

**Southeast Florida Coral Reef Initiative (SEFCRI)
 Land Based Sources of Pollution (LBSP)
 Technical Advisory Committee (TAC)
 Meeting #17
 Report of Proceedings
 November 8 - 9, 2012
 National Coral Reef Institute
 Nova Southeastern University Oceanographic Center
 8000 North Ocean Drive, Dania Beach, Florida**

MEETING ATTENDANCE

LBSP TAC Committee

Name	Affiliation	Day 1	Day 2
Joseph Boyer	Southeast Environmental Research Center – (FIU)		call in
Richard Dodge	Nova Southeastern University, Oceanographic Center	x	x
Phillip Dustan	College of Charleston		
John Fauth	University of Central Florida (UCF)	x	x
Dale Griffin	United States Geological Survey (USGS)	x	x
Piero Gardinali	Florida International University (FIU)		
Vladimir Kosmynin	Florida Department of Environmental Protection	x	x
Judy Lang	Atlantic and Gulf Rapid Reef Assessment (AGRRA)	x	x
Brian Lapointe	Harbor Branch Oceanographic Institution		
Erin Lipp	University of Georgia		
Margaret Miller	NOAA NMFS	x	x
Valerie Paul	Smithsonian Marine Station at Fort Pierce		
Esther Peters	George Mason University	x	x
Gene Shinn	University of South Florida (USF)	x	x
Alexander Soloviev	Nova Southeastern University, Oceanographic Center		
Peter Swart	University of Miami, RSMAS		

LBSP TAC Organizational Committee

Name	Affiliation	Day 1	Day 2
Ken Banks	Broward County EPGMD	x	
Nancy Craig	Broward County EPGMD	x	x
James Byrne	The Nature Conservancy (TNC)		
Richard Harvey	Environmental Protection Agency		
Linda Brine	FDEP		
Cheryl Miller	Coastal-Eco Group		
Joanna Walczak	FDEP Coral Reef Conservation Program		

Jamie Monty	FDEP-CRCP		
Katharine Tzadik	FDEP CRCP	X	X
Julio Jimenez	FDEP CRCP	X	X
Wendy Wood-Derrer	Nova Southeastern University, Oceanographic Center		

Additional Presenters and Observers

Name	Affiliation	Day 1	Day 2
Lew Gramer	NOAA AOML	X	
Joshua Voss	HBOI at Florida Atlantic University	X	
Jeff Beal	Florida Fish and Wildlife Conservation Commission	X	
Joe Lopez	Nova Southeastern University, Oceanographic Center	X	X
Kurtis Gregg	NOAA NMFS	X	X
Karen Bohnsack	FDEP CRCP	X	X
Dan Clark	Cry of the Water	X	X
Stephanie Clark	Cry of the Water	X	X
Doug Seba	Academy of Marine Sciences	X	X
Katie Unz	FWC Fish and Wildlife Research Institute	X	X
Kevin Carter	South Florida Water Management District (SFWMD)	X	X
Jack Stamates	NOAA AOML	X	X
Brian Walker	NSUOC NCRI	X	X
Tanya Tweeton	Sierra Club	X	
Amanda Costaregni	Nova Southeastern University, Oceanographic Center	X	X
Drew Martin	Sierra Club	X	X
Marie Guarino	City of Fort Lauderdale		X
Mauricio López Padierna	NSUOC NCRI	X	X

MEETING SUMMARY - DAY ONE: THURSDAY, NOVEMBER 8TH 2012 (MORNING)

Meeting Guidelines

Katharine Tzadik, Land Based Sources of Pollution (LBSP) coordinator for FDEP-CRCP, welcomed all in attendance to the 16th LBSP Technical Advisory Committee (TAC) meeting, reviewed meeting participation guidelines for TAC members and observers, which included the facilitator role, guidelines for discussion, consensus rules, comment card procedures, and the use of meeting evaluation forms. Katharine then reviewed the day's agenda.

Katharine Tzadik mentioned changes to the SEFCRI Charter and other recent changes that are part of the transition to a stakeholder driven process. One of the objectives of the meeting is to wrap up some of the Local Action Strategy Projects (LAS) that were begun in 2004.

The focus of this meeting is to evaluate these projects, determine if they met the original objectives and if there are any data gaps or new questions that have arisen.

Session 1: Determining the Link between the Resource and Pollution

SEFCRI LAS Goal: Identify how LBSP affect southeast Florida coral reef ecosystems

Presentation: LBSP Project 5 – Conduct a biomarker study to identify and trace specific contaminants that negatively impact coral reefs - John Fauth, UCF

- **Outline**
 - **Summarize results of two projects.**
 - Diagnose challenges faced by SE FL coral reefs – and those who study them.
 - Suggest new approach as next step.
- **Major Results of Pilot Project**
 - Stress responses of corals from Hollywood & Florida Keys consistent with wastewater discharge.
 - Responses of offshore colonies consistent with xenobiotic detoxification.
 - Xenobiotic exposure and decreased protein turnover associated with decreased coral regeneration.
- **Major Results of Current Project**
 - Negative effects of shipping channels and ocean outfalls at multiple biological levels.
 - *Porites astreoides* absent from two sampling sites: Hillsboro Inlet (HI2) & half of Port Everglades (PE2).
 - Episodes of freshwater, burial by sediment, red algae bloom, toxicity.
 - No station exempt from some negative outcome.
- **Experimental results**
 - Pilot project - no effect of Port Everglades water.
 - Current project - Larval settlement higher on plates conditioned at Hollywood Outfall (HWO3) ($66 \pm 2\%$) and Control (C3) ($61 \pm 2\%$) than at Port Everglades (PE3) ($52 \pm 2\%$).
 - In three-way reciprocal transplant experiment, no significant differences among stations of origin, stations of transplant, or their interactions.

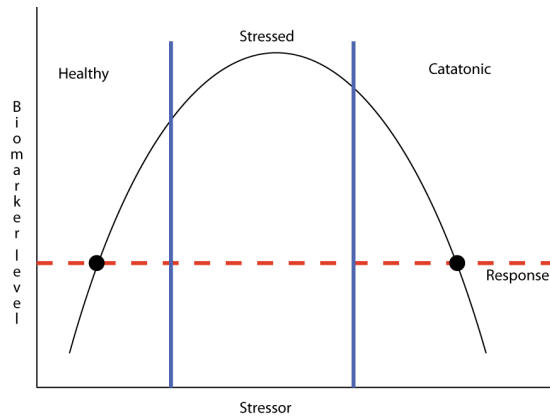
- **Diagnosis for SE FL Coral Reefs**
 - Overall pattern consistent with intermittent chronic stress rather than acute stress.
 - Portends continued slow, sporadic declines.
 - Should be reversible with good management.
- **Challenge Ahead**
 - Multiple potential sources of stress that might be interacting.
 - Needs more frequent sampling to understand causal relationships as well as after severe events.
 - Integrate across larger spatial scale.
- **Suggested Approach**
 - Working with Saint John's River Water Management District (SJRWMD) to control invasion of herbaceous marshes by Carolina willow draws parallels to questions in SEFCRI.
 - i.e. Habitats, hydrology, soils, nutrients, fire.
- **Parallels with Coral Reefs**
 - Already have great benthic habitat maps.
 - Know coral growth rates from cores, monitoring.
 - Understand many causal relationships: bleaching, sedimentation, nutrients.
 - Need to integrate information, develop spatially-explicit models, identify data gaps, explore scenarios.
 - Good news: modeling is relatively inexpensive.
- **Methods**
 - Sampled life history parameters & described distributions.
 - Lab, Greenhouse & Field Experiments.
 - Identified key factors, estimated parameters.
- **Results**
 - Generated a model for dispersion and management of the Carolina willow.

Questions and comments (LBSP Project 5):

1. (Esther Peters, with regards to experimental results) *We have analyzed the samples and even the control corals [as well as the exposed ones] didn't look good. Through histological methods and electron microscopy we were able to observe multiple areas where cells were lysing. The few zooxanthellae we saw did not look healthy. We have since found out that they were left in the lab aquaria for two months without feeding. The eosin stain which should show proteins in cells of healthy tissue, for example in the calicodermis, were not present, and other regions of the cells did not stain as expected, showing obvious signs of degradation.*

-(John Fauth) *The problem we have with biomarkers is that there's a response curve (diagram) so that a healthy coral will respond [by producing biomarker proteins] along a gradient, but after a period of prolonged acute stress, the corals will no longer be able to respond. Therefore a biomarker study might find that the corals look "healthy," but that is because they are actually catatonic [so the biomarker levels do not differ compared to controls]. This seems to be what happened with these samples.*

2. (Gene Shinn) *Porites astroides* doesn't usually grow very big; they get to a certain size and



then simply die. So they might look healthy, but they might not be. They are also often found in shallow water.

