

**Southeast Florida Coral Reef Initiative (SEFCRI)
Land Based Sources of Pollution (LBSP) –
Technical Advisory Committee (TAC)**

Meeting #9 Agenda • November 6-7, 2008

National Coral Reef Institute at Nova Southeastern University Oceanographic Center
8000 North Ocean Drive, Dania Beach, Florida, 33004

LBSP TAC Committee:

Name	Affiliation	Nov 6	Nov 7
Boyer, Joseph	Southeast Environmental Research Center, FIU	X	X
Davis, Hal	United States Geological Survey		
Dodge, Richard	Nova Southeastern University, NCRI	X	X
Dustan, Phil	College of Charleston	X	X
Fauth, John	University of Central Florida	X	X
Gardinali, Piero	Florida International University	X	X
Griffin, Dale	United States Geological Survey	X	X
Kosmynin, Vladimir	Florida Department of Environmental Protection	X	X
Lang, Judy	Independent	X	X
Lapointe, Brian	Harbor Branch Oceanographic Institution, FAU		
Lipp, Erin	University of Georgia		
Miller, Margaret	NOAA	X	X
Paul, Valerie	Smithsonian Marine Station at Fort Pierce		
Peters, Esther	George Mason University	X	X
Proni, John	NOAA – Miami	X	X
Shinn, Gene	University of South Florida		
Soloviev, Alexander	Nova Southeastern University	X	
Swart, Peter	University of Miami, RSMAS	X	X

LBSP TAC Organizational Committee:

Name	Affiliation	Nov 6	Nov 7
Banks, Ken	Broward County DEP	X	X
Brien, Linda	Florida Department of Environmental Protection	X	
Collier, Chantal	FDEP – CRCP	X	X
Craig, Nancy	Broward County DEP	X	X
Gadbois, Nicholas	FDEP – CRCP	X	X
Geselbracht, Laura	The Nature Conservancy		
Harvey, Richard	Environmental Protection Agency		
Miller, Cheryl	Independent		
Wood, Wendy	Nova Southeastern University, NCRI	X	X

Presenters and Observers:

Name	Affiliation	Nov 6	Nov 7
Beal, Jeff	Fish and Wildlife Commission	X	
Clark, Dan	Cry of the Water	X	X
Clark, Stephanie	Cry of the Water	X	X

Colbert, Marsha	FDEP	X	
Craig, Troy	FDEP	X	X
Crean, Dan	SFWMD	X	X
Fisher, Lou	Broward County NRPMSD	X	X
Futch, Carrie	UGA	X	X
Gilliam, Dave	Nova Southeastern University, NCRI	X	
Hochberg, Eric	Nova Southeastern University	X	
Lohman, Melinda	USGS		
Moulding, Alison	Nova Southeastern University, NCRI	X	X
Semon, Kathleen	Smithsonian Marine Station at Fort Pierce	X	
Swain, Eric	USGS	X	
Thanner, Sara	Miami-Dade DERM	X	
Worth, Dewey	SFWMD		X
Zygnerski, Mike	Broward County	X	

Day I, November 6th, 2008

Meeting Summary

Meeting Introduction -

Nick Gadbois welcomed the committee, presenters, and observers and facilitated introductions. Following the introductions, Nick Gadbois reviewed the meeting facilitator role, guidelines for discussion, consensus rule, comment cards, meeting evaluations and the meeting agenda.

Nick provided a brief overview of SEFCRI prior to commencing the agenda. The SEFCRI Local Action Strategy was developed by the Southeast Florida Action Strategy Team (SEFAST), which evolved into the SEFCRI Team. SEFCRI identifies key threats to the coral reefs of Southeast Florida and priority actions needed to reduce those threats. The SEFCRI is targeting four focus areas including Land Based Sources of Pollution (LBSP), Fishing Diving and Other Uses (FDOU), Awareness and Appreciation (AA), and Maritime Industry Coastal Construction Impacts (MICCI). The SEFCRI is in its fifth year and the FDEP Coral Reef Conservation Program has collaborated with federal, state, and local agencies and NGOs to implement many of the 140 SEFCRI projects. The website for the Florida Department of Environmental Protection Coral Reef Conservation Program which contains links to SEFCRI information and products is www.dep.state.fl.us/coastal/programs/coral/.

LBSP Project Status Updates

Nick Gadbois presented a brief update on LBSP project status summarized below.

LBSP Projects 3 & 19 involved conducting local, state, and federal agency surveys to compile a list of agencies, programs, and best management practices related to LBSP. The project was completed in July 2008. An Access Database was developed with the data from the surveys. The follow-up project, **LBSP Project 21**, will evaluate the information collected in Projects 3 & 19 to identify gaps in BMPs to reduce LBSP. The project has been contracted through NOAA to the Center for Watershed Protection. This

is a two phase project. The first phase of the project will be to analyze the information in the database define any gaps in current processes, and write a draft report of the findings with recommendations to fill the identified gaps. The second phase will be a workshop with the surveyees to extract more information that will be incorporated into a final report. The final report will summarize all findings in phase 1, incorporate any new information collected during the workshop and will provide additional recommendations that fill gaps in BMPs. CWP has begun the initial database assessment.

