

# Comprehensive Approach to Oyster Restoration in Charlotte Harbor National Estuary Program

*Estero Bay ABM – May 13, 2013*

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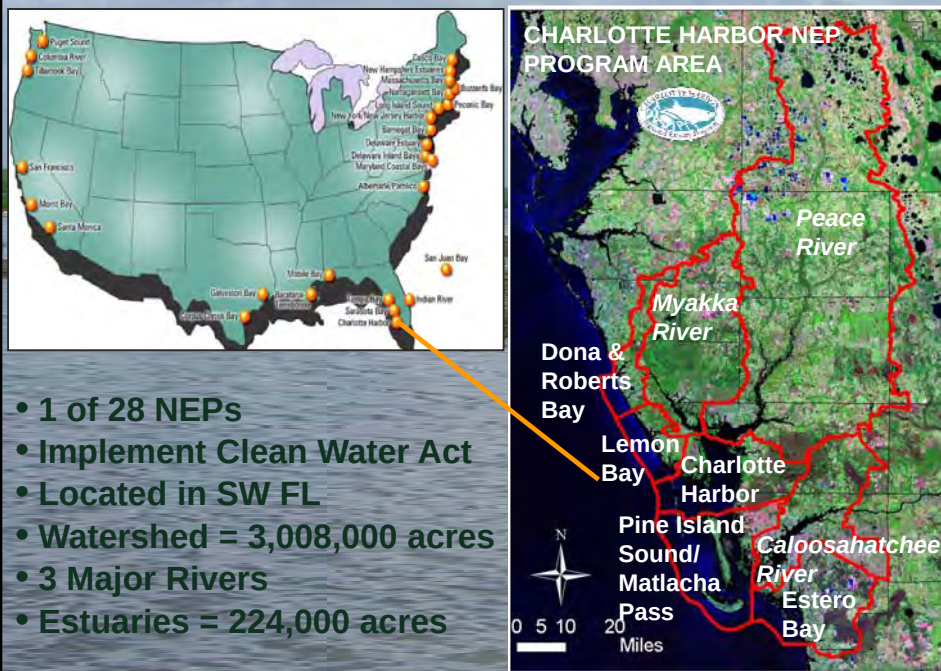
Background Photo: FGCU

**Purpose: Share approach & goals for oyster habitat restoration in Charlotte Harbor NEP.**

## **Topics:**

- **Reminder of what & where CHNEP is**
- **Why restoring oyster habitat is important**
- **How restoration needs were determined**
- **What restoration needs & goals resulted**
- **What follow-up actions resulted**
- **What the next steps are for restoration**

## What & Where is Charlotte Harbor NEP?



## CHNEP Estuaries are Diverse, Productive & Complex





## CHNEP Includes 14 Estuary Segments

- Dona & Roberts Bays
- Lemon Bay Upper & Lower
- Gasparilla Sound/Cape Haze
- Tidal Myakka & Peace Rivers
- Charlotte Harbor West Wall, East Wall & Proper
- Pine Island Sound
- Matlacha Pass
- San Carlos Bay
- Tidal Caloosahatchee River
- Estero Bay

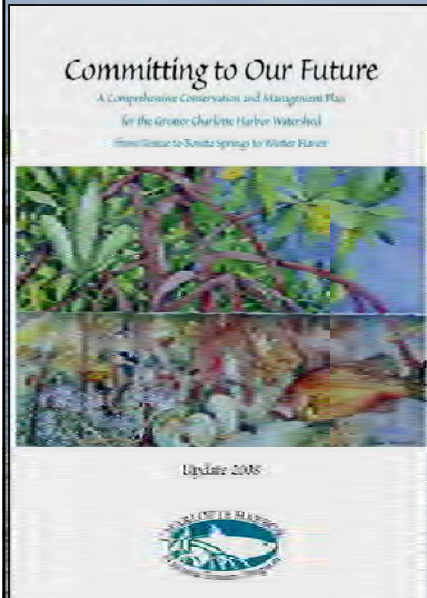


## CHNEP Is a Partnership that Makes Cooperative, Scientifically Sound, Consensus Based Decisions



Photos: CHNEP

## CHNEP Actions are Guided by the Comprehensive Conservation & Management Plan (CCMP)



- 4 CHNEP Priority Problems are:**
- Hydrologic Alterations
  - Water Quality Degradation
  - Fish & Wildlife Habitat Loss
  - Stewardship Gaps

