

**Southeast Florida Coral Reef Initiative (SEFCRI)
 Land Based Sources of Pollution (LBSP)
 Technical Advisory Committee (TAC)
 Meeting #14
 Report of Proceedings May 5-6, 2011
 National Coral Reef Institute
 Nova Southeastern University Oceanographic Center
 8000 North Ocean Drive
 Dania Beach, Florida**

Meeting Attendance

LBSP TAC COMMITTEE		Day 1	Day 2
Joseph Boyer	Southeast Environmental Research Center - FIU	X	X
Richard Dodge	NSU Oceanographic Center		
Phil Dustan	College of Charleston, South Carolina	X	X
John Fauth	University of Central Florida	X	X
Piero Gardinali	Florida International University		
Dale Griffin	United States Geological Survey		
Vladimir Kosmynin	Florida Department of Environmental Protection, Bureau of Beaches and Coastal Systems	X	X
Judy Lang	Atlantic and Gulf Rapid Reef Assessment Project		
Brian Lapointe	Harbor Branch Oceanographic Institution	X	X
Erin Lipp	University of Georgia		
Margaret Miller	National Oceanic and Atmospheric Administration	X	
Valerie Paul	Smithsonian Marine Station at Fort Pierce		
Esther Peters	George Mason University	X	X
Gene Shinn	University of South Florida	X	X
Alexander Soloviev	NSU Oceanographic Center	X	
Peter Swart	University of Miami, Rosenstiel School of Marine and Atmospheric Science		

LBSP TAC ORGANIZATIONAL COMMITTEE		Day 1	Day 2
Ken Banks	Broward County DPEP	X	X
Nancy Craig	Broward County EPD	X	X
Richard Harvey	Environmental Protection Agency	X	
Linda Brien	FL Department of Environmental Protection		

James Byrne	The Nature Conservancy	X	X
Cheryl Miller	Coastal-Eco Group		
Chantal Collier	FL Department of Environmental Protection - CRCP	X	X
Katharine Tzadik	FL Department of Environmental Protection	X	X
Troy Craig	FL Department of Environmental Protection	X	X

PRESENTERS		Day 1	Day 2
Greg Foster	NSU	X	
Greg Hendricks	USDA-NCRS	X	
Thomas Carsey	NOAA-AOML	X	
Jack Stamates	NOAA-AOML	X	
Chris Sinigalliano	NOAA-AOML	X	
Rob Ferguson	NOAA-CRCP	X	X
Jamie Monty	FDEP-CRCP		X
OBSERVERS			
Brian Walker	NSU	X	
Carla Ramos	UCF	X	X
Joe Lopez	NSU	X	
Marie Guarino	City of Ft. Lauderdale	X	X
Stephanie Clark	Cry of the Water	X	X
Dan Clark	Cry of the Water	X	X
Douglas Seba	Academy of Marine Science	X	X
Maribeth Gidley	NOAA-AOML	X	
Dawn Formica	NSU	X	
Betty Wershoven	Public	X	
Annalise Wershoven	Public	X	
Jeremy Wershoven	Public	X	
Joanna Walczak	FDEP-CRCP		X
John Proni	FIU		X
Daina Demaio	PBSWCD		X
Rosa Reyes	NCRS		X

Meeting Summary - Day One: Thursday, May 5th 2011 (morning)

Meeting Guidelines

Katharine Tzadik, FDEP-CRCP, welcomed the TAC members, organizing committee members, and guests to the 13th SEFCRI TAC meeting and asked each attendee to state their name and affiliation. She reviewed meeting participation guidelines, 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.

Presentation: Update – LBSP Project 8: Miami-Dade Acoustic Mapping – Greg Foster – NSUOC-NCRI

- Acoustic survey of Miami-Dade County to create “spatial benthic habitat maps” using dual-frequency (418kHz, 38kHz) single beam survey.
- Project started 8/9/10; 98% complete:
 - 100% complete: 75m E-W, and 150m N-S transects from 3m offshore to 40m depth profile; 6mi S of Government Cut to N of Haulover.
 - Remaining: Three 1x1km high resolution plots, accuracy assessment.
- Project outputs:
 - “Combined synthesis” with Brian Walker’s (NSUOC) thematic habitat mapping produced via LiDAR topography.
 - Ability to determine “deep” sand habitat areas (via 38kHz), allowing determination of ephemeral/transient sands.
 - Creation of “acoustic habitat classes” via training acoustic model against LiDAR habitat map.
 - Refined estimation of “true” hardbottom habitat, and differentiate hardbottom types (e.g. flat colonized pavement vs. rugose reef).
 - Allows for better understanding of intra-habitat variability.

Questions and Comments (LBSP Project 8):

1. (Joseph Boyer) *Is it important to distinctly separate habitat definitions? If not, could your end product contain lots of habitat overlap?*
 - Greg Foster: Absolutely, yes. The model utilizes predetermined NOAA geomorphological habitat classifications, based upon zonation and structure.
2. Greg Foster (responding to comments about possible habitat misclassifications – Joseph Boyer and John Fauth): not correct to interpret as incorrect classifications, because habitats being mapped are not “pure habitats.” New habitat maps actually a more accurate representation of habitat distribution.
 - Products of model proven to be temporally consistent, and can be faithfully replicated. Example: Indian River Lagoon sampling (275 samples from 2007-2010), habitats classify very consistently.
 - Adding gorgonian cover (due to prominence of biota):

- Short and tall classes
- A layer that can be added to habitat maps
- To do: calibrate planar vs. acoustic cover for a means to estimate gorgonian biomass
- High-resolution bathymetry (40cm spacing compared to 4x4m LiDAR); E-W profiles will create reef profiles (including data such as areas of maximum relief, small-scale rugosity, etc.)

Questions and Comments (LBSP Project 8):

1. (Brian Lapointe) *From the biomass estimations, can you generate units such as kg/m²?*
 -(Greg Foster) Yes, by calculating the number of hits, converting to a percentage, which can be converted to a percent cover (based on your calibration), and multiplying by the assumed average height with the average wet weight to end with mass.
2. (Brian Lapointe) *Do you think you could discriminate macroalgal taxonomy with this method? Such as determining Caulerpa beds?*
 -Due to the great degree of similarity between something such as *Caulerpa* with seagrasses, the model would lose a lot of accuracy if incorporated.
3. (Vladimir Kosmynin) *If you had a smooth platform, how close to the substrate can you detect algal cover?*
 -(Greg Foster) Minimum canopy height is theoretically 1.8cm, we've done ~ 5cm.
4. (Phil Dustan) *What's the approximate cost of this system?*
 -(Greg Foster) About \$50,000, not including the statistics and calculation.
5. (Vladimir Kosmynin) *Since the equipment can penetrate up to 50cm into sands, this method would be useful to show sediment dynamics, including changes in hard bottom exposure.*
6. *Since the software is trained off LiDAR data of Palm Beach, do you suspect there could be any variance in the response of the model as you deviate from the original LiDAR survey area?*
 (Greg Foster) It is possible, though for the Miami data set, the software will be trained with Miami samples. Will look for compatibility between the areas of source LiDAR data (for training) and varying survey areas. The goal is a universally acceptable input, although most habitat types in our area are probably fairly consistent.
7. (Vladimir Kosmynin) *What are the weather conditions required for surveying?*
 -(Greg Foster) Seas preferably ≤3ft, 2-4ft depending on period, <2ft is ideal. Variations in data due to wave motion are filtered out in software (self-made).
8. (Margaret Miller) *The filters disregard the points taken when the boat is off-axis?*
 -(Greg Foster) Yes, but the points collected are so numerous it is not a major concern.
9. *At some point do you lose resolution because of how many points you are potentially removing?*

-(Greg Foster) As long as seas are within acceptable conditions, the loss is reasonable (maximum ~15%).

Presentation: Update – LBSP Project 11: Develop an Integrated Management System with Florida Fish and Wildlife Research Institute (FWRI) – Katharine Tzadik – Florida Department of Environmental Protection (FDEP CRCP)

- Purpose: Graphically portray LBSP related data to assess for potential impacts to the reef environment.
- Status: Funding to upgrade system in FY11-13 NOAA CRCP; proposal was not awarded but data hosting needs to be investigated sufficiently.
- Future: Considering FDEP's MapDirect as possible host for data and information. Need to investigate its cost, capability and feasibility for what will be required.
- MapDirect: A powerful interactive mapping website that displays locations and data layers (e.g. DEP regulated facilities, FEMA flood zones, aerial photography, etc). Website: <http://ca.dep.state.fl.us/mapdirect/gateway.jsp>
- TAC members are invited to review MapDirect and submit their comments and suggestions.

Questions and Comments (LBSP Project 11):

1. *Why not use Google Earth and import GIS layers?* (Ken Banks)

-(Katharine Tzadik) Google Earth currently doesn't go into the depth that we require. We would also still need to produce a solution for hosting the data.