Through **L BSP Project 11**, an integrated data management system (IMS) was developed in conjunction with the Florida Fish and Wildlife Research Institute (FWRI). The IMS System graphically portrayed local, state and federal L BSP information. This information can be assessed to determine if polluted areas on land may have a potential impact to the reef system. FWRI will continue to host and maintain the IMS Pages through December 2010. Nick asked that additional data and other ideas to be included on the IMS system be sent to him.

The goal of **L BSP Project 24** is to educate and change stakeholders' behaviors in an effort to reduce L BSP impacts on coral reefs. The project team for this project is Stephanie Clark, Cheryl Miller, and Dan Crean. Cheryl Miller developed a brochure about fertilizer use which will be distributed to stakeholders at retail chains. The brochure is currently being revised. Chantal Collier suggested incorporating information about pesticide and herbicide use into the same brochure, but the project team felt this would be too much information for one brochure. The project team decided to develop a separate brochure specifically for herbicide and pesticide use. A southeast Florida watershed brochure was also developed addressing areas south of Lake Okeechobee. Nick Gadbois requested editing assistance and comments from the TAC on these brochures. The budget for this project is \$40,000 and a final professional editor will cost ~\$6,000. Based upon printing fees for other SEFCRI outreach materials, the printing of the brochures will not utilize the rest of the allocated funding (\$34,000) for this project so a brainstorming session was held to discuss ideas about how to spend the extra funds.

Several ideas were suggested for the balance of funds in this project. Phil Dustan suggested creating little stickers and/or bumper stickers to give to the public as a constant reminder and placing brochures at scuba shops or fertilizer distributors. Troy Craig suggested selecting a distribution target prior to producing the brochures. Judy Lang suggested distributing the brochures at school events like ocean appreciation days. Ken Banks furthered this idea by suggesting environmental clubs in high schools. Judy Lang recalled brochures given out with a house bought in her county and suggested working with realtors. Judy Lang also suggested getting native plant societies involved. Alison Moulding suggested placing brochures inside water bill envelopes. Wendy Wood suggested including information on email blasts from a water company, similar to FPL.

Nick continued the discussion by facilitating the brainstorming session away from method of distribution and towards related outreach projects. Margaret Miller suggested contacting landscaping companies for outreach, particularly about pesticides, and create

workshops or industry-based groups. Lou Fisher suggested promoting awareness through the licensing process of farmers and other agricultural positions.

The objective of ***LBSP Project 25*** is to establish a long-term regional water quality monitoring program. A proposal was submitted to NOAA in September 2008 to initiate a pilot water quality monitoring project at the 17 SECREMP benthic monitoring sites. Nick thanked Joe Boyer, Dick Dodge, and Dave Gilliam for their hard work in preparing the proposal for this project. NOAA's fiscal budget should be finalized by March and hopefully the status of the proposal will be known shortly thereafter. Due to the budget constraints of the funding opportunity only quarterly monitoring was proposed. Chantal is continuing to search for dedicated long-term funding. Joe Boyer said water quality may not be the issue, at least on the nutrient side and other parameters should be measured. Piero Gardinali responded that maybe true but nutrients are the cheapest to study.

The goal of ***combined LBSP Projects 27, 29, 32*** is to determine the flux of pollutants in groundwater and to identify bioaccumulants in algae and coral at the JUL7 monitoring site in Broward County. The main question driving the project is: "What is occurring at the JUL7 location that is contributing to the persistent *Lyngbya* spp. bloom?" To answer this question, groundwater wells will be installed at and around JUL7 and a YSI data sonde will be deployed. Quarterly collection of *Lyngbya* spp. algae will be performed by the Smithsonian Institute for bioaccumulant analysis and Harbor Branch will collect coral tissue samples for microassay analysis. Groundwater and water column samples will be collected at the sea surface and at depth to trace the transport mechanisms of pollutants at the Port Everglades land-sea interface. Iron, radon, silicon, methane, tritium, inorganic nitrate, phosphorus, and stable isotopes will all be sampled in the water samples, algae tissues samples and the coral tissue sample. Funding is still being sought for this project. Dale Griffin suggested that in order to reduce the cost of the project break the project up into phases. Phase 1 should include installation of the groundwater wells. The wells can then be used for this project or by other researchers.

Joe Boyer led a discussion on the Port Everglades Pollutant Flux study, ***LBSP Project 29***. NOAA will deploy an Acoustic Doppler Current Profiler (ADCP) to measure the amount of water moving directionally in and out of the inlet by comparing surface and bottom water column movements in Port Everglades Inlet. The Navy has agreed to allow an ADCP to be mounted to their buoy. The Florida Area Coastal Environment (FACE) Program will deploy the ADCP sometime in spring 2009. A SeaKeeper auto sampler will be deployed at Port Everglades Inlet to collect surface and bottom water samples. The project will quantify and identify pollutants on a seasonal timeframe as well as identify fluxes of pollutants flowing from the inlet after rain events. Meteorological and atmospheric data will be incorporated into the final analysis. Models of pollutant fluxes will not be funded through this initial effort but will be developed later.