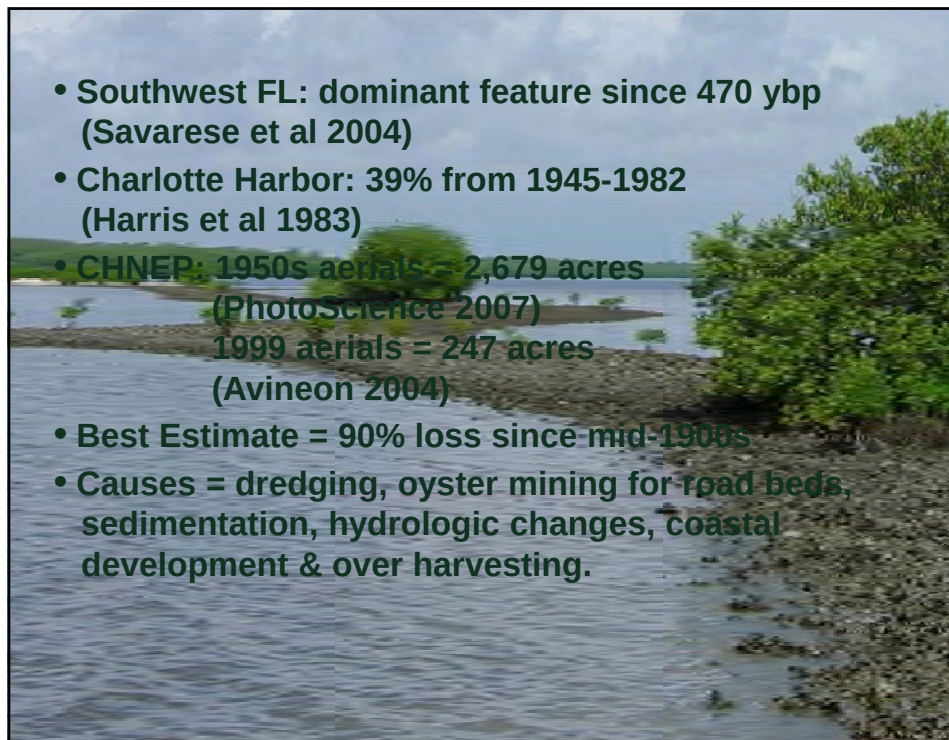
**Oyster restoration addresses all 4 Priority Problems & implements 10 Objectives & Actions.**

## Why is Restoring Oyster Habitat Important?

### Oyster Habitats have Declined Dramatically

- **Worldwide: most imperiled marine habitat** (Brumbaugh et al 2010)
- **Worldwide: 85% loss** (Beck et al 2011)
- **US: 60% area & 85% biomass loss** (zuErmgassen 2012)
- **South Florida: 90-99% of historic reefs** (Beck et al 2009)
- **West Florida: depletion of reefs from 1876-1898** (Smeltz 1898)

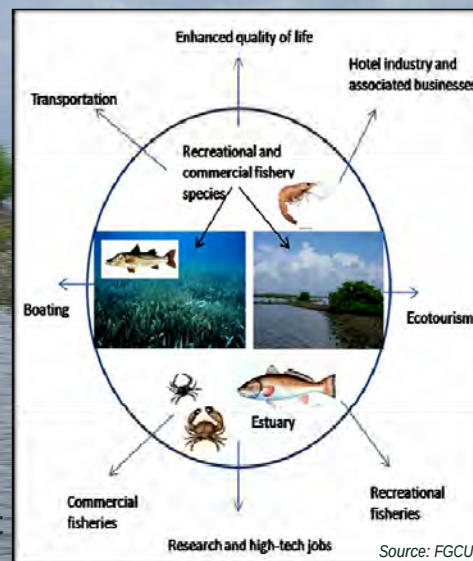




- Southwest FL: dominant feature since 470 ybp (Savarese et al 2004)
- Charlotte Harbor: 39% from 1945-1982 (Harris et al 1983)
- CHNEP: 1950s aeriels = 2,679 acres (PhotoScience 2007)  
1999 aeriels = 247 acres (Avineon 2004)
- Best Estimate = 90% loss since mid-1900s
- Causes = dredging, oyster mining for road beds, sedimentation, hydrologic changes, coastal development & over harvesting.

## Oysters Provide Essential Ecosystem Services

- Provide structure for complex biological communities, including permanent & transient species.
- Improve water quality by filtering water, reducing turbidity & nutrients & transferring energy.
- Stabilize sediments, shorelines & adjacent habitats.
- See CHNEP Oyster Habitat Restoration Plan Table 1 for details & references.



## Oysters Also:

- Serve as indicators of estuarine health in CHNEP.
- Are basis for TNC Charlotte Harbor Marine Priority Area
- Act as “charismatic mega-fauna” which link scientists, citizens & resource managers & enhance stewardship.



## How were CHNEP Oyster Restoration Needs Determined?

### CHNEP Shellfish Restoration Workshop – Feb 2011

- with TNC Oyster Restoration Collaboration Workshop
- Reviewed available scientific & permitting information
- Agreed to establish scallop & oyster working groups



### CHNEP Received TNC Support to Develop Oyster Habitat Restoration Plan – Spring 2012

#### Formed the Southwest FL Oyster Working Group

- Met 5 times from April – Sept 2012
- >40 participants from >26 organizations & agencies
- Provided technical assistance & review for CHNEP Oyster Habitat Restoration Plan



**Clarified the Purpose of the Plan:**

Provide a technically sound, consensus-based approach for oyster habitat restoration in the CHNEP estuaries.

