Charlotte Harbor National Estuary Program
Oyster Habitat Restoration Plan

Charlotte Harbor National Estuary Program
Technical Report
December 2012

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Appendix A:

Southwest Florida Oyster Working Group Members and Minutes

Southwest FL Oyster Working Group Participants

Name		Agency Organization	Meeting 1 4/24/12	Meeting 2 5/0/12	Meeting 3 5/25/12	Meeting 4 6/19/12	Meeting 5 9/7/12	Provided Additional Info & Review
Baret	Barry	Martin Co.		X				
Jim	Beever	SWFRPC	X	X	X		X	X
Lisa	Beever	CHNEP	X				X	X
Mark	Berrigan	FDACS				X	X	X
Anne	Birch	TNC	X	X	X		X	X
Lucy	Blair	FDEP S District		X	X	X	X	X
Jaime	Boswell	Contractor to CHNEP	X	X	X	X	X	X
Dan	Cobb	SWFRPC		X	X			X
Loren	Coen	FAU-HBOI			X		X	X
Beckey	Conway						X	
Jim	Culter	Mote Marine Lab	X			X	X	X
Holly	Downing	City of Sanibel	X	X	X	X	X	X
Kathy	Fitzpatrick	Martin Co.		X				X
Lizanne	Garcia	SWFWMD					X	X
Steve	Geiger	FWC FWRI Shellfish		X	X		X	X
Andrea	Graves	TNC	X	X	X	X	X	X
Eddie	Hughes	CSA International		X				X
Rene	Jenneman	Sarasota Co.	X					
Keith	Kibbey	Lee Co.				X		
Katie	Laakkonen	City of Naples	X	X				X
Keith	Laakkonen	Town of Fort Myers Beach				X		X
Marti	Maguire	NOAA					X	X
Katie	McBride	City of Cape Coral				X	X	
Kathy	Meaux	Sarasota Co.	X	X				X
Eric	Milbrandt	SCCF	X	X		X	X	X
Shelly	Norton	NOAA		X				X
Judy	Ott	CHNEP	X	X	X	X	X	X
Gregg	Poulakis	FWC FWRI Fisheries	X					X
Arielle	Poulas	FDEP					X	
Pete	Quasius	Snook Foundation		X			X	X
Erin	Rasnake	FDEP S District	X				X	X
John	Ryan	Sarasota Co.			X			X
Ed	Sherwood	TBEP	X					X
Heather	Stafford	FDEP Aquatic Preserves	X	X		X	X	X
Phil	Stevens	FWC FWRI Fisheries	X					X
Greg	Tolley	FGCU			X			X
Paul	Tritaik	USFWS "Ding"Darling NWR				X		X
Aswani	Volety	FGCU				X		X
Tim	Walker	SWFRPC				X		X
Barbara	Welch	SFWMD		X	X	X		X
Paul	Zajicek	FDACS	X	X		X	X	X
Total	**41**		**18**	**20**	**13**	**17**	**22**	**35**

Southwest FL Oyster Working Group Meeting 1
Tuesday April 24, 2012
12:30 am – 4:00 pm
SWFRPC, 1926 Victoria Ave., Fort Myers, FL 33901

MEETING MINUTES

Meeting Attendees:
Katie Laakkonen, City of Naples; Jim Culter, Mote Marine Laboratory; Kathy Meaux, Sarasota County; Rene Janneman, Sarasota County; Jim Beever, SWFRPC; Lisa Beever, SWFRPC; Erin Rasnake, FDEP; Heather Stafford, FDEP-CAMA; Eric Milbrandt, SCCF Marine Laboratory; Holly Downing, City of Sanibel; Andrea Graves, TNC; Anne Birch, TNC; Ed Sherwood, TBEP; Paul Zajicek, Division of Aquaculture-FDACS; Phil Stevens, FFWCC; Gregg Poulakis, FFWCC; Judy Ott, CHNEP; Jaime Boswell, CHNEP Sub-contractor

Purposes:
- **Explain t**he CHNEP Oyster Restoration Plan development **approach & schedule.**
- **Identify types, gaps & sources of data** needed to identify suitable oyster restoration sites.
- **Refine the outline** for the CHNEP Oyster Restoration Plan.

Agenda with Discussion Notes:
- **Welcome & Introductions** – Judy Ott & Group
- **Overview of CHNEP Oyster Restoration Plan Approach & Schedule** – Judy Ott & Group
  - **Approach**
    - ~ CHNEP Collaborative Partnerships for Working Together to Improve Water Quality & Ecological Integrity of Study area
    - ~ CHNEP Technically Sound, Consensus Based Approach
    - ~ Restore Oysters & Maintain Estuarine Diversity & Productivity
    - ~ Help Partners Efficiently Design & Implement Restoration Consistent with Plan
    - ~ Make Collaborative Projects More Competitive for Funding Support
    - ~ Foster Community Stewardship of Oysters & Estuaries & Watershed
  - **Schedule**
    - ~ Requested by TAC in 2010
    - ~ CHNEP Shellfish Restoration Workshop in Feb 2011
    - ~ TNC Shellfish Restoration Regulatory Meeting in Feb 2011
    - ~ 1st Meeting of SW FL Scallop Working Group April 2011
    - ~ Funding Support from TNC to CHNEP Feb 2012
    - ~ 1st Meeting of SW FL Oyster Working Group April 2012
    - ~ Draft CHNEP Oyster Restoration Plan to CHNEP TAC July 2012
    - ~ Draft SW FL Scallop Restoration Plan August 2012

Questions/Discussion:
- Are there restoration plans in other areas of FL? No, nor in GoM; See TNC Guidelines.
- Oyster Mapping to date focuses on open water bars; are many mangrove &salt marsh areas that are really oysters; especially in Myakka R.
- TNC interested in additional mapping; especially areas that come up as priority restoration areas in CHNEP;
- Traditional mapping methods only capture small percent of oysters.

- Sarasota mapping will be done by end of year/beginning of 2013; working on quantifying now.
- Raises questions about how to map CH oysters – too far to walk.
- Need to separate out submerged & relic oysters (those not alive).
- CHNEP 2010 shoreline survey update included oysters along the shoreline.
- 5 years ago FGCU did mapping of Estero Bay/Caloosahatchee/10,000 Islands.
- South Carolina just remapped oysters (contact: Nancy Hadley) – Paul will check for contact information.
- SCCF with ESC trying to determine Rapid Assessment Method – tiered approach: visual description & percent cover.
- Can't assume all mangroves/seawalls/rip rap will have oysters.
- Does Sarasota mapping include % live? Use qualitative scale.
- FGCU mapping of Caloosahatchee & Estero Bay probably was just presence/absence
- Remember even healthy oyster bars have some percent dead; also consider size classes.

  - **CHNEP Oyster Restoration Plan Objectives** – Jaime Boswell & Group
  - **Implement CHNEP CCMP**
    - ~ **Restore Native Plant & Animal Communities (FW-F)**
    - ~ **Restore Natural Hydrology (HA-a)**
    - ~ **Provide Public Opportunities in Research, Monitoring & Restoration (SG-B)**
    - ~ **Serve as Environmental Indicators**
    - ~ **Meet Shellfish Harvesting Standards**
  - **Enable Restoration of Oyster Habitats & Related Ecosystem Functions (historic, sustainable, harvestable?)**
  - **Develop Monitoring Plan for Measuring Success**
  - **Develop Regional Oyster Restoration Partnerships**

Questions/Discussion:

- Be flexible about options for restoration techniques; provide a suite of techniques.
- Include clear goals & objectives for each restoration project & develop correct monitoring techniques. What's total timeframe for restoration? If long term, need to consider how oysters will move, especially with sea level rise (SLR) & hydrologic changes; suggest 2100.
- Do we want to restore natural balance of oysters or include additional oysters to adapt to climate change or other human goals?
- Anticipate other changes people are planning for the estuaries; i.e.: water withdrawals & hydrologic alterations which would change oyster distribution & permitting future developments.
- So consider changing shorelines & land uses & hydrology.
- Need to include these questions & checks & balances when selecting priority restoration sites.
- What about "reef stacking" to enhance existing reefs to adjust to SLR?
- Remember the GIS Model will be an adaptive model which can include new info & plan will be flexible, too.
- Need to look at CERP & effects on hydrology in Caloosahatchee R – may slam between extremes.
- Can't restore all oysters in CH so start with the "easy" ones.
- Ideally plan will include map of where group agrees is the priority area for restoration; an organized plan of how restoration will proceed in CH.

- What does develop consistency between projects mean? Similar goals – i.e.: a different target density; don't want to require so much consistency that locks the flexibility to allow different projects.
- Can target both oyster restoration & other habitat benefits with 1 project (i.e. erosion).
- Monitoring needs consistency – especially relating to techniques.
- May have different targets for each project, but plan will include comprehensive list of targets & related monitoring techniques.
- Could consider Functional Assessment Method for submerged habitats (i.e. oysters…) – consider this may in effect be creating a guide book for mitigation.
- Add an objective to secure funding for restoration & monitoring.
- Make sure restoration projects include monitoring.
- Some restoration & monitoring can be done by volunteers; allows for basic design monitoring & long term support & sense of reward & ownership.

The following objectives will be edited to address discussion topics:

1. Implement the CHNEP CCMP
2. Develop the plan through a SW FL Oyster Working Group for the purposes of information sharing, developing consistency between projects, and for forming partnerships for future restoration projects.
3. Discuss permitting requirements and other management considerations.
4. Identify appropriate science based restoration sites, techniques & monitoring.
5. Identify priority restoration sites for the ten estuaries within the CHNEP region.
6. Identify appropriate restoration techniques.
7. Define success criteria for oyster restoration projects.
8. Develop an oyster habitat monitoring plan that can be used to test success of individual projects.
9. Develop a long-term monitoring plan for oyster habitat as an environmental indicator.
10. Identify potential funding sources for restoration & monitoring projects
11. Require restoration projects to including monitoring.

- **Permitting Considerations** – Jaime Boswell & Group (see notes in Plan outline)
  - **Endangered Smalltooth Sawfish Critical Habitat**
  - **Florida Aquatic Preserves/OFWs (258 FS & 18-20 FAC)**
  - **State Lands Authorization (18-21 FAC)**
  - **US Army Corps of Engineers**

Questions/Discussion:

- Encourage going through early & informal consultation.
- Consider essential fish habitat & sea grasses & other SAV.
- For aquaculture programmatic general permit (good for 5 years; include multiple activities); could consult with ACOE as lead agency.
- Will also have to consult on other ES - manatee & piping plover & state endangered species – reddish egret (i.e. Bunch Beach).
- In Sawfish Recovery Plan – 1 of the things they need is better understanding of how habitat is used – target is to complete study within 5 years; Gregg P. – 2009 Recovery plan; since then

looking at general habit use & "hot spots" (i.e. in Peace & Caloosahatchee); looking at boundaries & flows, etc; will be revising recovery plan in 2013; may address canals.

- As we begin to identify priority oyster restoration areas – keep in mind how we can avoid sawfish hot spots & move toward consistency between 2 plans.
- Is it possible to do a general/programmatic umbrella approach? Aquaculture is a single operator with different locations – i.e. 1 responsible party with in FDACS; if there is a central responsible party could get a programmatic permit.
- Did FGCU get 5 year? Erin had individual permit for 1 year for 1 estuary; CHNEP might not want to get programmatic permit.
- CHNEP could work on permitting guidelines – develop it with NOAA NMFS guidelines & anyone doing restoration within priority areas within plan & follow these guidelines, would be easier to get permits.
- Cape Coral is going through process associated with docks & sawfish – need to keep up-dated.
- Consider navigability & kayak trails/Blueways; don't want to impair on-going utilization.
- Another concern might be whether it is harvestable or non-harvestable; in general restoring oysters as an ecological base, not for harvest.
- FDACS posts shellfish harvest areas on maps (www.floridaaquaculture.com); Does FDACS have concern about oyster restoration in non-harvestable areas? Not really; review shellfish harvest areas every 5 years for FDA; FDACS can get us the GIS layers for shellfish harvest areas & aquaculture lease areas;

- **CHNEP Oyster Restoration Goals** (What will success look like?) – Judy Ott & Group
  - **Historic Acres based on Best Available Data (±2,700 acres)**
  - **Minus "Non-Restorable Areas" (ICW, filled causeways, etc.) (±1,800 acres for SAVs)**
  - **Compare to Results of GIS Model of Current Oyster Habitat Suitability**

Questions/Discussion:

- What is metadata for Current Benthic Habitat Maps? Lisa - 1999 oyster data from SFWMD SAV mapping; SWFWMD doesn't do oyster mapping with their SAV because of minimum mapping unit (mmu); in 2004 CHNEP contracted with Avineon to estimate 1999 oysters from SAV aerials.
- Haven't looked at historic vs. current locations in detail yet.
- Need to distinguish between tidal flats & oysters.
- In TBEP Michael Drexler mapped new oyster habitats in TB that were undocumented in the past & added to those observed in aerials – Ed will forward methods.
- Caution if start considering oysters on seawalls.
- Also did functional assessment between natural oysters & artificial substrate reefs.
- Need to look in more detail of causes of loss; was also oyster mining for shell for road bed (1850s -1880s); what about anecdotal information & data, too – i.e.: civil war & Navy uses; see historic logs; commercial oyster fisherman & military folks; see historic navigation charts from Pre-Develop Mapping & Basin Mapping (geo-rectified); 1960s paper from Charlotte County with some qualitative data on oysters – Kent Woodburn; Charles LaBuff didn't mention oysters in Sanibel Causeway; now there is a big oyster reef across from Punta Rasa.
- At a minimum compare the 1950 & 1999 GIS layers.

- Mike Savarese has identified oysters under the sediment & estimate where they were pre-historically – using cores; Harold Longless studied this in Everglades; historically isohaline has shifted further up-estuary & oysters have moved up with the change in salinity.

- **Define Process to Identify Suitable Oyster Restoration Locations** – Jaime Boswell & Group
  - **Historical Distribution**
  - **Permitting Considerations**
  - **Water Quality & Salinity (e.g. DO)**
  - **Water Quantity & Velocity**
  - **Substrate/Bottom-type**
  - **Oyster Diseases & Harmful Algal Blooms (HABs)**
  - **Larval Sink**
  - **Site-specific Causes of Decline & Potential to Resolve the Causes**
  - **Other Priorities**

  Discussion: see attached GIS Model Outline

- **Identify Gaps in Data and Possible Sources** –Jaime Boswell & Group

  Discussion: see attached GIS Model Outline

- **Review Oyster Restoration Plan Outline** – Judy Ott & Group

  Discussion: Due to lack of time please send any additional comments via email.