Chantal Collier gave an update on the 6th year of the Southeast Florida Coral Reef Evaluation and Monitoring Project (***LBSP Project 12***). FDEP-CRCP submitted a grant proposal which was awarded and will continue the project through 2011. Currently, there are three SECREMP sites in Miami-Dade County, four in Broward, three in Palm Beach,

and three in Martin. Additional funding was received to establish four new sites in 2009. The nearshore site in Palm Beach County has been covered by sand over for three years, so another site near this location will be created provide data for this habitat in this region. The other three new sites will be within the 32 mile stretch between the existing Broward and Palm Beach sites. Criteria for new site selection will be developed in 2009. Chantal welcomed suggestions for potential locations for the new sites. The plan is to identify the sites and have them marked in 2009 so monitoring can begin in 2010.

Presentation: LBSP Project 5 – Biomarker study

John Fauth, University of Central Florida, presented an update of LBSP Project 5 – biomarker study. Percent cover of *Lyngbya* and algae declined at all the project sites compared to 2005. In contrast, percent cover of sponges increased. The project team is waiting for good weather to get back out on the water and resample. John mentioned some coral lesions already have healed but there is high variability across sites; other coral lesions healed very little. Overall, coral regeneration rates appear higher than in 2005 but there is more variability within sites. Phil Dustan mentioned that his student, Drew Wham, sampled coral mucus, which was dominated by one or two microbial species. Lack of diversity could be a laboratory or sampling artifact or might be real dominance by a few taxa. Genotyping the microbes is a future goal of Drew's thesis research.

Presentation: LBSP Projects 8 & 9 - Miami-Dade and Martin Counties benthic habitat mapping project

Brian Walker, Nova Southeastern University & NCRI, was in the field ground truthing areas within the polygons he created for the Miami Dade mapping project so in his absence Nick Gadbois gave the presentation of *LBSP Projects 8 & 9*. Phase one of both projects is creating polygons that represent different habitat types based upon visual interpretation from LIDAR while Phase 2 involves acoustical ground truthing of the polygon areas. The benthic habitat maps for Broward and Palm Beach counties are complete and Miami-Dade and Martin are currently under development. Martin County Phase 2 has not yet proposed because Phase 1 was just funded and not complete. The objectives of the project are to create a GIS based benthic habitat map for the SEFCRI region, make all maps in the region compatible, and to develop benthic habitat data. Accuracy assessment was discussed and stated to be at 89% for the SEFCRI region mapping effort compared to 91% for NOAA's Caribbean wide mapping.

Bathymetric data of Miami-Dade has been assembled from data from several sources throughout the state. Draft habitat classification polygons have been created and are in the process of being ground truthed. Once the ground truthing is complete Brian will finalize a polygon map. The imagery helped to discern low reef patches from sea grasses. The end date of this project is June 30, 2009. Miami-Dade Phase 2, acoustical groundtruthing, has been included in the '09-'10 NOAA Coral Grant.

Martin County Benthic Habitat Mapping, LBSP Project 9, is being funded by the Florida Fish and Wildlife Commissions' State Wildlife Grant. NCRI are the principal investigators for the project and have issued a subcontract to The Blom Group to collect

Light Detection and Ranging (LIDAR) of the coastal waters. Surveys are expected to take place this winter and take 3-5 days. If the Martin County LIDAR cannot be collected this year due to weather, it will be collected next summer. The contract between NCRI and FWC is for three years so there is time available should there be any unforeseen delays. Jeff Beal suggested looking at this during the spring when there is better water clarity

Presentation: LBSP Project 27 – Quantify the flow rate and amount of pollutants being transported to the reef communities by groundwater

Dale Griffin, USGS, presented information on *LBSP Project 27*. Microbiology is completed for the first round of sampling. He is looking to quantify the flow rate and amount of pollutants being transported to the reef communities by groundwater by looking at wastewater compounds, pharmaceutical compounds, and microorganisms typically associated with wastewater. Samples were taken by pumping bottom pore-water into a sealed trough that was then pumped to the boat. The project will be completed within 6 months of the next round of sampling which is scheduled in early December.

Sample site information was discussed in depth. Inlet and outfall boil sites were unsurprisingly positive for certain microorganisms while two bottom water samples were surprisingly positive. The microbiology protocols were straight and enriched Polymerase Chain Reaction/ Reverse Transcriptase Polymerase Chain Reaction (PCR/RT-PCR) in standard single run or most-probable-number format. Enteroviruses were negative in the first round of samples.

Presentation: LBSP Project 33 – Identify sources and signals of LBSP in SE Florida using human enteroviruses as an indicator of fecal contamination

Carrie Futch, University of Georgia, gave a brief presentation on *LBSP Project 33* for Erin Lipp. She described the use of enteric microbes and sewage markers as markers for human waste. The objectives are to determine if reefs are exposed to and/or accumulating the microbes. From August 2007-2008 during the wet season, samples of water, coral mucus, and sponge tissue were acquired. Three areas were surveyed with eight samples each. Quantitative Polymerase Chain Reaction (Q-PCR) was used to analyze the 2008 data, so the 2007 analysis based on conventional PCR will be reanalyzed with Q-PCR. The surface water did have norovirus positive values. The inlet study consisted of onshore to offshore with surface and bottom sampled. For the 2008 incoming water samples, enteroviruses were negative. For the reef samples, one norovirus was positive at the surface water. Overall, outfalls contributed measurable amounts of fecal indicator bacteria (FIB). The inlet is a source of FIB and of viruses.

