Using GIS Technology to Map Oyster Habitat in Sarasota County Waters

Charlotte Harbor NEP
Conservation Lands Stewardship
Conference
September 13, 2012

Kathryn L. Meaux
Environmental Scientist
Sarasota County Water Resources

Sarasota County

Oyster Habitat Mapping

- *Oyster Conservation and Sustainability*
- *Why Oysters are Important*
- *Historical Data*
- *Our mission*
- *Strategy*
- *Mapping methods*
  - *Creek Methods*
  - *Bay Methods*
- *Habitat Categories*
- *What's Next*

Conservation

- Conservation Lands Important
  - Native landscapes
  - Native Flora
  - Native Fauna
  - Threatened/Endangered Species Protection
  - Greenspace and Wildlife Corridors
- Oyster Habitat Conservation Important

Conservation /Restoration Efforts

- *Chesapeake Bay*
- *Natural Resources Conservation Service*
  - *Northwest*
- *The Nature Conservancy*
  - *North and South Carolina*
  - *Georgia*
  - *Florida*
  - *Alabama*
  - *Mississippi*
  - *Louisiana*
  - *Texas*

Crassostrea virginica
The Eastern Oyster

Oysters Are Important Because They:
- *Are Adapted to a Wide Range of Environmental Conditions*
- *Provide Essential Habitat to Many Aquatic Organisms*
- *Are an Important Food Source for Many Organisms*
- *Improve Water Quality Through Filtration Mechanism*
- *Stabilize bottom sediments*
- *Dissipate wave energy – protect shoreline*
- *Are Key Bioindicators of Ecosystem Health*
- *Are Delicious – Harvested for Human Consumption*

Environmental Factors

- *Eurytopic organisms*
- *Salinity*
  - *Optimal salinity range 10ppt – 28ppt*
- *Temperature*
  - *Optimal temperature range – 59° to 77° F*
- *Current*
  - *Steady*
  - *Non-turbulent*
  - *Strong enough to carry feces, pseudofeces, heavy sediments, and liquid and gaseous metabolites away*
  - *Provide oxygen and food*

Environmental Factors

- *Substrate*
  - *Firm and stable conditions*
  - *Shell (reef) materials*
  - *Firm, sticky mud and shell mixtures*
  - *Cultch material – shell, rock*

- *Limited predation and disease*
  - *Oyster drill*
  - *American Oyster Catcher*
  - *Sea stars*
  - *Perkinsus marinus (Dermo)*
  - *MSX*
  - *Roseovarius*

What is the Issue?

- *Oyster structure has been identified as the most imperiled marine habitat in the world.*
- *Experts assert that world-wide oyster populations have been seriously declining and estimate the rate of loss at 85% globally over the last two centuries.*
  - *Intense Over –Harvesting*
  - *Little Restoration Effort*
  - *Decline in Estuarine Water Quality*
  - *Changes in the Salinity Regime*
  - *Extensive Coastal Watershed Development and Shoreline Alteration*
 - *Disease and Predation*

Historical Data

- *John Stevely – SeaGrant*
- *1883 Maps*
- *SBEP 1950's and 2001 Maps (SBEP Study Area)*
- *CHNEP 1999 Maps (Lemon Bay and DARB)*
- *1955 Maps*
- *Mike Jones – DARB*
- *Photo Science –2010*

Our Mission

- *Locate and identify all types of oyster habitat in Sarasota County bays, estuaries, and creeks*
- *Develop current, detailed baseline maps of all oyster habitats*
- *Document upstream extent of oyster habitat in coastal creeks*
- *Analyze the data to help identify potential habitat restoration needs and sites*

Strategy

- *Develop effective oyster mapping methods*
  - ◦ *Relatively short time frame*
  - ◦ *Cost effective – Using existing resources*
  - ◦ *Minimum staff time*
- *Model categories after FWRI mapping efforts*
  - ◦ *Would not quantify (Areal Extent)*
  - ◦ *No health determination (live/dead)*
- *Begin with creeks to test methods*
- *Map bays after creeks*
- *Develop Methods Manual*
- *GIS Analysis*