3. (Group) *On the reef slope it becomes flattened and can grow up to 50cm wide.*
4. (Vladimir Kosmynin) *Did you use a particular size class? They can grow bigger, but they tend to settle in areas of high stress. Shallow areas, with high wave action.*
 -(John Fauth) *We used samples that were big enough so that we could get a core about the size of a nickel.*
5. (Margaret Miller, regarding the plate experiment) *Do you know the growth rate of the corals on your settlement plates?*
 -(John Fauth) *We could go back and calculate it from the pictures.*

LBSP Project 32 – Identify sources and signals of land-based pollutants in southeast Florida using stable isotopes as a sewage signal in octocorals and macroalgae/Lyngbya tissue. - Valerie Paul, Smithsonian Institute

Canceled: Valerie Paul in absentia

LBSP Project 33 – Identify sources and signals of land-based pollutants in southeast Florida using human enteroviruses as an indicator of fecal contamination. - Dale Griffin, USGS

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- **Objectives**
 - To determine if reefs off the southeast Florida coast are exposed to microbial constituents of human sewage.
 - To determine sources of contamination (e.g., inlets vs. outfalls).
 - To determine if sessile reef organisms are accumulating these constituents (provides link between water quality and reef organisms).

- **Methods:**
 - Samples collected from offshore stations (July 2007 & 2008):
 - Coral (*Porites astreoides*)
 - Sponge (various)
 - Water
- **Human enteric viruses (q (RT) PCR)**
 - Enteroviruses
 - Adenoviruses
 - Noroviruses
 - Genogroups I and II
- **Fecal indicator bacteria:**
 - Enterococci
 - Fecal coliform bacteria
 - *Clostridium perfringens*
- **Study Sites**
 - Control sites: FTL1 and FTL3. These are the furthest from the inlet or the outfall. However, they are probably still impacted.
 - Polluted sites: Hollywood outfall, Hillsboro inlet and Port Everglades.
 - Inlet bacterial analysis showed presence of fecal coliform bacteria, *C. perfringens*, and *Enterococci* on the surface waters of Port Everglades on an outgoing tide event in 2007.
 - Norovirus assays (presence (X)/absence):

	HI3	HI2	BWD Outfall	FTL1	FTL3	PE	HWO2	HWO3	HWO outfall
Sponge	X	X		X	X	X	X	X	
Coral		X				X	X		
Water Column		X	X		X	X	X		X

- **Summary**
 - Are reefs off the southeast Florida coast exposed to microbial constituents of human sewage?
 - Yes, widespread.
 - What are possible sources of contamination?
 - Outfalls and inlets (inlets may be important source).
 - Are sessile reef organisms accumulating these constituents?
 - Yes, both corals (25%) and sponges (~40%) show exposure and are more likely than water to contain enteric viruses (consistent with findings in the Florida Keys).
- **Future needs:**
 - Spatiotemporal analysis of microbe/pathogen delivery and transport from inlets.
 - Analysis of pathogen transport from inlets to beaches (e.g., compare offshore versus onshore movement and evaluation of risk).
 - Sediment adsorption and release studies (infectious microbes – human and reef organisms).

- Uptake and retention studies of viruses among different types of sponges.
- Combined effects of nutrients, DOM (and presence of macroalgae) on microbial community and potential vulnerability of stony corals to disease.

Questions and comments (LBSP Project 27):

1. (Jack Stamates) *Did you test for viability?*
-(Dale Griffin) *No. PCR analysis doesn't allow that. Just presence/absence.*
2. (Andia Chavez) *What are you looking at as genogroups?*
-(Dale Griffin) *Genotypes.*
3. (John Fauth) *Unexpected results with higher concentrations found in the forks of Port Everglades as opposed to in the middle.*
-(Dale Griffin) *That is similar to what we have found at other sites throughout the Keys.*
4. (Jack Stamates) *Did you test your sponge samples? Some had viruses?*
-(Dale Griffin) *Two out of six samples were positive.*
5. (Vladimir Kosmynin) *Concentration might not be the most important trait to look at. It might only take one coral to get sick then it can spread. There's a higher chance for it to spread with higher concentrations, but it might only take one coral getting sick. This is important for monoclonal stands like Acropora where one colony can infect all of it. How would you correlate concentration with infection?*
-(Dale Griffin) *It would be nice to have quantitative data, but you can't culture Norovirus. Another interesting question is where are the viruses coming from that show up at to some of the nearshore sites off of Fort Lauderdale, long-shore transport?*
6. (Margaret Miller) *Do you conclude that the inlets represent a larger exposure than the outfalls?*
-(Dale Griffin) *That's the way it looks. Chlorine can interfere with the PCR reactions so it could be an artifact of the methodology too.*
-(Jack Stamates) *The amount of water coming out of the inlets is vast.*
-(Margaret Miller) *The inlets seem to be a large source of pollution.*
-(Dale Griffin) *There's viable organisms coming from other sources of pollution coming into the intracoastal and out through the inlets. That's different from the outfalls which output treated water.*
7. (Brian Walker) *We are mostly focused on land based sources, but in this case would it be relevant to look at other sources like cruise ships and boaters?*
-(Dale Griffin) *From our results concentrations were higher nearshore so it seems that the sources are land based.*
8. (Brian Walker) *There might be other sources, and that's why you're seeing stuff in controls?*

Session 2:

SEFCRI LAS Goal: Quantify, characterize, and prioritize the LBSP that need to be addressed based on identified impacts to the coral reef ecosystem.

LBSP Project 27 – Quantify amount and flow rate (flux) of pollution transported by groundwater to the coastal waters - Dale Griffin, USGS

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- **Objective:**
 - Quantify the flow rate and amount of pollutants being transported to the reef communities by groundwater.

- **Pollutants**
 - 64 Organic wastewater compounds
 - 16 pharmaceutical compounds
 - *Salmonella* spp., coliphage, and human enteroviruses
 - Nutrients
 - Radon and methane
- **Sample sites:**
 - Port Everglades entrance
 - HW03 (site described in - Fauth et al. 2006)
 - PE3 (site described in - Fauth et al. 2006)
 - HI2 (site described in – Lapointe, B.E. 2005)
 - JU2 (site described in – Lapointe, B.E. 2005)
 - FTL1 = Control 2
 - Hollywood boil

○ **Results**

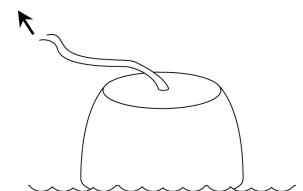
	HI2	FTL1/C2	PE1	PE2	PE3	HWO3	HWO boil
<i>Salmonella</i>		12/100 ml*	8/100 ml		12/100 ml	12/100 ml	19/100 ml
MS2 coliphage			2/100 ml				2/100 ml
Enterovirus				Present *			

*December sampling.

- **Conclusions:**
 - These data and Swarzenski’s Submarine Groundwater Discharge (SGD) study implicate the Port as the only significant source of SGD in the area.
 - SGD offshore is believed to be marine in origin.
 - Pollutants from outfalls and the inlet may get entrained into marine sediments through nearshore circulation patterns and tidal activity.
 - Viable *Salmonella* spp. were observed at two locations in July where previous low salinity events were observed, but were not detected in December.
 - The microbiological and chemical data indicate that the outfall and the inlet are the primary sources of pollutants to nearshore waters.
- **Future studies**
 - SGD well arrays are needed.
 - Salinity data loggers at SGD ‘suspect’ locations.
 - A high-frequency study of inlet pollutants.

Questions and comments (LBSP Project 27):

1. (Judy Lang) *Did you include pesticides in your analysis?*
-(Dale Griffin) *Yes.*
2. (Vladimir Kosmynin) *How was the water sampled?*
-(Dale Griffin) *We used a big water trough (diagram). We put it down to the ground in a flat spot. We looked for a spot with about 3*



inches of sediment over hard bottom. We would pump the water through for about 20 minutes and then take a water sample. We were attempting to get ground water. At the boil we simply took a surface sample with a hose.

3. (Vladimir Kosmynin) *Did you compare with surrounding water?*
-(Dale Griffin) *No. Only ground water.*
4. (Vladimir Kosmynin) *Wouldn't you be sucking in surrounding water?*
-(Dale Griffin) *Yes, that was inevitable with the design, but we were focusing on groundwater.*
5. (Ken Banks) *A Nova student found pollutants in their coral cores. Would that be another data source?*
6. (Doug Seba) *Did you do surface layer sampling?*
-(Dale Griffin) *No.*
-(Doug Seba) *Microbes could stay on the surface with lipids and be transported. So you're missing an important part of the community.*
7. (Judy Lang) *Could you talk about old sewage systems at hotels?*
-(Dale Griffin) *This is just speculation. In the Keys they had high salt water intrusion. They were all leaking. I was wondering how old sewage systems are around here?*
8. (Esther Peters) *Is monitoring still ongoing?*
-(Dale Griffin) *Not for all microorganisms. E. coli was found in the Marquesas where there are no human impacts; therefore it's not a good indicator of human sewage in tropical environments.*
-(Judy Lang) *You see the same problem in temperate waters. They're not looking to see if they're human E. coli.*

LBSP Project 29 – Determine flux of pollutants exiting ocean inlets and net flux to reef communities - Joe Boyer, FIU

Jack Stamates presenting

- **Objective:**
 - To quantify the flux of anthropogenic nutrients exiting the Port Everglades inlet.
 - This system would measure the flow through the inlet while samples were taken to determine the concentration of materials in the water.
- **Current meters at the Hollywood and Broward outfalls and at the 7 meters depth inshore from the outfalls have allowed us to quantify the proportion of southern flow and it is more than expected: (40-50% at the 7m depth at Hollywood and Broward) depending on the season.**
- **Port Everglades is highly stratified both in density and velocity structure. This makes it difficult to take measurements.**
 - The concepts of flood and ebb tides do not really apply to Port Everglades because it depends on your location along the inlet and depth.
 - Ebb tide lasts longer at the surface than at depth, also you can have water moving in at the bottom and out on the surface.
 - Because of the stratification of the water column we can also assume that the lighter water on top carries most of the pollution we are interested in.
 - On one occasion, we observed the surface layer maintaining an ebb flow during a flood tide defined as the rise of the water level.

