
a b c d e f g h i j k 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
0
0.5
1
1.5
2
2.5
Depth
0-0.5
0.5-1
1-1.5
1.5-2
2-2.5



Getting to The BOTTOM of Biodiversity

By: Derek Balling and Ramsey Fisher

Purpose: The purpose of this experiment to find and compare the biodiversity of different locations in the saltwater environment. The locations will have varying habitats, depths, and water qualities.

Hypothesis: If we test multiple locations for biodiversity, the location that has the sea grass habitat will have the most significant amount of biodiversity among the saltwater organisms.

Statistical Null: If we test multiple locations for number of species, the sea grass habitat will have the greatest number of species.

Procedure

Procedure: Our experiment primarily involves us setting up test sites in multiple locations, each with a varying environment. At each site, we will set up a standardized test zone, this will be a distance of 30 meters. This will be there area in which we throw the cast net. At each station there will be 4 throws and data collected immediately after each throw. After all the is data collected, the organisms will be released unharmed. While at the sites we will take a series of water quality tests. These include Ph, dissolved oxygen, salinity, ammonia, nitrite, nitrate, and turbidity. These results will be compared to the data collected by SCCF for accuracy. Photos will be taken of the sites as well as of all organisms. The experiment will also be videoed by the Go-Pro, while throwing the cast net and recording data. After all the tests are completed we will compare all the gathered information and reveal any patterns seen. We will rely mostly on the Shannon Weiner Biodiversity Index to show us the levels of biodiversity. This will show us which site, and thus what habitat, has the largest amount of biodiversity.

Variables

Independent Variable: Habitat of the station
Dependent Variable: Biodiversity level
Constant Variable(s): Tide, wind, water qualities(with slight deviation)
Control: None

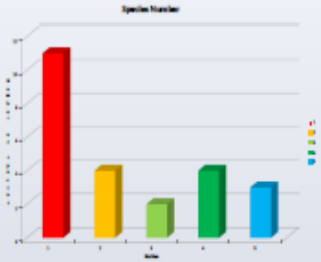
Abstract

The purpose of this experiment was to find and compare the level of biodiversity at all of our stations. This will allow us to discover which habitat has the greatest level of biodiversity. In this experiment we changed our independent variable, the habitat, each time we moved to a new station. Our dependent variable then followed suit and changed as the biodiversity changed to the new habitat. Using the Shannon Weiner Index, we showed that our first station (Seagrass/mud bottom), had the greatest level of biodiversity. Our other stations did produce many organisms, but none held more species than the first station. With all other contributing conditions remaining quite similar throughout the experiment, we could conclude that the habitat was the reason for the change in biodiversity. Only possible errors to have occurred may have been slight incorrect measurements of the organisms captured

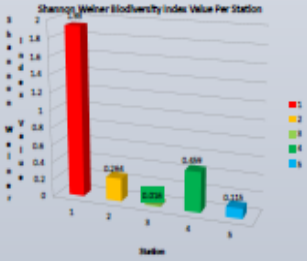
Background: In the marine world there are numerous habitats that range from coral reefs to open ocean. In this experiment, we exclusively looked at sea grass, sand, shell/rock, and mud bottom habitats that exist in the waters around the Sanibel Causeway (see photo attached).. The sea grass habitats are comprised of turtle grass and shoal grass. These grasses thrive in shallow waters, because they require sunlight to photosynthesize. Both of these grasses provide excellent habitat for many juvenile and small organisms. The mud, sand, and shell/rock bottoms provide less habitat for organisms to find protection and can be a reason why the organisms found here are more often than not in medium to large schools. In this experiment, we utilized a cast net to collect our data at each location. When fully open the net has a ten foot diameter, and has weights to sink the net to the bottom. Once on the bottom, the fisherman will close the net by pulling the rope, and thus the cast net, in to the shore. This method of catching the fish causes minimal harm to the organisms and the environment in which they live. The fish are kept in tanks with aerators to ensure survival and released healthy back into the environment once the data has been collected and recorded at each site. I chose this experiment because in find great interest in the marine world and the organisms within it. I found much interest in the trawling trip on the pontoon and saw it as a good independent research project. I had the tools and the locations to run the tests. The data we collect will be compared using the Shannon Weiner Biodiversity Index. This equation compares all of the data we have collected and gives us a value for the level of biodiversity that we can compare from station to station.

Shannon Weiner Biodiversity Graphs

Number of Species Per Location



This graph depicts the level of biodiversity found at each station. The Shannon Weiner index was used to calculate these results. The Shannon Weiner is used to measure species richness and evenness.



Station 1: Seagrass/ Mud bottom
Station 2: Sand/ Seagrass Bottom
Station 3: Shell/ Rock Bottom
Station 4: Seagrass/ sand, Shell Bottom
Station 5: Sand Bottom

Discussion

We were driven to conduct this experiment to find the biodiversity of different locations having different bottom structures. We tested this by changing one variable, the structure of the bottom habitat, by changing location. Our hypothesis was that the location mostly comprised of seagrass would yield the greatest biodiversity index, measured by the Shannon wiener index. The Shannon Wiener Index indicates how an ecosystem is doing as a whole. The data we collected proved our hypothesis correct. The station most entirely comprised of seagrass, station 1, produced the largest biodiversity. Giving us a Shannon Weiner Index Value of 1.93. This location had a total of 11 species. An example of this is if a species of fish that only feeds on a smaller species of invertebrates and we find a large number of those small invertebrates we would expect to see a large thriving abundance of that larger species. This data would allow us to further conduct this experiment by using the same locations in a later date after a natural or manmade event that may effect the habitat, thus affecting the biodiversity. This would give an over view of how the ecosystem was affected and how it is progressing through time. Possible errors include inaccurate measurements and alterations to the area the net covered when thrown.