Pictures were shown of the plumes of fecal coliform and enteroviruses originating from the Port. Piero Gardinali asked about the quantitative measures based on the photos.

General Discussion

Nick Gadbois discussed the Florida DEP Coral Reef Conservation Program (FDEP CRCP) and new upcoming program efforts. He introduced the Marine Ecosystem Event Response and Assessment (MEERA) program in place in the Florida Keys and the need

to respond to algal bloom events in southeast Florida utilizing a similar program. The FDEP-CRCP plans to develop a program which will create an online reporting mechanism for anyone to provide a report on local disturbance events. The goal is to use this mechanism to gather the information required about an event and mobilize resource managers and scientists to survey the area, collect samples, and analyze associated data. There have been several Lyngbya blooms off southeast Florida since July.

Chantal Collier mentioned that there are challenges associated with responding to disturbance events along the reef tract. The recurring Lyngbya blooms need to be documented to facilitate our understanding of their extent and patterns over time. Protocols need to be created based on rapid response techniques. Chantal has already sent out a new draft protocol to be reviewed by scientists working on algae and monitoring; feedback is still incoming. Limited staff resources and existing workloads have prevented testing the protocol. Once the draft protocol is finalized, the present Lyngbya bloom will be researched if it is still persistent.

The FDEP CRCP MEERA program will be adapted from the current MEERA program and protocols employed by Mote Marine Lab. Nick Gadbois explained that the Mote staff receives reports of events then either visually inspects the site in question or has an outside agency respond to the event. Phil Dustan asked if dive shop divers that are regularly in the area could be used. Nick Gadbois said that training in the protocol, reliability and quality control are problems associated with this idea. Dive shops have limitations based on detail and desire to help and randomization is a problem. However, Chantal Collier mentioned Bleach Watch as a possible program to duplicate in this region and use dive shops as Bleach Watch reporters.

John Fauth passed out white paper packets for everyone.

Presentation: Saltwater Intrusion, Climate Change, and the Biscayne Aquifer

Mike Zygnerski, Broward County, gave an update of his work in northern Broward County, specifically the areas north of the Pompano Canal. He discussed the historical perspective of the study area and the dynamic relationship between freshwater and saline water over the last century, including the inland intrusion of salt water as well as its subsequent regression ocean ward. Effects of natural stresses such as sea level rise and rainfall variations as well as anthropogenic stresses including municipal well field withdrawals, canal level management, and land use changes. There has been a drastic change in population over the past few decades leading to agriculture replaced by urban development. Current water management is based on an intricate system of culverts, weirs, and pump stations that is highly managed and complex. Inland well fields have been constructed to augment coastal pumping. Over the past century sea level has risen by 24 cm. It is common along the coast that salinity increases with depth in the aquifer; however, preferential flow due to municipal pumping has created a perched saltwater wedge in this area.

The SEAWAT based model has simulated the period of 1900-2005 and was calibrated using the automated parameter estimation program PEST. The use of PEST allowed

heterogeneity to emerge throughout the model as dictated by the field data. Pumping of the coastal Pompano Beach Airport well field was shown to be the stress that may have influenced the landward movement of the saltwater front. However, when the Palm Aire well field was constructed and the majority of the pumping was shifted further inland the movement of the saltwater front shifted back out to sea. This seaward movement was also aided by above average periods of rainfall and improved internal canal management strategies. Simulations also showed raising freshwater heads at salinity control structures only had a localized consequence and was not as effective as raising canal level through the entire internal canal network. Model results also suggest that the combined effects of hydrological processes, such as well field withdrawals and sea-level rise, are nonlinear. Therefore, when individual stresses are paired, the combined effect is greater than the sum of each individual stress's effect. Four sea level rise predictions were simulated from 2006-2106: 0, 24, 48, & 88 cm. The greater the sea level rise, the higher the chloride content of pumped water within the well fields would result. Results from sea level rise of 24 cm showed small intrusion in Pompano well field. The 2001 Intergovernmental Panel on Climate Change (IPCC) mean projection of 48 cm showed 4 wells would have to be abandoned and with the upper estimate of 88 cm, half of the Pompano airport well field wells would be compromised by saltwater and the Broward County 2A, Hillsboro Beach, and Deerfield Beach well fields would also be threatened.

Ken Banks asked if the actual measured data was used in the model along with the IPCC data. Mike responded only the IPCC data was used in the model. Margaret Miller asked if moving the well field inland could buffer the intrusion and if there additional freshwater head was coming in from inside. Mike Zygnerski said freshwater discharge at the golf course help buffer the intrusion. It was asked at what depth the deepest wells in the region are dug. Mike responded deep wells in the Broward area are at ~3,000 feet. Mike said that surface water discharge did not have much of an impact on buffering salt water intrusion.

