Southeast Florida Coral Reef Initiative (SEFCRI)
Land Based Sources of Pollution (LBSP)
Technical Advisory Committee (TAC)
Meeting #11
Report of Proceedings
November 12 - 13, 2009

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

TAC Members:

Name	Affiliation	Nov 12	Nov 13
Joseph Boyer	Southeast Environmental Research Center, Florida International University	X	X
Hal Davis	US Geological Survey (USGS)		
Richard Dodge	Nova Southeastern University	X	X
Phil Dustan	College of Charleston, South Carolina	X	X
John Fauth	University of Central Florida	X	X
Piero Gardinali	Florida International University	X	X
Dale Griffin	USGS	X	X
Vladmir Kosmynin	Florida Department of Environmental Protection (FDEP)	X	X
Judy Lang	Atlantic and Gulf Rapid Reef Assessment (AGRRA) Project	X	X
Brian Lapointe	Harbor Branch Oceanographic Institution (HBOI)	X	X
Erin Lipp	University of Georgia		
Margaret Miller	National Oceanic and Atmospheric Administration (NOAA)	X	X
Valerie Paul	Smithsonian Marine Station at Fort Pierce		
Esther Peters	George Mason Universito	X	X
Shinn, Gene	University of South Florida	X	X
Alexander Soloviev	Nova Southeastern University		
Peter Swart	Rosenstiel School of Marine and Atmospheric science (RSMAS)		
Judy Gray	NOAA		

Organizing Committee Members:

Name	Affiliation	Nov 12	Nov 13
Ken Banks	Broward County Department of Planning and Environmental Protection (DPEP)		
Nancy Craig	Broward County Environmental Protection Division (EPD)		
Richard Harvey	U.S. Environmental Protection Agency (EPA)		
Linda Brien	FDEP		

Cheryl Miller			
Wendy Wood-Derrer	Nova Southeastern University		
Chantal Collier	FDEP Coral Reef Conservation Program (CRCP)		
Nicholas Gadbois	FDEP CRCP		

Guests:

Name	Affiliation	Nov 12	Nov 13
Andrew Shepard	University of North Carolina at Wilmington		
Jack Stamates	NOAA		
Lew Gramer	University of Miami		
Christopher Boykin	FDEP		
Joanna Walczak	FDEP		
Troy Craig	FDEP		
Kevin Hemle	NOAA AOML		
Brian Walker	NSU		
Dave Gilliam	NSU		
Alison Moulding	NSU		
Kathleen Semon	Smithsonian Marine Station at Fort Pierce		
Chris Maingot	NSU		
Chris Sinigalliano	NOAA		
Ken Weaver	FDEP		
Russ Frydenbord	FDEP		
Andrea Livergood	NOAA		
Lou Fisher	Broward County NRPMD		
Stephanie Clark	Cry of the Water		
Dan Clark	Cry of the Water		
Greg Hendricks	USDA NRCS		
Ed Wright	USDA NRCS		
Sara Thanner	Miami-Dade DERM		
Jeff Beal	FWC		
Steven Blackburn	EPA Atlanta, GA		
Maribeth Gidley	NOAA AOML		
Thomas Carsely	NOAA AOML		
Dana Mendez	NOAA CRCP		
Dusty Marshall	NSU		
David Palandro	FWRI		
Joe Holland	Fort Lauderdale		

MEETING SUMMARY

DAY ONE, Thursday, November 12, 2009

Meeting Guidelines

Nick Gadbois, Florida Department of Environmental Protection-Coral Reef Conservation Program (FDEP-CRCP), welcomed the members, presenters, and observers to the 10th SEFCRI LBSP TAC meeting. He introduced himself and Chantal Collier, FDEP-CRCP, as the facilitators for the meeting. Nick reviewed the roles of the facilitators and observers and the guidelines for participation. Hard copies of the guidelines were provided in a folder for each member. The public was invited to fill out comment cards, submit them to the staff, and speak during the public comment period. Attendees were reminded to fill out meeting evaluation forms before end of the meeting on Friday.