- **Next Tasks, Duties & Schedule** – Judy Ott & Group
  - Compile Missing Data & GIS Layers
  - Continue GIS Analyses
  - Begin Writing Text
  - Meet *May 9* to:
    - ~ Identify Restoration Methods
    - ~ Identify Monitoring Methods
    - ~ Identify Success Criteria
  - Meet *May 25* to:
    - ~ Review & Finalize Priority Oyster Restoration Area Maps
  - Meet *June 19* to:
    - ~ Review Draft CHNEP Oyster Restoration Plan

Southwest FL Oyster Working Group Meeting 2
Wednesday May 9, 2012
12:30 am – 4:30 pm
SWFRPC, 1926 Victoria Ave., Fort Myers, FL 33901

MEETING NOTES

Attendees:
On site: Anne Birch/TNC, Kathy Meaux/Sarasota Co., Jim Beever/SWFRPC, Dan Cobb/SWFRPC, Lucy Blair/FDEP S District, Heather Stafford, FDEP Aquatic Preserves, Eric Milbrandt/SCCF, Katie Laakkonen/City of Naples, Holly Downing/City of Sanibel, Barbara Welch/SFWMD CERP, Pete Quasius/Snook Foundation, Jaime Boswell/for CHNEP, Judy Ott/CHNEP
Via WebEx: Shelly Norton/NOAA, Andrea Graves/TNC, Paul Zajicek/FDACS, Kathy Fitzpatrick/Martin County, Steve Geiger/FWC FWRI, Eddie Hughes/CSA International, Baret Barry/Martin County

Purposes of Meeting 2 of the SW FL Oyster Working Group:
- Review progress on CHNEP oyster restoration goal, objectives & suitability model.
- Define CHNEP oyster restoration success criteria.
- Create a list of suitable oyster restoration techniques for the CHNEP area.
- Develop pre-restoration & post-restoration monitoring guidelines.

Meeting Notes:
1. **Welcome & Introductions – Judy Ott, CHNEP**
   Members introduced themselves & Judy reviewed the purposes of the meeting & the agenda.

2. **TNC Overview: How CHNEP Oyster Restoration fits into the Big Picture – Anne Birch, TNC**
   Discussion:
   - Oyster restoration is a priority for TNC throughout the US coastal states, especially along the Gulf Coast.
   - TNC is working on identifying oyster restoration needs in each state, as well as how states can work together to implement effective regional oyster restoration.
   - TNC developed a GIS based tool to help identify potential areas where oyster restoration is viable, called the Gulf Restoration Decision Tool & it is available at gulfresorationds.org.
   - The purpose of oyster restoration is to restore habitats plus allow for climate change adaptation, the metadata for the tool is readily available.
   - TNC would like to add CHNEP Oyster Restoration Plan info into DS tool as a site specific and more geographically detailed application of the tool.
   - It will be helpful for TNC DS Tool GIS staff to coordinate with SWFRPC/CHNEP GIS staff.
   - TNC also has a coastal resilience website & a recent grant from NOAA/Sea Grant to help identify climate change adaptation strategies, including community workshops on resilience.
   - TNC also prepared a letter supporting the Restore Act, which is currently in committee under the Transportation Bill. The bill directs how the BP fine money would be specifically used. Anne emailed the letter in a "sign-on" format where agencies & NGOs & others could add signatures & they would be compiled into this 1 letter. Respond to Anne at abirch@tnc.org.

3. **Review Progress to Date - Jaime Boswell, contractor to CHNEP (see Power Point presentation slides 2 – 5)**
   CHNEP Oyster Restoration Goal (slide 2):
   - Suggest goal = "Restore ???? Acres of Estuarine Oyster Habitat & Related Ecosystem Functions".
   - Define ecosystem functions which are part of the goal – e.g. water filtration, habitat provision, shoreline protection – should public involvement be included here?
   - Use 1950s oyster maps with known non-restorable areas to determine suitable oyster restoration area.
   - Run restoration habitat suitability model to determine acres suitable for restoration under current conditions.

- Use historic & suitable habitat information to for realistic & meaningful oyster restoration goals.

Discussion:

- Early in CHNEP oyster restoration process, it's important we agree on goal we're working towards.
- Need to define "ecosystem functions" specifically.
- Suggest public involvement is a separate line item. Part of the planning & restoration process is identifying how to engage public & get buy-in & in-kind services.
- Public involvement includes public education of the value of these habitats plus hands-on restoration tasks.
- Question about if shoreline protection is a "goal" of this oyster restoration process. Shoreline protection could be a function of oyster restoration.
- Need to separate goals & functions.
- Need to define specific ecosystem functions & what functions we will consider as being restored & are measurable.
- Objectives of specific oyster restoration projects are different from the overall CHNEP oyster restoration goal.
- Need a variety of projects in a variety of locations to restore all the functions needed to accomplish the restoration goal.
- Goals may include different acres & projects for different regions of CHNEP. These will depend on how the priorities are defined for each estuary & watershed.
- For example, altered salinity regimes may change oyster acres & locations – is this a natural, desirable goal?
- Consider adding Flow into the GIS Habitat Suitability Model. Could use several options – 10 year average or projected future optimal flow. Need to include optimal salinity ranges plus the locations of those salinity ranges. Need to account for anthropogenic changes & identify locations for specific estuaries.
- Need flexible criteria to account for differences between current conditions & optimal conditions, with consideration of what is likely to be changed in the short term (dams; hydrologic) & long term (sea level rise). Model will point us toward locations/project designs with specific objectives.
- Do we need acres? Obtain more accurate estimates of historic & future oyster acres. Consider defining suitable oyster restoration habitats. Consider a percentage of suitable acres over a specific time period
- Include: increase public awareness of value of oysters & increase state & federal funding opportunities of restoration
- ***Suggested revised Oyster Restoration Goal: Restore ?? % of suitable oyster habitat & related ecosystem functions by 20??.*** Include specific percent (based on model results) & list of functions (in supporting text), while meeting site specific criteria.

CHNEP Oyster Restoration Functions & Discussion:

- Water filtration, transform water chemistry, sequestering nutrients, reduce turbidity
- Water circulation - define circulation patterns
- Reducing & supplying sedimentation
- Substrate stabilization
- Habitat, attachment for epiphytes – flora & fauna, refugia, resting habitat, foraging habitat, above & within oysters, symbiotic habitat/site specific (i.e.: obligate fish), rooting habitat for establishment of mangrove islands
- Shoreline protection
- Species migration routes for sea level rise
- Human resource – recreation – i.e.: fishery, harvest – commercial vs. recreational, cultural significance – i.e.: "old Florida"

Oyster Restoration Project Objectives & Discussion:

- Shoreline protection **-** needs to be included, either as CHNEP Oyster Restoration Goal or as Project Objective (where appropriate).

CHNEP Oyster Restoration Plan Objectives & Discussion (slides 3 & 4):

1. Implement the CHNEP CCMP
2. Develop the restoration plan through a SW FL Oyster Working Group for the purposes of information sharing - developing consistency between projects & for forming partnerships for future restoration projects.
3. Provide guidance on permitting requirements & other management considerations.
4. Identify priority restoration sites for the eleven estuaries (where suitable) within the CHNEP region using a science-based approach & the best available data.
5. Identify, using a science-based approach, a suite of appropriate restoration techniques.
6. Define success criteria for oyster restoration projects.
7. Develop a science-based oyster habitat monitoring plan that can be used to test success of individual projects. (provide suite of monitoring options) (combine #7 & #9)
8. Develop a science-based long-term monitoring plan for oyster habitat as an environmental indicator.
9. Identify minimum monitoring requirements for all projects intended to assist in meeting the CHNEP Oyster Restoration Goal (min. monitoring requirements – Combine #7 & #9)
10. Identify potential funding sources for restoration & monitoring projects.

- Consideration of sawfish critical habitat is part of #3.
- Consider adding an objective related to public outreach & community involvement
- ***Add - Identify opportunities for public outreach & community stewardship/public involvement.***

CHNEP Oyster Restoration Suitability Model (slide 5)
See handout titled "CHNEP Oyster Restoration Plan GIS Model Components".
Essential Model Factors & Discussion:

- Seagrass Persistence
- Boat Channels w/Buffers - channel width = 150' + buffer =75' = total 300'; channel = score 0 & buffer = score 0.2
- Aquaculture Lease Areas – buffer would be case X case basis so in model, just include aquaculture lease areas without/buffer as being unsuitable
- Depth – spoil islands = primarily from ICW owned by USCOE; spoil island may be considered to be outside of the aquatic preserve boundary & therefore have less stringent regulatory requirements. Maybe existing ICW spoil islands could be used as restoration areas – need to contact USCOE
- Salinity
- Dissolved Oxygen
- Temperature – not much variation throughout CHNEP. Most important for spawning & literature documents effect of temperature on filtering rate. Most critical near power plant outfalls – i.e.: Caloosahatchee/Orange R. Don't include in model but add in site specific considerations.
- Current Oyster Habitat – consider it's good to be close to existing (live, high quality) reefs. Is the primary benefit to spat settlement? Yes, but also indicates how suitable the site is for long term success of reef. Need to consider quality of reefs. Need to do spat recruitment before each specific project. If the location is good for settlement but lacks substrate, it's possible that adding oyster substrate may enhance settlement. Need info on reefs with high sediment load. Sedimentation rate & spat settlement rates are site specific conditions that need to be measured before projects. GIS mapping doesn't capture oysters in high turbidity area where oysters currently exist (i.e.; Peace R). Could use existing reefs as priority areas – i.e.: within a defined distance of healthy reef. Current oyster habitat is more appropriate as post-model tool. ***Include current oyster habitat as post-model evaluation factor***. Could include it both in & post model. We don't currently have accurate oyster habitat locations. ***Next step = map current reefs & add info back into model = adaptive approach. Cross check results of model with locations where we know current healthy reefs are. Look at Sarasota Co estuary qualitative mapping & quantitative mapping in creeks.*** Does FWRI/FNAI/Labins/USGS have sediment layers for some areas of state? Probably larger scale than we need. See also Ernie Estevez/Mote's benthic communities work in Charlotte Harbor from early 1980s. Check Peace R MFL sediment maps for specific locations. ***Use FDEP Aquatic***

Preserves seagrass transect mapping – has sediment at fixed quadrat locations along seagrass transects for 10 years.

Other Model Factor Considerations & Discussion:

- Sawfish Hotspots w/Buffer
- Aquaculture Lease Area Buffers – don't need to include buffer in model
- Shellfish Harvesting Area Classifications
- Historic Oyster Habitat
- Habitat Migration Shorelines
- Managed Lands
- Shoreline Type
- ***Add FDEP APs Seagrass sediment as a post-model consideration***
- ***Add Temperature as Site Specific consideration for pre-restoration monitoring***
- Use the 1950's oyster maps in conjunction with known non-restorable areas (e.g. boat channels, spoil islands) to determine a potential number of restorable acres
- Run restoration site suitability model to determine number of acres of suitable restoration areas under current conditions
- Use both numbers to inform a realistic & meaningful restoration goal

4. Oyster Restoration Success Criteria - Jaime Boswell, contractor to CHNEP (See PowerPoint presentation slides 6 – 8)

Success Criteria Overview (slide 6):

- Coen & Luckenbach (2000) "note importance of linking success criteria to specific goals & clarify ecological functions of shellfish & shellfish habitats.
- Success criteria typically tied to fishery harvest (i.e. # harvestable oysters).
- Minimum success is demonstrated by self-sustaining oyster populations (recruitment & growth).
- Density & size structure are important (Luckenbach et al., 2005)
- Size structure (Luckenbach et al 2005)
- Living Density
- Habitat Value for Associated Species
- Condition Index & Gonadal Condition
- Prevalence & Intensity of *Perkinsus marinus*
- Trends over time

TNC Success Criteria Categories (slide 7):

- From Brumbaugh et al., 2006
- Recruitment & growth of shellfish populations undergoing restoration – Include reef growth & individual growth.
- Provision of habitat for other associated species – Consider transient vs. resident reef community (Coen & Luckenbach, 2000). Locally, 10 decapod crustacean species & 16 fish species (Tolley & Volety, 2005). Estimate of local species seems low, these numbers may be for resident species on natural oyster clumps in Caloosahatchee, other estimates are several hundreds (300 transient species).

SCCF Oyster Restoration Success Criteria (slide 8):

- Growth - Positive (increase between two sampling periods)
- Recruitment - 50 oysters/m^2/year
- Resident Reef Community Development - Comparable to natural reefs. 10 or more species of fish & invertebrates
- Water Quality & Seagrasses - Positive influence**.** Difficult to measure water quality effects. Need direct measurements of seston uptake rates plus ambient water quality. Can use flurometer to measure seston uptake rates. Seagrass are often healthy near oyster restoration projects. Seagrass may be indirect measure of water quality benefits.
- Followed guidance from Sean Powers in FL panhandle & South Carolina.

- SCCF & TNC criteria match closely.

CERP Oyster Performance Measure Criteria (slides 9 & 10):

- See Volety et al., 2009.
- Density of Living Oysters (per m^2) - 0-200, 200-800, 800-4000
- Condition Index - 0-1.5, 1.5-3.0, 3.0-6.0
- Reproductive Activity - 0-1, 1-2, 2-4
- Larval Recruitment (spat/shell) - 0-5, 5-20, 20-200
- Disease prevalence & intensity - Prevalence – 0-20, 20-50, 50-100. Intensity – 0-1, 1-3, 3-5
- Growth (mm/month) - 0-1, 1-2.5, 2.5-5
- Trends – negative slope, no slope, positive slope
- Need success criteria for specific restoration projects plus for CHNEP oyster restoration overall.
- CERP success criteria are consistent throughout the CERF territory (east, west, southwest, etc.)
- Need easily measureable parameters – some of these are difficult & expensive to measure.
- Table 4 Component Score for Oysters in Caloosahatchee Estuary – Table 4 from Volety et al., 2009

Table 4 – Component score for oysters in the Caloosahatchee Estuary for translating performance measures into a stoplight display

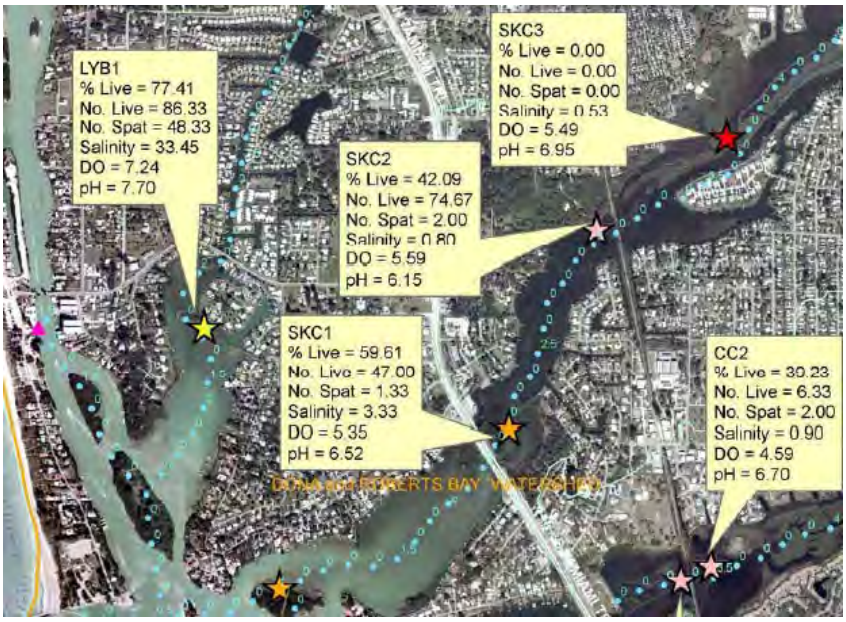
Component	Parameter value	Parameter value stoplight	Index score	Trend	Trend stoplight	Trend score	Average component score	Component stoplight
Oysters								
Living density (per m^2)	1029		1	±		0.5	(1 + 0.5)/2 = 0.75	
Condition index	2.96		0.5	±		0.5	(0.5 + 0.5)/2 = 0.5	
Gonadal Index	2.61		1	±		0.5	(1 + 0.5)/2 = 0.75	
Spat recruitment per shell	6.43		0.5	±		0.5	(0 + 0.5)/2 = 0.5	
Juvenile growth (mm/month)	2		0.5	±		0.5	(0.5 + 0.5)/2 = 0.5	
Perkinsus marinus prevalence	49.5		0.5	–		0	(0.5 + 0)/2 = 0.25	
Perkinsus marinus intensity	0.83		1	–		0	(1 + 0)/2 = 0.5	
Geometric mean of oyster component scores $(0.75 \times 0.5 \times 0.75 \times 0.5 \times 0.5 \times 0.25 \times 0.5)^{1/7} = 0.508$								
Final Eastern oyster index score = 0.5								

Sarasota County Monitoring (slides 11 - 13):

- Bi-annual – end of dry season & end of wet season since 2006
- Three ¼ m^2 quadrats at each site
- Live oysters, recently dead oysters, spat
- Percent live oysters – scoring
- Water quality

Percent Live Oysters	Descriptor	Numerical Score	Letter Score
0% - 19.99%	Very Poor	0	F
> 20% - 49.99%	Poor	1	D
> 50% - 69.99%	Fair	2	C
> 70% - 79.99%	On Target	3	B
> 80% - 100%	Excellent	4	A

	lyb1	db1	skc1	skc2	skc3	rb1	cc1	cc2
Oct-03	79.28	16.12	7.38	0.00		70.17	0.00	
Apr-04	73.85	50.74	80.04	70.15		76.24	38.85	
Oct-04	83.34	65.08	70.71	80.34		78.53	43.75	
Apr-05	81.88	80.71	89.58	93.09	67.92	77.52	73.12	16.34
Sep-05	77.65952	73.90	86.45	9.66	4.44	68.44	34.92	0.00
Apr-06	74.25972	68.10	77.85	82.84	78.62	83.16	74.65	57.33
Sep-06	77.41	60.44	59.6061	42.09	0	59.09	36.74	39.23
AVG	**78.24**	**59.30**	**67.37**	**54.02**	**37.74**	**73.31**	**43.15**	**28.23**



Metrics for Measuring Oyster Restoration Success from Coen et al 2007 (slide 14):

Table 2. Metrics associated with each of the major oyster reef restoration goals.