**Defined Oyster Habitat for this Plan:**

Substrate upon which a self-sustaining native oyster (*Crassostrea virginica*) community develops, providing habitat for commensal flora & fauna.

**Utilized TNC's Conservation by Design Approach:**

- Plan, design & select sites for successful restoration
- Identify priorities through data compilation
- Develop strategies to restore to fullest functionality
- Implement strategies
- Measure effects of implemented restoration
- Select & monitor goal-related success criteria

**SW FL Oyster Working Group Discussed:**

- Essential & limiting conditions for oyster restoration
- Data availability - GIS, published &/or local knowledge
- Oyster habitat restoration methods & success criteria
- Oyster monitoring & mapping needs
- Federal, state & regional regulatory requirements

**CHNEP Developed GIS Based Oyster Habitat Restoration Suitability Model:**

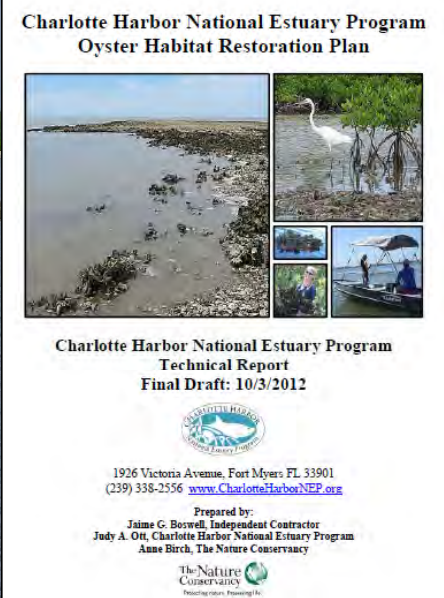
- Assumes larvae are plentiful & substrate is limiting
- Includes relevant factors that quality spatial data
- Creates categories of percent suitable for restoration

**Prepared CHNEP Oyster Habitat Restoration Plan:**

- Includes long term goals & short term actions
- Was approved by CHNEP Management Conference
- Will be updated regularly - at least by 2020

## What are the Resulting CHNEP Oyster Restoration Needs & Goals?

**Charlotte Harbor National Estuary Program  
Oyster Habitat Restoration Plan**



Charlotte Harbor National Estuary Program  
Technical Report  
Final Draft: 10/3/2012

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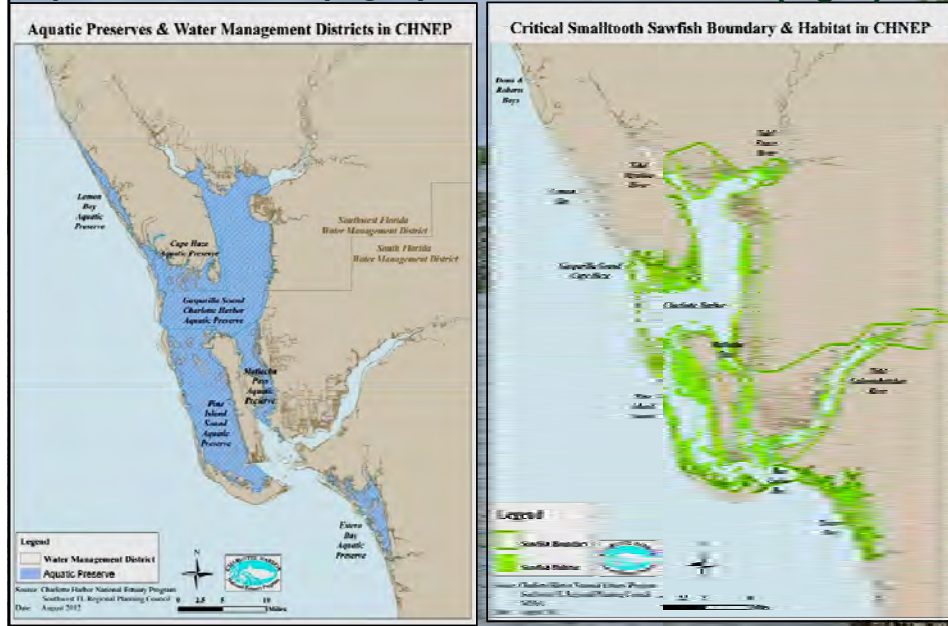
- Background
- Local Context
- Permitting Considerations
- Planning for Success
- Restoration Suitability Model
- Other Spatial Considerations
- Restoration Goals
- Restoration Strategies
- Success Criteria
- Monitoring & Mapping Needs
- Steps to Attain Goals
- Cost Estimates
- Funding Opportunities
- Community Stewardship