Cockroach Bay
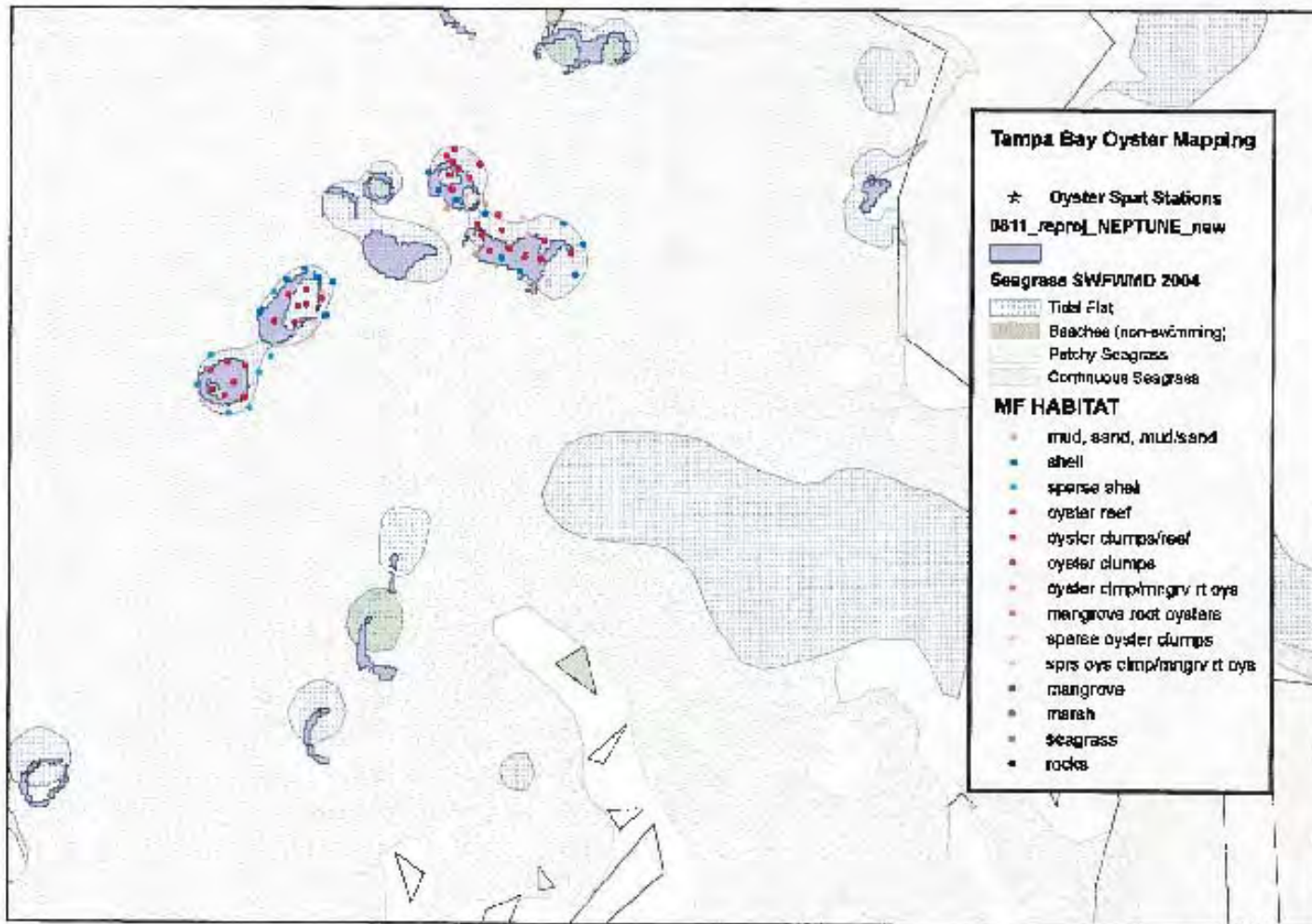
Ideal Mapping Conditions

▸ *Seasonal daytime low tides*
▸ *Predicted negative low tides*
  ◦ *Fall and Spring extremes*
▸ *Last hour of outgoing tide*
▸ *Five to six hour window*
▸ *Good weather*
▸ *Shallow-draft boat*
▸ *Experienced captain*

Mapping the Creeks
The "Old Way"

- *Laminated aerial maps of 17 creek shorelines*
- *Developed field log sheet*
- *Developed codes for habitats*
- *Scheduled trips relative to tide*
- *Drew oyster habitats on maps using permanent marker*
- *Coded habitats on map*
- *Transferred data to aerial maps in ArcMap*

County Creeks

Whitaker Bayou	Shakett Creek
Hudson Bayou	Curry Creek
Phillippi Creek	Hatchett Creek
Matheny Creek	Alligator Creek
Elligraw Bayou	Woodmere Creek
Clower Creek	Forked Creek
Catfish Creek	Gottfried Creek
North Creek	Ainger Creek
South Creek	

Habitat Codes

- S – Shell
- SS – Scattered Shell
- C – Clumps
- SC – Scattered Clumps
- R – Reef
- MA – Mangrove Apron
- MRO – Mangrove Root Oysters
- SW – Seawall
- RR – Rip/Rap