Presentation: Utilizing an Integrated Surface and Groundwater Hydrodynamic Model to Simulate Coastal Hydrologic Conditions and Transport

Eric Swain, USGS, gave a presentation on the hydrodynamic model developed by the USGS for Biscayne Bay. The objectives were to create an integrated model of Biscayne Bay and determine causes of hyper salinity. The model features consisted of flows from wetlands, aquifers, canals, and ground/surface water interactions. The project was conducted from 2006-2007. The model simulation period was 1996-2004. The hydraulic conductivity, the horizontal water movement, varies from 1500 – 9000 m/day. The coupled model is looking at leakage between bay and groundwater, tests for hypersaline conditions, and groundwater discharge pathways into the bay. The measured versus computed salinity for graphs shows a tendency to underestimate peak and trough issues. A video model of salinities over time was presented next. Hypersaline levels were consistent with less discharge. The cross section models showed a saltwater wedge. The saltwater intrusion line showed that the model simulation overestimates of intrusion at north Miami-Dade County.

Groundwater well plots were discussed. New research is showing various layers and levels of porosity of the aquifer.

This Biscayne Bay model is being added to the TIME model of Everglades National Park. In the future, the project will focus on temperature and salinity fluctuations for habitats, which is important for native species conservation.

Joe Boyer questioned the nutrient loads in Biscayne Bay from groundwater. Groundwater input compromises 5-10% of nutrients dominated by surface water; therefore groundwater makes up a smaller portion. However, groundwater is more significant on the Biscayne Bay side. Joe Boyer explained how a small amount of groundwater has big impacts due to the shallowness of the water. Piero Gardinali mentioned particle movement in south Biscayne Bay. This movement is heavily affected by the canal where convergence occurs due to recourse.

Presentation: South Florida Water Management District Program Update

Dan Crean, SFWMD, presented an update on the St. Lucie River Estuary (SLE) and Caloosahatchee River Estuary (CRE) water quality monitoring programs. Data from these programs were used to compare freshwater releases at two estuaries by researching nutrient and hydraulic loads over an 11 year period from Lake Okeechobee. Freshwater and thus Nutrient loads to the CRE are greater than to the SLE. Total phosphorus and nitrogen tend to be greater in the discharge from the C44 to the SLE. 28% of Phosphorus and 55% of Nitrogen in the CRE were contributed by Lake Okeechobee through C-43. Greater than 90% of the load to the SLE via the C44 canal is contributed by Lake Okeechobee.

Overall, a small increase in water flow changed the salinity in the CRE while the SLE needed much more freshwater influx to change. The CRE receives three times more water than the SLE. Basin generated loads for the C44 and C43 canals are significantly different. 90% of the loads from Lake Okeechobee flow into the SLE via the C-44. Monthly discharges to the SLE do not seem to have a significant effect.

The SLE water quality monitoring program consists of thirteen stations with three segments: the main portion, the south fork, and the north fork. The five fixed insitu stations receive temperature and salinity data. From 1993 through 2003, data was surveyed and compared. Salinity dropped dramatically in the wet season; it is more linear in the dry season. The color is the same in the north and south fork during the dry season. During the wet season, the north and south differ due to storm events. The total nitrogen does not react to wet/dry seasons, and is not impacted. There are huge loads of total phosphorus that stay high during the dry season and rise dramatically during storm events in the wet season. During storm events in the wet season, color masks the nutrient loads into the system as the colored and nutrient laden water encounter the salt water wedge color and particulates begin to fall out of the water column allowing sunlight to reach the nutrients greatly increasing the potential for a phytoplankton bloom.

The Indian River Lagoon (IRL) water quality monitoring program consists of twenty-one sites sampled seven times a year. Salinity tends to increase during the dry season and decrease during the wet season. Total nitrogen spikes in the receiving waters of the Indian River Lagoon due to inputs of the nutrient laden waters from the SLE. Phosphorus loads tend to increase in the wet season and decrease in the dry season. The color directly impacts sea grasses. Jupiter has low color values and therefore the best sea grasses. St. Lucie and Fort Pierce inlets contribute high volumes of nutrient laden freshwater during the wet season which can adversely impact the sea grasses in the IRL.

The presentation continued with discussions on future research based on new technology, the Microlab insitu water quality analyzer. The unit can remotely sample nutrients using wet chemistry for a month before needing new reagents. Sampling occurs every two hours with physical parameters sampled at two depths every fifteen minutes. Weather is sampled as well. This means pre-, during, and post event monitoring. Questions about the deployment locations were discussed. Safety issues were addressed based on vandalism. The unit costs \$65,000 which represents a large cost savings over a 4-5 year period. To sample by hand costs 900,000 per year. Phil Dustan asked why they chose microlabs. Dan responded that other units tested did not meet our requirements

Public Comment:

Dan and Stephanie Clark, Cry of the River gave public comment

Presentation: Reef Assessment Using Remote Sensing and In Situ Optics

Eric Hochberg, Nova Southeastern University, gave a presentation on remote sensing and bio-optics for coral reef assessment. He gave a basic introduction to how remote sensing works, and he explained that imagery can come from either airborne or satellite platforms. Data are available from governmental and commercial sources (e.g., Ikonos, Quickbird). He showed some example products, including traditional mapping of benthic communities, as well as mapping percent-cover of bottom-types.