Presentation: Update – LBSP Project 12: Southeast Florida Coral Reef Evaluation and Monitoring Project (SECREMP) – Katharine Tzadik (on behalf of David Gilliam – NSUOC NCRI)

- **Purpose:** provide status and trends of Florida's reef and hard bottom resources.
- Project History (SECREMP and CREMP):
 - 2003: project initiated with 10 sites (monitored yearly; 3 in Miami-Dade, 4 in Broward, 3 in Palm Beach)
 - 2006: added 3 sites (Martin County)
 - 2010: added 4 sites (2 in Miami-Dade, 2 in Palm Beach)
 - 2010-2011: continue monitoring 17 sites
- Year 2 of Water Quality monitoring effort includes addition of 5 sites; may serve as future SECREMP sites (pending funds availability):
 - 2 sites in N Broward (1 outer reef, 1 middle reef) – addresses gap between Palm Beach and Broward sites.
 - 2 sites in N Miami-Dade (1 middle reef, 1 nearshore reef) – addresses gap between Broward and Miami-Dade sites.
 - 1 sites in S Miami-Dade (Key Biscayne, nearshore reef)
- 2011 sampling beginning end of May. 2010 report not yet complete.
- SECREMP and CREMP:

- Coordinate in data collection, analysis, and protocol evaluation.
 - Needed: capture more stony coral demographic and condition data, as well as other important functional groups.
 - Limited resources necessitate protocol modifications as new data type collections are added.
- 2011 CREMP protocol modifications (SECREMP to follow):
- Transect video replaced with still imagery.
 - No sig. difference found in results from SD, HD, and still imagery.
 - Advantages: no post-processing, high resolution, multiple operators.
 - Transect reduction from 3 to 1:
 - Analyses show similarity in >90% of results for individual stations whether just one or all three transects filmed.
 - Time savings in field and in lab.
 - Coral demographic surveys (single 10x1m belt transect at all stations):
 - Replaces SSI (station species inventory) to calculate species richness.
 - Adds species density and size class data.
 - Will also be done for *Xestospongia* and gorgonia.

Questions and Comments (LBSP Project 12):

1. (Phil Dustan) *When this process was first created, it was put together with the idea to monitor a system that was headed towards collapse. CREMP has consistently reduced sampling effort of a resource that is consistently degrading. There are other analyses that suggest that (SE)CREMP is under sampling. SSI is critically important, and was put together very carefully to accurately assess the species present. Even though this saves money and time, it sacrifices a lot of resolution.*
2. (Vladimir Kosmynin) *Whenever there is a decline in percentage, at a point you need to sample more. Though the current sampling method doesn't detect a change if effort is reduced, it does not prove whether or not under sampling is occurring.*
3. (Phil Dustan) *If the point count imagery is changed to a significantly higher resolution, then all the statistics of previous years' point counting need to be redone to determine the optimal number of points to count with high definition images. The original analysis of variance was based upon a certain number of points within a certain number of pixels. We know that the current number of points per image is probably insufficient in areas of less than 5% coral cover. With current conditions at around 5 to 5.5% cover, the assertion that changes in cover are slowing (or not occurring) may be a result of the protocol's inability to detect such change.*

When originally set up, we knew we needed a minimum 40m² to begin to detect change; chose 80m² to add a degree of safety. We learned from sampling experimentation how much area was required to capture 95% of stony coral species. Cutbacks will result in a sampling scheme that cannot detect change.

4. (Margaret Miller) *Changes in protocol may be a recognition that coral cover signal is so small, and the new data sampling an attempt to compensate for possible losses in statistical robustness.*
5. (Phil Dustan) *There will be a loss in species recorded if the survey area is decreased the proposed amount, especially in those areas where there is just one individual of a given species.*
6. (Joseph Boyer) *Don't forget the financial reasons at work. CREMP funding has been consistent since 1995, and as costs rise with time, uniform funding buys less.*
7. (Vladimir Kosmyrin) *What about reducing the number of stations rather than sampling effort?*
8. (Phil Dustan): *It would be interesting to see what differences in sampling effectiveness might be seen if statistical analysis methods were changed.*

Presentation: Update – LBSP Project 24: Educate and inform stakeholders about LBSP – Troy Craig – FDEP CRCP

- Two outreach materials (brochure and poster) created to inform public of how their input affects our reefs.
- Fertilizer and Pesticide brochure:
 - Have close to a finished product (sample prints were passed out to the TAC)
 - Will be distributed to plant nurseries, and outreach events.
 - Will print 20,000, including a Spanish version; one size
 - Promising reception from gardening centers, independent landscapers, etc.
 - Provides recommendations for fertilizer application as well as promoting alternative, non-chemically based products.
- Watershed poster:
 - Changed from brochure, consensus that material more suited to poster format. Original brochure graphic (created at cost) better utilized in larger space of poster.
 - Help public understand the connectivity of FL waterways, and that pollution effects can reach hundreds of miles from source.
 - Primary destinations: environmental centers and teachers.
 - One size, distributed at teacher training events and directly to environmental centers.

Questions and Comments (LBSP Project 24):

1. (Gene Shinn) *NOAA utilizes Facebook, over 500 million people use Facebook, should we?*
 -(Chantal Collier) *An area where we are behind, only recently started using Twitter as an outreach tool. Still very limited in capacity due to FDEP information technology policies. We are actively looking into expanding our social networking presence.*
2. (Phil Dustan) *The watershed graphic is great for the local area, but the watershed begins farther north. There should be some element of the poster (e.g. satellite image backdrop) that portrays a larger expanse of FL; the current graphic might not be recognizable as FL to a child.*

- (Troy Craig) When originally designed, there was a key showing the location of the watershed graphic in the whole of FL, this will be incorporated into the poster.
 - (John Fauth) The Florida Cattlemen's Association (Central FL) might be a great group to approach. They're conservationally-minded when it comes to their own lands, but may not have even considered the larger-scale.
3. (Jack Stamates) *Since children are a primary target for these posters, what about including a degree of inter-actability?*
- (Katharine Tzadik) Possibly; worth looking into.

Presentation: Update – LBSP Project 25: Southeast Florida Coral Reef Water Quality Monitoring Project – Joe Boyer – FIU

- Background:
 - Started December, 2009
 - Establish a baseline to assist in determining reef condition and effects of LBSP
 - Quarterly sampling, built upon SECREMP sites (17; very sparse compared to Keys sampling of over 150)
- Sampling:
 - CTD takes vertical profiles of temperature, salinity, dissolved oxygen, light (K_d)
 - Surface and bottom: NO_3 , NO_2 , $\text{NH}_{3/4}$, TP, SRP, TN, TON, DOC, pH, turbidity, chlorophyll a
- Observations:
 - Spring increases in TN levels in Miami-Dade and S Broward sites. Increase more prominent in surface waters than bottom - likely land-based vs. upwelling.
 - Very low [TP] in the water column. Not as much variability as TN.
- Future:
 - Integrate with other programs (Broward Monitoring; FACE)
 - 5 new stations – 2011
 - Continued funding (EPA) for another 3 events (through March 2013)

Questions and Comments (LBSP Project 25):

1. (Phil Dustan) *It's clear quarterly monitoring is beneficial, what about acute events?*
 - (Joe Boyer) It would be rare for the current monitoring methodology to catch a short-lived event. The logistics (and expense) of having a team (or teams) at the ready throughout the area makes such an endeavor unrealistic. Data collection buoys at representative sites a preferable solution.
2. (Phil Dustan) *Current sampling will take too long to show trends, methodology should be changed to capture more useful data. An example is water quality transects via long-track sampling, which would show the movement of water masses across habitats.*

- Trends are revealing themselves faster than anticipated (i.e. Keys monitoring results in 5 years compared to the 20 expected). Shallow-water habitats don't always lend themselves to water mass tracking methods, since what is measured is surface water, which is not what is interacting with the benthic biota.
- 3. (Group) *Quarterly sampling makes trend stats and event capture difficult (i.e. peak summer rains and associated runoff likely missed between May and Sept. sampling).*
 - Exploring ways to be efficient with approach to obtain the most useful data, given budget limitations. A good idea would be to install instrumentation on bridges over canals and outlets to measure flow velocity and water parameters.
- 4. (Brian Lapointe) *Lots of winter upwelling this year, captured in sampling?*
 - There are temperature loggers out there at SECREMP sites which haven't been brought in yet, should have captured that data.
- 5. (Jack Stamates) *Some of your K_d values seem very low.*
 - Yes, we've observed these values. The CTD (Seabird with lightcore sensor) measures every meter.
 - (Phil Dustan) Need to be careful when calculating K_d , in shallow waters, it has been shown that K_{dpar} captures the extinction of wavelengths of red light, which rapidly decreases in the first few meters of the water column.
 - (Joe Boyer) Yes, and we graph and correct for discontinuities in K_d values in the water column due to things such as turbidity.
- 6. (John Fauth) *There are many databases of water monitoring by different entities, possible to compile such data?*
 - We've done that with Biscayne Bay. Difficulties with creating watershed models (three attempts produced three differing models) due to how unnatural the system is; can't rely on standard models.
- 7. (Jack Stamates) *What about utilizing the (forewarned) opening of channel gates?*
 - There is a resource for checking what gates are open/closed, but unsure whether openings and closings are announced. If you had instruments on site, you could look for instances of increased flow, etc.
 - (Group) Different channels have different schedules and conditions for release, would be beneficial to look into gaining access to such data and/or the committees that decide when to open gates.