### Summarizes Regulatory Requirements (Table 2)

| Authority                                | Statute                                                               | Agency          | Role                                                                                                                                                   |
|------------------------------------------|-----------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| NWP 27 or Individual Permit              | Sec 10 RHA;                                                           | USACE           | Lead agency, reviews applications & determines if NWP 27, individual permit &/or Sec 7 consultation is required                                        |
|                                          | Sec 404 CWA                                                           |                 |                                                                                                                                                        |
|                                          | Endangered Species Act                                                | NMFS            | Sec 7 consultation if USACE determines may affect smalltooth sawfish & sea turtles or their habitat                                                    |
|                                          |                                                                       | USFWS           | Sec 7 consultation if USACE determines may affect threatened or endangered species other than fish & sea turtles                                       |
| ERP & Sovereign Submerged Lands Approval | Chapt 373 FS (ERP); 18-20 FAC (Aquatic Pres); 18-21 FAC (State Lands) | FDEP            | Reviews applications for oyster habitat restoration projects for consistency with state statutes                                                       |
|                                          |                                                                       | SWFWMD or SFWMD | Reviews permit applications for oyster habitat restoration projects when FDEP is applicant or if part of larger project being reviewed by the district |



## Summarizes Resource Management Considerations Aquatic Preserves (Fig. 3)      Sawfish Habitat (Fig. 5)



### Oyster Habitat Restoration Suitability Model (RSM):

- Uses best spatial (GIS) data to identify areas suitable for restoration
- Provides regional map of potential & priority restoration areas in each estuary
- Directs partners to potential restoration sites for more site specific monitoring & evaluation

### How the RSM Works:

- Identify Factors – relevant & regional GIS data available
- Set value scale for each factor = 0-1 where 0 is not suitable & 1 is highly suitable
- Multiply each factor X scale value (in attribute table)
- Calculate end RSM score = factor 1 score X factor 2 X...
- Final RSM scores = 0-1 = 0% - 100% suitable
- Resulting scores are displayed geographically on maps

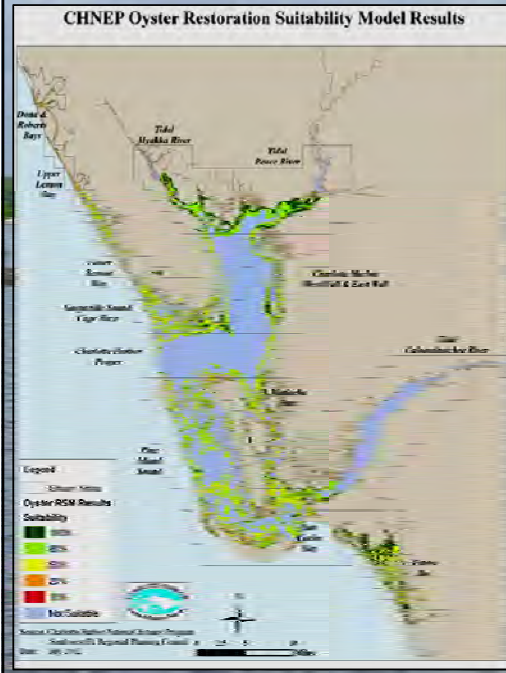
| <b>Restoration Suitability Model Factors (Table 4)</b> |                                       |                                                         |                                   |                                                                                |
|--------------------------------------------------------|---------------------------------------|---------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------|
| Component                                              | Factor                                | Metric                                                  | Source                            | Model Scoring                                                                  |
| Avoidances                                             | Seagrass Habitat                      | Seagrass Persistence<br>1999, 2001, 2004<br>2006 & 2008 | SWFWMD,<br>SFWMD,<br>Janicki 2009 | SAV Absent = 1<br>SAV Present 1-4 yrs = 0.5<br>SAV Present 5 yrs = 0           |
|                                                        | Aquaculture Leases                    | Lease Area<br>+ 30' buffer                              | FDACS                             | Lease Absent = 1<br>Lease Present = 0                                          |
|                                                        | Boat Channels                         | Official<br>Boat Channels                               | WCIND,<br>NOAA<br>Bathymetry      | Channel Absent = 1<br>Channel Buffer (75') = 0.2<br>Channel Present (150') = 0 |
| Biological,<br>Chemical<br>& Physical                  | Depth                                 | Depth at MLW                                            | NOAA<br>Bathymetry                | 0-3' = 1<br>3-6' = 0.8<br>> 6' = 0<br>dredged or spoil = 0                     |
|                                                        | Tidal River<br>Salinity<br>Isohalines | Wet Season<br>3 psu isohaline                           | SWFWMD,<br>PRMRWSA,<br>SFWMD      | Downstream of<br>Isohaline = 1<br>Upstream of<br>Isohaline = 0                 |