- During a flood tide the highest velocities are seen at depth. During ebb tide, the highest velocities are near the surface.
- **Estimated flow rates:**
 - Deep layer mean = -44 m³/s (a negative sign indicates inland (west) flow)
 - Shallow layer mean = 69 m³/s
 - Net = 24 m³/s
- **Part of the project was to track the fate of materials flowing out of the inlet; through the FACE program we sampled multiple sites at different distances from the port.**
 - Measured Salinity, Phosphorous, Silicates, Nitrogen and TSS.
 - Overall, with distance the levels return to background levels pretty rapidly.
- **Flow rates according to depth.**
 - In the deep layer you can see symmetrical histograms indicating equal amounts of water coming in and out.
 - However in the surface layer (<3m) there is a significantly higher amount of water coming in. This might be due to the fact that the ebb phase is longer on the surface.
 - Velocities don't seem to change much throughout the year.
- **Other environmental factors:**
 - Precipitation has a significant effect on the inlet.
 - Wind was not a large factor at Port Everglades.
 - This contrasts with Boynton where the North component of the wind has a large effect on flow out of the inlet.
- **Future work:**
 - Hillsboro
 - Boca: data indicates 3.5 million m³ of water exiting on strong, spring, ebb tide.
 - Biweekly sampling of water quality. North and South of the inlet

Questions and comments (LBSP Project 29):

1. (Jack Stamates) *How often do you collect data at Port Everglades?*
 -(Nancy Craig) *Started about 6 years ago, it was supposed to be monthly but usually between 6 to 9 times/year due to weather.*
2. (Kurtis Gregg) *Did you observe similar stratification at the Boynton inlet?*
 -(Jack Stamates) *No.*
 -(Joshua Voss) *You wouldn't expect that because it is much shallower.*
3. (Kurtis Gregg) *How are the early data looking at Hillsboro and Boca compared to Boynton?*
 -(Jack Stamates) *We don't expect the same sort of stratification at these inlets because of their topography just as we didn't at Boynton.*
4. (Judy Lang) *Do any of the canals empty into the inlets?*
 -(Jack Stamates) *Yes, water from the canals that empty into the intracoastal waterway near the inlets eventually exit through the inlets.*
5. (Judy Lang) *So are your discharge data influenced by this?*
 -(Jack Stamates) *Absolutely, we are trying to get a better handle on that. At Boynton we did intense data collection at the inlet for 48 hours and examined the response of the inlet using data from the Water Management District at Lake Worth and saw a significant effect.*
6. (Katharine Tzadik) *Is there any chance of expanding this to the St. Lucie Inlet?*

- (Jack Stamates) We are not currently working there, but we are discussing expanding our program to the northern inlets.*
- (Joshua Voss) The relative scale is triple; it's a very large system.*
- (Jack Stamates) How big is it?*
- (Joshua Voss) At least ¾ of a mile.*
- (Katharine Tzadik) We have had several questions from the public because there has been a lot of water coming through for the past 49 days from Lake Okeechobee. There's information on the Martin County webpage on when they open the gates, so that could be something to look into for further information on the impacts of water discharge on the inlets.*
- (Joshua Voss) They have reduced the amount recently, but not a lot.*
7. *(Brian Walker) Is the diagonal configuration in Port Everglades affecting your data? Showing different ebb tides on each side?*
- (Jack Stamates) We also gathered calibration data taken from a boat equipped with a down looking ADCP to help account for this. We also apply smoothing filters to the data to reduce the effects of short term variability.*
8. *(Brian Walker) Do you think large vessel traffic is affecting this?*
- (Jack Stamates) There is some effect but as our sampling interval is longer than the typical transit time of a vessel past the measurement point (six minutes), the effect is reduced. Also the system looks at the data from all three of the acoustical beams. If one of the beams is significantly different from the other two, (i.e. a boat is passing across the beams) that data is marked bad and not used in the ensemble average.*
- (Judy Lang) So you could count the boats going through?*
- (Jack Stamates) You could if you wanted to.*
9. *(Brian Walker) Can you see a difference on the weekends? When all the cruise ships leave could they be pulling out a lot of water?*
- (Jack Stamates) Haven't looked at it yet.*
10. *(Dale Griffin) Has anybody looked at data from the outer buoys for upwelling and flow directions and rates?*
- (Jack Stamates) We are looking at current meter data from the area to try and learn about the nearshore and offshore current patterns.*

LBSP Project 30 – Determine flux of pollutants from oceanic sources to coastal waters - Lew Gramer, NOAA AOML

- **Overview of past projects**
 - **Project partners: NSUOC, NOAA, FWC and FDEP**
- **Bathymetric Maps:**
 - Source: National Geodetic Survey's Coastal Relief Model
 - North of West Palm Beach to Port Everglades
 - Reefs are not linear throughout the latitudinal gradient.
- **Monitoring Stations:**
 - Broward County, Jupiter and further North.
 - Detect upwelling events which are episodic by nature. So they can only be detected by long-term sampling, especially for sea temperature.
 - NSUOC has established two ADCP monitoring stations at Port Everglades.

- AOML has also established sites at 27m and 7m at the Hollywood and Broward outfalls.
- Alex Soloviev's 12-year sample period should be sufficient to observe some of the seasonality of upwelling events.
- **Partnership with FWC**
- **Determine the causes of upwelling events:**
 - Wind driven?
 - Florida Current eddies and meanders?
 - Tidal?
 - For example: significant drop in water temperature with no corresponding change in ocean height during July 2010.
 - Also data from a ship hull mounted ADCP from 2009.
 - Sample through eddies propagating along the coast.
- **Detected an eddy in 2009 with vertical moorings off of Broward and Boca:**
 - Vertical moorings off Broward, Boca.
 - Thermistors at ~10, 20, 30m depth.
 - Rapid temperature changes: T~6-12h
 - Significant cooling: 7-8°C at depth.
 - Simultaneous with larger scale eddy circulating off the Florida Keys.
 - But >100km away from that eddy!
 - Consistent with internal wave packets propagating along the shelf – a possible physical mechanism to explain “bleeding eddies” often seen along the Florida reef tract?
- **Proposal:**
 - 2013: What can we glean from previous studies?
 - Seasonal incidence of upwelling (sea temperature).
 - Geographic patterns of upwelling (sea temperature, currents).
 - Dominant physical mechanisms of upwelling (currents).
 - 2014: What are nutrient fluxes associated with it?
 - Analysis of previous ship-board studies.
 - Targeted water sampling.
 - 2015: Contribution to SE Florida nutrient budgets.
 - Spatial and seasonal patterns
 - Net contribution to overall mass balance budget

Questions and comments (LBSP Project 30):

1. (Judy Lang) *I'm interested in the correlation between internal waves and eddies. They seem to be fairly spatially related, if that is true then you should be able to infer the presence of one from the other?*

-(Lew Gramer) Eddies yes. Internal waves can be detected with Synthetic Aperture Radar (SAR). The problem with this is that data collection is very episodic. Eddies are easier because you can always detect a change in sea temperature and chlorophyll.

-(Jack Stamates) A well placed ADCP setup to sample at the appropriate frequency should be able to detect them coming in.

-(Lew Gramer) We are hoping to look at this from the older records from the AOML and Nova moorings.

2. (Doug Seba) *How do you know that there is not a lot of internal wave activity out there? Have you seen any internal waves at these inlets?*
 - (Jack Stamates) *That is unlikely that we would be able to detect with our sampling techniques, there's too much variability in the inlet itself.*
 - (Lew Gramer) *You would expect to see high frequency waves caused by the passage of ships, but internal waves propagating so far inland seems highly unlikely.*
3. (Dale Griffin) *If you had to look at the county two miles out, what would you estimate the volume of water being transported by the waves?*
 - (Lew Gramer) *You would have to take an average of eddy passages and internal waves coming in. You would need the cross shore data. We don't have all that information right now.*
4. (Dale Griffin) *Can you make a crude estimate with the data you have now?*
 - (Lew Gramer) *That is definitely one of the things we will be looking at and hopefully in about a year we will be able to answer that question using some of the historical data.*
5. (John Fauth) *How would this affect the biota that we might be able to detect?*
 - (Lew Gramer) *We would need further information on the details of the topography so we can look at the benthic boundary layer. We are not looking at that for now.*
6. (Dale Griffin) *Could it maybe affect the temperature?*
 - (Brian Walker) *Looking at the SECREMP temperature data, using temperature as a proxy for upwelling, events seem to be a lot more frequent as you go North, i.e. higher frequencies in Martin County compared to Palm Beach and also higher than here in Broward. We recently did a quantitative assessment of the coral communities in Martin and we see a very different composition than we see in Broward, I would interpret it as an effect of these upwelling events. Water was 59°F in August. The only coral we saw was Oculina sp.*
 - (Jeff Beal) *We observed the same temperatures on the inshore reefs in the summer. For example in 2010 the temperature dropped 20°F in 14 hours it went from 80°F to 60°F and it lasted for about 10 days in 7 ft. of water. It definitely affects the corals. This happened just before they should spawn, so we don't know how it affects their reproduction.*
 - (Jack Stamates) *We should also look at nutrients. We have been using temperature, but it would be nice to have some kind of autonomous sampling device that looks at nutrients.*
 - (Jeff Beal) *I agree, because we have observed two types of upwelling. Either crystal clear water or highly turbid water coming up onto the shelf.*
7. (Lew Gramer) *Would you anticipate this having anything to do with the source of the water? If it comes from above or below the chlorophyll maximum layer?*
8. (Brian Walker) *As an aside, I would just let you know that Martin County mapping is wrapping up. It hasn't changed much from what we had before. There's not a lot of hard bottom out there, there's a narrow shallow component and a ridge at about 70ft. We have also done some mapping on the northern Miami shelf, and the data should be coming out soon.*

Session 3: Determining the Extent and Condition of the Resource

SEFCRI LAS Goal: Characterize the existing condition of the coral reef ecosystem.