Eric addressed the Lyngbya issue, presenting case study by Roelfsema et al. that demonstrated Lyngbya detection/mapping in Moreton Bay, Queensland, Australia, using Landsat. Based on field spectra, Lyngbya should be distinguishable from other bottom-types, but Landsat has some limitations. The bottom line is that remote sensing and field surveys complement each other greatly. Field surveys are very accurate, but cover only small areas. Landsat is less accurate, but gives a synoptic view. Other sensors have the potential to be more accurate than Landsat. The Roelfsema approach could easily be implemented in Florida.

Finally, Eric presented his work on measuring coral pigment concentrations and zooxanthellae densities using a spectrometer. The optical method is diver-operated, easy to use, cheap, non-invasive, and very accurate. It works for both bleached and fully-colored corals. The method is still under development; Eric needs more data to make the bio-optical model applicable across coral species, morphologies, and conditions.

John Proni asked about coverage percentages and how often the data coverage is available. He also wants a good understanding of depth and contamination issues and how in situ measurements might work into a set. John then asked about the spatial extent of plumes from dredging. Eric said this was not a good idea based on the shortness of the event, though repeat coverage from airplanes might be useful.

Chantal Collier asked about color discrimination and clarity limitations. Eric said there are limitations with remote sensing like there are for other high resolution imagery. Ken Banks mentioned research on stratification of plumes. Eric suggested using LIDAR for this because LIDAR uses multiple returns. Judy Lang asked if LIDAR was previously used to study a plume or stratification. Eric said it was noted that it was possible but that it has not been tried.

Presentation: Southeast Florida Coral Reefs – Impacts of Land-Based Pollution Document

John Fauth, University of Central Florida, presented the updated “Impacts of Land-based Pollution” document to the committee and asked for additional suggestions and comments. The objectives of the document are to create a document target toward 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. John Fauth also wants to include data about pollution sources and impacts of pollution on the coral reefs, personal accounts of reef degradation over time, and illustrations to clarify the issues.

Editing and formatting of the document began with discussions about a title change in order to grab the audience’s attention. Chantal Collier suggested using before and after pictures of the coral reefs on the cover. Multiple discussions were about personalizing the reefs as ‘your gold coast reefs’ - giving possession to the Florida residents.

Other brainstorming ideas included:

- Joe Boyer mentioned including all the names of the members of the Technical Advisory Committee at the end of the document and a heading stating the need for clean water.
- Chantal suggested using an analogy such as ‘returning the favor’ to the reefs to illustrate the point of the importance of reefs.
- Judy Lang mentioned the public has a high opinion of terrestrial habitats because terrestrial habitats are seen every day, reefs are not. She suggested comparing terrestrial habitats to the reef ecosystem.
- Troy Craig suggested using positive language throughout the document to keep the tone positive which may ensure action by both the policy makers and the general public.
- Dale Griffin recommended incorporating information about new polyps and coral recruits as something “new” to protect by mentioning the thriving areas throughout the reef system. Dale also suggested placing a picture of the plumes at the inlets next to the bullet points.

- Judy Lang mentioned using ‘we’ versus ‘everyone’ phrasing in order to promote responsibility.
- Margaret Miller said technical information needs to be added.
- Dale suggested creating a two page fact sheet to give to politicians. Resource managers need a short and sweet document to bring to policy makers. Piero Gardinali wants an “owner’s manual for reefs” with scientific information.
- Margaret said carbon footprints and CO₂ should be included in the document.

It was decided to create a 2 page fact sheet about the southeast Florida coral reefs. John Fauth will create the document. He asked for additional information and suggestions be emailed to him.

Day II, November 7th, 2008

Nick Gadbois welcomed the TAC back to the meeting. He reviewed the facilitator roles, meeting guidelines, and the agenda.

Presentation: Comprehensive Everglades Restoration Projects Benefiting Estuaries

Dewey Worth, SFWMD, gave a presentation on Everglades restoration projects.

Flood Control District and Purposes - This project is known as the Central and Southern Florida Project (CSF Project). He discussed the major subdivisions of the Everglades and their specific regions and ecosystem importance. The major features of the project are the Herbert Hoover dike restoration, water conservation areas, protective levees, and drainage network and river channelization. Dewey discussed the water control structures and their intentions to hold water during the dry season and then get rid of it as quickly as possible during the wet season to control flooding. A historical overview of the drainage networks was given (see presentation).

Impacts on the Everglades System - The amount of land throughout the Everglades has been reduced by 1/3 in terms of total spatial area due to compartmentalization from agricultural and urban development. The major issues for both of these regions are water supply, too much or too little water. Both areas are plagued with either flooding or drought conditions Restoration efforts should help to restore historic flows to the Everglades alleviating these concerns.

Comprehensive Restoration Project was authorized by congress in the Water Resources Development Act of 1992. This project led to the adoption of a formal Everglades restoration plan which is comprised of 68 components for restoring the historic sheet flow to the Everglades and will be implemented over a 35 year time period.