Presentation: Update – LBSP Project 5: Conduct a biomarker study to identify and trace specific contaminants that negatively impact coral reefs

The purpose of *LBSP Project 5: Conduct a biomarker study to identify and trace specific contaminants that negatively impact coral reefs* is to determine how LBSP affect southeast Florida coral reef ecosystems and the links between pollution and coral reef resources.

John Fauth, University of Central Florida, presented the updates for the project. Land-based sources of pollution (LBSP) and other stressors directly impact the molecular and cellular functions of corals. Defenses to stressors are overcome at increasing organizational levels and the effects of pathologies of individuals progress to the colony, population, and community. Effects examined at the cellular level can be detected much sooner than at higher organizational levels. Efforts of the project are to identify the sources of stress to corals and the effects on their physiology, ecology, and structure of using biomarkers and contaminant analysis. Biomarker sites include areas near outfalls and inlets and control sites at locations that may not be affected by outfall or inlet waters. Preliminary results showed corals at the control and inshore sites showed positive regeneration of the removed tissue. Corals at other sites showed stasis of lesions and a deep water site off of Port Everglades showed expansion of lesions. One more field recon visit will be conducted prior to the end of the contract to monitoring lesion recovery. A captive planula settlement experiment was conducted using *Porites astroides* at the Nova Southeastern University Oceanographic Center. Seawater from the control and experimental sites and artificial seawater was used to identify settlement rates of planula in the different waters. There were no significant differences in settlement rates, with all groups having overall low settlement. The final report for the project is due in December, 2009. The biomarker analysis will be completed within the next few weeks and a reciprocal transplant study will begin next year.

Phil Dustan, College of Charleston, mentioned that lack of genetic diversity in the population of corals in southeast Florida may indicate a genetic bottleneck in the population. Gene Shinn asked if the conclusion is that the inshore sites are doing better

than the offshore sites. John responded that the results from this year are not as conclusive as last year and there is still one more time interval to be analyzed. John also mentioned light difference between the inshore and offshore sites may be a possible factor affecting results. He stated that light, temperature, and other conditions have been found to be factors affecting coral health in other studies.

Presentation: Update – LBSP Projects 8 and 9: Miami-Dade County and Martin County benthic habitat mapping

The purpose of *LBSP Projects 8&9: Establish a sub-work group responsible for generating required maps* are to establish a sub-work group and acquire and overlay information to map the benthic habitats of Broward and Palm Beach Counties.

Brian Walker, Nova Southeastern University, provided an update for the benthic habitat mapping projects. The greater objective is to create a geographic information system (GIS)-based benthic habitat map for the southeast Florida region. Brian has created the maps for Broward and Palm Beach Counties and is currently developing the mapping for Dade and and is leading the Martin County mapping effort. The Miami Dade County and Martin County maps will be created using similar methodologies as the previous mapping projects; scale, minimum mapping unit, and classification scheme. Coral reef acoustic mapping has been conducted for Broward and Palm Beach Counties. The Acoustical mapping assists with distinguishing benthic substrates. The mapping effort is a 2 phase approach. Phase I involves visual interpretation of light detection and ranging (LIDAR) imaging and aerial photography of large-scale features. Phase II involves acoustic ground discrimination (AGD) the use of biosonics and other techniques to map features within reefs. Greg Foster and Bernhard Riegl of Nova Southeastern University have been involved with analyzing the AGD data and have developed a gorgonian canopy cover model to identify gorgonian coverage along the reef.
Phase 1 for Martin County was funded through Florida Fish and Wildlife's Legacy Initiative Grant Program. Light detection and ranging (LIDAR) bathymetry was collected last year by the Blom Group. Reflights will occur this winter/early spring to pick up areas that had noise in the data. Once the LIDAR is completed GIS polygons will be created to identify the benthic habitats and groundtruthing of the polygons can commence. A stratified random design will be used to find accuracy assessment points, and these will be incorporated into the map to finalize the polygons. Phase 2 for Martin County is currently unfunded. Benthic habitat maps have been completed for Dade, Broward, and Palm Beach Counties. AGD has been completed for both Broward and Palm Beach Counties. AGD for Dade has been funded through the NOAA CRCP management grant and has been contracted to Nova Southeastern University National Coral Reef Institute (NSU NCRI) . The AGD will commence this winter/early spring 2010.