	OYSTER REEF RESTORATION GOAL					
Metric	**Habitat**	**Shoreline**	**WQ**	**Harvesting**	**Broodstock**	**Education**
Reef Condition						
Density	X	X	X	X	X	X
Size Frequency	X	X	X	X	X	?
Associated Fauna	X		X			X
Reef Size	X	X	X	X	X	
Reef Architecture	X	X	?	X		X
Landscape						
Fragmentation	X	X	?	X	X	
Salinity	X		X	X	X	X
DO	X sub		X	X	X	X
Chl			X			
TSS/Turbidity			X			X
Temperature	X		X		X	

- Consider these metrics for individual projects plus long term CHNEP Environmental Indicators.

CHNEP Oyster Restoration & Environmental Indicator Success Criteria:
See handout titled "CHNEP Oyster Restoration & Environmental Indicator Success Criteria Matrix".

Metrics:
- Density of Living Oysters
- Percent Living
- Size Structure
- Condition Index
- Reproductive Activity
- Larval Recruitment
- Disease Prevalence
- Disease Intensity
- Growth
- Reef Relief
- Resident Reef Community

- Transient Reef Community
- Water Quality Adjacent Seagrasses

Categories of Effects Measured by each Metric

- Environmental Indicator
- Recruitment & Growth
- Provision of Habitat
- Water Quality
- Shore Protection
- Other

Discussion of CHNEP Oyster Restoration Success Criteria & Matrix:
See handout titled "CHNEP Oyster Restoration & Environmental Indicator Success Criteria Matrix Revised".

Discussed Reef Size & Elevation:

- Next step is mapping current reefs – could use real estate maps & other aerials. Need to translate images into GIS with lat/longs.
- See references, especially Grizzle, to see methods for determining % live from aerials.
- One potential assessment tool (pre & post) = hummingbird side scan sonar. Can get scale, height, lat/longs. Can convert to GIS. Cost $800 - $3,000. Can add into Google Earth. Still need some % to be ground truthed.
- Is reef footprint a good indicator region-wide? Remember Environmental Indicators need to be measurable region-wide. Reef footprint may be more appropriate for project specific assessment. How much do reefs change over 5 years? Not too much, depends on WQ. If using reef size as a success criteria, need to define details of what "success" is - could be increasing, neutral, decreasing. Need to consider size & height, both are important & both could be changing & could be different rates of change in different geomorphic positions (i.e.: in areas with high fetch reefs tend to be flatter). Any increase would be good.
- Environmental Indicators are big picture; measure overall health of system; easy to measure.
- Next 4 columns are categories of Success Criteria from TNC.
- Can add columns of criteria as desired.
- ***Add reef size (to project specific criteria) & reef coverage (to CHNEP region-mapping criteria).***
- ***Add requirement that more mapping is needed.***

Discussed CHNEP Region-Wide Environmental Indicator Metrics:

- Density, % living & size structure are good indicators.
- Disease prevalence is important, could be used as a follow up criteria/adaptive strategy.
- See current CERP monitoring. Need to expand on CERP monitoring throughout CHNEP. Could be collaborative effort among CHNEP partners using consistent SOPs & metrics throughout area.
- Need both "must have" (primary) & "wish list" (secondary) indicators.
- ***Suggested Primary Indicators =*** density, size structure, larval recruitment, reef coverage, (Important - See TNC Monitoring Diagram on Page 12)
- ***Suggested Secondary Indicators =*** biodiversity/resident reef community (could be from FIM data) (note some obligate fish & crab species are indicators of health of reef), condition index, reproductive activity, disease prevalence, disease intensity;
- Convey results regionally; consider regional variability – i.e.: "report card"; convey trends (see Sarasota Co & CERP), water quality is important, but captured already through other programs.

Discussed Sites Project Specific Success Criteria:

- ***Primary Criteria = recruitment & growth - density of living, size structure, reef relief, reef size.***
- ***Secondary Criteria = percent living & recruitment***.

- % living (use consistent methodology, grids work well, consider recently dead vs. dead = articulated vs. not articulated. TNC doesn't use % living, they count # living & don't compare that to # dead. Include with size structure.
- Literature suggested size structure & density of living oysters at a minimum. See TNC Monitoring Fig 4 on pg 12. Need to develop simpler less destructive field sampling technique. In Indian river, use random quadrate & count every live oyster you can see.
- Need to include size structure? Would be hard & need to be careful with methods because on healthy reefs get several layers of live oysters & top layer may not be best indicator, depends on reef morphology.
- Measuring size classes include number of spat. Could measure in the field with calipers & trays.
- Important to sample natural, control reef as part of monitoring a project. Could use tray imbedded in reef. Trays - variety of types = coke bottle tray) are lined with mesh, staked in place on reef, with same material as used in restoration site added. Then count recruitment of all oysters, as well as inverts (run animals through sieve) & calculate to recruitment/area.
- What about oyster drills? Included in reef resident measurements as predators.

Discussed Provision of Habitat:

- ***Primary criteria = diversity & abundance residents (define methods – maybe tray?) & epiphytes (both flora & fauna) with categories & % cover.*** Need to measure amount, diversity, seasonal variability. Need to define methods. Need to assess similarity to natural reefs. What about drift algae & relationship to hard substrate? What about hook & line fishing for larger predators & gut contents? (no – not really indicative). Epiphytes can be defined categorically and with percent cover.
- ***Secondary criteria = transient residents.***

Discussed Water Quality:

- ***Primary criteria = turbidity & clarity.*** Need methods & SOPs, See Grizzle seston & water quality monitoring methods. Seston water quality monitoring is expensive. If measure ambient water quality, needs to be right over reef & include measurements up-tide vs. down-tide of reef. See TNC light sensor experiment. Could use data loggers. For specific restoration projects, water quality monitoring is important but not as a success criteria. Could set up specific SOPs. Consider up-tide vs. down-tide seston sediment removal.
- Do we need to (& is there a tool to) measure & analyze oysters themselves? C:N?
- Water quality monitoring is required by some funding agencies.
- Improved WQ is sometimes an expected result of oyster reef restoration.
- See TNC Monitoring Handbook for water quality methods.
- Consider Secchi & transparency tubes & field turbidity meters.
- Need SOPs & suggested equipment.

Discussed Shoreline Protection:

- Is Shoreline Protection a goal for CHNEP Oyster Restoration? Yes, as an option for objectives for some specific projects. May need a better title.
- ***Include Adjacent Habitat Protection as a project objective &/or benefit, as a secondary benefit (not the primary).***
- Shoreline protection or adjacent habitat protection is not something all projects are going to do. Shouldn't be a required goal of CHNEP region-wide oyster restoration. Could do oyster restoration for the protection of salt marsh, sediment stabilization. See TNC Monitoring page 14 – measure edge of shoreline & habitats near oyster bar. Could also be hurricane & property protection & help with tourism & economy.
- Need to identify state ownership line that remains after accretion – otherwise state ownership moves with mean high water line. Need to clarify the purpose of restoration project isn't filling state lands to create uplands above MHWL.

- In Aquatic Preserves, projects need to be in the public interest. Oyster restoration is a positive public interest because it is good habitat restoration except if used as "breakwater" to accrete land for private benefit.

Discussed Other Environmental Indicators & Success Criteria:
- Invasive species needs monitoring – lionfish, green mussels, Calurpa, exotic sea roach

5. Potential Oyster Restoration Techniques - Jaime Boswell, contractor to CHNEP (See PowerPoint presentation slides 15 - 19)

General Oyster Restoration Technique Considerations:
- See Brumbaugh & Coen 2009, Manley et al 2010
- Substrate materials (oyster shell, other shell, fossilized shell, sandstone, limestone etc.)
- Bagged/Contained Cultch (FGCU & SCCF)
- Loose Cultch (FDACS small barge method)
- Spat sticks
- Community Restoration (e.g. oyster gardening at docks)

Oyster Substrate Restoration Substrate (see slide 15):

Materials
- Fresh Oyster shell
- Fossilized Oyster shell
- Other shell (clam, whelk)
- Sandstone
- Limestone
- Cement – loose recycled
- Cement reef balls
- Vertical stakes (e.g. spat sticks, bamboo, wood) – good in high sedimentation areas
- Need to Consider
  - Interstitial Space - important
  - Vertical orientation in intertidal (Bahr & Lanier 1981)
  - Aging of fresh shell – to decrease disease & parasites
  - Availability/cost of materials
  - High-energy areas
  - High-sedimentation areas
  - Depth of water

Technique Examples (see slides 17-19):
- Bagged cultch
  - used for ecosystem restoration (Brumbaugh & Coen 2009)
  - SCCF – Clam Bayou - 4,200 bags/100 tons = 750 m^2
  - FGCU – numerous sites throughout Caloosahatchee Estuary & Estero Bay
  - SBEP – bagged shell around loose shell
- Caged cultch
  - high energy, shoreline protection (TX TNC project in Brumbaugh & Coen 2009)
  - Outperformed bagged shell in high sedimentation area in GA (Manley et al 2010), but not as good a stakes
- Loose cultch
  - fishery and/or ecosystem restoration, typically subtidal (Brumbaugh & Coen 2009)
  - Not good in areas with moderate to heavy boat traffic (Brumbaugh & Coen 2009)
  - Estimated cost - $100,000 per acre (Brumbaugh & Coen 2009)
- FDACS – Cedar Key Area - *Hoglet* (12' x 30' x 36") capacity of 24 cubic yards, 5 mph effective speed, 30 inch loaded draft & a working range of 5 to 6 miles
- Martin County – areas > 3 feet deep. 31 acres restored
- Vertical stakes

- Intertidal provides – vertical relief, good where sedimentation is an issue, outperformed bagged & caged treatments (Manley et al 2010)
- Community Restoration
  - Shallow water bag deployment
  - Bag filling
  - Oyster Gardening – keep oysters on dock. See Fl Oceanographic Society methods. is this ok in non-Shellfish Harvesting Areas?
- Use mats in Mosquito Lagoon = mats "quilted" over loose shell.
- Need to consider permitting requirements.

6. Pre-restoration & Post-restoration Monitoring - Jaime Boswell, contractor to CHNEP (See PowerPoint presentation slides 20 - 14)

Note: Because the meeting was running late, the Working Group read through the Restoration Monitoring slides without discussion & members were requested to provide comments to Jaime via email within a short time period, as specified in a follow-up email.

Pre-Restoration Monitoring - Site-Specific Considerations (slide 20):
Consider why are oysters not present &/or self-sustaining now
- Substrate limitation
- Recruitment limitation
- Water quality
- Water quantity
- Predation/disease

Suitability Assessment Metrics
- Substrate/landscape
- Recruitment (March-Oct)
- Temp, salinity, DO
- Sedimentation
- Water flow/flushing
- Predators
- Disease
- Wave action/boat traffic
- Seagrass

TNC Oyster Restoration Monitoring (slide 21):
- Before – After – Control – Restoration (BACR)
- Abundance, Density, Size Frequency – annually for a minimum of 5 years, ¼ m^2 quadrat excavated to 10-15 cm, use sampling trays embedded in reef which are non-destructive
- Recruitment – settlement collectors, use to infer relative magnitude & distribution
- Habitat Value – lift nets, drop nets, seines, gill nets, divers, video, trays
- Water Quality – TSS, Chl a, water clarity, seagrass abundance
- Shoreline protection – shoreline migration relative to reference, change in vegetative cover

SCCF *Pre*-Restoration Monitoring (see slide 22):
Consider what you need to measure before restoration to adequately test success criteria
- Native Oyster Density/Recruitment
- Resident Reef Community Composition
- Reef Relief
- Water Quality
- *In situ* Seston Uptake
- Seagrass

SCCF *Post*-Restoration Monitoring (see slide 23):

- Recruitment, growth, invertebrate reef residents - 0.125 m^2 trays, at 8 months & 14 months
- Reef Survey – Reef relief & footprint
- Seston Uptake – *In situ* flourometry, up-tide & down-tide
- Water Quality – Temperature, DO, salinity, turbidity, chlorophyll *a*
- Seagrass

CERP Monitoring (see slide 24):

- Sites along Salinity gradient
- Oyster density – spring & fall, using ¼ m^2 quadrat
- Condition index – monthly
- Recruitment – monthly, using stringers
- Reproductive & Disease – monthly
- Juvenile growth & water quality mortality – monthly, using bagged oysters
- Water quality – depth, temperature, salinity, conductivity, pH, dissolved oxygen & turbidity

Discussion of Monitoring Requirements to Be Conducted via Email:

- ***Considerations for pre-restoration monitoring:*** water quality & temperature, recruitment, disease, predation, water flow, sedimentation
- ***Considerations for post-restoration monitoring:*** relate back to success criteria

7. Next Tasks, Duties & Schedule – SW FL Oyster Working Group Participants

- Jaime will email Meeting 2 notes with request for comments by the end of the week.
- Working Group participants will provide comments on Monitoring Techniques, as well as GIS Model Components & Success Criteria ASAP.
- CHNEP & SWFRPC will conduct GIS Oyster Restoration Habitat Suitability Analysis.
- Meeting 3 of Working Group will be Friday May 25 to review draft maps of potential oyster restoration areas. The meeting will be in Fort Myers at SWFRPC from 12:30 – 4:30 pm.
- CHNEP staff & contractor will begin writing plan.
- Regulatory sub-working group will meet to discuss variety of regulatory considerations.
- Meeting 4 of Working Group will be Tuesday June 19 to review draft plan. The meeting will be in Fort Myers at SWFRPC from 8:00 am – 12:00 pm.
- Draft CHNEP Oyster Restoration Plan will be presented to TAC Wednesday July 11 (agenda packet due July 4).