Projects to Improve Conditions - Quantity, quality, timing, and distribution are the major areas to be improved through the restoration efforts. 15 surface water storage reservoirs will be used to restore natural systems, and be used as water treatment areas. Some of the reservoirs have already been created while others are still under development.

Northern Palm Beach County - This section of the project focuses primarily on restoration of natural flow to the Loxahatchee River by concentrating on flows through the Loxahatchee Slough and Lake Worth Estuary. Water treatment and storage areas are being used around these locations. Phil Dustan asked about evaporation and adiabatic cooling driving thunderstorms and suggested some tree coverage to reduce the rate of evaporation. Dewey said the SFWMD is aware that evaporation will occur uncontrollably. Phil then asked if seepage is occurring out of the reservoirs. Dewey gave an example of the L8 reservoir where there is very little water movement due to its historical use as a rock mine. Therefore, 90% of the water stays allowing more volume to be stacked to reduce the evaporation rate. He said geologic structures are being taken into consideration to reduce water loss to seepage.

West Basins in Broward County - Urban development in the western portions of Broward County causes unique problems for the restoration efforts. Blasting, water table height, proximity to urban areas, mean dike construction and levee heights are a few issues facing this region. Runoff from these urban areas will also likely enter the canals further degrading water quality to the coastal area.

Indian River Lagoon Project - Several major hydrological changes were caused by previous development: less water storage areas and higher peak stormwater runoff, less water flow, and higher total nitrogen & phosphorus levels. A future goal for the Indian River Lagoon project is to incorporate more storm water treatment areas and direct the flow back into the St. Lucie and north fork systems to provide more flow during the dry season.

Comprehensive Everglades Restoration Program - The goal of this program is to create aquifer storage and recovery areas. Currently, a number of test systems are being used, and additional systems will be built throughout the region. Once complete a total of 300 will be in use throughout the area.

The Key Restoration Project - This project will return natural flow patterns and distributions in the central Everglades by backfilling canals. Future efforts will restore the western flow as the major component of the drainage by removing barriers, canals, and internal levees. Problems with this plan are the effects on seepage out of the Everglades and future flood burdens on urban areas. Due to the cost of this project a federal and state partnership has been established with each paying 50% of the project cost.

The overall budget is expected to be \$10.9 billion over 35 years. This will include \$10 million per year for monitoring and \$172 million per year for operation and maintenance. A large amount of the funding will be going to land acquisition (acquisition is currently at 50% projected).

Chantal Collier suggested using the Microlab system that Dan Crean discussed to help reduce costs. She inquired about a potential cost sharing option and possible funding from FDEP for pilot level monitoring along the reef tract. Dewey said that could be an

option and would follow up with her after the meeting. John Proni said this plan is being applied to address the water needs in the St. Johns River area.

John Fauth mentioned: northern agricultural areas with livestock and fertilization concerns still may affect the water quality of Lake Okeechobee. He asked how the plan integrates these areas and the resultant Lake downstream areas. Dewey Worth responded a large section of the Lake Okeechobee Plan looks at pasture areas, reservoirs, and the STA north of Lake Okeechobee. Projects will include areas to treat that water before it reaches the lake in hopes of reducing nutrient loading

Joe Boyer asked how the water from the north that's flowing east and west is going to be diverted south when obstacles such as the Tamiami Trail block the flow. Currently, the Tamiami Trail only has one, one-mile long bridge. Dewey responded that the system at the Trail must be reengineered. The Trail will have to be elevated but where and for what distances still needs to be determined.

Development of LBSP Project Scope of Works/Next Steps for LBSP Projects

Nick Gadbois began discussions about the current unfunded LBSP Projects and if each project should still be pursued through this current Local Action Strategy.

LBSP Project 18 – Determine Areas for Additional Biological and Water Quality Monitoring

Nick Gadbois comment that programs such as TMDL, Superfund and others agency initiatives as well as portion of *LBSP Project 21* identifies pollution hot spot areas of concern. He suggested the project not be pursued. Phil Dustan seconded.

Nick said he would e-mail the LBSP Focus team and LBSP TAC to vote if each project should still be pursued through this Local Action Strategy.

LBSP Project 25 – Long-Term Water Quality Monitoring

The pilot water quality monitoring project will consist of collecting samples from the 17 SECREMP biological monitoring locations. The FDEP-CRCP has submitted a funding proposal for one year of monitoring to NOAA. Judy Lang asked if microbiology monitoring was included. John Proni said another project through FACE was researching microbiology and source tracking. Dale Griffin commented that wastewater sampling can be done but is extremely expensive. Piero Gardinali said he could help run the analyses for organics in each sample. Peter Swart said that N-isotopes in the water column should also be studied. Margaret Miller asked if samples could be archived to leverage funding to analyze the samples at a later time. Everyone agreed that could be done but a location needs to be found to house the samples. John Proni said (for one year at 14 sites, 3 depths, once a month, plus 6 tracer studies) the ship costs total \$900,000. This cost is reflective of a research cruise and not a smaller vessel which would have to be used for inshore sample collection. Chantal Collier said the funding status won't be known until at least March 2009. She said it is the highest priority project that has been submitted for this year.