- SW–1 ≤ 6"; 1 layer
- SW–2 >6"≤12"; > 1 layer
- SW–3 >12"≤18"; > 1 layer
- SW–4 >18"; > 1 layer
- RR–1 ≤ 6"; 1 layer
- RR–2 >6"≤12"; > 1 layer
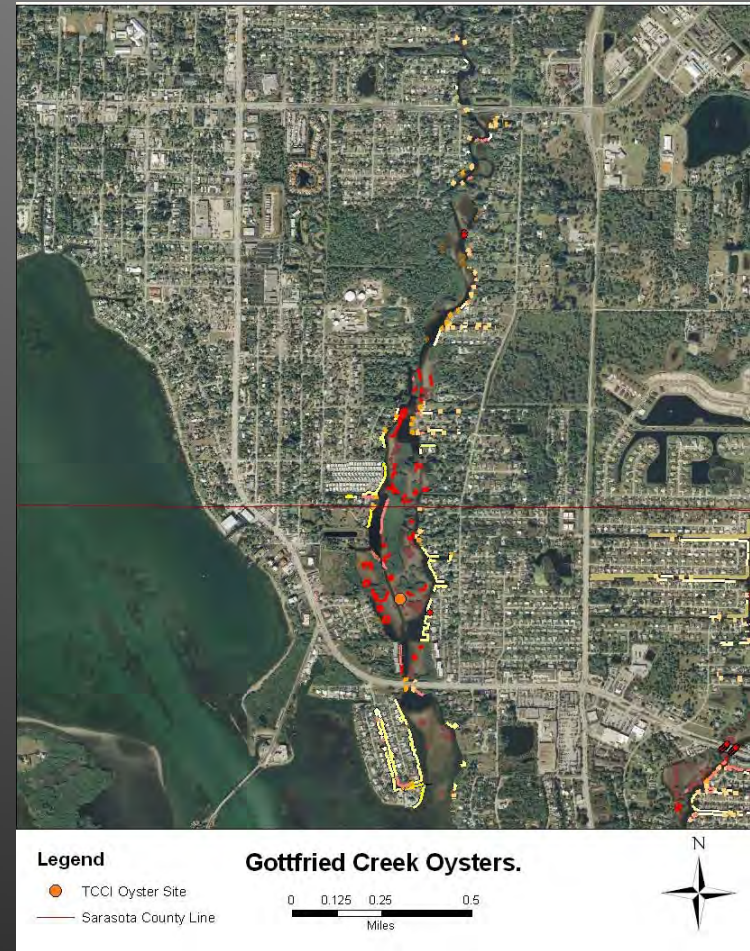- RR–3 >12"≤18"; > 1 layer
- RR–4 >18"; > 1 layer

Laminated Shorline Map

SOUTH CREEK - 2

Examples of Creek Maps

Whitaker Bayou Oysters

Legend
- TCCI Oyster Site

0   0.03   0.06   0.12
Miles

Gottfried Creek Oysters.

Legend
- TCCI Oyster Site
- Sarasota County Line

0   0.125   0.25   0.5
Miles

The New Way

GETEC Rugged Tablet Computer

Mapping the Bays
The "New and Improved Way"

- *Tablet Computer*
- *Arc Map Aerials – real time GPS*
- *Created Shapefiles*
  - *Points – pilings, single clumps*
  - *Lines – seawalls, riprap, MRO*
  - *Polygons – reefs, mangrove aprons, areas of scattered clumps and shells*
- *Record directly on aerial – editing tool*
- *Insert code in appropriate field box*
  - *Habitat Code (SW-1, RR-1, etc.)*
  - *Condition Code*
  - *Date, Waterbody, etc.*
- *Download files*

2011 Habitat Codes

- S – Shell
- SS – Scattered Shell
- C – Clumps
- SC – Scattered Clumps
- R – Reef
- MA – Mangrove Apron
- MRO – Mangrove Root Oysters
- SW – Seawall
- RR – Rip/Rap
- P – Pilings
- D – Docks (floating)