L BSP Project 25 – Establish a long-term coastal water quality monitoring program in the SEFCRI geographic region. Joe Boyer – FIU (presentation via teleconference)

A discussion led by Katharine Tzadik about the future of a water quality monitoring project as funding has finished.

1. (Joe Boyer) *Everybody has been interested in this project because we need to design the project in a way that it is relevant to people; that the data we obtain must be useful for the questions we are trying to answer.
In this case we had a fortuitous setup because we were able to join it with the SECREMP monitoring and were able to get some good quarterly data.
Last year I had compared some of the SEFCRI data to the water quality targets that the EPA has set for the Florida Keys. The results are pretty encouraging as we can see that for light extinction, inorganic nitrogen and phosphorous the SEFCRI region has comparable contents to the Keys. It has slightly higher chlorophyll content, but this might just be a natural occurrence. So these results show that, at least at the SECREMP sites, they are not totally degraded as far as nutrients are concerned. What are your comments?*
3. (Katharine Tzadik) *Do we want to continue the project as it is or address new questions?*
4. (Joe Boyer) *We attempted to look at nutrients loading with PESCO, but we would really need to concentrate on the largest sources of pollution, which would be the inlets. What is FACE looking at in the future?*
5. (Jack Stamates) *We have put a proposal in that will give us funding for some water quality data near outfalls, inlets and some of the SECREMP sites.*
6. (Joe Boyer) *It had been mentioned to try to get a volunteer program running with samples being run at the DEP lab? Maintaining collection standards can be a challenge with volunteers.*
7. (Katharine Tzadik) *DEP told us that they currently analyze samples from a variety of sources. One of them coming from Charlotte Harbor. They have a volunteer network through which they get their samples once a month.*
 - (Karen Bohnsack) *They sample the first Monday of every month at 7am at 49 sites.*
 - (Katharine Tzadik) *These samples are directly linked to the TMDL's in the area. Could we do something similar for the SEFCRI area? EPA has some funding specifically for water quality and community involvement.*
 - (Dan Clark) *As far as sampling, it would make sense to use the dive operators. They're out there all the time anyway. We would just have to make sure you train the people to take the samples.*
 - (Katharine Tzadik) *Karen, how many volunteers do they have in Charlotte Harbor?*
 - (Karen Bohnsack) *Close to 100. One of the main differences is that most of their sampling sites are land based and also it's just surface water.*
8. (Margaret Miller) *So can the DEP lab analyze the samples? It seems like as long as the SECREMP team can continue to collect the samples then the lab should be able to analyze the samples.*
 - (Katharine Tzadik) *The problem with that is that the SECREMP team only goes out once a year for benthic. There was funding for three additional trips a year.*
 - (Margaret Miller) *Well that data could still be used as some sort of cross calibration for the volunteer network?*

- (Nancy Craig) Concentrations are really low, because the samples are not at outfalls or inlets. Not that many labs are set up to detect to those levels.*
- (Joe Boyer) That's something we need to talk to with the DEP lab.*
- (Katharine Tzadik) So we would need to talk to the DEP lab to see if they could do it, and to Dave Gilliam and his team to see if they could include the water quality sampling into their usual monitoring.*
9. *(Doug Seba) Where is the DEP lab?*
- (Katharine Tzadik) I'm not sure. But could we freeze the samples to ship them?*
- (Joe Boyer) Can't freeze the samples. There's a very strict protocol. Some analyses have to be done within 48h, although you could look at total nitrogen and phosphate which would eliminate that problem. The lab is in Tallahassee.*
10. *(Nancy Craig) You would need to acidify the samples, so you would have to have acid at the sampling sites.*
- (Margaret Miller) Using acid means using acid-cleaned bottles and creates a whole new level of complexity for using a volunteer network.*
- (Judy Lang) You need a facility to clean and maintain all the equipment.*
11. *(Margaret Miller) What parameters would be less problematic, for example chlorophyll?*
- (Nancy Craig) It is less problematic, but it will not be a very good indicator for what we are trying to look at.*
- (Gene Shinn) I know there is a difference between sampling for scientific purposes and legal purposes. Which standards should we be adhering to?*
- (Nancy Craig) It depends on what the data is going to be used for. If it will be used for enforcement actions then it needs to be legal.*
12. *(Joshua Voss) How about going for a different type of grant? Some fund instrumentation rather than the actual sampling. So that we would have the instruments and then tack on the sampling onto other projects?*
- (Jack Stamates) The equipment for in-situ measurement of the low levels of nutrients that we typically see in the coastal ocean here doesn't really exist as of yet (although I am aware of some promising new technologies being developed commercially and at AOML). We need long-term monitoring, we should be thinking about 20 years from now.*
13. *(Dale Griffin) Has anybody setup off-shore sampling lines? Like a hose from one of the labs out offshore or into Port Everglades. That has been done in other parts of the state. You would have fewer sampling sites, but really how many do you need? That way you wouldn't have to take a boat out.*
- (Nancy Craig) Then you have issues with fouling of the lines.*
- (Dale Griffin) Yes they would need some maintenance, but that's only periodical.*
14. *(Tanya Tweeton) At Sierra National we have the Water Sentinels group, Chris Costello is running it and it just started in Tampa. There are about 100 volunteers working at lakes and streams.*
- (Dan Clark) They have started to work on some marine environments. QAQC is still a challenge. They were going to hire a lab to do the analysis.*
- (Esther Peters) You need to know what standard you're working to and then work to those standards. Depends on the purpose of the data.*
- (Nancy Craig) If we plan to use it for TMDL's there's a standard for that. So it is important to define what the data is going to be used for.*

15. (Joe Boyer) *What if it is mainly for public education? In the Caribbean we had the Caribbean Wide Water Quality Snapshot (CARWASH). Volunteers across 26 countries who went out within a week to take samples and then we compared. It was more a qualitative outreach experiment. That might create awareness about the need for a proper water quality monitoring program.*
- (Katharine Tzadik) *That could be coordinated through SEAFAN.*
 - (Judy Lang) *Volunteer effort should concentrate along areas of high concentrations like the canals so that the analysis would be easier.*
 - (Joe Boyer) *There's an organization, World Water Monitoring Challenge, where 78,000 people from 48 countries are taking part. It's already happening in the US.*
16. (Kurtis Gregg): *Are we only concentrating on surface waters?*
- (Katharine Tzadik) *That's what we are here to discuss. I'm seeing two different approaches: figuring out what we are going to collect the data for? So that then we can decide on to how we are going to collect that data.*
 - (John Fauth) *That's why it was originally setup to be part of SECREMP so that we could look at the effects of water quality on the benthic communities that we monitor.*
 - (Judy Lang) *That's giving you the response, but not where it's coming from.*
 - (John Fauth) *That could be the next question. Track where it's coming from.*
17. (Jeff Beal) *If you are looking at inlets then salinity can be a proxy for all these nutrients. Salinity is a good proxy and we have HOBOS that are less than \$1,000 that can sample continuously. They just have to be cleaned every five weeks.*
18. (Jack Stamates) *From our experience with several projects the area of influence of these point sources seems to be less than 1km. At that distance measurements fall back to within background measurements. So it's not a huge radius.*
19. (John Fauth) *This doesn't take into account bioaccumulation. It's looking at dilution but it's also important to look at bioaccumulation.*
20. (Dan Clark) *Has anybody been looking at the infrastructure on the barrier islands? What is the influence of groundwater, meaning sewage and leaking pipes?*
21. (Katharine Tzadik) *A suggestion that came up for that earlier was drilling wells to see those effects.*
22. (Dale Griffin) *You could also use microbiological techniques to detect viable versus dead organisms. If you have leaks you would expect to see live organisms.*
23. (Katharine Tzadik) *We might need to take a different approach. Coordinate with the District so that efforts are not duplicated, they have inland monitoring efforts. How can we reach more people? Do more outreach, i.e., Charlotte Harbor.*
24. (Jack Stamates) *Nuttrification on the reefs is something we have looked at. Is there something we can do that will give us information on that; a simple, accurate method that volunteers could do?*
- (Joe Boyer) *There are kits you can give volunteers. These are not sensitive enough to detect the levels that exist offshore.*
 - (Jack Stamates) *Would the DEP lab be able to do this? What should we measure or collect?*
 - (Joe Boyer) *Total phosphorous, chlorophyll, organic carbon, total nitrogen. Also water clarity with a Secchi disk. Anyone could make one and it's used worldwide.*
 - (Jack Stamates) *Aren't total phosphorous and total nitrogen hard to get to the lab?*