R/V OREGON II
R332
SAFETY FIRST!

10 SHOTS
CRANE OPERATOR
HAND SIGNALS
DANGER
NO
SMOKING

SC.912.N.4 :As tomorrows citizens, students should be able to identify issues about which society could provide input, formulate scientifically investigable questions about those issues, construct investigations of their questions, collect and evaluate data from their investigations, and develop scientific recommendations based upon their findings.
LACC.RST.910.1.1 - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
Lexile Level=1430

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Facts/Examples=Blue
Statistics=Green
Experts/Opinions=Black
Unknown Vocabulary=Red

To date, we have explored less than five percent of the ocean

¶1 Much remains to be learned from exploring the mysteries of the deep. The ocean is the lifeblood of Earth, covering more than 70 percent of the planet's surface, driving weather, regulating temperature, and ultimately supporting all living organisms. Throughout history, the ocean has been a vital source of sustenance, transport, commerce, growth, and inspiration.
Yet for all of our reliance on the ocean, 95 percent of this realm remains unexplored, unseen by human eyes. NOAA's Office of Ocean Exploration and Research is leading efforts to explore the ocean by supporting expeditions to investigate and document unknown and poorly known areas of the ocean. These expeditions represent a bold and innovative approach by infusing teams of scientist-explorers with a "Lewis and Clark" spirit of discovery and equipping them with the latest exploration tools.

¶2 **Weather** NOAA's weather programs touch the lives of every American. Every day, decisions are made based on NOAA weather information – from the mundane "should I pack an umbrella today?" to the most critical and potentially life-saving.With the mission to protect life and property, and enhance the United States' economy, NOAA's National Weather Service is the sole official voice of the U.S. government for issuing warnings during life-threatening weather situations. Covering the sun to the seas, the National Weather Service provides local and regional forecasts, and emergency alerts for severe storms, tornadoes, hurricanes, floods, extreme heat, winter storms, fire threats, tsunamis and solar flares. From its national centers to its 122 Weather Forecast Offices and 13 River Forecast Centers, the National Weather Service is watching over the nation and your neighborhood. Weather and climate sensitive industries in the United States account for about one-third of the nation's Gross Domestic Product. Marine, aviation and space interests rely on National Weather Service information, alerts and warnings. In addition, NOAA has a responsibility to support the growth of an environmental information enterprise, a partnership between government, academia and the private sector. These services are supported by organizations throughout NOAA, including NOAA's Satellite and Information Service, which maintains the satellites and data used in weather forecasting as well as historical climate records, and research and products provided by NOAA's Office of Oceanic and Atmospheric Research and the National Ocean Service to improve forecasting ability.

¶3 **Ocean** The ocean covers 71 percent of the Earth's surface and contains 97 percent of the planet's water, yet more than 95 percent of the underwater world remains unexplored. The ocean and lakes play an integral role in many of the Earth's systems including climate and weather. The ocean supports the life of nearly 50 percent of all species on Earth and helps sustain that life providing 20 percent of the animal protein and five percent of the total protein in the human diet. One of every six jobs in the United States is marine-related and over one-third of the U.S. Gross National Product originates in coastal areas. The ocean is key to transportation, recreation and its resources may hold the cures to many diseases. NOAA protects, preserves, manages and enhances the resources found in 3.5 million square miles of coastal and deep ocean waters. NOAA's National Ocean Service provides products, services and information that promote safe navigation, support coastal communities, sustain marine ecosystems, and mitigate coastal hazards.

¶4 **Fisheries** NOAA is dedicated to protecting and preserving the nation's living marine resources through scientific research, fisheries management, enforcement and habitat conservation. NOAA's National Marine Fisheries Service (NOAA Fisheries) is the lead federal agency responsible for the stewardship of the

SC.912.L.17: Recognize possible changes in an ecosystem (biodiversity) that can result from natural catastrophic events, changes in climate, and human activity.

SC.912.L.17:Recognize that living things in oceans and fresh water are affected by the location, availability of light, depth of the water, and temperature

LACC.RST.910.1.1 - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
Lexile Level=1450

NOAA TEACHER AT SEA
STEVEN WILKIE
ONBOARD NOAA SHIP *OREGON II*
JUNE 23 — JULY 4, 2011

Mission: Summer Groundfish Survey
Geographic Location: Northern Gulf of Mexico
Date: June 24, 2011

The Oregon II after repairs are completed ready to set sail.

Facts/Examples=Blue
Statistics=Green
Experts/Opinions=Black
Unknown Vocabulary=Red

¶1 **A Brief Introduction:**My name is Steven Wilkie, a teacher from South Fort Myers High School — go Wolfpack — in Lee County Florida . I have the distinct honor of serving as a NOAA Teacher at Sea this summer aboard NOAA Ship *Oregon II* as part of NOAA's summer ground fish survey. It is my hope that my passion for marine education will come through in this blog and that you can get a better understanding of what it is that NOAA scientists do and the importance of their work. I look forward to sharing the adventure with all of you. You can listen to brief interview from WGCU radio (Lee County's local public radio station at Florida Gulf Coast University) at the following link http://wgcu.org/audioplayer/12947.aspx

Although not aboard as mighty a ship as the Oregon II, grants through NOAA allow us (that's me on the right) to explore our own little part of the ocean, in this case the Estero Bay Estuary.