Southwest FL Oyster Working Group Meeting 3
Friday May 25, 2012
12:30 am – 4:30 pm
SWFRPC, 1926 Victoria Ave., Fort Myers, FL 33901

MEETING NOTES

Attendees:
On site: Anne Birch/TNC, Greg Tolley/FGCU, Loren Coen/FAU-HBOI, Jim Beever/SWFRPC, Barbara Welch/SFWMD, Holly Downing/City of Sanibel, Lucy Blair/FDEP, Steve Geiger/FWC FWRI, Dan Cobb/SWFRPC, Jaime Boswell/for CHNEP, Judy Ott/CHNEP
Via Teleconference (WebEx was down): John Ryan/Sarasota Co., Andrea Graves/TNC

Purposes of Meeting 3 of SW FL Oyster Working Group:
- Review oyster restoration suitability model output.
- Review post-model GIS considerations.
- Identify priority restoration sites by estuary segment.

Meeting Notes:
Due to technical difficulties, the meeting was not available via WebEx & started at 12:50 pm.

1. **Welcome & Introductions – Judy Ott, CHNEP**
   Members introduced themselves & Judy reviewed the purposes of the meeting & the agenda.

2. **Discussion of Oyster Habitat Suitability Model (HSM) Output – Jaime Boswell & Dan Cobb**
   Jaime & Dan summarized the key components of the Oyster Habitat Suitability Model, including:
   - Acres of suitable habitat for entire area & by estuary segment
   - Classification of data (i.e. percent suitability ranges)
   - Interpretation of results
   - Identify any errors & changes needed

   Discussion:
   - Questions & discussion regarding salinity. What salinity values should be used – monthly, daily, ranges, etc.? How should salinity be included in model? Need to review salinity data for San Carlos & Dona/Roberts Bays. Need to look at salinity variability & duration.
   - Discussion regarding how depth, salinity, seagrasses & oysters relate & what drives suitability in specific estuaries. To review habitat suitability model outputs for an estuary, look at model results for that estuary & then look at handouts for specific model inputs to see what is driving results.
   - Discussion regarding whether using GIS analysis is appropriate for developing a habitat suitability analysis, but no alternatives were offered. Suggested that it would be helpful to have a hands-on look at the Oyster Habitat Suitability Model & be able to turn different layers on & off to see how the results are affected.
   - There are 6 Oyster Habitat Suitability Model Components: Submerged Aquatic Vegetation (SAV), Aquaculture, Boat Channels, Depth, Salinity & Dissolved Oxygen (DO).
   - Discussions regarding omitting DO from Habitat Suitability Model.
   - Discussion regarding SAV: SAV is scored based on persistence – if present all 5 years = not suitable for oyster restoration & score 0, if present 1-4 years OK for further consideration for oyster restoration. SAV persistence drives model results a lot. What about effects of clam aquaculture on seagrass? What about small areas within or near seagrass that could be suitable for oysters? This is addressed at a large scale by excluding areas with 5 years of SAV.
   - Discussion regarding Aquaculture Lease Areas - need to be pull aquaculture lease areas out of potential oyster restoration areas, but no buffer is needed.
   - Discussion regarding boat channels: Used a simplistic approach - omit channels & do a lower ranking for a 75 foot buffer along channels. Recognize that a larger buffer maybe needed in some major channels.
   - Discussion regarding depth: areas less than 3' gets highest score. 3-6 gets 5; over 6' gets a 0.
   - Lengthy discussion regarding salinity - see ranges on maps.

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- Generally the model is doing what we want it to do but have some areas to fix.
- Discussion regarding how far out into the Gulf of Mexico to extend oyster HSM – need to clip out Gulf areas across mouths of passes.
- Reminder that the oyster HSM is designed to give a big picture by estuary segment: how many acres of suitable habitat are available on a broad scale. Goal is to establish CHNEP oyster restoration acres – where oyster habitat restoration may happen in the future.
- Need to define what suitable habitat is then overlay where oysters actually exist. Need mapping of current oysters.
- Discussion & questions regarding overlaying existing oysters with oyster HSM output & accuracy of GIS layers of historic & existing oysters – which range from 1000s to 100s of acres. In reality, could be close to 1000 acres – are more oysters in Myakka & Peace R; think ground truthing will show many more acres of oysters. A lot of aerial photos aren't shot at correct tide & under mangroves & with sun glare, so miss a bunch of oysters. Google pictures are often helpful.
- Discussion & questions regarding ranking of HSM components: Are all model components weighted equally? Yes – factors are multiplied together – see model outcome summary.
- Discussion regarding percent of suitable habitat that actually has oysters: Detailed imagery & mapping in SC only found about 30% of oyster reefs; especially under mangroves.
- Discussion regarding substrate: CERP has a map of substrate of substrate that is ground-truthed for Caloosahatchee R & San Carlos Bay.
- Additional discussion regarding salinity: Salinity is a pretty conservative parameter so there shouldn't be pockets of very high or very low salinities - higher habitats tend to show up with higher salinities. Need to go back & look at salinity data – because it is such an important deciding factor. Suggest using the layer of salinity data from CERP for Caloosahatchee R. How SCCF RECON salinity data could be used? Would need special context to use recon data & ground truth upstream "killing floods" (as well as dry season high temps) & salinity durations. Duration & frequencies of low salinities are more limiting & critical than average salinities. Discussion that there are more dead reefs more in high salinity areas, but these could be relic reefs. Predation may be higher in high salinity areas, too. Low salinities occur in SW FL in summer when temps are high which may minimize diseases. Possible cause is that isohalines changed over time, especially with canals & salinities became flashier, adversely affecting oyster. 1960s restoration included lots of dumped oyster shells which didn't all survive – may look as relic reefs in Pine I Sound. We discussed how to incorporate salinity in oyster HSM in previous SW FL Oyster Working Group meetings. Originally had 10 year averages & tried to include killing floods, but eliminated it because there wasn't a good method to estimate it. We could add killing flood back into the oyster HSM, but need direction on how to do that. Before we used the salinity data available from the CHNEP Water Atlas. Killing floods are going to be the biggest problem upstream. Salinity could be a recommendation about how to move on to the next step & other salinity steps will be needed in more detail during project design & implementation. Would be hard to pull data logger data into oyster HSM at this stage of development. We are interested in where there are excessive freshwater flows & if this process identified the areas that would be very helpful.
- Discussion regarding oyster harvesting & dredging: Oyster dredging has been active in the past.
- Discussion regarding grid size used in the oyster HSM: Used 50 feet X 50 feet. Seagrass is mapped from aerials & will need to refine in more details when designing & implementing restoration projects. Reminder that many oyster reef smaller than 50 feet X 50 feet. In SC used a minimum mapping unit of 10 feet.
- Additional discussion regarding SAV: Need to not adversely impact seagrasses when using volunteers to deliver oyster bags across seagrasses to oyster restoration sites. Along the west side of Pine Island, volunteers brought in lots of oyster bags next to SAV without damage.
- Discussion regarding optimal places for oyster which don't need restoration.

- Discussion regarding what changes are needed to the oyster HSM to provide a realistic big picture estimate of oyster restoration areas: Summary = 2 key changes = clip out the Gulf of Mexico from the HSM & refine the salinity to reflect limiting low salinity conditions.
- Summary discussion of Gulf of Mexico & Coastal considerations: What about wind component & calculating wave energy based on wind speed & direction. What about the Coastal Control Construction Line? We know oysters don't grow in high energy areas below CCCL. On Ft Myers Beach, show significant loss of oysters along the Gulf, near the passes – possible because the shorelines moved a lot. What about Sea Level Rise & the future of oyster restoration? TNC doing restoration for CC resilience. What is the time period of this restoration? We want to look at areas that may be suitable in the future, & be adaptable & consider areas for restoration now & in the future.
- Reminder that if things change (i.e. salinities) can rerun the HSM, which we plan to do regularly (every 5 years?) &/or as new data becomes available.
- Summary discussion of salinity considerations: Staff requested direction from the group. Could use current data & clean it up or could incorporate something to address killing floods now (or in future runs of the oyster HSM). Could do model specifically for each river (Peace, Myakka & Caloosahatchee). Could use MFLs for Peace & Myakka from SWFWMD – other hydrologic models are very detailed. Killing floods relate to seasonality of rainfall - use rainy season, so focus on peak of wet season. What about duration of killing flood? Duration of killing flood is important. Don't average entire wet season – look for 30 day consecutive period below 5-7 ppt – but would have to look at data logger data to be able to do this. Need to look at Caloosahatchee R Aug – Oct pulse releases. Should we take salinity data out of HSM? Need to look at average salinity as a big picture. Wet season salinity is more important for oyster restoration. As an easiest first cut, select rainy season data – Jul – Oct. \
- Conclusion of oyster HSM discussions: use wet season average & clip geographic extent & investigate tidal river details for killing floods using Peace & Myakka MFL isohalines & Caloosahatchee data loggers &/or flow/salinity estimates.
- Additional discussion: Need to add areas where we think would be the best place to do restoration & provide the rational as to why these areas would be good. What about using USGS & SCCF data?

3. Discussion of Post-model GIS considerations – Jaime Boswell

Reviewed & discussed maps including SHAs, Historic Oyster Habitat, Current Oyster Habitat, Sediment Type, Managed Areas, Shoreline Type, Sawfish Hotspots w/1km buffer.

Discussion:

- Difficult to map oysters using aerials, either historically or currently.
- Sediment type will be reviewed in more detail during restoration project design & implementations.
- Habitat restoration projects are consistent with Aquatic Preserve Management as long as habitat restoration is the goal of the project.
- Will review sawfish hotspots when designing & implementing oyster restoration projects.
- Will discuss regulatory topics in more detail with a smaller group in the near future.

4. Determine Priority Restoration Sites by Estuary Segment – Jaime Boswell & Judy Ott

Reviewed & discussed oyster HSM & post-model considerations for each estuary & added local knowledge to maps for each estuary, including: Dona & Roberts Bays

Dona & Roberts Bays

Oysters end at intersection with Fox Creek and are most abundant east of 41, Blackburn Canal hydrology may affect success

Priority Areas – east of 41

Lemon Bay
SWFWMD Coral Creek restoration should benefit oyster habitat
Priority Areas – all tributaries

Peace River
Suitable up to the I-75 bridge
Priority Areas – northwest of Punta Gorda Isles, Alligator Bay, behind Hog Island

Myakka River
There are lots of healthy oysters in the Myakka River, additional substrate may be added west of the 776 bridge.
Priority Areas – west of 776 bridge, Tippecanoe Bay

Upper Charlotte Harbor
CCA is a citizen's group interested in oyster restoration in this area
Priority sites – add fringing reefs near islands north of Pirate's Harbor

Gasparilla Sound/Lower Charlotte Harbor
Avoid manatee natality area in Turtle Bay
Priority sites – sandbars to the north of Bokeelia, south side of Cape Haze, west side of Cayou Pelau

Matlacha Pass
The southern area, south of the powerlines, near the mouth of the Caloosahatchee River is not likely to have optimal salinities until the implementation of CERP. Avoid Pine Island Creek due to conflict with American Crocodile.
Priority sites – shallow areas outside of the channel, north of the powerlines

Pine Island Sound
Locations of existing reefs – northwest of York Island, near MacKeever Keys, near Regla Island, underneath mangroves outside of Tarpon Bay's shallow cut, east of the north end of Buck Key, south of Demere Key, Captiva Rocks, near fish houses west of Pineland, between Cayo Costa and Cabbage Key
Priority sites – add substrate near existing reefs

Caloosahatchee River
Salinity is currently not stable enough in the Caloosahatchee River for oyster restoration, with the implementation of CERP salinities could be appropriate up to the area between the midpoint and Cape Coral bridges.
Priority Sites – area on the north side of the mouth of the river near Cattle Dock Point may be the only potential site

Estero Bay
Higher quality oyster habitat is near Estero River and Spring Creek. High flows from the Imperial River and Mullock Creek reduce the quality of habitat in these areas. High flows from Mullock Creek also flow up Hendry Creek, reducing salinities.
Hell Peckney Bay and Hurricane Bay may provide good habitat.
Priority Sites – Hell Peckney Bay, Hurricane Bay, around Estero River and around Spring Creek

5. **Next Tasks, Duties & Schedule – Judy Ott**
   - June 19th – Oyster Working Group Meeting 4 to review revisions to oyster HSM & restoration methods & some components of draft Restoration Plan.

Southwest FL Oyster Working Group Meeting 3
Friday May 25, 2012
12:30 am – 4:30 pm
SWFRPC, 1926 Victoria Ave., Fort Myers, FL 33901

- June 26th – Comments on Draft Restoration Plan Due
- Present oyster HSM results & methods & parts of draft plan to the July/Aug round of CHNEP Management Conference meetings.
- May extend schedule for developing CHNEP Oyster Restoration Plan to allow additional technical review & input from the SW FL Oyster Working Group & CHNEP Management Conference until Oct/Nov round of Management Conferences to assure technically sound, consensus based, usable document.

Southwest FL Oyster Working Group Meeting 4
June 19, 2012
8:00 am – 12:00 noon
SWFRPC, 1926 Victoria Ave., Fort Myers, FL 33901

MEETING NOTES

Attendees:
On site: Kathryn McBride/City of Cape Coral, Aswani Volety/FGCU, Keith Kibbey/Lee Co. Environmental Lab, Heather Stafford/FDEP Estero Bay & Charlotte Harbor Aquatic Preserves, Andrea Graves/TNC, Holly Downing/City of Sanibel, Eric Milbrandt/SCCF, Jim Culter/Mote Marine Lab, Lucy Blair/FDEP South District, Paul Tritaik/USFWS "Ding Darling" NWR, Tim Walker/SWFRPC, Jaime Boswell/Contract to CHNEP, Judy Ott/CHNEP
Via WebEx: Barbra Welch/SFWMD, Paul Zajicek/FDACS, Mark Berrigan/FDACS, Keith Laakkonen, Town of Fort Myers Beach

Purposes of Meeting 4 of SW FL Oyster Working Group:
- Finalize the design of the Oyster Restoration Suitability model.
- Identify a suite of suitable oyster restoration methodologies.
- Review estuary segmentation scheme for Oyster Restoration Suitability model results.
- Review regulatory/permitting discussions, the need to identify CHNEP oyster restoration goals & next steps.

Meeting Notes:
1. **Welcome & Introductions – Judy Ott, CHNEP**
   Members introduced themselves & Judy reviewed the purposes of the meeting, previous meetings, need to set potential final goals & the agenda, as follows.
   Summary of SWF OWG meetings to date:
   - Meeting 1: April 4, 2012 discussed CHNEP Oyster Restoration Plan approach, schedule, data needs & plan outline.
   - Meeting 2: May 9, 2012 discussed TNC perspective of CHNEP & TNC oyster restoration, progress on CHNEP Oyster Restoration goals, objectives, Oyster Restoration Suitability Model & introduced success criteria & restoration methods & materials.
   - Meeting 3: May 15 discussed Oyster Restoration Suitability Model outputs, post-model GIS considerations & identified priority oyster restoration areas for each estuary.
   - Meeting 4: June 19 will discuss final Oyster Restoration Suitability Model components (see handout), oyster restoration methods & materials (see handout) & estuary segmentation scheme for Oyster Restoration Suitability Model outputs, oyster regulatory/permitting discussions to date & the need to identify CHNEP oyster restoration goals (acres).

