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

You may also join the meeting remotely via Teleconference &/or WebEx:

- **To view via WebEx:** In your internet browser, ***enter https://suncom.webex.com/,*** click on the ***Meeting Center*** tab & then on the ***Browse Meetings*** link. Click on the ***Weekly*** tab & find ***June 17-23.*** Scroll down to ***TuesdayJune 19*** & click on the ***SW FL Oyster Working Group.*** Click on the ***Join Now*** button & you will be able to see the host computer screen. The meeting number is 590 588 331.
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AGENDA

Purpose: The purposes of the Southwest FL Oyster Working Group Meeting 4 are:

- Finalize the design of the oyster restoration suitability model.
- Identify a suite of suitable restoration methodologies.

Meeting:

1. Welcome & Introductions – Judy Ott

2. Review Modifications to the Oyster Restoration Suitability Model – Jaime Boswell

3. Discuss Suitable Restoration Methodologies – Jaime Boswell

4. Next Tasks, Duties & Schedule – Judy Ott

THIS MEETING IS OPEN TO THE PUBLIC

Two or more members of the Everglades West and Caloosahatchee Basin Working Groups, Peace River Basin Management Advisory Committee, Peace River Basin Management Working Group, or Southwest Florida Regional Planning Council may be in attendance, and may discuss matters that could come before the respective body.

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

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, 212 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 appositive public interest; Aquatic Preserves in CHNEP all estuaries except Dona/Roberts Bays, southern Matlacha Pass & San Carlos Bay.

- USACOE 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 is site specific evaluations).
- Dissolved oxygen (not included in model; reviewed data; no critical DO found).
- wave energy.
- 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 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 10 year (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 – 2012; 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 2012 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 with 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 implement; we do need to 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 may 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 a much space for 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 used seagrass persistence is used in the Oyster RSM; make sure in meta data 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 the 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 thing & 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 month 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 the 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 use 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 mover 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 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, 20120: Present final CHNEP Oyster Restoration Plan & restoration goals to Management Conference committees for approval.