Presentation: Update – LBSP Project 29: Nutrient Flux in Port Everglades Ship Channel Observatory (PESCO) – Joe Boyer – FIU

- Objective: quantify exchange of water and nutrients through Port Everglades.
- Flow measured at both surface and bottom.
- Estimate nutrient flux based upon nutrient concentrations and water volume transfer.
- Planning to send a group out to collect hourly surface and bottom samples over ~2 days to relate to instrumental data. Hoping to relate flow to meteorological forces (e.g. strong East winds keep water “piled up” in port). Possibility of creating port flow prediction model.
- Produce load estimates on tidal, daily, and seasonal timescales.

- Instrumentation:
 - Side-looking ADCP; hourly measuring.
 - CTD casts across channel (temp, salinity, DO, turbidity) for 36 hours (during daylight).
 - Hourly grab samples during 36 hour interval ($-\text{NO}_3^-$, NO_2^- , NH_4^- , TN, SRP, TP, SiO_2 , & TOC).
- Observations:
 - Bottom flow is larger than surface flows.
 - Tidal cycles influence chlorophyll concentrations (higher values at surface than at bottom)
 - TN and phosphorus increases most at surface during slack low tide.
 - Flow and nutrient loads:
 - Surface: $1156 \text{ m}^3 \text{ s}^{-1}$ output, 1514 kg TN, 38kg TP, 13kg chl a
 - Bottom: $-1569 \text{ m}^3 \text{ s}^{-1}$ (input), -671kg TN, -29kg TP, -5kg chl a
 - Net: $-413 \text{ m}^3 \text{ s}^{-1}$ (input), 844kg TN, 9kg TP, 8kg chl a
 - Net inflow could have been a result of strong east winds during observation period (or minor discrepancies between sampling times relative to tidal cycle).
 - A very complex system, not lending itself to a simple model. More sampling will hopefully elucidate a pattern.

Questions and Comments (LBSP Project 29):

1. (Phil Dustan) *If you look at chlorophyll and salinity, you often see a chlorophyll concentration peak at half tide – chlorophyll aggregations: something we've observed in a similar study of tidal fronts in Charleston Harbor. Might be worth looking into as a useful element of characterization for this system; it seems apparent in the data.*
2. (Jack Stamates) *Something else that may be in play is mixing between the upper and lower layers (via pulses of water upwelling from the lower layer to the upper). This can have an unpredictable influence on measurements.*

Presentation: Update – LBSP Project 32: Using Cyanobacteria and Macroalgae Stable Isotopes as Anthropogenic Point and Non-point Source Nutrient Indicators – Katharine Tzadik (on behalf of William Anderson – FIU)

- Purpose: establish indicator organisms for monitoring anthropogenic nutrients using an isotopic approach with *Lyngbya* spp. and *Dictyota* sp.
- Status: Field work to start in May.
- Future:
 - At least 3 surveys will be conducted during May-September at established monitoring sites N and S of Hollywood sewage outfall and Port Everglades.
 - Broward County's 25 offshore reef monitoring sites will be sampled for *Lyngbya*.

Questions and Comments (LBSP Project 32):

1. (Ken Banks) *Lyngbya* collection sites chosen because of long record of *Lyngbya* presence/absence at existing reef monitoring sites.

Presentation: Update – LBSP Project 5: Conduct a biomarker study – John Fauth – UCF

- Purpose: assess coral condition on multiple levels:
 - Cellular – contaminant analysis, cellular diagnostic
 - Organismal – lesion regeneration, mortality, etc.
 - Coral Assemblage – species richness, evenness, percent cover, index of biotic integrity
- Completed:
 - “Organismal” and “Coral Assemblage” measurements
 - Sample pore and reef-level water to test for toxicity
 - Toxicity not found - proceeded to reciprocal transplant experiment
- Reciprocal transplantation (*Porites astreoides*):
 - Colonies collected from biomonitoring control site, quartered, transplanted to Hollywood outfall, Port Everglades region, and back to original position (last quarter retained in fixative for toxicity and contaminant assays).
 - Fragmented colonies transplanted on porcelain-ceramic tile. Plate cemented and tagged.
 - Each site also has two tagged, untouched *Porites* colonies.
- Future:
 - Spring 2011 – settlement tile experiment (at NSUOC):
 - Previous settlement experiment (on ceramic tiles in laboratory conditions using collected *Porites* planula) yielded very low settlement.
 - This year: settlement tiles left in situ to grow native benthic community before being brought to the lab for settlement study. Will investigate effects of settlement tile conditioning on coral planula settlement.
 - June 2011 – cellular diagnostic
- To do:
 - Continue monitoring of reciprocal transplant experiment
 - Conduct *P. astreoides* settlement experiment
 - Assay biomarkers
 - Complete final report (June, 2011)

Presentation: Spatial analyses of benthic habitats to define coral reef ecosystem regions and potential biogeographic boundaries along a latitudinal gradient – Brian Walker – NSUOC; canceled.

Presentation: NOAA-AOML chemistry and currents – Tom Carsey and Jack Stamates – NOAA Ocean Chemistry Division

I. AOML-OCD COASTAL OCEANOGRAPHY PROGRAMS – Tom Carsey (NOAA AOML)

A. FACE PROGRAM

- Objectives:
 - Quantify sources and destinations of select nutrients and microbial contaminants within areas of interest along SE Florida coast.
 - Measure relevant physical parameters (e.g. ocean currents and meteorology) with which the chemical measurements will be interpreted.
 - Determine the likely exposure of coral reef resources to those nutrients.
- Six treated wastewater outfalls: Delray Beach, Boca Raton, N Broward, Hollywood, N Miami, central Miami
- Outfall studies:
 - V-Fin studies of surface plumes
 - CTD
 - Tracer studies (RD and SF₆ – Delray and Hollywood)
 - Stable isotope studies of sediments
 - Acoustic backscatter imaging (Delray)
- Observations:
 - Plumes variable in cross section and down-current
 - Bifurcation into multiple strands common (“vortex pair”)
 - Temperature differences less indicative than salinity deficit
 - Plumes determined to rise rapidly, followed by quick dilution at surface
 - Nutrient dilution (order of 5-10x) observed within 300m distance from outfall
 - Plumes dissipate at surface without downward advection of nutrients
 - Stable isotope study: no conclusive proof of anthropogenic associated nitrogen influencing algal samples (67 surface sediment samples, 206 algal samples, analyzed for ¹⁵N and ¹³C isotopic composition)
 - Tracer studies: within 6-7km, plume nutrient concentrations diluted beyond detection
 - Ammonium: found near Delray outfall but decreased rapidly with distance; small ammonium peaks found elsewhere

B. OCEAN INLET CHARACTERIZATION

- Dosed SF₆ and rhodamine dye tracers at ebb tide to produce a pulse of tracer-containing water released into coastal waters (2/22/07).
- A current reversal occurred (2/22/07) which split the plume; dilution only could be described in a general way.
- Plume concentration profiles suggest plume quickly broken up into several irregular “boluses.”
- **Boynton Inlet flow and flux characterization:**
 - Total outbound flow ~2 billion gal d⁻¹.
 - Net outbound ~0.25 billion gal d⁻¹.
 - Nutrient flux highly variable, seasonal changes observed (higher flux in rainy season).
- “Background” concentrations used to characterize SFL inlet nutrient contribution to coastal waters (spatial scale, and daily nutrient mass contribution).
- **Hollywood plume** (compared against background concentrations):
 - Prism of outfall influence calculated (based upon outfall pipe length, depth, and one day’s local current travel distance).
 - When daily mass of TN ejected by outfall distributed into volume area of prism, TN daily contribution is ~10% of background levels.
- **Boynton Inlet** nutrient contributions to output “prism”:
 - NH₄: 3.84% of background levels day⁻¹
 - TN (N+N): 9.50% of background levels day⁻¹

C. COASTAL UPWELLING ASSOCIATED WITH THE FL CURRENT

- November 2009, three eddies identified via ship side-mounted ACDP and satellite data.
- Rapid (over 6-12 hours) temperature changes (7-8°C) detected by installed thermistors at ~10, 20, 30m depth in Broward and Boca.
- Simultaneous with larger scale eddy circulating off FL Keys (>100km away).
- Consistent with “internal wave packets” propagating along shelf – possible mechanism to explain “bleeding eddies” observed in FL reef tract.

D. ONGOING – BROWARD COASTAL WQ MONITORING

- Monthly for 1 year.
- Measurements obtained (at 3 depths): salinity, temperature, O₂ sat, pH, turbidity, N+N, NO₂, NO₃, NH₄, orthophosphate, silicate, chl-a, phaeopigments, tss, total dissolved nitrogen, total dissolved phosphate, total particulate nitrogen, total particulate phosphate, DOC, enterococci, Giardia and cryptosporidium, *Staphylococcus aureus*.
- Elevated nutrient levels near outfalls (Broward, Hillsboro, Hollywood, Port Everglades), rapid concentration decrease with distance.