   CHNEP oyster restoration goals (acres) will need to consider:
   - Oyster Restoration Suitability Model output ($\pm$ 22,500 acres of 100% suitable habitat within CHNEP).
   - Historic acres of oysters ($\geq$ 2,700 acres based on best available interpretation of 1950s black & white photos; this is $\pm$ 1% of Oyster Restoration Suitability Model output).
   - Literature (Volety et al., 2010) estimate of percent of "accommodation space" where oyster are found (i.e. 1-5% of salinity >5 ppt; this is $\pm$ 2,000 – 10,000 acres within CHNEP).
   - Smalltooth Sawfish Critical Habitat ($\leq$ 3 feet deep, unvegetated, within Critical Habitat boundary; is $\pm$ 53,500 acres within CHNEP).

   Regulatory/Permitting Subcommittee:
   - Met May 29, 2012; included representatives from FDEP ERP & EBAP/CHAPs, SWFWMD ERP, NOAA Endangered Species, FGCU & TNC; discussed the topics below:
   - FDEP/WMD Environmental Resource Permit (ERP) requirements & Aquatic Preserves Public Interest requirements; oyster restoration projects need to be designed as habitat restoration projects; within Aquatic

Preserves project must have a positive public interest; Aquatic Preserves in CHNEP - all estuaries except Dona/Roberts Bays, southern Matlacha Pass & San Carlos Bay.

- USCOE requirements & NOAA Endangered Species review of USCOE permits; NOAA reviews projects for potential adverse impacts to endangered species critical habitat, as defined by not crossing a threshold where the projects (cumulatively) would jeopardize the existence of the species (Smalltooth Sawfish); need estimate of acres of critical Smalltooth Sawfish habitat within CHNEP study area (unvegetated areas < 3' deep within defined boundary of Critical Habitat for Smalltooth Sawfish which includes CHNEP estuaries minus Lemon Bay & Dona/Roberts Bays).
- Need to set CHNEP oyster restoration goals to clearly represent habitat restoration, have a positive public interest value & don't cross the threshold of impacts that would jeopardize Smalltooth Sawfish existence.
- CHNEP Oyster Restoration Plan will include summary of regulations & estimate of Smalltooth Sawfish Critical Habitat for Smalltooth Sawfish acres.

Next steps include:

- After today's meeting: run final Oyster Restoration Suitability Model & add priority restoration areas (identified at Meeting 3) to maps.
- July 11 – August 20, 2012: Present Oyster Restoration Habitat Suitability Model & oyster restoration methods & materials to CHNEP Management Conference committees & determine draft CHNEP Oyster Restoration goals.
- August 27, 2012: Present draft CHNEP Oyster Restoration Plan to SWF OWG Meeting 5 & determine final CHNEP Oyster Restoration goals.
- October 10 – November 16, 20120: Present final CHNEP Oyster Restoration Plan & restoration goals to Management Conference committees for approval.

2. Review Modifications to the Oyster Restoration Suitability Model (RSM) – Jaime Boswell, Contractor to CHNEP (see PowerPoint presentation)

Jaime summarized the key components & modifications of the Oyster Restoration Suitability Model.

Purpose of Oyster Restoration Suitability Model (RSM) & Discussion (slide 2):

- Use best available spatial data to determine best locations for oyster restoration within CHNEP.
- Direct partners towards potential restoration sites where site specific monitoring could occur.
- Help partners be more competitive for grants by demonstrating regional approach.

Factors Effecting Oyster Restoration Success & Discussion (slides 3 - 4):

- Salinity & killing floods (see discussion below).
- Substrate (not included in model; insufficient data; consider in site specific evaluations).
- Larval supply (not included in model; insufficient data; consider in site specific evaluations).
- Dissolved oxygen (not included in model; reviewed data; no critical DO found).
- wave energy (not included in model, site specific evaluation)
- Temperature (not included in model; reviewed data; no critical temperature found).
- predators (not included in model), disease (not included in model; not strong limiting factor; consider in site specific evaluations), & harmful algal blooms (HABs) (not included in model; insufficient data).
- Seagrass (included in model; range of scores based persistence/years present).
- Boat channels (included in model as areas to avoid; channel widths plus buffer on either side).
- High density aquaculture lease areas (included in model as areas to avoid).
- Permitting & regulatory considerations (not included in model; consider in site specific evaluations & designs; includes FL Aquatic Preserves, NOAA Smalltooth Sawfish Critical Habitat).

Final Oyster RSM Components (slide 5; also see handout):

- Depth (exposed – 3 feet = 1; 3-6 feet = 0.5; > 6feet = 0).
- Seagrass persistence (not present = 1; present 1-4 years = 0.5; present 5 years = 0).
- Boat channels (identified channels standardized to 150 feet wide = 0; adjacent buffer 75' on either side = 0.2).
- High density aquaculture lease areas (in lease area = 0; out of lease area = 1).;

- Tidal river isohalines (removed average estuary salinity from model & added 3 ppt isohalines for Peace, Myakka & Caloosahatchee; upstream from isohaline = 0; downstream = 1).

Salinity Components of Oyster RSM & Discussion (slides 6 – 18):

- Salinity Contouring (slides 6 - 9):
  - Originally used 10-year average salinity & Water Atlas contours; contours didn't look representative near San Carlos Bay (slide 7).
  - Based on review of 10-year average contours at last meeting decided wet-season data more appropriate.
  - Compiled wet season data; used July-Oct 10 years fixed & random station data; included SFWMD DB Hydro data; interpolated & reviewed output; (slide 8); results didn't look representative either.
  - Need to determine best way to contour available data.
  - Could use fixed stations & extrapolate; might smooth out contours.
  - Researched how others contoured water quality data; TBEP used random data; others used fixed data.
  - There are concerns about how data could be used; difficult to capture near shore water quality conditions; might be helpful to overlay bathymetry with water quality data.
  - Consensus that this is a future analysis need & not to include estuary salinity contours in model.
- Killing Floods Peace & Myakka Rivers (slides 10 – 12):
  - Used 12 years (2000 – 2011) wet season (July-Oct) data by river Km from SWFWMD & PRMRWSA.
  - Averaged river isohaline data available to estimate river Km associated with 3 ppt.
  - Peace R isohalines available for 0 ppt & 6 ppt; 3 ppt isohaline found at river Km = 15 Km.
  - 3 ppt isohalines are upstream from historic oysters, but consistent with current oysters.
- Killing Flood Caloosahatchee River (slides 13 – 18);
  - Caloosahatchee R more complicated to estimate isohalines for because of artificial releases over S79;
  - Estimated typical flows for wet season for 2000 – 2011; used highest 30-day average flow & rainfall; averaged 6,000 cfs.
  - Flow management & discharges changed in 2008.
  - Reviewed Caloosahatchee R flow/salinity models; using Bierman model & 6,000 cfs the 3 ppt isohaline is upstream from Shell Point 4 Km near Peppertree Point; using Volety et al 2010 analyses & 6,000 cfs the 3 ppt isohaline is near Shell Point at Cattle Dock Point & Peppertree Point is near the 1 ppt isohaline.
  - Changes in management probably overshadowed rainfall impacts; without knowing future management of flows it is most representative to use 10 year average & change model with changes in management.
  - Could run the model using with MFL scenario to see where isohalines would be & compare to current output; MFL based on maintain salinity of 10 ppt at Ft Myers; rerun model to show habitat we would expect in the future; maximum flows are more of a concern for oyster restoration than MFLs.
  - Changes MFLs & flows will change isohalines; different perspectives of what changes would be; one thought is that if change MFL & release more water this will drive the isohalines further downstream & change the salinities in the estuaries; another thought is that if constantly release water on more even flows, the isohalines would move further upstream; effective management scheme could be to maintain some flow during dry periods but continue to discharge excess flows during rainy periods; but that could mean that there would be less water to release during high flows; Lake O fills faster than can be drained.
  - Salinity data from City of Sanibel (slide 16) shows that 5 ppt during high flow is at Peppertree (based on data logger from USGS); oysters in this area are sustainable, except for a couple of years at Cattle Dock; also get runoff from Cape Coral.
  - Aswani estimates that 3,000 cfs would be good for oysters; Shell Point is reasonable cutoff; may have a killing flood in late summer, but spat still recruit to this location which has a very high oyster growth rate; the Oyster Restoration Suitability Model (RSM) should show that Shell point is a good place for oyster restoration; improved water management should improve oyster suitability at Shell Point (see slide 17 with Volety's oyster density data).
  - Usually oysters don't do well in hyper-saline conditions like Tarpon Bay should be but high flows from the Caloosahatchee keep the salinity adequate to support oysters there.
  - Review what's in Oyster RSM now & decide what to keep in current model & what to add in the future.
  - Ernie Estevez from Mote did a study of the upriver extent of mollusks in Peace River; no similar surveys in Caloosahatchee R but they are needed.

    - Consensus to use a 3 ppt isohaline at Pepper Tree Point for the Oyster RSM; upstream from isohaline = 0 in RSM; downstream = 1.
- Discussion regarding depths:
    - Subtidal oysters are found upstream in Caloosahatchee up to the Cape Coral bridge.
    - Depth & substrate play role in oyster restoration; oysters may be restorable deeper than 6 feet; need to look at substrate on a site specific basis; not sure if historically there were more subtidal oysters; deep locations currently are in channels which may have different sediments; may not matter if the depth is 3–6'.
    - Consensus to change value for depths in Oyster RSM for 3 – 6 feet depths to 0.8 instead of 0.5.
- Question about salinity & killing floods in Estero Bay tributaries:
    - Requested information about salinity from FDEP data loggers in Estero Bay tributaries.
    - Erin indicated data loggers were likely further upstream from oyster cut off points.
    - Lower salinities are not really a problem up into the tributaries except for Imperial R; generally higher salinities are more of a problem for oysters in Estero Bay tributaries.
    - If doing restoration in tributaries, it will be important to look at natural oyster populations & do salinity monitoring for site specific conditions; will include discussion of tributaries in Plan text.

Revised Oyster Restoration Suitability Model (RSM) Output (slides 19):

- Included isohalines.
- Removed Dissolved Oxygen (DO).
- Removed estuary salinity contours.
- Clipped out Gulf & most canals (model not designed for canals, but that doesn't mean canals aren't potential habitat).

Draft Oyster RSM Suitability Score Map for Meeting 4 Consideration (slide 20):

- 100% suitable = 22,549 acres (10% of total) = 10 X estimate of historic acres
- 50% suitable = 40,847 acres (18% of total)
- 30% suitable = 8,200 acres (4% of total)
- 20% suitable = 1,795 acres (<1% of total)
- 10% suitable = 1,936 acres (<1% of total)
- 0% suitable = 149,507 acres (67% of total)
- Total = 224,869 acres
- Note: reviewed Oyster RSM results for each estuary following discussion of estuary segmentation scheme.

3. Segmentation Schemes & Discussion (slide 21):

- Need to consider segmentation scheme for conveying oyster restoration goals; currently use CHNEP sub-basins & CCHMN strata for technical analyses & basis for management within CHNEP.
- Considering that larval transport crosses segment schemes could combine Tidal Caloosahatchee, San Carlos Bay, lower Pine Island Sound, lower Matlacha Pass & western Estero Bay.
- Question why we need to convey oyster restoration goals on a segment basis; could help set targets for certain acres; partners & funders will focus locally as a place;
- It is important not to place order of importance on some strata & areas; this will allow for partners with most interest will begin restoration; originally CCHMN strata was to encourage partners to participate in monitoring & management; could have partners place projects on strata map after they are proposed &/or complete.
- Question if Management Committees will likely prefer to have goals for each estuary or each segment or just the CHNEP total:
    - Some SWF OWG members don't see the need for estuary specific goals.
    - Some members suggest combining strata appropriately for reasonable management goals (i.e. Tidal Caloosahatchee + San Carlos Bay + lower Pine Island Sound + lower Matlacha Pass + Estero Bay).
    - Could do segments like Seagrass Targets & identify goals for each strata & measure changes over time, but don't see the same value for doing this for oysters; if partners want to do restoration they will choose projects in own estuary & find appropriate partners.

- If present goals for each strata or estuary can estimate % restoration accomplished for each strata or estuary as projects are implemented; we do need a measure of success; could use both overall CHNEP plus local goals.
- Having subdivision doesn't really cause a problem, but it would be better not to focus on them; track success but not focus on specific identified locations; don't' want to require having restoration in every subbasin if not realistic or practical.
- Could break out restoration suitability based on existing strata for consistency with other CHNEP analyses, but not set specific restoration acres for each strata; just identify suitable number of acres for each estuary & have 1 overall CHNEP-wide restoration goal; i.e. how suitable habitat by estuary but total acres of oysters for restoration for CHNEP overall.
- Could use 4 segments = 3 major rivers + Estero Bay.
- Could let the segments speak for themselves; could let TAC decide; could use it as additional information but not a deciding factor; could have 1overall goal for CHNEP, but show data by strata; could look at areas of higher probability of success;
- Could include historic by segment; Jim – primary question – where do we not have many oysters now but is good habitat;

- Question how estuary goals influence grant decisions:
  - Partnering as important along as scientific methodology for many grants; in Indian River Lagoon the TNC projects have been driven by partners.
- Question if there is value of concentrating oysters for sustainable population:
  - Some literature indicates concentration helps & some says spreading the restoration out is more successful;
  - Could be based on funding opportunities – i.e.: urban vs. protected areas;
  - Part of question is based on larval supply & substrate; some areas don't have shortage of larval supply.
  - It will be helpful to ask TAC about segmentation scheme at the July 11 meeting; should provide sub-basin acres to them.
  - Segmentation Preferences: CCHMN strata are useful because they represent inflow.
- Consensus to show Oyster Restoration Suitability Model habitat by strata & suggest a total CHNEP restoration goal.

4. Review Oyster RSM Results for Each Estuary & Discussion (see RSM Map handout):

- Dona/Roberts Bays: many channels which limit available oyster restoration habitat; notes from CHNEP Shellfish Restoration Workshop in February 2011 are consistent with model outputs.
- Lemon Bay: many boat channels & much seagrass which limit available oyster restoration habitat; discussed oyster restoration under boat docks like in Loxahatchee; are different ways to get homeowners involved; not much space in Lemon Bay for oyster restoration except under docks; this brings up regulatory questions; there have been many previous requests similar projects using unnatural materials; concerns that materials could drift or blow away in hurricanes; need to address filling of submerged lands & keep projects out of seagrass; the process of involving homeowners worked for TNC in Loxahatchee; asked homeowner first, then did site specific review to avoid seagrass; homeowners worried about oysters expanding in the future & causing problems for navigation or when replacing the dock or if oysters would become essential fish habitat; most of the interest for oyster restoration in Lemon Bay is in tributaries.
- Myakka River: see 3 ppt isohaline at river Km 11.5; has "lots of healthy reefs" & habitat; need mapping of existing oysters.
- Peace River: see 3 ppt isohaline at river Km 15; lots of potential habitat; see locations of potential restoration sites identified at CHNEP Shellfish Restoration Workshop in February 2011; had good oysters historically.
- Charlotte Harbor: see potential for islands along east wall; note areas along shore that aren't available due to persistent seagrass; need to consider wave energy as part of site specific considerations.
- Gasparilla Sound /Cape Haze/Lower Charlotte Harbor: high potential for oyster restoration on Cape Haze shoal & along islands; need more mapping of oysters in this area; historically was good for oysters based on a 1960s narrative description of oysters; there are currently oysters here; were historically oyster on sand bars off Bokeelia shoals.