**Factors Evaluated but Not Included in RSM (Table 3)**  
includes metric, source, evaluation & future action  
for each:

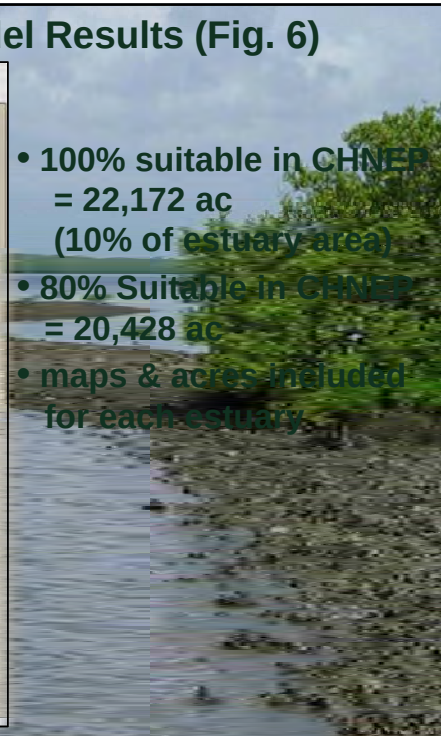
- 
- Dissolved Oxygen
  - Salinity – Ave. Annual
  - Salinity – Wet Season
  - Temperature
  - Sediment Type
  - Larval Distribution
  - Water Flow
  - Disease
  - Current Oyster Locations
  - Shellfish Harvesting Areas
  - Historic Oyster Locations
  - Managed Areas
  - Shoreline Type
  - Identified Climate Change  
Habitat Migration Shorelines
  - Sea Level Rise
  - Sawfish “hotspots”
  - Aquaculture Lease Buffers



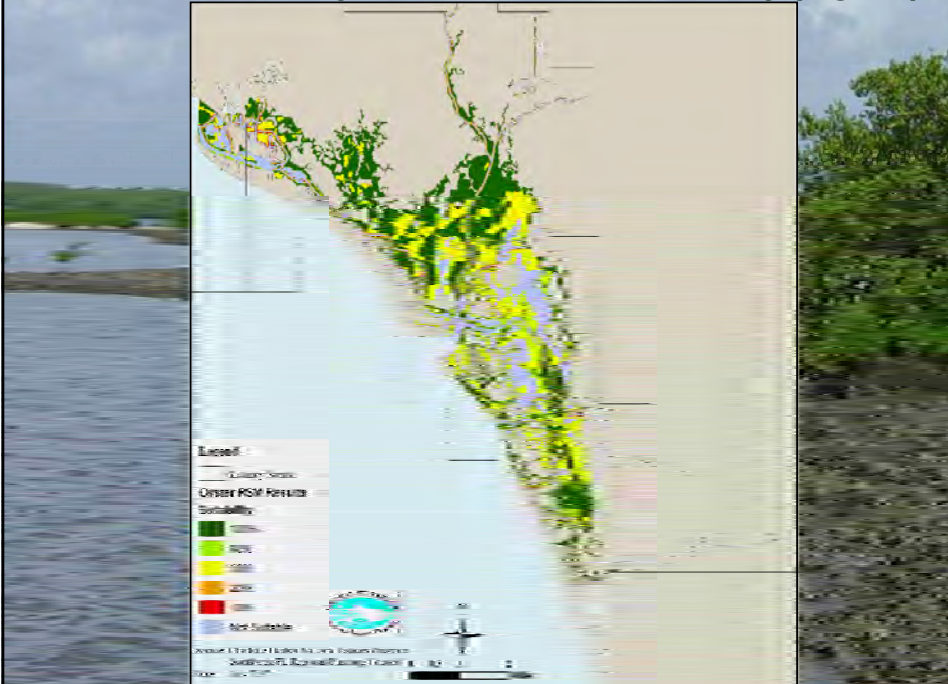
## Restoration Suitability Model Results (Fig. 6)