- Reports available at:
<http://www.aoml.noaa.gov/themes/CoastalRegional/projects/FACE/Coastal-Surveys.html>

E. FUTURE:

- Wish to continue at N and central Miami inlets
- Continuation of inlet studies at Boca Raton, Hillsboro, and Haulover inlets:
 - Current flow structure via ADCP
 - Chemical measurements for flux calculations
 - Microbiology

Questions and Comments I:

1. (Phil Dustan) *From the results of the plume study, the answer to pollution is dilution? After 10km it's undetectable, but does that mean it could still be there? Could it be metabolized?*
 -(Tom Carsey) Dilution will happen regardless, the question is what is responsible for the background concentration. From Miami to Boynton the background concentrations are consistent, with no increases with northern progression (as you might expect as you pass more inlets).
2. (Gene Shinn) *There was no detectable nutrient increase at the bottom because of the plume, yet all along we've been told this pollution fuels benthic macroalgae.*
 -(Tom Carsey) The transition from nutrient levels to algae isn't so simple it seems (nor did we examine such mechanisms in FACE).
3. (Brian Lapointe) *Over time the nitrogen will accumulate in the biota, eventually contributing to macroalgal growth. We've observed elevated concentrations of wastewater isotopic ratios in macroalgae – but it isn't necessarily from just outfalls.*
 -(Phil Dustan) *Even if they're getting a small percentage of what is expelled from the pipe, it's still a significant contribution over time.*
 -(Joe Boyer) *This still assumes the premise that isotopic nitrogen ratios are an appropriate indicator of sewage N assimilation. Other studies have documented getting a signal you'd expect from "sewage nitrogen" when in fact it was false.*
 -(Brian Lapointe) *There are obviously many sources and paths of nitrogen for fixation and assimilation.*

II. FACE CURRENT MEASUREMENT PROGRAM – Jack Stamates (NOAA AOML)

- October 2010, installed 2 ADCP units (Hollywood and Broward outfalls)
- Data taken mid-range in water column
- Primarily S and N components of current direction; S component can be stronger.
- Average direction near zero, (period: Oct '10 to Feb '11)
- Deeper ADCP has higher proportion of N current
- 27m depth thermistor captured Oct '10 cold event (not observed in 7m thermistor)

III. Quantify the flux of pollutants exiting the Port Everglades Inlet and entering the coastal waters – Jack Stamates

- Goal: to quantify the flux of anthropogenic nutrients exiting Port Everglades.
- Three beam H-ADCP installed March '09; collected 2 years continuous data (including temperature and salinity). Planned to run through 2011 calendar year.
- Port Everglades bathymetry: S bank 4m depth, N bank 2m, channel depth 16m.
- Port width ~7 seconds latitude; central channel width ~4-5 seconds; shallow compared to width
- Observations:
 - During Spring tide, main channel and surface layer move together with some phase shift. Ebb tides begin at surface and propagate down; flood tides begin at depth and spread upwards. Can sometimes have times of (weakly) opposed current direction between layers.
 - Around times of neap tide, the surface layer during flood tides has less motion than in the main channel.
 - Water column stratification: bulk of anthropogenic nutrients likely contained in surface layer (upper 3m depth)
- Velocity estimates from H-ADCP
 - Derived from acoustic return of a path transecting the channel (from ADCP at ~2m depth to center of channel bottom).
 - Relationship between current velocity and H-ADCP measurements calibrated via small boat equipped with 1200kHz ADCP which transected the inlet.
 - 289 calibration runs over 6 days on both ebb (4 days) and flood tides (2 days) produced 219 useful calibration runs.
 - Relationship of deep layer H-ADCP measurements and calibration runs more robust than surface layer.
 - Surface layer ebb tide H-ADCP relationship stronger than flood tide.
 - Inlet velocities are often not homogeneous across either vertical or horizontal profiles.
- H-ADCP models were mildly improved by incorporating meteorological data (wind velocities) and the increased residuals between layers.
- Wind effects, even when incorporated, don't significantly change H-ADCP relationships.
- **Results:**
 - Shallow layer mean flow: $69.4 \text{ m}^3\text{s}^{-1}$ (excurrent, range approx -200 to $250 \text{ m}^3\text{s}^{-1}$)
 - Deep layer mean flow: $-44.4 \text{ m}^3\text{s}^{-1}$ (incurrent, range approx -1000 to $900 \text{ m}^3\text{s}^{-1}$)
 - Net flow mean: $24.7 \text{ m}^3\text{s}^{-1}$ (excurrent)
 - $9 \times 10^6 \text{ m}^3\text{d}^{-1}$ expelled (rough estimate)
- **Next:** use nutrient concentrations to determine loads

Questions and Comments II:

1. (Phil Dustan) – *What kind of mixing do you think is in effect here? (referring to cross section graph of inlet showing inhomogeneous current velocity).*
 - It appears to be cellular mixing.
 - (Joe Boyer) – *Do you think this could be a ship movement interference?*
 - I think this is a natural occurrence. Ship effects are much shorter than what we've observed here.
2. *Given how shallow it is, how much influence does a strong E or W wind have?*
 - On our calibration data, not a strong influence. (Showing a graph of deep and shallow current velocities along with wind speed) But you can see here, a strong wind does have an effect on surface current velocities (the strongest discrepancy between surface and deep layer velocity was shown to occur during the period of highest wind).
3. (Joe Boyer) *Would be interesting to see what sort of water inputs there are from land. Such as how many millions of gallons a day are required for mass balance. If salinities could be tied to the freshwater input, then the contribution could possibly be determined.*
4. (Ken Banks) *Do you know of anywhere else in the country that this sort of sampling and quantification is being carried out?*
 - (Jack Stamates) Not sure, but what's unique to this work is the separation of layers; something I haven't been able to find much reference to elsewhere.
 - (Joseph Boyer) An important distinction, since the nutrients are largely limited to the surface layer. You can say that a nutrient wedge is intuitive, but this proves it.
5. *Any seasonal changes observed in net outflow?*
 - Nothing to present today, but we have observed correlations with net outflow and rainfall data. Something else we've observed is a very prominent effect of rainfall on salinity data.

Meeting Summary – Day One: Thursday, May 5th 2011 (afternoon)

Presentation: NOAA-AOML Environmental Microbiology and Molecular Microbial Source Tracking (MST) for the Florida Area Coastal Environment Program – Chris Sinigalliano – NOAA AOML

I. THE ENVIRONMENTAL MICROBIOLOGY PROGRAM

- **What:** Use molecular microbiology to make coastal water quality (WQ) assessment faster, easier, cheaper, more accurate.
- **Purpose:** to better protect coastal public health, ecosystems, and economy from LBSP, human pathogens, and HABs.
- **How:** Develop and/or adapt molecular assays and sensors to detect contaminants using DNA/RNA signatures.
- Forefront of qPCR-based testing and validation for environmental WQ assessment

- Participant in multi-lab validation study of Enterococci (entero1) and Bacteroides (GenBac3) detection via qPCR for revised WQ criteria
- Gulf of Mexico alliance MST methods assessment
- California SIPP study
- Testing and validation of zoonotic MST markers for dog and gull fecal contamination testing (developed at AOML)
- Many potential benefits to biotech methods: speed, sensitivity, species-specific ID, high-throughput.
- Molecular approach: intended to supplement and enhance culture-based methods.
- Multiple assays can be incorporated: standard and alternative fecal markers, host-source tracking markers, pathogens (bacteria, viruses, protozoa).
- Challenges for Environmental qPCR:
 - Variable DNA extraction efficiencies
 - Variable DNA amplification efficiencies
 - Carryover of environmental inhibitors that interfere with polymerase
 - Cannot currently discriminate between active, dormant, and dead cells
- Benefits of MST for Reef Assessment
 - Indicators for direct impact of fecal pollution
 - Proxies for particulate transport or other land-based contaminants
 - Host-source tracking can help discriminate type/source of land-based contaminant

II. PARTIAL SUMMARY: MICROBIAL CONTAMINANTS DISCHARGED FROM 6 SE FL WASTEWATER OUTFALLS

- **Boynton-Delray 2006:**
 - Relatively low levels of enterococci via culture methods (none above EPA levels)
 - However, instances of Cryptosporidium and Giardia at levels of concern
 - Chlorination treatment working to kill bacteria, but breakthroughs of cysts and viruses
 - *Though concentrations are not beyond EPA levels, what are the effects of chronic low-level exposure? (due to volume of effluent)*
 - Collections from the surface at outfall boils
 - Protozoan cysts appear to be in a viable state
 - Dilution is rapid with distance from source (to background levels within 1km)
- **Boynton Inlet (outgoing tidal discharge, 6/07-7/08):**
 - Moderate to low viable enterococci (fecal indicator bacteria)
 - Periodic spikes of viable protozoan cysts and human-source viruses