- Pine Island Sound: at SWF OWG Meeting 3 focused on existing oysters on east side of Pine Island near fish houses; aquaculture leases are located in open shellfish harvesting areas; near shore area Pine Island is out for shellfish harvesting; may be good to restore in areas where shellfish can't be harvested to protect projects.
- Matlacha: includes lots of suitable oyster restoration areas & existing oysters; could expand existing reefs.
- Caloosahatchee River: includes lots of suitable oyster restoration areas; FGCU restoration sites are shown; also shows isohaline & oyster loss areas.
- Estero Bay: includes lots of suitable oyster restoration areas; there has been oyster loss based on historic mapping & comments; restoration sites are shown; also shows oysters present based on observation.
- Additional questions & comments:
  - Tarpon Bay seems to make sense.
  - Lemon Bay: discussed if should 3-6 ft depth be considered 50% suitable in model; seagrass persistence makes sense, but not sure of depth considerations.
  - Discussed depth: there are areas where oysters are deeper than 6 feet, but not too healthy; don't' find oyster as often deeper; could be a factor of DO; in Tarpon Bay there is something going on at deeper depth that seem to limit oyster distribution; could be sponges are limiting oyster in Tarpon Bay; asked if everyone is OK with depth as it is in the Oyster RSM; need to make sure the text describes this as guidance; would rather see 0-6 feet valued as 1 (100% suitable); many participants at previous SWF OWG meetings felt strongly that oyster restoration should focus on intertidal areas; model looks OK for upper reaches of creeks; could weight depth as less important consideration i.e.: 80%; could change Oyster RSM factor for depth to .8 for 3-6'; would use different restoration methodologies for inter vs. subtidal projects; question about how depth is considered in permitting; for FDEP ERP, permits aren't depth dependant; including deeper depths would minimize Smalltooth Sawfish overlaps; FGCU's restorations go to about 3 – 4 feet deep due to logistics.
  - Consensus to use a depth rating factor of 1 for 0 – 3 feet & 0.8 for 3 – 6 feet in Oyster RSM.
  - Discussed seagrass & scale of mapping; many oyster reefs are found in seagrass, but would not show up on seagrass maps due to minimum mapping unit; this is why seagrass persistence is used in the Oyster RSM; make sure in meta data to include minimum mapping unit in metadata; need to consider areas with improving water quality & increasing seagrass.
  - Discussed sand bars: in the past may have had oysters; north side of Peace River used to have oysters;
  - Discussed adding historic locations: hesitant to use historic locations as a goal because there is a reason they aren't there now; might be misleading to direct people to restoring oysters in historic locations
  - Consensus to include historic oyster map in Plan for reference but not use it in setting restoration locations or goals.
  - Peace R includes many areas shown as moderately (50%) suitable for restoration; could be a function of depth; salinity is more important than depth; weight model factors differently; question whether we are using depth as proxy for DO; if this is the case, needs to be explained in text; reminder that we think historically most oysters were intertidal so need to focus restoration on intertidal area where we have a better chance for success.
  - Discussed rookery islands: avoid rookery island as site specific consideration; include a buffer area; suggest 300'; some rookery islands are consistent & some move around; include map of rookery islands in the Plan in the permitting section; could also do rookery island persistence scale.

5. **Suitable Oyster Restoration Methodologies – Jaime Boswell, Contractor to CHNEP**
   Reviewed the draft matrix of Oyster Restoration Methods & Materials (see Restoration Methodology handout).
   Oyster Restoration Methodologies & Materials & Discussion (see Restoration Methodology handout):
   Oyster Restoration Methodologies:
   - Methodology used for restoration is considered during permitting process.
   - NOAA is interested in methodology list & designs to review for impacts to Smalltooth Sawfish Critical Habitat & harm to sawfish; therefore, entanglement potential is included in methodology matrix.
   - Need to ensure that the methodology list is complete but doesn't include methods that aren't successful or permittable within our area.
   - Literature doesn't include many different types of oyster restoration methods; see paper by Brumbaugh & Coen (2009); are some papers comparing some methods & cultch types.

- "Cultch" = substrate used for the restoration; commonly use fossilized shell here.

Bagged Cultch:

- Bagged cultch is the only method used in our area so far; bags allow high or low relief; mostly intertidal with some subtidal; harder to place in deeper water; generally use non-biodegradable aquaculture grade mesh; not generally anchored; bags became popular when oyster restoration for ecosystem services (vs. fishery enhancement) began; use bags for oyster fishery enhancement.
- See Oyster Restoration Methodology matrix for pros & cons.
- Dredging isn't used for oyster fishery very often anymore; use tongs for commercial oyster harvest in Apalachicola; limit harvesting on public bars to tongs; mechanical harvesting means are allowed as defined in a lease agreement between leasee & state; have 1 private lease in Apalachicola from 1960s which uses mechanical harvesting; in the past 1 clam lease (leased in perpetuity) used an elevator dredge in past; some interest in "hydrologic dredge" which is a spray bar that liquefies sediment & strains clams out of bottom; clam farmers looking at Sunray Venus clam with bottom planting which would require different harvesting methods; in CHNEP aquaculture lease area off Demere the sediments are thin & the clam farmers try not to displace sediments or pull the sediment up with the bags.
- When enhancing oysters for harvest, often add loose cultch onto existing reefs; don't generally establish new reefs but if this would be done, would need to consider current & flow
- See pros & cons on table; bagged cultch method is good for community involvement, stable & can control size; mesh = about ½ to 1 inch & flexible; discussed alternatives or concerns; need to consider Smalltooth Sawfish entanglement.
- Discussed if bags need to be biodegradable; don't want bags to break into pieces & float away.
- Discussed spacing of bags; keep spaces between bags for sawfish; need to identify what would be a good space; in natural reefs don't have breaks; would be good for flow to have breaks & would reduce the percent loss of Smalltooth Sawfish Critical Habitat; helpful to leave open space between mangroves & oyster restoration, too.
- Consider methods on a case by case basis but we do want to give NOAA this Plan for review & comment; NOAA would like to see bigger picture of oyster restoration plan in CHNEP; NOAA needs to consider cumulative impacts.
- Bags prevent shell washing away from boat wakes; will colonize in 2 months to 2 years; mesh is incorporated into reef so plastic doesn't find its way into the environment; burlap bags disintegrate before good oyster colonization & larvae can't penetrate the small hole size to settle.
- SCCF found quality control issues with the bag; if the bags aren't filled enough it creates a loose bag "tail" that flap around; could address "tails"; more of an issue if bags.
- Discussed Smalltooth Sawfish entanglement: how small of a mesh is would influence how potentially entangling the bag is; bags get biofilm within 2 weeks which reduced entanglement potential; some SWF OWG members identify entanglement as a major issue; when Smalltooth Sawfish are young they feed more like rays; need to ask FWC fisheries biologists (Gregg Poulakis) about Smalltooth Sawfish feeding & browsing behavior when the fish are young & design bags to minimize entanglement; might help to fill bags as full as possible; could compare pictures of fouling rates on bags after defined time periods; discussed potential for wire mesh but little enthusiasm; question about crab trap entanglement; need to ask Gregg if there are documented cases of Smalltooth Sawfish entanglement in bags & traps.

Caged Cultch:

- Basically it is a crab trap filled with shell & anchored; can create high & low relief; most commonly used intertidally; used in areas of high waves & sedimentation; not used in our area much.
- See Oyster Restoration Methodology matrix handout for pros & cons.
- Could use plastic coated metal or uncoated metal which rusts away in a few years;
- Not likely to be used in our area because of depth; would use bags in shallows or loose cultch deeper.
- Discussion about using caged cultch in areas with higher wave action; better to move restoration away from high wave areas to areas with lower energy; cages have been used along narrow seawalled channels where the water is deep, but a small footprint is needed due to narrow channels.

- Consensus to keep caged cultch on the list of methodologies; could be used in deeper or muckier areas to avoid sawfish habitat; also good strategy for armored shorelines where want to create EFH & oyster habitat.

Loose cultch:
- Used by FDACS, SBEP, Martin Co.; used in Loxahatchee & Martin Co with good success.
- Usually used subtidally in depths; appropriate for 3-6 feet depths; can use intertidally in low energy areas; commonly use fossilized shell.
- See Oyster Restoration Methodology matrix for pros & cons.
- In Loxahatchee use loose cultch surrounded by bagged cultch; was by permitting to avoid cultch from being washed away.
- Discussed turbidity; use turbidity curtain during deployment; turbidity is reduce within hours of placement.
- Used on Pelican Island; deployed using Blackhawk helicopters; had good target footprint success; accomplished both creation & restoration & avoided seagrass (endangered *Halophila johnsonii*); used fossilized shell deployed intertidally which has stayed in place since 2006; < 1 acre; high energy from wind fetch & boat wakes; helped stabilize shoreline.
- Need to consider additional mapping for site specific evaluations.
- Need to consider permitting concerns related to stability, turbidity & flow/hydrology for site specific evaluations.

Oyster mats:
- 16.5" squares of hard plastic mesh with 36 drilled oyster shells tie wrapped on; tie wrapped in quilt pattern held down with sprinkler "donut" weights; developed by Linda Walters at USF.
- Used in Indian River Lagoon & Cape Canaveral National Seashore.
- See Oyster Restoration Methodology matrix for pros & cons.
- Provides high community & habitat restoration value; all ages of citizens can participate.
- Not as applicable in high sedimentation areas because of low profile.
- May cause less entanglement of Smalltooth Sawfish.
- Time intensive but provides good community involvement opportunities; used Royal Caribbean Cruise lines to drill holes in oyster shells.

Reef balls:
- Concrete reef ball; available in variety of sizes.
- See Oyster Restoration Methodology matrix for pros & cons.
- Used in Tampa Bay; see Tampa Bay Watch website.
- Can have small & high relief; somewhat controversial primarily because of artificial aesthetics & structure;
- oyster balls (1/2 size).
- Use small ones under deeper end of docks for oyster dock restoration; haven't documented oyster colonization, but fish use is high;
- would need to see more data on success rate;
- Used in Martin Co.; have program where kids make small reef balls (basket ball size); funded through community restoration program.
- Larger ones are heavy & hard to deploy.
- In Aquatic Preserve, have limited application because of artificial aesthetics but be used in place of riprap in front of seawalls.
- Not a Smalltooth Sawfish entanglement concern.

Vertical stakes:
- PVC stakes installed vertically to provide substrate for colonization & spat settling.
- Available from private company infused with calcium carbonate ("spat states") & deployed densely (81/sq m).
- Used in areas of sedimentation; can adjust the height off bottom; had higher success rates than bags & cages in high sedimentation areas; not tested or used much in SW FL; used in France used to increase larvae.

- Could be submerged or intertidally; adjust to correct height to be effective, avoid navigation hazard & be aesthetic; used in low profile; covered with shell in little time & then coalesce.
- Discussion about potential to be dislodged due to currents, wind &/or boat strikes.
- Question if we have areas with high enough sedimentation to warrant using them; would be more appropriate to select alternative location & methods; could also be used in soft sediment by driving stake deep enough into sediment & provide substrate instead of bags.
- Some SWF OWG members would like these to be removed from the list of usable oyster restoration methods; need more information, documentation & testing in SW FL; add potential navigation & aesthetic impacts as Cons to matrix.

Oyster Restoration in Canals:

- Discussion about appropriate methods for oyster restoration in canal; need to avoid conflicts with navigation; could be beneficial if designed correctly.
- Need include discussion of restoration in canals in text of Plan; need to include caveats; suggest including "other" category on matrix to allow consideration of new ideas instead of excluding them.
- Could use "oyster gardening" where residents attach bags of shell to attach to dock to help produce spat for restoration of larger areas; FGCU has an oyster hatchery & can provide spat.
- Consider other options for homeowners to enhance oysters:
  - Bags under dock though are permitting concerns.
  - Reef Balls: in the past permits for reef balls under docks in Punta Gorda were denied because of navigation & aesthetic concern & concerns that reef balls would roll away; could chain reef balls to dock;
  - Bumper railing (PVC?) along seawall to mimic mangrove roots.
  - Astroturf or oyster mats vertically hanging from dock.
- Considerations for oyster restoration are different in canals vs. open water; for both need to consider cumulative impacts &changes to hydrography.
- Currently FDEP & City of Sanibel are discussing Sanibel's ordinance that requires riprap under terminal dock; causes lots of permit review questions.
- Riprap adjacent to seawalls is good for habitat, seawall protection & wave attenuation; could use oyster bags along sea wall; FDEP encourages use of riprap in front of seawalls but causes concerns for Smalltooth Sawfish habitat; if oyster bags are approved by NOAA could be used instead of riprap for a variety of benefits.

Materials:

- Fresh oyster shell: best substrate; available from restaurants; needs to be quarantined for 1-3 months; takes coordination & storage space near restaurants & restoration sites.
- Fossilized shell: very good if available; has good complexity & variety of sizes & spaces.
- Other types of shell: aren't as successful for oyster restoration, probably due to small interstitial spaces.
- Sandstone & limestone: limestone more successful than clam shell & sandstone.
- Cement: loose &/or recycled; alternative method tried in Mosquito Lagoon instead of mats; similar method as oyster mats but used concrete grids instead to avoid using plastic; grids were poured concrete with shell in it; didn't recruit larvae as effectively as oyster mats & lost community outreach component.
- Spat sticks: see discussion under "Vertical Stakes" above.
- Discussed whether coquina rock could be appropriate; if easily available could be easier to test; may not have much interstitial space; could be considered in the future.

6. Next Tasks, Duties & Schedule – Judy Ott, CHNEP

- After today's meeting: run final Oyster Restoration Suitability Model & add priority restoration areas (identified at Meeting 3) to maps.
- July 11 – August 20, 2012: Present Oyster Restoration Habitat Suitability Model & oyster restoration methods & materials to CHNEP Management Conference committees & draft CHNEP Oyster Restoration goals.
- August 27, 2012: Present draft CHNEP Oyster Restoration Plan to SWF OWG Meeting 5 & determine final CHNEP Oyster Restoration goals.

- October 10 – November 16, 2012: Present final CHNEP Oyster Restoration Plan & restoration goals to Management Conference committees for approval.

Southwest FL Oyster Working Group Meeting 5
September 7, 2012
1:30 pm – 4:30 pm
SWFRPC, 1926 Victoria Ave., Fort Myers, FL 33901

MEETING NOTES

Note: The Southwest FL Oyster Working Group Meeting 5 was originally scheduled for August 27, 2012, but was rescheduled to September 7, 2012 due to Hurricane Isaac.