- (Joe Boyer) You just need to have acid, then you can ship anywhere. They don't need to be there within 48h. It does require a backbone, infrastructure that will maintain and clean the bottles.*
- (Katharine Tzadik) Do we measure iron?*
- (Nancy Craig) We have only just started doing it, but we have one person whose job it is to look at iron exclusively.*
- (Dale Griffin) Iron would definitely be important. It is important for fertilization and reproduction, as well as African dust storms.*
- (John Fauth) How about some surrogate for human pollution like caffeine?*
- (Joe Boyer) Organic carbon is a good indicator of the source of water. Inland water will have high concentrations of organic carbon.*
- (Dan Clark) How soon do you have to fix the samples in acid before it has to be shipped? People will not want to take acid on the boats.*
- (Joe Boyer) We usually ship the bottles with acid. Then they don't have to handle the acid, you just need to put the sample in the bottle and you are done. It's 1/2 ml of acid, it's a small amount.*
- (Dan Clark) Do they make kits for E. coli and other microorganisms for seawater?*
- (Dale Griffin) You can do it, but you need to incubate them. It's not hard, but requires a little more work. Another option is to do viral work, and then the samples can be kept in the freezer for about a year, it's cheap about \$15 a sample. Then you run PCR on them and have some results.*
- (Katharine Tzadik) That sounds like a different question. But it seems easier to do.*
- (John Fauth) The information is less ambiguous, which is the upside.*
25. *(Nancy Craig) What is the question that you're trying to answer?*
- (Dale Griffin) Where are the fecal coliforms coming from? We already know they're there; it's more determining the sources. It would also be important to look at alive versus dead to look at the viability of the organisms, which means you have to culture them.*
26. *(Joe Lopez) How about high throughput microbial community analysis? Some of these could be great student projects.*
- (Joshua Voss) Expense would be your biggest hurdle there.*
27. *(Katharine Tzadik) Going back to the original question, would we want to continue the project as it is with the SECREMP sites, getting one sample a year during the summer, assuming DEP lab can analyze the samples. Would it be worth it?*
- (Joe Boyer) If it doesn't cost anything, why not?*
- (John Fauth) Do we have data for 2012? It would be interesting to continue sampling so that we can establish some patterns.*
- (Katharine Tzadik) Yes, up through September. The cost of water quality monitoring is \$50,000 per year. But that was quarterly sampling.*
28. *(Doug Seba) If you're thinking of going the kit route, then why not put barcoded tags on them and let them throw them into the water and then you would also get data on the currents and water movements. When the sample drifts onshore they can be mailed back and analyzed.*
29. *(Joe Boyer) We should check with State to see if they have any plans for water quality monitoring so that we can build off of it. The data are up on the website. It was already used for numeric nutrient criteria.*

1. (Katharine Tzadik) *Mass balance budget projects. We had discussed the projects on the inlets, groundwater still needs to be looked at and Lew's project should get some good data. We still have the outfall and atmospheric projects that round off the whole picture. If we request funding what should our priorities be?*
 - (Ken Banks) *I would vote for the wells.*
 - (Esther Peters) *I would also vote for the wells it is a one time investment.*
 - (Nancy Craig) *With that you will be able to see the land-based sources. It's harder to see this with the atmospheric approach, and we have a better chance of doing something about it. It's not coming from far away where we might not be able to do anything about it.*
2. (Dale Griffin) *We know that a lot of our problems come from dust. Florida gets 178 tons of dust statewide on land yearly. We might assume that there's a similar input to the Florida shelf. I would love to see that study done, but it is unlikely to get funded. Another project that I would like to see would be the primary effluent analysis. It would be useful for risk assessment.*
 - (Katharine Tzadik) *This could be potentially low cost?*
 - (Dale Griffin) *Yes, we would only need a few samples.*
 - (Ken Banks) *We have sampled at the outfalls, we sampled the Broward outfall.*
 - (Jack Stamates) *All the outfalls have a sample point near the coast. They take weekly samples. There's probably lots of data available already.*
 - (John Fauth) *It is important information because what the biomarkers show is that it is xenobiotics that are affecting the corals and that is the stuff coming out of the pipes.*
 - (Nancy Craig) *It dilutes very quickly. When we sampled it, you could clearly see the brown water going straight up; 30 min later it was gone.*
3. (Jack Stamates) *We used rhodamine dye at the Broward plant to trace the effluent. There's a lot of variability in the surface expression of the plume. It depends on the water conditions as well as the winds. One thing that is important to talk about is that we have been studying the outfalls for a long time and we do observe impacts, but we haven't really looked at how far the impacts go. We certainly have impact at ground zero, but the radius is not that big. Typically within a fairly short distance our measurements are within background levels. Dilution is fairly rapid.*
 - (Dale Griffin) *It depends on the environmental conditions, on slack tide they will just umbrella over a point, but on an outgoing tide you will have a large plume away from the source.*
 - (Ken Banks) *Under certain winds the plume gets locked in to the shore, too.*
4. (Vladimir Kosmynin) *We must also look at the effect over time. The outfall keeps going and going. You don't have a signal let's say at 50 m, but every day is different and it is distributed to different places over time.*
5. (John Fauth) *We have used biomarkers before, however, we have never run transects away from the point source.*
6. (Judy Lang) *For pathogens we also have to look at the bottom biota, because we know they can get trapped in the macroalgae and then get into the food chain. They might be going a certain distance physically but the impact might be wider biologically.*

7. (Gene Shinn) *From the pictures I have seen the plume goes out at an angle, but in Miami it goes straight up to the surface.*
 -(Jack Stamates) *We have always thought that most of the dispersion is at the surface because of the buoyancy of the material, so the bottom impact is minimized.*
8. (Dale Griffin) *An interesting result from our sediment study is that we saw them at least 100 m away from HWO3. I agree with John on the idea of doing transects so that we can see how far the nutrients are going.*
 -(John Fauth) *You saw the highest concentrations in sponges, correct? That is evidence of bioaccumulation.*

Discussion on the potential of doing a one day sample effort on a radial sample design

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1. (Ken Banks) *We had talked about trying to pick up the gradients along the outfalls or inlets. We have a team and some resources to do a project if we come up with the indicators and a sampling design that makes sense. It should be possible to do in a day and we must be able to do the analysis, too. It might be possible for a graduate student to lead it.*
 2. (Jack Stamates) *We have talked about this at AOML, but we haven't come up with something concrete yet. Derek Manzello is one of the people that has been talking about it, looking at size classes of corals and plants, looking for a gradient of degradation.*
 -(Margaret Miller) *Coral demographics could be a relatively easy thing to do. We just deploy several groups across the gradient and collect the data.*
 -(Vladimir Kosmynin) *You must make sure that you stay on the same habitat.*
 -(Richard Dodge, others) *That is the one thing I'm confused about. Where does the gradient lie? If it lies across several habitats it might be hard to detect.*
 3. (Jack Stamates) *That's another issue the outfall is at 27 m depth and the predominant current is about 5° so that may be too deep to dive.*
 -(Ken Banks) *Yes, I had thought about diving on the reef not out where the outfall is too deep.*
 -(Vladimir Kosmynin) *At 27m you have about 30 min of bottom time, that's plenty of time for sampling.*
 -(Esther Peters) *Maybe we should try it at the inlet first where it is shallower.*
 4. (Vladimir Kosmynin) *We should include recruitment in the study.*
 -(Judy Lang) *Recruits can be done through sub-sampling. We could also take some samples that someone like Dale might be able to use. We might be able to look at sediment size.*
 5. (Ken Banks) *We must have AAUS divers, as well as a maximum of two teams from one boat.*
 6. (John Fauth) *We also have to look at sampling effort to have robust results. I would say a minimum of 11-12 points, which might be too many for one day.*
 7. (Richard Dodge) *You must also look at the variability of the inlet effluent. It will require a large effort.*
 8. (Judy Lang) *So which are we most interested in, the outfall or the inlets?*
 -(Group) *Inlets are easier, shallower to look at.*
 -(Ken Banks) *From my observations there's momentum from the effluent, so you might not be able to pick up anything in the nearshore, it doesn't seem to disperse while it's in the channel, only start seeing it farther out.*
 -(Vladimir Kosmynin) *You won't be able to pick it up in the third reef either.*