- SW–1 ≤ 6"; 1 layer
- SW–2 >6"≤12"; > 1 layer
- SW–3 >12"≤18"; > 1 layer
- SW–4 >18"; > 1 layer
- RR–1 ≤ 6"; 1 layer
- RR–2 >6"≤12"; > 1 layer
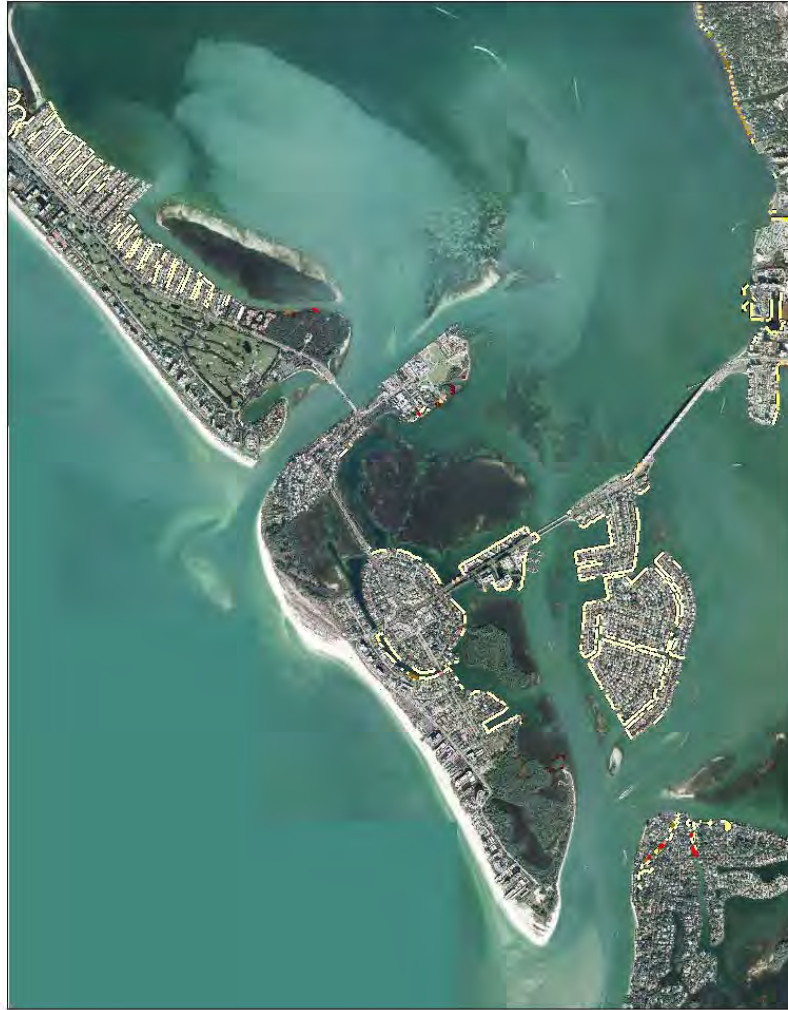- RR–3 >12"≤18"; > 1 layer
- RR–4 >18"; > 1 layer

Condition Codes

0 – Mostly Dead

1 – Live/Dead

2 – Mostly Live

Example of Bay Maps

Sarasota Bay Oysters 2011

GIS Analysis

- *Analysis ongoing*
- *Developing a classification system to quantify.*
  - *Oyster Type: Shell, Clumps, Reef, Root, Apron*
  - *Coverage: Scattered/Not Scattered*
  - *Habitat Type: SW, RR, P, Substrate, Mangrove*
  - *Abundance: 1, 2, 3, 4,*
  - *Height based on SW/RR/P codes (band Height)*
  - *Thickness based on estimated average thickness*
  - *Numeric buffer distance for all types except for reef*
  - *Reef acreage can be calculated from polygon*

Oyster Habitat Categories

SW-1 Oysters

SW-2 Oysters

SW–3 Oysters

SW –3 Oysters and Piling Oysters

SW-4 Oysters

Rip-Rap Oysters

Mangrove Root Oysters

R – Patch Reef

R – String Reef

MA – Mangrove Apron/Fringe

MA – Mangrove Apron/Fringe

SC/SS – Scattered Shell and Clumps

SS – Scattered Shell

What's Next?

- *Complete bay mapping*
  - *Fall 2012/Winter 2013*
- *Complete GIS analysis*
  - *Spring 2013*
- *Report*
  - *Mid-2013*
- *Participating in the CHNEP SW FL OWG*
- *Participate in other working groups*
- *Share methodology*

Acknowledgements

- *Rene Janneman, Sarasota County Water Resources, Field Assistance*
- *Jon Perry, Sarasota County Water Resources, GIS and Field Assistance*
- *James Grimes, Sarasota County, GIS Analysis*

Sources

- Beck, M.E., R.D. Brumbaugh, L. Airoldi, A. Carranza, L.D. Coen, C. Crawford, O. Defeo, G.J. Edgar, B. Hancock, M.C., Kay, H.S. Lenihan, M.W. Luckenbach, L.L. Toropova, G. Zhang, and X. Guo. 2011. Oyster Reefs at Risk and Recommendations for Conservation, Restoration, and Management. BioScience 61:107–116.

- Brumbauth, R.D., M.W. Beck, B. Hancock, A.W. Meadows, M. Spalding, and P.Z. Ermgassen. 2010. Changing a Management Paradigm and Rescuing a Globally Imperiled Habitat. National Wetlands Newsletter. November–December 2010:16–20.

- Cake, F.W., Jr. 1983. Habitat Suitability Index Models: Gulf of Mexico American Oyster. U.S. Department of the Interior Fish and Wildlife Service. FWS/OBS–82/10.57.37.pp.

- Charlotte Harbor Estuary Program,

- Kennedy, V.S. and L.L. Bresch. Biology of the Oyster. Maryland Sea Grant Publication. UM–5G–TS–81–04. 304 pp.

Questions?