- Majority of microbial contaminants in outgoing tide, comparatively little delivered by incoming tide
- Graph of contaminants against tidal flow produces cyclical pattern (mimicking tide)
- June 2007: enterococci levels at or below EPA closure levels
- September 2007: levels regularly exceed EPA recommended levels
- **Miami-central, Miami-N, Hollywood:**
 - Higher enterococci levels detected at surface vs bottom (consistent with buoyant plume)
 - *Salmonella*, *C. jejuni*, *S. aureus*, adenovirus genetic signatures detected at all sites; though presumed not viable
 - Some microbial contaminants still detected in bottom samples

III. MOLECULAR MST FOR “BEACHES” EPIDEMIOLOGICAL SURVEY

- Hobie Cat Beach, Miami FL; 12/07 – 6/08
- Swimmers determined to have sig. higher health risk vs. non-swimmer
- Periodic elevations of enterococci and bacteroides
- Low levels of human-source marker
- Periodic fluctuations of dog-source marker
- High seasonal elevations of gull-source marker
- Significant populations of enterococci persisting in beach sands. Environmental persistence found to be common, especially at high-tide level.
- Beach sand enterococci washed out with every tidal cycle; significant wash out with rainwater
- Extremely high levels of enterococci and bacteroides detected in beach run-off during storm event sampling (3/8/08)

IV. SHIFTING EFFORTS (BROWARD, HOLLYWOOD):

- Viable enterococci by culture: higher at inlets and outfalls, no levels beyond EPA
- Viable enterococci by qPCR: generally low levels (below EPA). Two spikes beyond EPA (Hollywood outfall November '10, Broward outfall January '11)
- In general, viable enterococci below EPA levels via both culture and qPCR
- Total and human-source bacteroides significantly high at and near outfalls (periodic). Some (but lesser) at inlets.
- Though presumably dead, large export of human-source marker likely means large export of human pathogen genes.
- Potentially viable protozoan cysts: breakthroughs in both Hollywood and Broward outfalls.
- Dilution extremely rapid with distance. Significant drops within even 500m. Immediate public health risk minimal.

- Chronic low dosing to region may have implications in terms of sequestration and concentration in other areas (e.g. coral and sponge tissue).

V. SIGNIFICANCE OF FACE MICROBIOLOGY RESULTS

- Coastal inlets may be important contributors of nutrient and microbial loading to coastal zone.
- Inlets may discharge viable fecal indicator bacteria and pathogens, including viruses and protozoan cysts.
- Generally, treated wastewater of SE FL outfalls not discharging high levels of viable bacteria, though discharging potentially infectious protozoan and viral pathogens and their genetic material.
- Contaminants appear to dilute rapidly with distance. Risk to human or fishery health likely low, except at point of discharge or possible instances of re-concentration (e.g. filter feeders).
- Beach sands possible non-point source reservoirs of fecal indicators and pathogens.
- Stormwater may be a sig. source of fecal contaminants, and serve to mobilize background fecal indicators. Coastal WQ management may need to focus on stormwater as well as wastewater.
- Currently very limited MST data of filter feeders and corals in terms of microbial contaminant sequestration. Further investigation warranted.
- Large volume of discharge by coastal inlets warrants further investigation to assess impacts on ecosystem and public health.
- To better assess regional microbial water quality and its impacts, a holistic regional approach is needed incorporating all sources.

Questions and Comments:

1. (Joseph Boyer) *You mentioned the potential for horizontal gene transfer, it is a real issue especially in organisms such as sponges. Would it be worthwhile to look at antibiotic resistance?*
 - (Chris Sinigalliano) There are a number of gene markers for “undesirable traits” which would be useful to look at; especially in coral and sponge tissue. Horizontal gene transfer is most abundant in surfaces and bio-films (by orders of magnitude). We know what sponge tissue and other attached surfaces are hot spots for gene transfer. In these areas you not only have the concentration effect, but are also putting them in an environment where they are more likely to come in contact with each other. We’re also finding that beaches may be another potential area where this is occurring; anywhere where you have interfaces between different environments.
2. (Gene Shinn) *You mentioned you had Ceratium markers, were there any viable?*
 - Majority of these samples not tested with that marker (new), but we can go back and re-test all our archived samples as new markers come along. Currently re-testing for *Ceratium* that’s shown to be involved in white pox disease in corals.
3. (Brian Lapointe) *You found high levels of coliform in beach stormwater, what was the source?*

-Two primary sources: the sand itself (background concentrations), which produces spikes at higher high tides (washing out concentrations just above high tide line); the other being high levels of gull contamination. This illustrates a problem of not having good host-source tracking ability. If you're doing nothing but culturing, it can't discriminate the source, which may or may not represent a sewage sample.

4. (Joseph Boyer) *Due to the retainment and re-growth of these organisms in sediments, it stands to reason that it may not be a viable indicator at all. Is the EPA going to move away from using enterococci as an indicator?*

-No, but they are considering alternatives. They have a limited timeframe to produce the revised criteria in 2012. So far they've settled on molecular tests for *enterococci* and total *bacteroides*; an improvement but they don't include any host-tracking. They are well aware of these issues, and may incorporate host-markers into future revisions.

-(Joseph Boyer) But irrespective of the host, using bacteria (Enterococci) that regrows in situ is not a good indicator for external sources.

-Correct, and that is why the EPA is adding in Bacteroides, which is anaerobic and does not appear to persist as Enterococci does.

5. (Doug Seba) *You have a test for hot pepper components which denote human waste, is there possibility to adapt that to test for specific gene signatures in other plants, such as genetically modified crops (i.e. Roundup-Ready soybeans)?*

-The technique is applicable to a wide range of unique markers, just need a marker that is known to be exported, and a good assay for it. WQ testing is certainly going towards using a suite of markers instead of a single-marker system.

6. (Phil Dustan) *Have you thought of looking at coral microbial communities with these methods?*

-Yes, but would require additional funding. There are other groups investigating profile changes in coral microbial communities (as a whole) when the organisms are exposed to varying environmental conditions and contamination; and in different habitats. Certainly are many restrictions on coral sampling, sponges may be great organisms for this.

7. (Joe Lopez) *Sponges would be great, as they are shown to have very high microbial assemblages and to be highly adaptable in this regard. It's been shown that sponge microbial communities can actually outcompete and "push out" foreign microbes.*

-Yes, pathogenic bacteria detection in sponges may then point to a recent contamination event, rather than background levels.

Project 21: Technical Meetings for Projects 3 & 19 – Programs to Reduce LBSP – Katherine Tzadik

- Project History:
 - Identify existing programs and identify gaps in best management practices
 - A survey developed and administered to different organizations and agencies (33% return rate)
 - Survey responses compiled February 2008

- 31 draft recommendations developed to more effectively address LBPS in SE FL
- Recommendations to identify specific, short-term implementable actions
- Previous Technical Meeting Outcomes:
 - Key data gaps addressed
 - Draft recommendations reviewed
 - Reached consensus on recommendation language
 - Prioritized recommendations
 - To do at 2011 TAC: start developing implementable projects based upon recommendations
- TAC Exercise Objectives:
 - Prioritize “Top 5” draft recommendations drawn up from previous meetings (*survey results attached*).
 - Develop project ideas from prioritized recommendations

Discussion (LBSP Project 21):

1. (Katharine Tzadik) In selecting your choice recommendations, we’re not looking specifically for new project ideas, but more for what actions would be best to reduce LBSP in our area. Looking for input on what is most important to direct attention to.
2. (Margaret Miller) We all have own individual areas of expertise, should select partly based upon what the TAC is equipped to address.
3. (Chantal Collier) This is a step in the process of continuing current action, but also the possibility of spinning off new projects. The idea is to pick something today to begin brainstorming with tomorrow.
4. (Richard Harvey) Liveaboards discharge lots of waste, possibly in the SEFCRI area; is this a known issue?
 - (Dan Clark) There are new regulations that prohibit renting dock space to liveaboard vessels without a sewage connection (echoed by Marie Guarino).

Public Comment (moved ahead of TAC Exercise 2 to contribute material to group discussion):

I. Annalise and Jeremy Wershoven of Boca Raton – Sea Turtle Observations

- Card contents: *“I do volunteer observations of juvenile green sea turtles on the first reef in Deerfield, a reef that was recently buried by the Deerfield / Hillsboro Re-nourishment project. The impacts on this reef and the feeding habitat [of juvenile green sea turtles] are extensive.”*
- High concentration of juvenile green sea turtles (~25cm – 55cm) observed feeding at shallow, low-profile macroalgae beds

- Grounds used for feeding and rest, whereas artificial substrate of adjacent reef not used for feeding.
- Proximity to shore = high susceptibility to re-nourishment projects
 - Permit violations during previous re-nourishment activities resulted in high sedimentation
- Facebook page created to spread public awareness:
<http://www.facebook.com/protectFLreefs>

I(b). Bob Wershoven of Boca Raton

- Card contents: *“To discuss past observations while diving / snorkeling and how the reefs and oceans have fewer sea turtles, reefs, fish, etc. (particularly in Ft. Lauderdale and Deerfield).”*
- It would appear that these near shore hard bottom areas are important developmental habitats for this species, and should be considered when investigating the effects of re-nourishment projects, storm runoff, etc.