Attendees:
On Site: Jim Beever/SWFRPC, Lisa Beever/CHNEP, Anne Birch/TNC, Lucy Blair/FDEP, Loren Coen/FAU, Jim Culter/Mote Marine Lab, Holly Downing/City of Sanibel, Katy McBride/City of Cape Coral, Eric Milbrandt/SCCF, Judy Ott/CHNEP, Pete Quasius/Snook Foundation, Erin Rasnake/FDEP.
Via WebEx: Jaime Boswell/Independent Contractor, Mark Berrigan/FDACS, Becky Conway, Lizanne Garcia/SWFWMD, Steve Geiger/FWC, Andrea Graves/TNC, Marti Maguire/NOAA, Arielle Poulas/FDEP, Heather Stafford/FDEP; Paul Zajicek/FDACS.

Purposes of the Meeting:
- Review the Draft CHNEP Oyster Habitat Restoration Plan.
- Define the CHNEP Oyster Habitat Restoration Goals.

Meeting Notes:

1. **Welcome & Introductions – Judy Ott, CHNEP**
   The meeting was called to order at 1:30 pm. Members introduced themselves & Judy Ott/CHNEP reviewed the purposes & agenda for the meeting, progress on the draft CHNEP Oyster Habitat Restoration Plan since the previous meeting (June 19, 2012) & thanked Jaime Boswell/Independent Contractor for her excellent work preparing the draft plan.

2. **Schedule for Oyster Restoration Plan Completion – Judy Ott, CHNEP**
   Judy reviewed the schedule for completing the final draft CHNEP Oyster Habitat Restoration plan to allow presentation to the TAC at its October 10, 2012 meeting for approval, including:
   - All comments on draft plan are due by September 10, 2012.
   - Comments will be incorporated & the final draft plan will be prepared for TAC agenda packet by October 2, 2012, for TAC approval at its October 10, 2012 meeting.
   - TAC comments will be incorporated & the final plan will be prepared for the Management Committee agenda packet by October 26, 2012, for Management Committee approval at its November 2, 2012 meeting.
   - Management Committee comments will be incorporated & the final plan will be prepared for the Policy Committee agenda packet by November 9, 2012, for Policy Committee approval at its November16, 2012 meeting.
   - Final publication details will be incorporated & the approved CHNEP Oyster Habitat Restoration Plan will be published in mid-December 2012.

   Discussion: (none).

3. **Overview of the Complete Draft CHNEP Oyster Restoration Plan – Jaime Boswell, Independent Contractor**
   Jaime thanked the members for their contributions to compiling technical information & developing the draft plan. She began leading the discussion through the draft plan to solicit comments & edits. Significant discussion ensued & is summarized by section below.

   Copyediting/proofreading (throughout):
   - Jaime: We are currently working on proofreading & editing; comments are due to her by September 10.

   Discussion: (none).

   References (throughout):
   - Jaime: We will add new references where suggested & use consistent format throughout the document & Literature Cited section.

- We are currently incorporating additional references; references are due to her by September 10.

Discussion: (none).

Tables (throughout):
- Jaime: We are currently formatting tables for consistency.
- We will include a table of data layers used to create the RSM with dates, sources, & resolution.

Discussion: (none).

Figures (throughout):
- Jaime: We will add sources for all data layers that were not created by CHNEP and/or SWFRPC will be included on the maps with dates.
- We will discuss making the scale consistent on all figures in Appendices C & D.
- We will discuss including a map of isohalines.
- Figure 3: We will clarify if the Water Management District boundaries cross through Charlotte Harbor; need to confirm with FDEP & WMDs.
- Figure 6, etc.: We will change colors on all maps to better distinguish between 100% & 80% suitability.
- Figure 7, etc.: We will correct the spelling of Accommodation on all maps.
- Figure 7, etc.: We will check with Aswani & Lesli Haynes to ensure accuracy & completeness of existing oyster restoration sites & change label to "Completed Oyster Restoration sites.
- Figure 8, etc.: We will add the two bird rookeries suggested by Pete Quasius, as well as other rookeries known by members and provided to Judy Ott.
- Appendix C: We will incorporate editorial changes suggested above.
- Appendix D: We will incorporate editorial changes suggested above.
- Cover: We need good photos of oyster restoration; please send photos to Jaime.
- Jaime & Judy will incorporate edits to figures.

Table of Contents (pages iv-vi):
- Jaime will continue to up-date the Table of Contents as edits are incorporated into the draft plan.

Introduction (pages 2-5):
- Jaime: The purpose of this section is to set the stage for why & how CHNEP is developing oyster restoration goals & define the objectives for the CHNEP Oyster Habitat Restoration Plan.

Discussion:
- Erin Rasnake/FDEP: Need to update the CHNEP Management Conference membership page; Lisa Beever/CHNEP & Judy will provide an up-dated membership list.
- Eric Milbrandt/SCCF: Need to change language in FW-1 from oyster bar to oyster habitat (page 2); Lisa would like to include the language from the current 2008 CCMP update & clarify that the definition will be updated in 2013 CCMP.
- Heather Stafford/FDEP: Is there a definition of oyster habitat? Jaime: In draft plan we included mangroves & seawalls, but will revise the language in the final draft plan to include mangrove prop root, reef & clump oysters.
- Eric: Oysters can be on prop roots; Jim Beever/SWFWPC: types of oysters vary by region within the CHNEP; Loren Coen/FAU: Predominate species in CHNEP is *Crassostrea virginica.*
- Jim B: CHNEP oyster restoration won't just be oyster reefs restoration, it will restore other habitats, too; Jaime: The plan does state that CHNEP will focus on restoration of "native species" of oyster; Heather: So oyster habitat contains live oysters, not a substrate that oysters can grow on, just putting a hard bottom down doesn't mean restoring habitat…; Jim B: goal is area of living oysters.
- Jaime & Judy will clarify definition of oyster habitat & species throughout document.

Oyster Population & Habitat Loss (pages 5-7):
- Jaime: We will add a paragraph on use of oysters by indigenous people in SW Florida.

- We will add some additional wording on sea level rise in Charlotte Harbor & incorporate reference to Laura Geselbracht's work at TNC.

Discussion:

- Jim B: Earlier we mentioned including history & indigenous species; one of major loss was direct habitat destruction & dredging & secondary effects from siltation & oyster mining; Jaime: do you have references; Jim B: doesn't have any; also can use nautical charts & historical records; Loren: need to rewrite introduction to reflect that the primary loss here hasn't been due to over harvesting; Jim B: references aren't in scientific journals, are more in history books; Steve Geiger/FWC &/or Mark Berrigan/FDACS might have records; Steve: doesn't have historical references; Lisa: Need to review historical nautical charts that are geo-referenced the CHNEP has; Lisa will find the GIS files.
- Loren: Need to add a mapping objective; Jaime: did not intend to do mapping as part of this plan & the objectives on page 5 are only for this CHNEP Oyster Habitat Restoration Plan, not the details for all the CHNEP oyster restoration in tasks; Eric: plan talks about doing mapping effort concurrently with restoring.
- Loren: Need to define success criteria & relate them to project goals.
- Jaime: We will clarify the plan objectives on page 5 & strengthen the Background section.

Ecosystem Services (pages 7-8):

- Jaime: We are trying to balance an introduction to some of the ecosystem services oysters provide with keeping the document readable; so the idea is to provide the basics of oyster ecosystem services.

Discussion:

- Loren: Need to include complete list of references, including current ones to table 1; would prefer references are listed by year not name; need to separate categories for water quality from bio-assimilation, especially as they relate to living shorelines; need to include indirect effects where restoration enhances SAV, like in Clam Bayou; the references are skewed to SW FL, need to include references for broader geographic scope.
- Jim B: Need to differentiate between documented services & hypothetical services; there is scientific debate about how oysters help or hinder storm & SAV; need to add review papers that summarize other references.
- Jim Culter/Mote Marine Laboratory: However, need to consider time constraints & level of detail appropriate for this plan (it is not a thesis) & not get lost into details; suggest adding the word "key" ecosystem services.
- Loren: There is also scientific debate if oysters are carbon sinks or sources & how they will be effected by pH change; Jim B: oysters could be carbon transformers.
- Anne Birch/TNC: Please provide additional references to Jaime ASAP.

Oyster Life History (pages 8-9):

- Jaime: we need to add life span of individual oysters & oyster reefs (page 9).

Discussion:

- Erin: Is there a typical life span for oysters & how do you estimate the life of an oyster reef?
- Jim B: Did provide references to Jaime suggesting oysters can live 20 years; Loren: oyster reefs can continue to grow for 1,000 years; Jim B: Under healthy conditions, individual oyster can live up to 20 years, & reefs have been documented to continue to grow for over 100s of years; Jim's rule of thumb is that oysters in CHNEP generally live intertidally for 3-5 years; remember that once oyster habitat is restored will provide habitat for future.
- Judy: Please provide references to Jaime & we will incorporate them into this section.

Oyster Distribution (pages 9-11):

- Jaime: We will add language & references regarding effects of pollution on oyster viability; need to review & include additional references from Erin Rasnake.

Discussion:

- Loren: This section could use some work & Loren has many comments, which he will provide to Jaime.
- Jaime: Steve also had a comment of needing new information.
- Loren: Need more current references for factors listed on page 10, including Kennedy, et al; DO isn't as critical for intertidal oysters; Jim B: most important problem is Dissolved Oxygen < 3ppt.

- Eric: Need to define & separate pollutant vs. disease vs. chlorophyll; quite a bit of debate about optimal conditions; need to mention nonpoint sources pollution & blue green algae blooms; distinguish contaminants vs. water quality.
- Jim B: Need to add chlorophyll, water quality & food availability; don't want Charlotte Harbor to be too "pristine" because need adequate food for oysters; tannic waters aren't a problem; need to add a paragraph about food & nutrient resources.
- Jaime: Need to refine this section; Judy: could split "pollutant" into 2 categories, contaminants & nutrients; Loren: either expand & clarify or lump into general paragraph.
- Loren: Need a discussion, section & references about sedimentation; some areas with high sediment have healthy oyster reefs; there are also additional conditions that have little effect on oysters (i.e. flatworms); need to bring this section up to date & either just provide a list or expand the descriptions in more detail.
- Loren: Also, need to clarify if focusing on intertidal or also including subtidal oysters, because the list will change, especially dissolved oxygen.
- Lisa: Need to look at the purpose of document & audience; these brief descriptions are useful & form basis of further goals; useful; Loren: should this section focus on CHNEP area or a broader geographic area; need to reword generalized statements.
- Jim C: For this section, these factors need to be more generalized & qualified with a sentence recognizing site specific consideration.

Past Oyster Mapping Efforts (page 12):

- Jaime: We have updated the 1950s map to remove the area off Fort Myers Beach & need to update the acres in the text.

Discussion: (none).

Current Oyster Mapping Efforts (page 13):

- Jaime: We will add Mike Savarese's work coring/mapping to list of monitoring/mapping (p13)
- We need to add the dates of the current mapping efforts; please provide dates for your monitoring & mapping efforts to Jaime.

Discussion:

- Loren: Be explicit about the locations & types of oyster that the mapping is referring to; Jaime: We introduce historical mapping briefly, but it isn't the scope of this plan to include the details of all mapping & monitoring efforts.

Current Oyster Restoration Activities (page 13):

- Jaime: We need dates for oyster restoration activities; please provide dates of your restoration activities to Jaime.

Discussion:

- Judy will help get values from Jay/SBEP.

Shellfish Workshops & Working Groups (pages 13-14):

- Jaime: The list of relevant oyster restoration workshops & working groups is included in the plan.

Discussion:

- Loren: Do you want to include ones that aren't relevant to SW FL oyster restoration?
- Erin: Need to add dates for meetings & start dates for working groups.
- Jim B: If we include names of contact people for meetings & working groups, need to add contact information; could include it as an appendix, or exclude the contact name.

Regional Management Considerations (pages 14-17):

- Jaime: We will expand the water management section to include more detail about FDEP work, including BMAPs & TMDLs.

Discussion:

- Loren: Need to define geographic scope of "regional"; Jaime: We are referring to SW FL & will clarify language throughout the document.

- Jim B: need to differentiate water volume/quantity vs. quality.
- Jaime & Judy will clarify water quality vs. water quantity language.

Regulatory Permitting Considerations (pages 17-21):

- Jaime: This section has been reviewed by FDEP, USACE, SFWMD, & FDACS & we have received comments from most agencies which will be incorporated.

Discussion:

- Loren: Do we need to bring in permitting as it might relate to other activities that include oysters like living shorelines; TNC is pulling together regulatory information about other activities; Judy: we will limit the discussions in this plan to restoration of oysters as habitat; Loren: What about reefs that are greater than a certain height?; Jaime: This is for projects where the primary goal is restoring oyster habitat.
- Anne: Are there regulations that would be different for living shorelines? Loren: Only as it distinguished between height, which is a function of the number of bags; Lucy Blair/FDEP: The discussion in the draft plan is adequate for FDEP concerns; Jim C: That determination would be up to permitting agencies;
- Anne: What is missing from this section? Loren: Discussions about permitting for larger multi-acre subtidal; could include permitting discussion from past restoration projects like those on Sanibel.
- Lucy: If write in this more specifically, will be out of date soon.
- Erin: Need to add a paragraph about a team approach to permitting to the 2nd paragraph after "Practitioners planning on implementing oyster restoration…"
- Jaime & Judy will work with Lucy & Erin to clarify language.

Planning for Successful Oyster Habitat Restoration (page 22):

- Jaime: This is the introduction to the oyster habitat restoration suitability analyses.

Discussion:

- Loren: This would be a good add to add need identify site selection process.
- Heather: Need to consistently use oyster restoration, not oyster habitat restoration; Lisa: CCMP focuses on habitat restoration; Jim B: The CHNEP Oyster Habitat RSM is based on habitat restoration, not just oyster restoration; Jim C: Oysters in effect create their own habitat so it's a circular argument.
- Heather: Need to define oyster habitat restoration; the goal to restore oysters not oyster habitat; Jim B: Oyster habitat is more than 1 thing; can restore oysters using strings to settle spat, but that has limited habitat value; Heather: Red mangrove planting could be oyster habitat;
- Anne: We can define this in more detail when we get to project specific details; Paul Zajicek/FDACS: habitat restoration has longer term goals; Heather: OK with oyster habitat if end up with oysters;
- Marti Maguire/NOAA: Would prefer "habitat" because there are values to the benefits of both oysters & oyster habitat species.
- Loren: Clarify that goals refers to oyster habitat; Jim B: Need to implement oyster restoration appropriate to CHNEP.

Oyster Restoration Suitability Model Development (pages 22 -23):

- Jaime: We will include additional GIS information & may need to reorganize the section.
- Do we need to add a map of isohalines?

Discussion: (none).

Restoration Suitability Model Scoring (page 24):

- Jaime: The SW FL Oyster Working Group has already seen & accepted the RSM scoring scheme.

Discussion: (none).

Restoration Suitability Model Component Descriptions (pages 25-29):

- Jaime: The SW FL Oyster Working Group has already seen & accepted the RSM components.

Discussion: (none).

Restoration Suitability Model Results (page 29):

- Jaime: The SW FL Oyster Working Group has already seen & accepted the RSM results.
- We updated the text to include the additional acres of oyster restoration habitat that would result from an improved management flow in the Caloosahatchee River.

Discussion: (none).

Additional Spatial Considerations for Oyster Restoration (pages 30-32):

- Jaime: We will add a statement that there are other important factors to consider when planning oyster restoration, such as: "Some additional considerations include sea level rise, adjacent habitats, shoreline protection, water quality, recreational fishing. How each of these is considered will be determined by the goals of each project."
- We will correct all the references to 1950s & 1999 oyster mapping efforts.