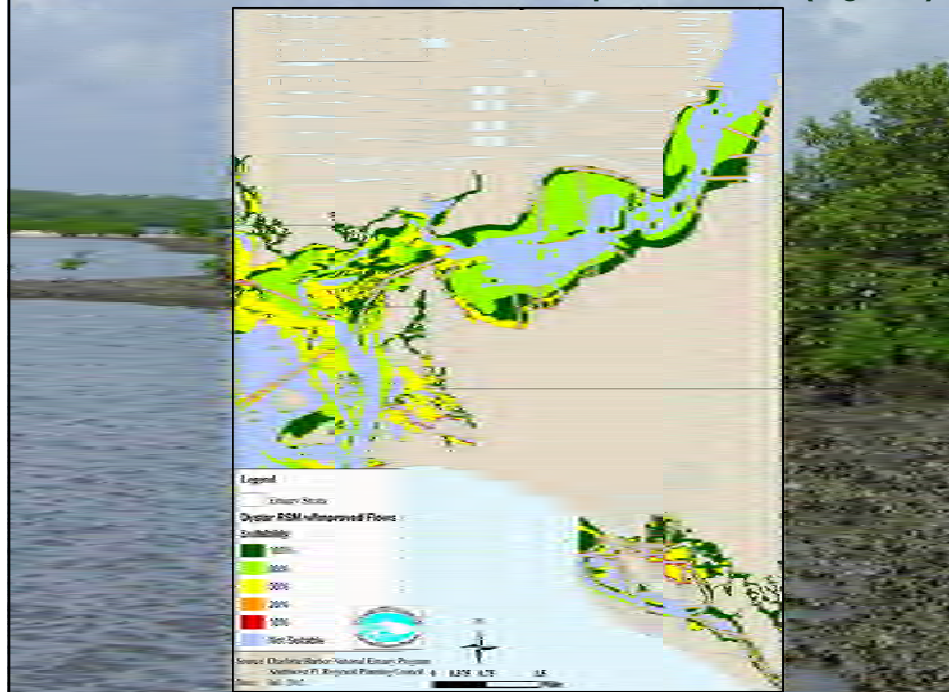
- 100% suitable in CHNEP  
= 22,172 ac  
(10% of estuary area)
- 80% Suitable in CHNEP  
= 20,428 ac
- maps & acres included  
for each estuary