Questions and Comments (Public Comment I, I.b):

1. (Phil Dustan) *People love sea turtles; a great way to build awareness and spread it beyond just the beach (nesting).*
2. (Brian Lapointe) *You observed them feeding on red algae, do they feed exclusively on reds?*
 - (Annalise Wershoven) Not necessarily, they eat some browns as well.
 - (Bob Wershoven) Necropsies I've performed in the past revealed that these turtles were feeding almost exclusively on the red algae *Gelidium*.
3. (Brian Lapointe) *An interesting observation in Hawaii: sea turtles were consuming invasive red algae which was high in nitrogen, which is associated with fibropapillomas.*
 - (Bob Wershoven) *I haven't seen turtles with fibropapillomas offshore, but inshore had instances.*
 - (John Fauth) *The UCF turtle research group has been researching sea turtles on the same kind of worm rock reefs (N of the SEFCRI area for years); a good source of info.*
4. (Gene Shinn) *Can you tell if they're ingesting any sediment?*
 - (Bob Wershoven) When I did the necropsies, you could barely detect any; I never found much.
5. (Vladimir Kosmyrin) *Do they eat Dictyota at all?*
 - (Bob Wershoven) I haven't found *Dictyota* in G.I. tracts.
6. (Group): *Near shore habitats an important consideration in mitigation efforts, given the habitats' vulnerability. Mitigation efforts should investigate what attracts turtles to specific areas, and try to reproduce the type of habitat lost (i.e. near shore hardbottom reef) rather than mitigate offshore.*

II. Dan Clark of “Cry of the Water” – Card Contents: Beach Projects, Port Everglades Expansion, New House and Senate Bills

- What to do about re-nourishment permitting?
- Sand compatibility being redefined –no longer be able to investigate the “fines” component of sands being selected for re-nourishment projects.
- \$28 million appropriated for possible new beach project in Ft. Lauderdale; in areas that haven’t yet been re-nourished.
- Bill HB613 – would roll back “outfall dates”
- Bill SB991 – would make it easier to do port projects. \$100 million per year for the next five years have been appropriated to deepen SFL ports
- Bill 1490 – wants to do away with water quality numerical standard via reclassifying water bodies

Questions and Comments (Public Comment II):

1. (Annalise Wershoven) *The nearshore hardbottom community in that region (Lauderdale segment 2) is a very diverse benthic community (soft corals, hard corals, juvenile turtles, small fish, etc.), even an Elkhorn individual.*
2. (Stephanie Clark) *Such areas [hardbottom] really are some of our “best,” often comprised of large stony corals, our staghorn coral populations, etc. Burying this habitat would be devastating.*

III. Stephanie Clark of “Cry of the Water” – Reclassification of Colonized Pavement

- Card contents: *“Gulf Marine Fisheries Management Council has voted to remove octocorals from their fisheries management plan – South Atlantic Fisheries Management Council wants to also exclude octocorals – most [of which] are harvested in state waters. FWC is looking to take over the management in both state and federal waters. [The] current [harvest] limit is 50,000 in federal waters but since 2000*
- Harvest is primarily for sale in the aquarium trade. Majority of collection in FL Keys.
- Fishery councils want to remove management plans for octocorals, in which case the state would assume the fishery.
- Established that the fishery closes if collection reached 50,000 in federal waters; however, only ~5,000 collected in federal waters yet 90% of harvest (~45,000) occurs in state waters.
- FWC wants to assume fishery management and raise limit to 70,000.
- With our reefs as degraded as they are, why raise the limit?
- Additional recommendation: harvest zones. What happens if there’s an event in the Keys which forces the majority of harvest into the SEFRCI area? Don’t need a sudden harvest of 70,000 octocorals from the Broward region.

Questions and Comments (Public Comment III):

1. (Phil Dustan) *How do we know how many are being taken? How big are these octocorals? How much do they sell for?*

-(Dan Clark) Currently on the honor system. Most harvested colonies between 1ft – 2ft (larger colonies result in high shipping expense due to water volume). Price varies.

Primary concern for this region is the accessibility of these species (and other organisms such as fish and crustaceans) to shore-based collection. In the Keys there are only so many registered and licensed collectors, but with increasing lionfish populations (and their consumption of small tropical fish), there's worry that collectors will turn to octocorals for income. Worse, imagine the harvest if a medicinal fad based upon "gorgonian extract" or something of that nature were to arise.

They are reporting 50,000 colonies collected per year, who knows how many are actually harvested.

2. (Vladimir Kosmynin) *Who's to say these soft corals should be harvested at all? It's been demonstrated that they are very easy to grow from small clippings.*

Announcements and Discussion: Day 1

1. (Chantal Collier)
 - o Fall CRTF meeting set: October 17th – 21st at Harbor Beach Marriot, Ft. Lauderdale
 - o Official workshop of CRTF meeting the "Reef Resilience" conference October 18th – 19th
 - o Field trips October 20th for conference participants and CRTF members
 - o Official business meeting October 21st
 - o Currently working on issues, agenda, themes
2. (John Proni) *Does anyone present have a hydrocarbon monitoring program for this area? This can be for the water column, for sediment, etc.*
 - (Joseph Boyer) There used to be one for pesticides.
 - (Margaret Miller) As part of the Deepwater Horizon event, there was a one-shot deployment of sensors last summer to get baseline data; as well as the collection of sediment and water samples.

(Break)

Following afternoon break, the TAC reconvened to work on the "***Southeast Florida Coral Reefs: Impacts of Land-Based Pollution Document***" – led by John Fauth – UCF

Day One – adjourn

Meeting Summary – Day Two: Thursday, May 6th 2011

Meeting Guidelines

Katharine Tzadik reiterated meeting participation guidelines, guidelines for discussion, consensus rules, comment card procedures, and the use of meeting evaluation forms. Katharine Tzadik then reviewed the day's agenda.

Presentation: NOAA Coral Reef Conservation Program: The Land-Based Sources of Pollution Implementation Plan – Rob Ferguson – NOAA CRCP

- I. Three Priority Threats identified for CRCP future roadmap (guiding CRCP direction through 2015):
 1. Climate Change
 2. Land-based Sources of Pollution (focus of this presentation)
 3. Adverse Impacts of Fishing

II. LBSP Goals (3) and Objectives (12):

- **Goals:**
 1. Reduce pollutant loading from watersheds to priority coral reef ecosystems.
 2. Promote in-water management activities to restore priority coral reef ecosystems that have been adversely impacted.
 3. Build and sustain management capacity to reduce and prevent the impacts of land-based sources of pollution on coral reef ecosystems.
- **Primary Objectives:**
 - #1.3 Implement watershed management plans (WMPs) and local action strategies (LAS) within priority reef ecosystems and associated watersheds to improve water quality and coral reef resilience.
 - #3.2 Build partnerships in governing bodies to identify, leverage, and apply resources to improve watershed management to protect reefs from LBSP.
 - #1.5 Determine efficacy of management through baseline and performance monitoring.
 - #3.1 Ensure reef jurisdictions have adequate resources to develop and implement management plans, assess ecosystem condition, and evaluate performance.

III. Potential Activities for LBSP Objectives:

- Objective 1.3:
 - WMP development for remaining FL jurisdictions, incorporates 9 EPA elements.
 - Implementation of management activities and BMPs identified in WMPs.
- Objective 3.2
 - Partner with government and private organizations that support the purchase, preservation, protection, and restoration of coastal habitats.
 - Develop partnerships that leverage and increase resources available to address LBSP.

- Coordinate with other agencies and support efforts through their specific areas of expertise to implement watershed planning efforts.
- Objective 1.5
 - Monitoring projects that collect baseline data for the L1 PM3 Performance Measure (i.e. projects that monitor sediment loads).
 - Monitoring projects that assess the efficacy of management activities.
 - Short term monitoring projects which provide data to support management decisions that decrease sources of an impacts from LBSP.
- Objective 3.1
 - WMP development workshops, LBSP trainings, development of best management practice manuals and educational material.
 - Conduct capacity assessments for each jurisdiction which will:
 - Define and identify gaps in knowledge, skills, and abilities required to achieve specific management priorities related to coral reefs and LBSP.
 - Identify a specific suite of actions for increasing such capacity.

Questions and Comments (NOAA-CRCP LBSP Plan – interjected):

1. (John Fauth) *If you go from correlations shown by monitoring directly to decision-making, you're missing causality. When will NOAA support experimental research, which would demonstrate causality much faster?*
 - (Rob Ferguson) Currently characterizing St. Thomas east end reserve watershed, this will serve as a model to help identify the various management activities that need to be created for these objectives.
 - (Phil Dustan) We've known for many years from Gene Shinn's research that septic tanks have been a big problem in the FL Keys. And yet it took so long for action to take place.
 - (Rob Ferguson) The objective is to identify short-term, viable monitoring projects.
 - (John Fauth) Maybe the word "monitoring" could simply be removed; and just have "short term projects." The word "monitoring" assumes passive action, and works to exclude many types of activities.
 - (Brian Lapointe) For the same reason (monitoring without experimenting for causality), management action taken for the FL Bay hypersalinity hypothesis to reduce salinity was a failure.
 - (Margaret Miller) Can projects be "hypothesis driven" monitoring?
 - (Chantal Collier) Also agree with the notion that monitoring alone is inadequate to provide data for justification of management action/decision.
 - (Rob Ferguson) We're still in the drafting phase, concerns will be conveyed, and these and many more changes may be incorporated.
2. (Phil Dustan) *Does NOAA headquarters in Silver Spring recognize that the Keys coral communities are essentially collapsed? Is the severity truly acknowledged?*
 - (Rob Ferguson) Difficult to speak for all the varying jurisdictions as a whole.