Discussion:

- Loren: Need to include substrate; Jim C: when sediment discussion came up, we couldn't come up with hard data; Jaime: We can add substrate to the Table 3.
- Figure 8: Mangroves & Bird Rookery Map – there are additional oyster restoration sites to add; there are additional bird rookeries to add; need to add mangroves from Shoreline Survey work or change legend to "vegetation".

4. Discussion of CHNEP Oyster Restoration Goals (pages 32-36)– Judy Ott, CHNEP

Suggested CHNEP Oyster Restoration Goals include (page 35):

- Restore self-sustaining oyster habitat & related ecosystem functions to the historic level of 2,679 acres (10.9 km^2) within the CHNEP study area over the long term.
- Maintain ***or increase*** the current extent of mangrove oyster habitat throughout the CHNEP study area.
- Map existing oysters consistently throughout the CHNEP area by the year 2020, including those on reefs, mangroves & seawalls, using the best scientific methods.
- Implement projects to restore 25 acres (0.1 km^2) of oyster habitat each year within the CHNEP study area until the region-wide oyster mapping is completed & the CHNEP goals are reassessed or at least until 2020.
- Reassess CHNEP oyster restoration acreage & schedule goals once the oyster mapping is completed or at least by 2020.
- Increase public awareness of the ecosystem value of native oyster habitat by community stewardship components in each oyster restoration project.
- Assist partners in seeking state, federal & organizational funding opportunities to support oyster restoration projects.

Lisa suggested consideration of the CERP C43 Reservoir EIS oyster restoration goals, which include:

- Estimates of current acres of oysters as 3 acres of oysters in the lower Caloosahatchee estuary & 15 acres of oyster in lower Charlotte Harbor.
- Causes of the low number of oysters being primarily due to freshwater inflows, lack of suitable substrate & past shell mining.
- Preliminary oyster targets of 40 acres in the lower Caloosahatchee upstream from Shell Point & 60 acres in lower Charlotte Harbor (downstream from Shell Point), in the next 10-15 years.
- Future targets with the addition of hard substrate, could increase to 200-300 acres upstream from Shell Point & 150-200 acres downstream from Shell Point.

Discussion:

- Lisa: Need to add 1999 oyster acreages to Table 6; CHNEP used a similar method (comparing best available 1950s & 1999 aerial information) to estimate seagrass targets; using similar methods for setting oyster goals is technically consistent.
- Lisa: There are also some additional oyster acre estimates & goals in the EIS for C-43 Reservoir as part of the CERP process.
- Jim B: Need to focus on question we are trying to answer; need to add date certain, suggest 2020; doesn't matter what the historic or current oyster acres are; what does matter is that we set goals that can be achieved; can achieve & measure success in incremental fashion; can't do it all at once; need to decide what we can do in a reasonable time; need reasonable goal; need persistence of vision, not a get oysters quick scheme.

- Lucy: We did this comparison to put boundaries on the maximum number of acres of restoration & help identify appropriate restoration targets; need to look at cumulative efforts; need a reference point of balancing habitats.
- Pete Quasius/Snook Foundation: "Reasonable" goal definition depends on how much money is thrown at it; oyster restoration is a good fit for RESTORE Act funding.
- Anne: Historic acres is mute; we developed a model of suitable habitat; what is a feasible percentage; the goal is just an acreage goal; oyster habitat restorations about more than just acres of oyster reef; we need to define the goals for restoration & projects; there will be a suite of goals; suggest picking an acreage & give permission to adjust as needed in the future based on additional information.
- Jim B: Functionally when CHNEP sets goals, it has always exceeded them; don't want to set goal as something we won't achieve; Loren: Need to start small & monitor for success.
- Anne: Need to put in pilot projects & evaluate them & make sure we're doing them correctly; need to test methods for success & replicate successful methods.
- Group discussion: By 2020, need to identify best way to achieve oyster restoration; state that a large scale project is needed – 1 - 2 acres; used to be an oyster bar all across the Caloosahatchee R that you could walk over.
- Group discussion: Need to consider current conditions & different habitat types; include different types of projects – intertidal, shoreline/rip rap, subtidal; include different estuaries, Lemon Bay vs. Caloosahatchee vs. Myakka R.
- Group discussion: Puts us at a disadvantage for competing for grants if we don't have goals.
- Anne: Need to identify pilot projects throughout CHNEP to submit to RESTORE which will give us the science & mapping information we need to develop more specific oyster restoration goals; Pete: this is a unique opportunity to compete for RESTORE; Jim B: Could set a goal to get a project in ground by 2013 & monitor the results.
- Loren: Need to consider permitability; east coast project was subtidal because couldn't get permits for intertidal restoration; Anne: we work within the regulatory confines & work to change the confines; Lucy: we are developing regulatory guidance complimentary to planning process; talked about 4 regulatory topics: 1) draft NGP, 2) guidance document for more consistent review of restoration projects, 3) partnering applicant with CAMA/FDEP & WMD to use existing GP for environmental restoration permitting & 4) conceptual permit that would show if project met guidelines; important that much of the permitting refers to restoration plans; Anne: there are regulatory options.
- Pete: In April, USACE provided $7 billion for oyster restoration in Chesapeake; need to leave option open for larger scale projects.
- Lucy: Originally oyster restoration was at odds with critical smalltooth sawfish habitat due to lack of clarity of scale of restoration compared to size of sawfish habitat, but we all have a better understanding of scales now & discussions are going more smoothly; Jim B: sawfish live with oysters over the long term; sawfish shouldn't drive oyster restoration goals.
- Jim B: Need to restore oysters in appropriate locations; need separate goals for different estuaries; need current oyster locations to know where we don't need restoration; need to estimate oyster acres; need a variety of restoration of projects over variety of locations.
- Lisa: Would like to have a 2020 number.
- Eric: if know what you have, can increase by given percent
- Judy: can we agree on these goals:
  - ***Map oyster habitat within CHNEP by 2020 by habitat type.***
  - ***Design, implement & monitor success of a pilot oyster restoration project in a variety of habitats in 50% of the CHNEP estuary segments by 2020.***
  - ***Increase public awareness of ecosystem value of native oyster habitat by including community stewardship components to each oyster restoration project.***
  - ***CHNEP will assist partners in seeking state, federal & organizational funding opportunities to support oyster habitat restoration projects.***
- Group discussion: Restoration projects need to address specific scientific questions: depth; testing several methods; with replicates.
- Group discussion: Goals need to include qualifier about permitability.

- Holly Downing/City of Sanibel: If we have too much flexibility in the goals & variability in the projects, we may not get the new technical information we are seeking in the 8 years of the goal.
- Jim C: Could add goal to implement X number of pilot projects in each estuary segment in appropriate habitat.
- Eric: Were land conservation & acquisition goals set by quality of habitat? Jim B: set overall goals & achieved with partners; Eric: how were acre goals determined? Jim B: knew what current public acres were, connected pieces; Eric: that's not too different from setting oyster acre goals.
- Jim B: Need to gain more science before spending too much money & getting unintended consequences; Pete: Need to remember what is driving this oyster restoration plan.
- Erin: How do we define success? Science plus community education.
- Anne: Could consider compromise about acres: target goal is up to 10% of accommodation area, & we are going to accomplish it by initiating pilot projects; Lisa: could identify range, 1-5% of accommodation area = 1200 – 6,200 acres throughout the CHNEP.
- Jaime: Using accommodation area makes sense; gives us acres without having to rely on estimates of historic acres; accommodation area was used in a USEPA study of gulf estuaries & isn't based on hard science, but gives a percentage of what can be expected in gulf area; this is our estimate that could be changed in the future; also remember that this plan isn't a tradeoff between buying land & doing estuarine restoration – we're trying to accomplish both together.

3. Continued: Overview of the Complete Draft CHNEP Oyster Restoration Plan – Jaime Boswell
Oyster Restoration Strategies & Methods (pages 36-45):

- Jaime: The SW FL Oyster Working Group has already seen & accepted the oyster restoration methods matrix.
- We clarified that the mesh is aquaculture grade & $\leq$1" mesh.
- We will add information about research regarding biodegradable mesh.
- Note from Jaime: Suggest adding language from Coen et al. poster presentation on evaluating stabilized mesh & related approaches, including study observations that: 1) no material was ideal & there are few biodegradable options; 2) in the restoration is subtidal, the materials are never exposed to biodegrade; & 3) if the restoration is intertidal, the materials are quickly incorporated into the oyster matrix & covered by sediments, etc.".
- Note from Jaime: Also see TNC Shellfish Reefs at Risk report, especially the chapter with fish caught in larger mesh.
- Note from Jaime: Overall we need to note that function, location, & size opening need to be considered.

Discussion:

- Time constraints limited discussion. Please provide comments to Jaime.

5. Discuss Success Criteria – Jaime Boswell, Independent Contractor
Oyster Restoration Success Criteria (page 46):

- Jaime: We will change ***year*** class to ***size*** class throughout the document & tables.
- Comment submitted from Mark Berrigan: Viable 3+ year-classes may not be necessary for a project to be successful, as long as oyster size-frequency distributions demonstrate successful recruitment, growth & survival; only a very small percentage of oyster populations on intertidal reefs will live beyond two years, but the reefs can be very productive.
- Comment submitted from Mark Berrigan: The issue of high mortality among oyster populations with "Dermo disease" is the basis for the statement about few oysters living beyond two years; natural mortality is extremely high on infected oysters on intertidal reefs in warm southern waters in Florida; by inference, few oysters survive & live into a third year.

Discussion:

- Eric: Is it reasonable to use an increase in reef foot print increase as a measure of success?
- Loren: it takes years for a reef to increase in size; next week monitoring document will be available & Loren will provide link; Anne: Is there a definition of success criteria in the monitoring document? Loren: There is a standard method for monitoring for measuring success criteria; Anne: Because of time constraints we can look at what we have in this draft plan, clarify the language & add Loren's information in once it's available.
- Jaime: Added levels of success criteria; Level I = 1 year; Level II & II over time (see page 48).

- Jaime: Would like the groups thoughts on including &/or deleting disease prevalence/intensity as a success criteria; many of the questions about region-wide criteria are related to disease; disease criteria aren't really relevant success criteria, so could be deleted as success criteria, but keep as an indicators.
- Loren: Concerned about considering some species as obligate species for reef resident community; would be more descriptive to call them indicator species.
- Jaime: What about categories of % living (see page 49)? 100% isn't reasonable; suggest changing the categories to 20-50% 50-70% & >70%.
- Eric: part of problem is determining how long oyster has been dead or alive; Loren: some have been using mean size;
- Jaime: Last time we talked about this, many didn't think this was a good success measure; but keep in as 2ndy to be consistent with Sarasota Co – who uses "recently dead" if 2 shells available; Loren: hard to measure; Jim C; have seen it done, but it is kind of intuitive; Erin: need to keep timing in mind, too – can bias data.
- Loren: Density may be difficult to estimate accurately.
- Jim C: Could use mean size class.
- Anne: We can look at density & mean size class together.
- Erin: Need to include sampling size (suggest quarter meter) & require triplicates.
- Erin: Need to set goals per m^2 (see page 49).
- Time constraints limited further discussion. Please provide comments to Jaime.

Region-wide Success Criteria (pages 46-51)

- Jaime: Should ***disease prevalence & intensity*** be included in the region-wide success criteria? Disease plays an important role in the ecology of oyster reefs, but is it a measure of success?
- Comment submitted from Mark Berrigan: I do not believe that reducing the prevalence & intensity of disease (Dermo) should be seen as criteria for success; "Dermo disease" & resultant summer mortality are part of the ecology of Gulf oyster reefs. Most oyster populations may be subject to extensive mortality from disease, but they are sufficiently resilient to recover, as long as the substrate is not destroyed or impaired. It is my opinion that high natural mortality from Dermo disease is an essential part of oyster ecology & the shells of freshly dead oysters provide the primary substrate & attachment sites for subsequent generations. Summer mortality is generally followed by a strong spat set (on freshly available clean shell surfaces) in the fall on many productive reefs.
- Comment submitted from Mark Berrigan: Disease prevalence & intensity may also be correlated with oyster density, so the prevalence & intensity may be higher in more productive & sustainable oyster populations; high density populations aren't likely to have lower disease prevalence & intensity. But the highly productive populations (higher reproductive potential) will be able to sustain greater mortality rates & still recover quickly, so lower disease prevalence & intensity do not necessarily reflect increased success.
- Comment submitted from Loren Coen: All the papers & talks never show a high intensity (vs. prevalence) here. We had 100% prevalence for decades but never saw high infections to suggest Dermo killed a lot of oysters.
- Jaime: What levels of ***percent living*** are representative of an ideal self-sustaining oyster reef? For example should the success levels be changed to Level 1, 20-50%; Level 2, 50-70%; Level 3, greater than 70%?
- Comment submitted from Steve Geiger: In Table 20 you list a successful reef as having 90-100% live oysters, but in fact some level of mortality is normal, so 100% live is actually not attainable.
- Comment submitted from Kathy Meaux: In looking at our bin definitions we are using for the Tidal Creek Condition Index developed by Ernie Estevez, we use 4 categories: 0% =1; 1-50% = 2; 51-74% = 3; & ≥75%= 4. In looking at our past data (5 years) our lowest % for 16 creeks was 28.8% & the highest was 97.3%. In taking a quick look, 3% of the total numbers were between 1 & 50%; 32% of the total numbers were between 51 & 74% & 65 % of the total numbers were over 75%.
- Comment submitted from Kathy Meaux: Eliminating the 0% category for your applications (we never found 0%), your ranges are not that far off. For level 1, I would probably use 25 – 50%; Level 2 would be 51-74% & level 3 would be ≥75%. I probably would not use 0% at all. If you get 0% your project wouldn't be a success, it would be a failure. On the other hand, a value as low as 10% would indicate that recruitment is taking place. You would have to see if the numbers increased or decreased in subsequent monitoring events. Even up to 25% live oysters is an indication that the reef may not be that healthy. – but it can be an indication that it is

sustaining & subsequent monitoring may show an increase in % live. With only 3% of total numbers sampled in SC waters falling below 50% live, I think I would keep level 1 at 25-50%.

Discussion:

- Time constraints limited discussion. Please provide comments to Jaime.

6. **Discuss Monitoring (pages 51-52) – Jaime Boswell, Independent Contractor**
   - Jaime: We included a sampling tray size of 0.14-0.25m^2, will change to 0.1 – 0.25.
   - We added other sampling methods for transient reef residents, including gill nets, hook & line, large lift nets, encircling nets.

   Discussion:
   - Time constraints limited discussion. Please provide comments to Jaime.

7. **General Discussion/Comments – Judy Ott, CHNEP**
   - Note from Jaime to discuss draft Notice General Permit Language.

   Discussion:
   - Time constraints limited discussion. Please provide comments to Jaime.

8. **Next Tasks, Duties & Schedule – Judy Ott, CHNEP**
   - Judy requested comments be submitted by September 10 (or ASAP).
   - Additional clarifications & requests for details will be coordinated one on one.
   - Comments will be incorporated & the final draft plan will be included in the agenda packet for discussion 7 approval at the TAC meeting October 10, 2012.

9. **Adjourn –** The meeting was adjourned at 5:30 pm.