- (Jack Stamates) The easy thing about the outfalls is that you have a point to go to.*
- (Richard Dodge) There's a point at the bottom, but then it all goes up to the surface and disperses so how do you account for that?*
- (Dan Clark) A similar thing happens with the inlet. We have been diving some of the wrecks which are 3 to 4 miles away and you can see a surface layer of green water.*
- (Ken Banks) You would think that the frequency of a given spot on the bottom being impacted decreases as you move away from the source, forming a gradient.*
9. *(Margaret Miller) Having people in the water might be better to do. Collecting samples implies further analysis and work after which might be harder to do. With divers you already have data by the end of two days.*
- (Dale Griffin) I would focus on sediment samples rather than water samples because the sediment is constantly being washed over by the effluent. I would argue to do the outfalls too, especially since there's the risk that they might back out from actually shutting them down.*
10. *(Esther Peters) It would be interesting to include human impacts like viruses.*
11. *(Doug Seba) It would also be relevant to pick out a couple of points which would serve as a control for all this? So that you have something to compare it to.*
12. *(Katharine Tzadik) The data can be confounded by regional effects. It's hard to find a real control site.*
13. *(Judy Lang) Would sponges be candidates as bioindicators?*
- (Margaret Miller) Do we have data on the sponge demographics? How about Cliona?*
- (Esther Peters) We have a student here at Nova working on that. We should include recruitment, as well as abundance.*
14. *(Ken Banks) There's one more TAC meeting before the summer.*
- (Katharine Tzadik) What are people's availability in April? When would be a good time to do it?*
- (Judy Lang) If we tie it in to the TAC meeting, some of the people from abroad might be able to help, and the weather will probably be better in June.*
15. *(Jack Stamates) What are our resources?*
- (Katharine Tzadik) Potentially we have some for analysis, tied in with Karen Bohnsack and the SEAFAN project (South East Florida Action Network).*
16. *(Dale Griffin) John, have you looked at using Ames tests, from the University of Tennessee? It's a chemoluminescent kit for toxicity. John Paul also published one several years ago for marine settings. There's also the SOS chromatest which also tests for toxicity and mutagenicity. You can run 96 at once on a micro plate.*
- (Unknown) This would be an instantaneous test for toxicity of the water. However, I think we should be looking at the chronic effect, the outfalls and the inlets have been running for a long time. There is a lot of variability in the water column, but it would be nice to have something that would show the 60 years of cumulative effects. Is there a pattern?*
- (Margaret Miller) We could couple the data, using monitoring and looking at the benthic community to look for these effects, by looking at community exposure and long-term effects on it, as well as using the instantaneous data from the water column using one of these tests.*
17. *(Judy Lang) Could we do sediment pore water? That might show some of the accumulation.*

-(Margaret Miller) I think we should do both, test the water or sediment as well as look for chronic effects on the organisms.

-(Dale Griffin) With this kind of setup we would be able to do both sediments and water column because it's high throughput. Also, we would also be looking at needing funding for this to buy the kits, etc.

-(Judy Lang) We would be looking more for chronic effects rather than acute effects.

18. (Margaret Miller) *We also need to get maps to establish these sites. My team might also be able to get a boat if we deem it necessary.*

19. (Dale Griffin) *Ken and John will provide us with some best guess sites for transects.*

20. (Ken Banks) *We also need to narrow down the parameters we want to look at. They have to be tied to a resource and a high probability of being able to detect it.*

Public Comment Session – Day 1

I. Drew Martin - Sierra Club

- A. I am concerned about the reefs and want to see them protected. Impressed, but concerned with the idea that you can just disperse all the pollution. The ocean doesn't go anywhere, so as population increases what is the cumulative effect?
- B. The science might be behind the curve on this. If we can't detect the damage with current science, we might be causing a bigger problem. We haven't really looked at pharmaceuticals for example.
- C. We should take advantage of any opportunity for monitoring. It's not that expensive in the grand scheme of things.
- D. Often times we miss events because we are not monitoring constantly. As humans we can stop swimming but fish can't do that.

II. Dan Clark - Cry of the Water

- A. Broward County has put in petition for Segment 2 beach renourishment. Now they want to use truck hauls instead of dredging which is better, and it's a smaller profile than before.
 - Unfortunately we haven't learned from past mistakes, they are moving forward with renourishment.
 - They haven't done mitigation for segment 3, which I would like to get done before segment 2. I think there still are many issues to deal with before they proceed.
 - Beaches and coastal systems branch has been eliminated from government.
 - Bill 748 passed. Only requires one Request for Information (RAI).
 - Multiple nearshore reefs offshore of planned renourishment areas, with high relief, this causes important dynamics with water and sand movement.
 - There's no vegetation on beaches up by Birch State Park, this is supposed to be required, it is just in front of the staghorn patches.
- B. We just had a real event in the past weeks, the storm surge affected several blocks inland.
 - Water was 5ft high on the west side of intracoastal.
 - They used front end loaders to put sand back onto beach after Sandy for two days.
 - Depth of closure is not a good enough measure.
 - 5 acres buried predicted at 15m equilibrium point, however segment 3 was closer to 60 acres. Also, if depth of closure is at 16 ft., most of the staghorn coral here is at less than 15 ft.

- With the new law, once they are approved they can continue to renourish without having to get a new permit.

-(John Fauth) *If we are looking at averages with the depth of closure, wouldn't it be reasonable to look at the variance and confidence intervals of this?*

-(Vladimir Kosmynin): *Also, let's say that the depth of closure is correct, but that doesn't mean that there is no further shedding of sand through time.*

III. Stephanie Clark - Cry of the Water

C. We have a good volunteer base that we can tap if you guys are looking into doing volunteer groups. Please engage us.

D. The outfall legislation is coming up again. It might be changed and turned around. So keep an eye on it.

-(Gene Shinn): *I worked on something similar in the Keys and it's a good thing to engage the public, we have a large idle population that could jump into it. We have already been trained for other projects, and eventually it died off, however we might be able to start slowly with a few volunteers who have some experience and then possibly make it grow later. Tropical Storm Debbie washed away sand on the west coast. There is beach renourishment going on there, too.*

-(Dan Clark): *There's another important point with regards to how the sand moves. The sand bars are never taken into consideration in the cross-shore models.*

-(Vladimir Kosmynin): *It is true that the sand comes back after a storm; however it never comes back to the same height. That is the problem that we have with the dunes, if they get washed away then you lose their protective properties.*

-(Dale Griffin): *Who does the permitting for beach renourishment? Does the EPA have a risk analysis for coral reefs?*

-(Vladimir Kosmynin): *All effects should be predicted, but it is hard to do so (equilibrium total fill ETOF) predict these things, so a risk assessment is even harder to do. Unfortunately the big money maker is the beach; the tourism because of the beaches is a large economic driver.*

-(Dale Griffin): *Could you use endangered species as a way to protect the environment? Didn't they do something similar in California?*

MEETING SUMMARY – DAY TWO: FRIDAY, JUNE 1ST 2012

Meeting Guidelines

Katharine Tzadik reviewed meeting agenda and participation guidelines, and what topics would be focused upon for day two.

Meeting Guidelines/Agenda Review/Overview of Day 1 Discussions - Katharine Tzadik, FDEP CRCP

(Jamie Monty) *There have been a few changes to our team at FDEP so I would like to explain what happened. The previous manager Chantal joined The Nature Conservancy and moved to New York, so Joanna Walczak the assistant manager was promoted to Manager. I'm now the Assistant Manager. More recently, in April/May FDEP decided that they wanted one person to manage the efforts both in South Florida and the Keys, Joanna was promoted to that position, and I was moved up to acting manager. Then Julio Jimenez who was program assistant was moved to the Fishing, Diving and Other Uses position which I previously held.*

Katharine Tzadik reviewed meeting guidelines and agenda.

Session 4: Designing and Implementing Activities to Reduce Land-Based Sources of Pollution Affecting the Coral Reef Ecosystem

SEFCRI LAS Goal: Designing and Implementing Activities to Reduce Land-Based Sources of Pollution Affecting the Coral Reef Ecosystem

South Florida Water Management District Watershed Initiatives – Kevin Carter SFWMD

- **Broad overview what the district is doing from Orlando to the Everglades in the Florida watershed.**
 - NEEPP=Northern Everglades and Estuaries Protections Program.
 - CERP=Comprehensive Everglades Restoration Plan.
 - CEPP= Central Everglades Planning Project.
 - RS=Restoration Strategies.
- **Changes to the waterflow in the past 150 years.**
 - Draining of several canals in early 1900's.
 - Coastal ridge forced water south; 9 million acres.
 - 1926/28 flood control. Lake Okeechobee levee failed.
 - 1930s Hoover dike was constructed.
 - 1931-45 saltwater intrusion threat because of drought.
 - 1947 strong hurricane season prompted people to advocate Washington to help.
 - 1948 Southern and central Florida flood control and other purposes project; led to the establishment of Florida water management districts in 1972.
 - The natural systems were greatly altered, diverting water flow to the east and west of Lake Okeechobee.
 - Now the WMD is trying to deal with quality, quantity, timing and distribution of water that were altered, trying to reestablish the natural flow with restoration programs.
- **Goals of restoration?**
 - Reduce flows to east coast, improve flows to the south, reestablish river of grass.
 - NEEPP focused on the restoration of Lake Okeechobee. In 2007 it was extended to St. Lucie and Caloosahatchee watersheds.