-(Brian Lapointe) One of the CRCP's goals is "Enhancing Reef Resilience," with the state that our reefs are in today, what does that actually mean?

3. (Doug Seba) *In response to the Keys septic tank issue, with the amount of construction and expense incurred to install the infrastructure... the reefs keep degrading, where's the return of investment?*

Has anyone heard the concerns of a pending dead zone in the Gulf of Mexico due to the flooding of farmlands? Is there a committee like the TAC to handle that issue, if so should the TAC collaborate with such a group?

-(Rob Ferguson) Wouldn't be in CRCP jurisdiction, but DARP is working on that and likely has a committee(s) working on the matter.

-(Doug Seba) I'm sure there are deep reefs in the Gulf that would be affected, depending on how flexible your definition of "reef" is.

-(Dan Clark) Have been trying to bridge the gap between this group and Everglades divisions (i.e. South Florida Ecosystem Restoration Task Force), since what they do influences us and our ecosystem here.

-(Rob Ferguson) Exactly the point of objective 3.1 – develop collaboration and encourage the sharing of expertise among organizations.

-(John Fauth) A primary example of that need, the lack of communication and coordination: the South Florida Water Management District isn't here, why not?

(presentation continues)

IV. Florida's Management Priorities

- Based upon National LBSP objectives
 1. Minimize impacts of reduced WQ due to fresh water deliveries and construction in coastal, estuarine, and lagoonal habitats. Irregularly timed, high volume releases of FW can carry excessive nutrient and pollution loads.
 2. Use monitoring data to assess effectiveness of abatement measures.
 3. Design and implement a long-term, spatially robust WQ monitoring program for SE FL coastal waters to determine sources of pollution and prioritize reduction efforts.

V. LSBP in SE Florida

- USEPA funding WQ monitoring at over 100 sites in FL Keys. CRCP provided funding for 22 sites in Martin, Palm Beach, Broward, and Miami-Dade.
- Educational materials addressing lack of public awareness of LBSP.
- Two other projects to identify links between LBSP and coral reef resources. Outcomes will provide critical data to link reef degradation to LBSP and enable resource managers a way to evaluate LBSP control measures.

VI. Florida's LBSP Needs

- An assessment and prioritization of sub-watershed units that comprise SE FL watershed.
- Development of WMPs once SE Florida has been classified into sub-watersheds.
- Development of BMPs and replicable demonstration projects that address LBSP.

- Further studies to understand the relative influence of pollutants from submerged groundwater discharge, upwelling, and inlets along the SE Florida Reef Tract.
- Assess the efficacy of implemented management activities. Evaluate impacts of change in water quality on reef habitat.

Questions and Comments (NOAA-CRCP LBSP Plan):

1. (John Fauth) *Same problem: “use monitoring data to assess...” There are other methods that are much faster and more effective.*
2. (Joseph Boyer) *With all these projects to assess management activity effectiveness, there are many areas where there is no (or inadequate) baseline data? How do you then assess management effectiveness?*
 - (Rob Ferguson) The purpose of the St. John characterization is to gain such baseline data.
 - (Ken Banks) The “monitoring” terminology comes from the need for research, but with current plans management action is what is being targeted. “Monitoring” may be used in lieu of “research” simply because it is more “palatable” in terms of the goals of these drafted plans.
3. (Esther Peters) *In addition to “research monitoring” there is “risk assessment.” You need to show exposure and effects, and link those to stressors. Confirmation of effective management is a decrease in stressors and their effects.*
 - (Rob Ferguson) This comes back to agency coordination, so tasks can be shouldered by multiple working bodies with resources beyond what the CRCP possesses.
4. (Chantal Collier, in regard to FL Objective 3): *That is good to see as a priority, since we were looking to continue and grow the WQ monitoring program and similar projects.*
5. (Phil Dustan) *All pictures in booklet show beautiful, vibrant communities. You’d be hard-pressed to find that; it’s not representative of the situation at all. Pretty pictures make people feel good about saving the reefs, but we need to acknowledge the serious reality of the situation; especially in public outreach material.*
 - (Chantal Collier) When selecting imagery for the “*Southeast Florida Coral Reefs: Impacts of Land-Based Pollution Document*” this should be taken into consideration.
6. (Vladimir Kosmynin) *Restoration efforts don’t make sense in a large scale. It can be expected for the reefs to take a long time to recover, should we redirect our short-term efforts if we can’t expect to see short-term results?*
7. (Joseph Boyer, in regard to “FL’s LBSP Needs”) *Need to be careful with watersheds, they are unique in this area when you take into account the amount of canals and groundwater contribution. Traditional watershed models might not be appropriate.*
 - (Rob Ferguson) Yes, though the CRCP won’t be defining the watersheds (and sub-watershed units), rather it would be local agencies.
 - (Chantal Collier) In order for FL to participate in the CRTF (partnership) goals of defining watersheds, would need to take steps (within funds) to produce meaningful results; probably by dividing southeast Florida area into smaller sub-units rather than attempting to define/address the whole area from the outset.

- (Joseph Boyer) The big inlets are definitely the main source of LBSP; you'd think that this kind of program would've been implemented already.
- (Brian Lapointe) Groundwater likely a large contributor, and not well understood here. A proven driver of macro algae in Hawaii.
- (Esther Peters) Groundwater nutrient seepage could be exacerbated by pending plans to inject water into ground reservoirs to hold back SW intrusion.
- (Dan Clark) New bill (#796; redefining water re-use) proposes injecting reclaimed water into the Biscayne aquifer.

8. (Doug Seba) *A lot of monitoring proposed here. What amount of monitoring would result in a large-scale, meaningful management action? For example, let's say there's a big hurricane season and Lake Okeechobee is near over-flowing, what would it take to say it's a better management practice to flood a nearby town instead of flooding the farmlands and estuaries (and subsequently transporting that nutrient load to the coastal ecosystem)?*

- (Joseph Boyer) As much a research question as a political question.

Outcomes from TAC Exercise 1

- Projects 20 – “Develop specific projects in designated hot spots,” could be applied to a watershed definition program being discussed.
- Project 23 – “Initiate the implementation of projects to reduce pollution from high-priority sources.”
- (Above) applied for funding (2011), but returned with condition that specific project idea(s) needed.

TAC Exercise 2 (Project Development)

- Objectives of Exercise:
 - Outline project ideas
 - Products should reduce threats
 - Research projects should clearly inform (or evaluate) management action
 - Projects should be implementable within 1-5 year timeframe

Exercise 2 Discussion

(Phil Dustan) *Do we have adequate knowledge of the actual paths and inputs of water (inlets and groundwater) into the coastal system? We have general ideas of how much water and nutrients are released via inlets, but do we have enough understanding to create projects?*

(B. Lapointe) *Groundwater remains the big gap in our knowledge.*

(Group) *The source, destination, and contaminants of introduced water (inlets and groundwater) essential to effective direction.*

(Gene Shinn) *For several years there's been discussion to install monitoring wells.*

(Esther Peters) *Observation of natural freshwater seeps in the area could be a good source of data.*

- (C. Collier) *We have some funds from ship groundings, but are restricted in spending. Working to propose increasing spending authority by demonstrating project need (will take at least a year).*
- (B. Lapointe) *3D groundwater modeling software exists, would be interesting to see what that could produce using existing data.*
- (C. Collier) *There will always be a need for more data, have to move forward with what is available. Should ask what we can do with what we currently have.*
- (Group) *Working with agricultural operations an interesting pursuit (i.e. nursery operations in West Palm); looking at how they handle their water.*
- (G. Hendricks) *Florida Ranchlands Environmental Services Project (FRESP) Payment for Environmental Services (PES) program an effort to encourage reuse of agricultural irrigation water (via “tailwater” recovery systems); primarily in cattle ranchlands north of Okeechobee. Much opportunity for collaboration – first place to look would be county Soil and Water Conservation Districts.*
- (Phil Dustan) *If successful (FRESP PES), would be good practices to bring to south FL.*
- (B. Lapointe) *We’ve mentioned before about investigating phosphorus content of detergents in the SEFCRI area. Limitations already in place for Monroe County; provides an immediate and substantial reduction in phosphorus loads to wastewater treatment.*
- (C. Collier) *Is this still an issue, most detergents now low/no phosphate?*
- (Joseph Boyer) *Preliminary data from SEFCRI WQ monitoring shows very little phosphorus.*
- (B. Lapointe) *As a limiting nutrient you’d expect it to be low. Concentrations don’t necessarily reflect amount artificially introduced.*
- (Phil Dustan) *Should look at what’s being sold and in what bulk (detergents, fertilizers, etc.).*
- (Dan Clark) *Another consideration: landfill leachate – especially since something like the Pompano landfill is permitted to connect directly to sewage treatment operations (after preliminary organic processing).*
- (Group) *Many possible chemicals, toxins, xenobiotics, pharmaceuticals, etc. not tested for in WQ projects.*
- (Phil Dustan) *Maybe get someone to aggregate this data (available in permits, etc).*
- (Phil Dustan) *We have maps of many significant point sources of chemical pollution. We have positive results of corals reacting negatively to foreign compounds (biomarkers). We should investigate a link.*
- (C. Collier) *Very pertinent, especially considering the contribution of these chemicals to groundwater and inlets.*
- (Ken Banks) *Drilling into the reef (to sample groundwater) expensive, but you can cheaply and easily get results by piping down into sands between our reef tracts).*
- (James Byrne) *Looked at fish in regards to bioaccumulation of these chemicals? Could make it a public safety issue in addition to a reef-specific issue.*
- (John Fauth) *Agriculture a major source of pollutants (pesticides and herbicides). Ranchers love projects which pay for them to follow their land ethic while still allowing them to utilize the land. Such “win-win” projects (tying environmental concerns with agricultural concerns) a very desirable route.*