### Restoration Suitability Model Results - Estero Bay (Fig. D7):



### RSM Results - Caloosahatchee with Improved Flows (Fig D13):

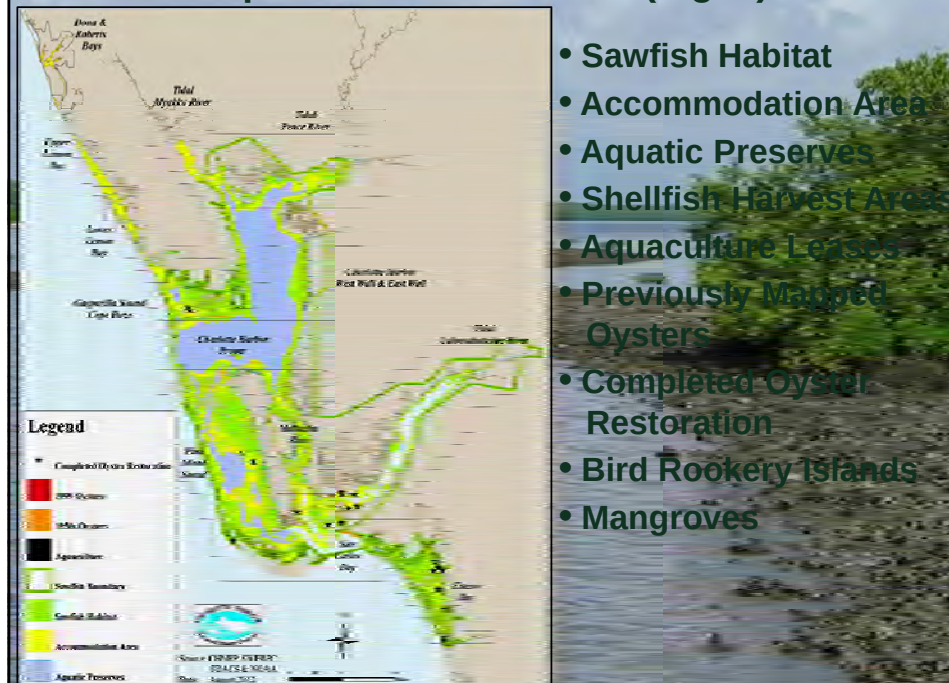


### RSM Results for Each Estuary (Table 6)

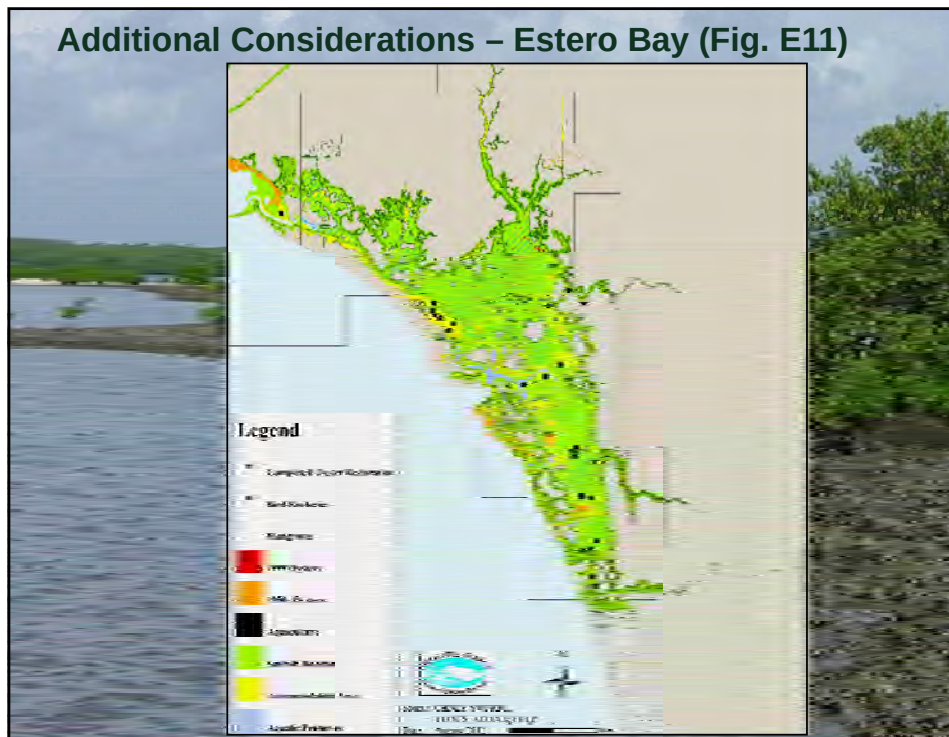
| RSM Score<br>Suitability %<br>Strata | 1.0<br>100%<br>(acres) | 0.8<br>80%<br>(acres) | 0.5<br>50%<br>(acres) | 0.2<br>20%<br>(acres) | 0.1<br>10%<br>(acres) | 0.0<br>0%<br>(acres) | Subtotal |
|--------------------------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|----------|
| Dona & Roberts Bays                  | 108                    | 40                    | 34                    | 170                   | 22                    | 432                  | 807      |
| Upper Lemon Bay                      | 163                    | 220                   | 461                   | 190                   | 187                   | 1,278                | 2,499    |
| Lower Lemon Bay                      | 514                    | 582                   | 1,062                 | 256                   | 140                   | 2,797                | 5,351    |
| Gasparilla Sd Cape Haze              | 1,321                  | 1,526                 | 3,237                 | 69                    | 48                    | 6,675                | 12,875   |
| Tidal Myakka River                   | 2,231                  | 1,778                 | 298                   | 314                   | 1                     | 2,513                | 7,136    |
| Tidal Peace River                    | 3,834                  | 3,371                 | 343                   | 431                   | 2                     | 5,422                | 13,402   |
| Charlotte Harbor West W              | 455                    | 1,332                 | 780                   | 7                     | 1                     | 14,453               | 17,029   |
| Charlotte Harbor East W              | 1,482                  | 1,363                 | 1,247                 | 30                    | 16                    | 18,252               | 22,390   |
| Lower Charlotte Harbor               | 360                    | 1,027                 | 1,709                 | 69                    | 65                    | 30,271               | 33,502   |
| Pine Island Sound                    | 2,481                  | 4,171                 | 8,471                 | 267                   | 182                   | 34,606               | 50,177   |
| Matlacha Pass                        | 2,271                  | 1,265                 | 3,252                 | 134                   | 100                   | 6,940                | 13,962   |
| Tidal Caloosahatchee R               | 728                    | 977                   | 340                   | 140                   | 11                    | 15,082               | 17,278   |
| San Carlos Bay                       | 1,563                  | 2,663                 | 3,802                 | 197                   | 83                    | 8,585                | 16,892   |
| Estero Bay                           | 4,660                  | 114                   | 2,982                 | 492                   | 99                    | 2,807                | 11,154   |
| Total                                | 22,172                 | 20,428                | 28,016                | 2,766                 | 956                   | 150,114              | 224,453  |



## Additional Spatial Considerations (Fig. 7)



## Additional Considerations – Estero Bay (Fig. E11)



### CHNEP Oyster Habitat Restoration Goal:

Enhance & restore self-sustaining oyster habitat & related ecosystem services throughout the estuaries & tidal rivers & creeks in the CHNEP.

- Considered RSM results & additional spatial factors.
- Considered limitations of historic mapping of oysters.
- Considered “Accommodation Area” = proper salinity & < 3’ deep & 1-5% suggested by literature.
- Based on current data & understanding & 1-5% of the Accommodation Area, a range of 1,000 – 6,000 acres of oyster habitat is appropriate for CHNEP.
- Short term actions will be steps towards this goal until region-wide mapping is completed & the Plan is updated in 2020.

### CHNEP Short Term Oyster Habitat Restoration Actions:

- Map oyster habitats by type within CHNEP by 2020.
- Design, implement & monitor success of pilot oyster habitat restoration projects in a variety of habitats in 50% of 14 CHNEP estuary segments by 2020.
- Increase public awareness of ecosystem value of native oyster habitats by including community stewardship components in each oyster habitat restoration projects.
- Assist partners in seeking state, federal & organizational funding to support oyster habitat restoration projects.