- Objective is to meet Total Maximum Daily Loads and increase watershed storage (i.e., QQTD).
- **NEEPP is coordinated by SFWMD, FDEP and FDACS.**
 - Plan components and goals:
 - Source control.
 - Construction projects and dispersed water management.
 - Research and water quality monitoring program.
- **NEEPP: St. Lucie Watershed Update**
 - 2009: Initial River Watershed Protection Plan (RWPP) delivered to State Legislature.
 - 2009: FDEP finalizes Total Maximum Daily Load for Estuary and Watershed.
 - 2012: RWPP update completed.
 - 2013: FDEP planning stages of Basin Management Action Plan (roadmap to TMDL implementation).
 - Next public meeting November 29th in Stuart, FL.
- **CERP**
 - 1999: SFWMD got the authority to be local sponsor.
 - Yellow book submitted to Congress. 60 components to “get the water right.”
 - 2000 Florida Legislature passes Everglades Restoration Investment Act to fund the state’s 50% cost-share for the Comprehensive Everglades Restoration Plan (CERP).
- **Kissimmee River Restoration**
 - Acquired 103,000 acres.
- **CEPP Goals and Objectives**
 - **GOAL: Enhance Ecological Values**
 - Increase the total spatial extent of natural areas.
 - Improve habitat and functional quality.
 - **GOAL: Enhance Economic Values and Social Well Being**
 - Increase availability of fresh water (agriculture/municipal/industrial).
 - Reduce flood damages (agricultural/urban).
 - Provide recreational and navigation opportunities.
 - Protect cultural and archeological resources and values.
- **What’s next?**
 - Reduce undesirable discharges to east and west coast estuaries.
 - Deliver “new” sources of clean water to the Central Everglades and Everglades National Park.
 - Restore habitat in the central Everglades, focusing on the “River of Grass.”
- **Restoration Strategies:**
 - Science Plan – Requires research regarding STA and FEB performance, factors effecting phosphorus reduction.
 - Consent – Any material change to permits or Consent Orders would require District consent.
 - Consent Orders – applicable until last milestone is complete for all flow-paths.
 - Eastern Flow-path – 2024.
 - Central Flow-path – 2024.
 - Western Flow-path – 2025.

Questions and comments (SFWMD Watershed Initiatives):

1. (Gene Shinn) *How deep are they digging the Flow Equalization Basins (FEB's)?*
-(Kevin Carter) *Not sure, they usually have to deal with submerged as well as emergent vegetation so they can't be too deep.*
2. (Jack Stamates) *Where is the Site 1 impoundment?*
-(Kevin Carter) *It is in Palm Beach close to the Hillsboro canal. It should help decreasing flows to the East coast. The main idea behind all this is to get the phosphorous discharge down to 13 ppb. The local science plan is currently being vetted by the EPA.*
3. (Vladimir Kosmynin) *What happened with the sugar cane in the area? It had been suggested that they would be bought out so that the land could be returned to the original community.*
-(Kevin Carter) *That project has since been changed in its scope as well as its footprint. A smaller segment of the properties has been bought out and some restoration is underway. But it has been changed.*
-(Vladimir Kosmynin) *So the sugar cane industry will remain? Because they are known to have a large effect on nutrient loading.*
4. (Dan Clark) *What about Broward County? You can't dump water out in Palm Beach or further south, so the New River has become the dumping area, and it's all coming out of Port Everglades.*
-(Kevin Carter) *The concept behind the project is to manage the water flow of the whole system. There has been a high volume of output recently because of Isaac but as far as the water quality it seems to be pretty good in Broward County.*
5. (John Fauth) *One of my projects is the Florida Ranch Lands Environmental Services project, where the ranchers are being paid to retain water on their land, this way they are providing an environmental service. However there are caveats, the material they used for the boards are not very good, and there are issues with radial canals. When it rains a lot it can cause a lot of flooding. The regional flows have a larger effect than expected. The local structures can't handle it. The ranchers have bought in and are happy with it, but the engineering needs to be improved.*
6. (Stephanie Clark) *What does FEB mean?*
-(Kevin Carter) *Flow equalization basin. It is a tool to decrease the high pulses of water flowing through, and to reduce phosphorous.*
7. (Dale Griffin) *Has anybody looked at the role of limiting nutrients in these bodies of water? Or at any of the microbiology?*
-(Kevin Carter) *It has been talked about in the science plan. It could be important in reducing phosphorous.*
8. (Brian Walker) *The old system before all the modifications was a flood system. Is all this trying to mimic it at all, or you focusing on laminar flow?*
-(Kevin Carter) *The concept is to try and mimic the original flow, including the flood and dry periods.*
-(Kurtis Gregg) *The quality, quantity, timing and distribution aspects of the plan deal with that, the seasonality of the flows and the quantity.*
9. (Vladimir Kosmynin) *Was the rise of sea level in the past 150 years taken into account? It has risen by about 40-50 cm, this means a slower discharge to the ocean.*
-(Kevin Carter) *I don't think the planning has taken climate change into account that much.*

10. (Jack Stamates) *How much less water is going to be coming down and going east, proportionally? It will be less water and fewer nutrients.*
-(Kevin Carter) *I'll have to get back to you.*

Upcoming activities to assist with the goal of reducing the impacts of land-based sources of pollution to the coral reef ecosystem - Kurtis Gregg, NOAA NMFS/Katharine Tzadik, FDEP CRCP

- **SFWMD is backbone for smaller management entities.**
 - Drainage districts.
 - Water control districts.
 - Water control boards.
- **Focus for SEFCRI are the offshore environments.**
 - Inlets and outfalls as the main sources of pollution.
 - Have not focused on inland sources.
- **Designed a proposal to do watershed-scale planning in the SEFCRI region.**
 - Fill in the gaps between the inland sources of pollution and the offshore sources.
 - Watershed does not function as a single watershed.
 - Compile all information that has been generated for the watershed.
 - The Lake Worth Lagoon initiative has made important strides in this area, so we have been looking at their work to see what lessons we can apply to our region.
- **Known data gaps:**
 - FWC's data shows no seagrasses in Broward County however, personal observations indicate that there are seagrasses in several places in the County.
 - Intracoastal waterway is providing several services such as nursery and estuary functions which have not been fully investigated.
 - Identify sources of LBSP's.
- **NOAA's Coastal Services department will be doing most of the GIS data.**
- **Objectives:**
 - Map of the SEFCRI region showing where the water is coming from?
 - Agricultural.
 - Urban.
 - Best management practices to manage LBSP's at each portion of the watershed?
 - Defined 9 inlet contributing areas.
 - Workshop to illuminate where our efforts should be focused.

Questions and comments (Reducing LBSP impacts on coral reefs):

1. (Gene Shinn) *I've heard talk of an inland port by Belle Glade. Have you heard any of this?*
-(Kevin Carter) *I have heard some discussions in our department. The idea is to build a cargo distribution center. Containers would be moved by rail inland and then distributed from there.*
2. (Vladimir Kosmynin) *So things are much more complex than I originally thought. The smaller entities have no chain of command? They act independently.*
-(Kurtis Gregg) *That is correct. There's some design constraints in their structures to prevent them from flooding the next area down, but they act independently.*
3. (Stephanie Clark) *Are you going to be looking at the water quality inland and then offshore so that you may be able to infer what's going on in the middle?*

-(Kurtis Gregg) *Yes that is the goal of the project. To identify the hotspots of pollution, look at where it's going and deploy best management practices for it. Where we can find links through existing information we will try to take action and where there are gaps we must prioritize to see where we devote resources.*

-(Dale Griffin) *I would recommend including source tracking protocols into your project not just water quality assays, so that you can determine where the water is coming from.*

-(Kurtis Gregg) *The idea with this project is to use information that is already available. We will not be designing and conducting any new work yet. We are first collecting and compiling existing data. For example we know that there's water quality testing already ongoing at several points, so we want to leverage this.*

-(Dale Griffin) *You will probably find that there is a lot of chemical data already, but there isn't much microbiological data. These could be used as indicators.*

-(John Fauth) *I have seen water sampling machinery at individual ranches. So you could get to that level of detail, individual wetlands.*

-(Kurtis Gregg) *The ultimate question is how does all this affect the coral reefs?*

4. (Judy Lang) *Do you know how many drainage districts there are?*

-(Group) *28 in Broward country.*

5. (Katharine Tzadik) *Pointed out that there is a one page description of the proposal in the packets, for further review. Final determination will be in December.*

6. (Margaret Miller) *I remember talk on a Watershed Management Plan for the SEFCRI region a few years ago; this might be helpful as a starting off point.*

-(Kurtis Gregg) *One issue with that project is that it is still considered one priority watershed, which we now know is not the case.*

7. (Jack Stamates) *What do you envision your data products as being? What will be the time resolution?*

-(Kurtis Gregg) *It will vary depending on the data we have. We will have higher resolution at some places for some parameters than others.*

Update on LBSP TAC White Paper - Julio Jimenez – FDEP CRCP

- **Objectives:**
 - Establish an intended audience.
 - Technical editing.
 - Develop a distribution plan.
- **Quick guide characteristics:**
 - A short document with bullet points.
 - Targeted towards policy makers by explaining the current health of coral reefs in south Florida, build arguments for protection of the reefs, and conclude with protection recommendations.
 - Show the resource is more important than the money being spent on it; get the public's attention.
- **White paper characteristics:**
 - A "long, detailed document that includes scientific information related to LBSP impacts to coral reefs."

- Technical information should be rewritten in layman’s terms.
- Language needs to show how imperative the situation currently is.
- Document should be shorter (than the 33 pages without action items), with “hard hitting” language.
- **Currently needs:**
 - Needs an executive summary.
 - Recommendations need to be less technical more hard hitting.
 - Talk about SEFCRI TAC, who we are and why the recommendations are relevant.
 - Communications Plan.
 - The white paper is only a small part of delivering this message.
- **Timeline**
 - Executive Summary by November 25th.
 - Draft by December 17th.