LBSP Project 28 – Determine flux of pollutants from the wastewater outfalls

Nick Gadbois asked John Proni if the FACE program is determining the flux of pollutants from the outfall. John Proni said FACE is monitoring the outfalls and will be starting a study that evaluates the vertical mixing of the effluent plume using tracers. Margaret Miller said the bulk of this project was already being covered. Dale Griffin motioned not to spend the money if FACE is conducting this work; Margaret Miller seconded.

LBSP Project 30 – Determine the flux of pollutants from oceanic sources

Nick Gadbois recommended continuing to move forward identifying and quantifying pollutants entering coastal waters from oceanic sources. The objective of this project is to determine the pollutant concentration on reefs when high density water is upwelled. John Proni explained that upwelling occurs throughout the year based on six years of data collected by the FACE program at multiple locations throughout south Florida. FACE has found 14-degree temperature drops with upwelling events. John hopes it will become a continually funded government program.

Peter Swart asked if there is sufficient data to determine when seasonal upwelling events occur and how each upwelling event affects nutrient loads along the reefs. John Proni responded that FACE has long term data of upwelling events along the coast John Proni want to begin collecting water samples during upwelling events to measure nutrients and wants to incorporate isotopic work. Chantal Collier said temperature loggers have been deployed at the SECRMP stations. This data can be compared to the FACE programs temperature/upwelling data. John Proni said the FACE's results are available but not yet published due to staffing issues. Chantal Collier asked about future plans for publishing the data. John Proni said the FACE data will be released soon since the first report has been recently completed. Margaret Miller said that LBSP Project 30, determine flux of pollutants from atmospheric sources, could compliment the efforts of the FACE program. Dan Crean mentioned a data sampler could be used in place of divers to collect water samples. John Proni said their auto sampler is simple and they would be willing to implement the system. Phil Dustan asked about the amount of money for the system. Dan Crean said \$12-15,000. John Proni said a major deployment of 17 samplers may occur at the end of summer 2009.

Margaret Miller and Dan Crean were tasked with developing a scope of work for LBSP Project 30.

LBSP Project 31 – Determine the flux of pollutants from atmospheric sources

Nick Gadbois recommended continuing to pursue LBSP Project 31 – determine the flux of pollutants from atmospheric sources. He suggested to include an inland monitoring site to compare to coastal monitoring locations. Dale Griffin mentioned they work with stations in the area near Port Everglades. The data from these stations needs to be analyzed. Phil Dustan asked about the local atmospheric pollution from ships. Ken banks responded that the ship coming into and out of the port will have an influence on the atmospheric deposition. John Fauth suggested revising the budget: 50% to look at the current data and find gaps. Everyone agreed to have a data mining project. Peter Swart said atmospheric inputs are major culprits of nitrogen in the coastal oceanic regions.

Stephanie Clark asked if the dust could be correlated with specific spatial origins. Dale Griffin responded that they could not with the system they are using. Dale Griffin, Piero Gardinali, and Peter Swart were deemed as the members of the team and tasked with developing a scope of work for the project. Dale Griffin mentioned using a graduate student to help with this project. He said he would take the lead on the project and would create a scope of work.

Public Comment:

Dan Clark, Cry of the Water, gave public comments

Continuation of the Impacts of Land-Based Pollution Document

John Fauth, University of Central Florida, continued his talk on the “Impacts of LBSP” Paper from Thursday by discussing the new changes. A two-page, bulleted document, formatted as a quick start guide was created. Images will be used throughout the document to illustrate bulleted points. Nick Gadbois e-mailed the TAC members a copy for review. The new document will use ‘Gold Coasts Reefs’ to refer to the Southeast Florida Reefs and use ‘our’ phrases to refer to the reefs to make the document more personal.

Other brainstorming ideas included:

- Judy Lang suggested adding a picture of storm water draining into a canal to show a contamination source.
- Chantal Collier mentioned including in the document the need to establish a long-term water quality monitoring program and as well as the necessity to continue and expand the existing research efforts.
- Ester Peters recommended to mention a ‘why we should protect the reefs’ section to again specify the importance of the reefs.

Nick Gadbois agreed to email the revised impact paper to the TAC members for review. Chantal Collier expressed needing to have the finalized paper when she goes to Washington, D.C. in February to pass out to the lawmakers she encounters. Nick Gadbois set a deadline for comments on the white paper for the end of next week.

TAC Administrative Business

Nick Gadbois closed the meeting by asking for dates for the next meeting. Ester Peters requested that it not conflict with the 2009 International Marine Conservation Congress in May 20-24. Nick Gadbois suggested the May 7-8th or 14-15th as possibilities to be considered. Nick will e-mail everyone a date preference form to gain consensus for the next meeting.

Nick Gadbois adjourned the meeting at 12:43 pm.

Action Items

No.	Action Item	Responsible Party	Date
1	Distribute electronic copy of the LBSP Impact Paper	John Fauth	None
2	Set the next TAC meeting date	Nick Gadbois	None