Photo: CHNEP/Ott



## Oyster Restoration Strategies:

Methods – depth, pros & cons, entanglement (Table 8)

- Bagged\*, caged or loose\* cultch
- Oyster mats\*
- Reef balls
- Vertical stakes & experimental

Materials – source & success (Table 9)

- Fresh, fossilized & other shell
- Sandstone, limestone & cement
- Spat sticks & experimental



## Oyster Restoration Success Criteria:

Region-Wide – measures & references (Table 10)

- Important to evaluate specific project goals
- Primary – determine if oysters are self-sustaining & increasing or decreasing, including area, density, size & recruitment
- Secondary – provide additional information, including resident species, condition index & gonadal condition

Goal-Specific – measures & references (Table 11)

- Provide consistency between projects
- Based primarily on local research & monitoring
- Include reef stability, growth & recruitment, provision of habitat, water quality improvement & adjacent habitat protections
- Include Primary & Secondary measure

### Monitoring & Mapping Needs:

#### Site Suitability – metrics, timing & other (Table 12)

- Substrate
- Boat Traffic
- Food Availability
- Recruitment
- Water Flow
- Dissolved Oxygen
- Temperature
- Predators
- Adjacent Habitats
- Salinity
- Disease
- Sedimentation
- Water Depth
- Wave Energy

#### Restoration Success – methods & guidance (Table 13)

- Include Before-After-Control-Restoration (BACR)
- Funding Dependant
- Consistency between Projects

#### Long Term Monitoring & Mapping

- Need Oyster Habitat Mapping throughout CHNEP
- Need consistent monitoring throughout CHNEP

### Cost Estimates for Attaining CHNEP Oyster Habitat Restoration Goals:

#### Cost Estimates of Supplies (Table 15)

- Estimated from existing restoration projects in FL
- Based on 7 project types, including bagged & loose cultch & shell, oyster mats, reef balls & concrete grates
- Includes cost of materials
- Estimates range from \$3,000/acre - \$605,000/acre
- Ave. cost for conventional methods = \$54,500/acre



## Funding Opportunities for Oyster Habitat Restoration in CHNEP:

### Oyster Habitat Restoration Funding (Table 16)

- Encourages partnerships
- Based on ecosystem restoration goals
- Includes examples of 14 federal, agency & organizational grant opportunities
- Includes amount available, purpose, eligibility & contact information
- Plus RESTORE funding & coordinated effort in SW FL by 3 NEPs to develop comprehensive Gulf restoration approach

## What Follow-Up Actions Occurred to Date?

- Presentations:
  - Gulf Estuarine Research Society – Nov. 2012
  - DEO Working Waterfronts Workshop – Nov. 2012
  - Charlotte Co BOCC – Feb. 2013
- Draft General Permit Language for Restoration, Establishment & Enhancement of Low Profile Oyster Habitat to incorporate into recent ERP Rule Changes – Feb. 2013
- RESTORE SW FL Shellfish Restoration Proposals – April 2013
- TNC Oyster Restoration Project in Punta Gorda – field visit April 2013, currently design & permit
- TNC NOAA CHNEP Sawfish Critical Habitat Regulatory Staff Discussions – May 2013

## What are the Next Steps To Implement CHNEP Oyster Restoration Needs & Goals?

- Build partnerships & continue SW FL Oyster Working Group.
- Continue restoration permitting discussions & design & secure permits for projects.
- Enhance community stewardship opportunities & raise awareness – work with community groups & leverage volunteer hours.



Photos: SCCF



## Next Steps Continued:

- Secure funds using partnerships & regional approach – submit regional project to RESTORE
- Fill knowledge gaps with targeted research & monitoring:
  - ~ historic & current distribution of oysters
  - ~ Intertidal vs. subtidal restoration
  - ~ biodiversity & relationships with key species



Photo: TNC/Birch



Photo: FGCU



Photo: SCCF



## Thank You to Our Many Partners:

- FAU – Loren Coen
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- FDEP - Lucy Blair & Heather Stafford
- FGCU - Greg Tolley & Aswani Voley
- FFWCC - Sarah Stephenson & Steve Geiger
- Fort Myers Beach – Keith Laakkonen
- Sarasota Co - Kathy Meaux & Jon Perry
- Mote marine Lab – Jim Culter & Ernie Estevez
- NOAA - Sean Meehan & Shelly Norton
- Sanibel – Holly Downing
- SBEP - Jay Leverone/SBEP & TBEP - Ed Sherwood
- SCCF - Eric Milbrandt & Rick Bartleson
- TNC – Andrea Graves & Laura Geselbracht
- UF Sea Grant - Betty Staugler, John Stevely, Joy Hazell
- SW FL Oyster Working Group & Many Others

## For Questions & Information, Please Contact:

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