Questions and Comments (Update on LBSP TAC White Paper)

1. (Dale Griffin) *Who is doing the executive summary?*
 -(Julio Jimenez) *Me, I’m just compiling the data we already have.*
2. (Dale Griffin) *What is the status of the quick-guide? I got a copy about a year ago.*
 -(Katharine Tzadik) *It is done; we just need funds to publish it.*
 -(Dale Griffin) *Why don’t we just put it on-line then?*
 -(Julio Jimenez) *I agree we could put it on-line but we also need to stay involved in it and stay in touch with stakeholders. I will also be working on a Frequently Asked Questions document. We would like to publish that with the white paper.*
 -(Stephanie Clark) *So was the one that was passed out at the previous Task Force Meeting the Quick Guide?*
 -(Judy Lang) *That was an earlier version; it has been modified substantially since then. It has been improved*
3. (Esther Peters) *What has to be done to put it on-line?*
 -(Katharine Tzadik) *We need to look at the proper procedure for the SEFCRI logo and DEP review. Probably SEFCRI website too.*
4. (Dale Griffin) *USGS has a vetted review process. Does the State of Florida have a similar process?*
 -(Katharine Tzadik) *Depends on how we publish it.*
 -(Esther Peters) *DEP hasn’t reviewed it yet?*
 -(Katharine Tzadik and Jamie Monty) *Not fully. Pam will review it. She makes the decisions on the communications documents.*
5. (Kurtis Gregg) *Have you considered presenting it to the DEP Office of Cabinet Affairs so that it can go straight to the policy-makers?*
 -(Julio Jimenez) *Yes, we will put that in the communications plan.*

**SEFCRI Team Meeting Update - Katharine Tzadik, FDEP
CRCP**

- **68 participants**
- **57 SEFCRI team members.** Had several observers from different user groups.
- **Continue with an annual meeting.**
- **Main topics covered:**

- Charter Update.
- Who can be on project teams? Used to be only SEFCRI team members.
- Reduce workload on the team members and delegate to advisory project members.
- **SEFCRI Management Options Identification Process (MOIP) Update:**
 - Themes for Outreach: what SEFCRI is and what it's doing?
 - First Public Meeting & Stakeholder Working Groups: Scheduled for May 2013.
 - What working groups do we need? How many?
 - Post Working Group Process: How to condense the information coming from the working groups.
 - SEFCRI Involvement: outreach and getting the word out.
 - Coastal Ocean Task Force: started by Commissioner Jacobs. Finding a way to support SEFCRI politically.
- **TAC Development**
 - Expand the TAC to involve members from 4 focus areas.
 - Bridge the gap between the needs of the SEFCRI group and the TAC.
 - SEFCRI must provide tasks to the TAC.
 - SEFCRI still needs technical advice for LBSP.
 - What are the areas of expertise we need to cover?

Questions and comments (SEFCRI Team Meeting Update):

1. (Margaret Miller) *How will the working groups be populated? Ads in the paper?*
 -(Julio Jimenez) *It will be an open application process, but next year's Public Meeting will be a good gauge of interest and who might want to be involved.*
2. (Dan Clark) *Some of the areas of expertise that we had discussed were economics and fisheries.*
 -(Katharine Tzadik) *Also, GIS and agriculture.*
 -(Vladimir Kosmynin) *We could probably have guest speakers instead of having full members. If we need to discuss a certain subject, it might make sense to invite someone in, but not have them present at all meetings.*
 -(Margaret Miller) *Bringing in more people could complicate things with people from disparate areas of expertise. So it might make sense to keep it as a small working group and be careful about how to include more people.*
 -(Dale Griffin) *How about an environmental law attorney? This is especially relevant for management actions.*
 -(Katharine Tzadik) *We already work closely with Chris Bird in Tallahassee he deals with vessel groundings and anchor damage cases. He could be someone to talk to.*
 -(Esther Peters) *This will be important when we have suggested courses of action, since we have to refer them to the proper agencies and will also need to know what legal tools we might have at our disposal to enforce these actions.*
 -(Dan Clarke) *Lisa Gregg also knows a lot about the processes at FWC.*
3. (Drew Martin referring to working groups) *How would you balance the members of the working groups? You can't necessarily group all anglers or all divers together. Some anglers might do catch and release and others might not. Some divers want to preserve the reefs, but others might have other uses like spear fishing, etc.*
 -(Katharine Tzadik) *We have thought about this. As people want to join working groups we might have an interview process or other vetting process to take this into*

consideration. It will be the responsibility of the selection committee to achieve this balance.

Public Comment Day 2

I. Stephanie Clark

- A. Most of the discussion at the SEFCRI team meeting was around keeping the TAC together. It is important to do so and that as many of the members be present as possible.
- B. At the last team meeting some members of the TAC presented their work and I think that had a very positive impact. So further exchange of information would be beneficial.

II. Drew Martin

- A. Plastic, Styrofoam, garbage coming from tsunamis, etc. is somebody studying what it's doing to the corals? I know it has been shown on other marine mammals.
 - We are trying to get a ban on plastic bags at the Sierra Club.
- B. Dispersants used during the oil spill. Are they here? Did they have an impact on the reefs?
 - We don't like them; we would like to get rid of them. But we need to get your expert opinion on it to have a broader impact.
- C. Is there an issue with horse manure in Broward County? I have heard there are issues with this in Palm Beach County. Our drainage systems don't currently work, everything shoots straight out to the ocean. Has anybody looked at this?
- D. Marine reserves seem to work. You should be asking for some of these areas to manage so that you can do more experimental research.
 - Are you looking into no-take reserves? I know they are hated by fishermen but we need to start this dialogue. I have talked to people in Australia that say they do work.
- E. If you need money for monitoring we as NGOs can help if you tell us what you need. We can also advocate and have contacts which we can use in cases where you might not be able to lobby.

III. Dan Clark

- A. We need to get the white paper out. We will take the info to the politicians, if you give us something we can use.
- B. Thank you, Kurtis for looking into the connection to the Everglades. To show what is coming off the land on to the coast.
- C. SEFCRI meeting, glad to see it moving forward. We need to engage stakeholders early and often. It's a little late to wait to spring, I would like to see it sooner rather than later.
- D. We need a management plan. Please expedite whatever you can if possible. We won't be able to implement anything without a management plan.

Questions and comments (Public Comment Day 2):

- I. (John Fauth) *We put in a proposal to look at oil dispersants. It didn't get funded.*
 - (Esther Peters) *There was lots of work done in the 70s. More recently there's work that showed that dispersant killed the hydrocarbon-eating bacteria, which is really counterproductive.*
 - (Drew Martin) *Two divers died of cancer because they were diving in areas with dispersants and told they didn't require protective gear.*
 - (Gene Shinn) *Lots of this work was done at Texas A&M. The decision with the BP spill was more of an out-of-sight-out-of-mind thought.*
 - (Esther Peters) *We put in a proposal too, to look at toxicity. We didn't get funded. Dispersants disrupt lipids, that is their job, so they will disrupt lipids in organisms too.*

- (Joe Lopez) There's new literature coming out recently not just on the effects on bacteria, but on eukaryotes. And they are showing they are quite harmful.*
- (Drew Martin) There's concern on the West coast of allowing people in the water. We know it has been absorbed by the oysters. So what are the long-term effects of this?*
- (Doug Seba) We were the first to analyze Corexit in the 1960s. It's very effective as a dispersant but it's very harmful.*
2. *(Jack Stamates - Talking about Port Everglades Inlet) Delft3D model is a good model to run for inlets. I will follow up with Claire Paris (UM) and the Army Corps of Engineers to see if we can run it for Port Everglades. It would be great tool to have to model the flows coming out of the inlet.*
- (Vladimir Kosmynin) The Delft3D model is very broadly used for near shore sediment transport. It would be a good choice.*
3. *(Doug Seba - referring to John Fauth's diagram on board) Please support John's model. This model is less wrong than others. It is very hard to discern when it's chronic disease. It seems to me most of the things that are affecting the reefs are chronic (outfalls, inlets, mosquito planes) then when there's a cold snap or some abnormal event lots of corals die because they are already stressed. Therefore, we need to attack before we enter that third phase (catatonic). What do you think about this model? Does it reflect what is going on in the reefs?*
- (Dale Griffin) I don't think all models are bad. We've all been averse to use them because if the data entry is wrong then they go wild.*
- (Margaret Miller) We agree ecologically that is what's going on. But it's not good as a monitoring tool. Because you can't tell if a low reading is good or bad.*
- *(John Fauth) You can, if you use multiple biomarkers.*
- (Esther Peters) Yes this was a discussion when we started using biomarkers in the 1980s. It just means that you have to combine the tools: physical, biochemical and histopathological indicators of organisms' responses. So we have to integrate all these tools so that we can make them better. From a veterinarian's point of view there's a movement called conservation medicine, which refers to impairments to an organisms systems taking a broader view on disease. We need to understand better so that we can talk about coral reef conservation. When I was doing my postdoc on diseases of invertebrates I presented a poster on cancer in invertebrates. People didn't know other animals got cancer. We are currently trying to integrate across kingdoms. If lower groups are being affected as well as vertebrates and humans, then you have certain stressors that are affecting everything.*