Presentation: USDA National Resources Conservation Service – Florida Coral Reef Tract LBSP Initiative – Project Proposal – Greg Hendricks - USDA-NRCS

I. Proposal Components

- A. Irrigation Efficiency Assessments and Recommendations
- B. Nutrient (and Pesticide) Management Planning and Recommendations
- C. Use of Low-Maintenance Plants

II. Irrigation Efficiency Component: Mobile irrigation teams address water conservation

- Evaluations inform homeowners and property managers total water use and provides efficiency recommendations.
- Primary concern: overwatering to compensate for irrigation inefficiencies ('dry areas'). Longer irrigation periods push fertilizers and chemicals past plant root systems; wasteful.
- Proper irrigation techniques promote water conservation, save money, and prevent over application of herbicides, pesticides, and fertilizers.

III. Nutrient Management Component: Teams can provide nutrient management plans

- Four R's of Nutrient Management:
 - Right Source of Nutrients
 - Right Time of Application
 - Right Rate
 - Right Method of Application
- National Nutrient Management Strategy Includes:
 - Irrigation Water Management
 - Drainage Water Management
 - Erosion Control
 - Suite of other conservation practices as needed

IV. Low-Maintenance Plants Component: Teams may provide "Florida-Friendly Landscape" guidance

- University of Florida – IFAS, FDEP, Water Mgt. District
- "Right Plant for the Right Place" - emphasizing plants that have low maintenance and drought tolerant characteristics
- Conducting soil tests to determine appropriate fertilizer needs
- Controlling invasive plant species
- Mulching, irrigation efficiency & other water conservation methods
- Recycling yard waste
- Attracting wildlife and beneficial insects e.g., pollinators

- Shoreline conservation buffers & filter strips

Questions and Comments (NOAA-CRCP LBSP Plan):

1. (Phil Dustan) *Any way to have the MIL (Mobile Irrigation Lab) vehicles expand to the urban/suburban sector?*
 - (Greg Hendricks) Have given thought to that; had a recent program. On a per acre basis, suburban areas can use more fertilizer than agriculture operations; pesticides too. We're hoping to use coral reef resource concern to fund MIL operations in urban areas.
2. (John Fauth) *What about golf courses and park areas?*
 - (Greg Hendricks) Cooperation depends on individual managers. Most rely on professional gardeners/master gardeners, often with little understanding or realization of resource use efficiency.
3. (Vladimir Kosmynin) *Do you have a rough average estimate of how much money could be saved per unit area?*
 - (Greg Hendricks) Not a monetary estimate, but average operations use ~50% less water, and 25-30% less fertilizer.
 - (Vladimir Kosmynin) Having a monetary figure would go a long way to encourage efficiency; numbers can impress the benefits well.
4. (James Byrne) *Corporate partnerships with businesses like Lowes or Home Depot? A good opportunity to reach homeowners.*
 - (Vladimir Kosmynin) They're probably more concerned with sales.
5. (Joseph Boyer) *What about herbicides in lakes, ponds, etc? Regular practices of spreading herbicides on/over small water bodies to control aquatic vegetation.*
6. *The average homeowner doesn't know, and simply follows instructions on the bag (or gained from home improvement store employees). Approaching homeowners associations, water utilities, municipalities and other entities that are in direct interaction with homeowners a possible tactic.*

Presentation – Update on the Development of SE Florida's Management Alternatives – Jamie Monty – FDEP CRCP

I. Background

- Reviewed: FDEP CRCP Mission. Highlighted directive: *“Direct and coordinate implementation of the Southeast Florida Coral Reef Initiative – including development of management alternatives, which may include a managed area and a corresponding management plan, that balances use of, and protection of, southeast Florida's coral reef ecosystems.”*
- Reviewed: SEFRCI Vision Statement: *“To develop an effective strategy to preserve and protect southeast Florida's coral reefs and associated reef resources, emphasizing balance between resource use and protection, in cooperation with all interested parties.”*

- Achieving both FDEP-CRCP and SEFCRI goals: SEFCRI LAS Projects. A combination of stakeholder and science projects which will contribute essential information to stakeholder working groups (to provide a prioritized list of management alternatives to reduce threats to FL reefs), and eventually to public meetings.
- Examples of SEFCRI Science Projects:
 - FDOU Projects 18 & 20A: Fisheries Resource Status and Management Alternatives for the SE FL Region
 - FDOU Project 33A: Identification of Vessel Use Patterns in SE FL
 - FDOU Project 33B: Determining Coral Reef Impacts Associated with Boat Anchoring and User Activity
- Examples of SEFCRI Stakeholder Projects:
 - FDOU Project 10: A Compilation and Comparison of Social Perceptions on Reef Conditions & Use in SE FL
 - FDOU Project 23: Evaluation of the Potential for a Marine Zoning Plan for SE FL
 - FDOU Projects 18 & 20B: Development of Management Alternatives for the SE FL Region According to Stakeholder Interviews

II. Stakeholder Working Groups (FDOU Project 26A)

- Objectives:
 - Series of management alternatives developed in stakeholder interviews
 - Flesh out details necessary for management implementation, and provide recommendations
- Proposed Methodology:
 - Establish working group(s) (possibly one per county)
 - Series of meetings
 - Professional facilitator to keep process inclusive, balanced, and effective
 - Provide marine spatial planning concepts
 - Real-time GIS/marine spatial planning software using all SEFCRI LAS data
- Spatial Planning Concepts:
 - Review of successes & challenges (examples of successes and failures in FL, national, and international)
 - Precautionary principle
 - Resilience concepts (biological and socioeconomic)

III. Public Meetings (FDOU Project 26B)

- Objectives:
 - Present results of SEFCRI science & stakeholder LAS projects
 - Verify accuracy of user-provided information from LAS projects

- Obtain public feedback on working groups' preferred management alternatives and recommendations
- Proposed Methodology
 - Public meeting/series of meetings
 - Original project contractors present results of SEFCRI FDOU LAS projects
 - Working panel members present their preferred management alternative and recommendations

IV. Timeline

- 2004 – 2011: FDOU Science and Stakeholder Projects
- 2012 – 2013: Stakeholder Working Groups
- 2014 – 2015: Public Meetings
- 2015 Final prioritized list of management alternatives transferred to responsibility of governing authorities.

V. TAC Roles and Opportunities

- Spread awareness of SEFCRI planning process
- Informally provide comments/concerns about process
- Serve as Project Advisor with FDOU Project Team on either Working Group or Public Meeting projects
- Participate as a Working Group member

Questions and Comments (Update on Management Alternatives):

1. (Esther Peters) *Good to see there will be interaction with LBSP groups and data collation of all these projects.*
2. (Doug Seba) *A point raised yesterday, beautiful reef pictures used in outreach documents and presentations (including yours) are not representative of the actual condition of our reefs. When you have these workshops, would you include realistic images?*
 - (Phil Dustan) *A possible addition to the data set: pictorial progressions of south FL reef change over the decades. With the active history of diving in our region, should be easy to acquire imagery from public.*
 - (Group) *A public call for historic photos (perhaps via a contest) may yield much.*

TAC 2011 – Meeting Conclusion

Katherine Tzadik thanked the TAC for its attendance and contributions. Dates for the next TAC meeting were not announced, as they were not yet finalized. Katherine Tzadik posted major project idea areas produced from previous TAC exercises (below).

TAC 2011 – Exercise Project Ideas

- Data Mining and Aggregation
 - Paths of industrial pipes to wastewater treatment facilities and inlets
 - List creation of land use permits (landfills, agriculture, industry, etc)
 - Roadway and storm drain coverage and associated water paths
- Experiment: impacts using biomarkers
 - Screen coral tissue for foreign chemical stressors possibly sourced from agricultural operations
- Groundwater: sources, paths, and contaminants
- Fish: bioaccumulation products as a possible means to broaden importance (and funding sources) of groundwater and inlet contaminant investigation
- Water Quality monitoring project: add testing of pharmaceuticals