Mapping completed by the project through Palm Beach and Dade Counties:

600 km^2 of habitat
220 km^2 of coral reefs

320 km^2 of unconsolidated sediment
53 km^2 of seagrass
15 km^2 of artificial reefs and inlet channels

Brian also stated that he will be conducting a quantitative benthic biological study in Martin County to identify benthic resources. This project was funded through the NOAA CRCP. Brian will use 3 - 50 meter transects at different locations throughout Martin County.

Gene Shinn asked why LIDAR was flown in the winter. Brian responded there was simply an unfortunate scheduling problem with the company used to perform the LIDAR. The company agreed to fly over areas of missing data in December. Phil Dustan asked about the use of transects in the project. Brian replied the choice of transect number and size was chosen to give the best representation of coral cover and habitat type, keeping in mind that some areas are believed to have very little or no coral. Dale Griffin asked if all of the mapping effort by different projects and agencies is an overlap of effort and money. Brian replied that the different projects have been targeting different objectives. It was asked how much the LIDAR for Martin County cost. Brian said a deal was made with the Blom Group to fly both Biscayne Bay for FWC and Martin County For FDEP. Each area was given at a reduced rate. The total cost was approximately $310,000.

Presentation: Update – LBSP Project 11: Establish an integrated management system (IMS) with Florida Fish and Wildlife Research Institute (FWRI)
The purpose of *LBSP Project 11: Develop an integrated management system (IMS) with Florida Fish and Wildlife Research Institute (FWRI)* is to develop an IMS to visually present LBSP and related southeast Florida coral reef data from the different local, state, and federal agencies.

Nick Gadbois, FDEP CRCP, gave an update of the project. Through *LBSP Project 11,* an integrated data management system was developed in 2007 in conjunction with the Florida Fish and Wildlife Research Institute. FWRI is contracted to continue hosting and maintaining the website through December 2010. Nick Gadbois said increased outreach is needed to inform the public about the website and its uses. Nick showed the TAC the different datasets currently available for viewing on the IMS website. Nick stated this project can be used to assess the data for potential impacts to the coastal environment.

Examples of the GIS data include:

Biological monitoring stations
Benthic Habitats
Groundwater Contamination areas

This and other information regarding the IMS project can be viewed at
http://ocean.floridamarine.org/sefcri/splash.html

It was asked whether there is one site where all of the GIS data from every agency can be

seen. Nick and Brian Walker answered that data is currently available but not in one central location. To access the data you have to go to each respective agency's website.

Presentation: Update – LBSP Project 12: Expand the Florida Keys Coral Reef Evaluation and Monitoring Project (CREMP) to Southeast Florida (SECREMP)
The purpose of *LBSP Project 12* is to expand the CREMP project to include southeast Florida (SECREMP) and to assess and identify any gaps in data.

Chantal Collier, FDEP-CRCP, gave a status update of the Southeast Florida Reef Evaluation and Monitoring Project (SECREMP) and reviewed its grant funding. She clarified that the DEP website has reports from all completed SEFCRI projects including the completed projects presented here today. The sites that are being monitored through SECREMP have been done so since 2003. There has been little change in the sites for the duration of the experiment, with incidence of disease in 2008 less than in 2007. Macroalgae and octocorals are the two non-substrate functional groups with the largest coverage area in the region. There is a new three-year funding cycle for monitoring in the region including four additional sites through 2011. Efforts this year included identifying new sites in Miami Dade and Palm Beach counties. Large areas with no coverage have been identified in Broward, Palm Beach, and south of Miami-Dade, and coverage is necessary in these areas for a better understanding of the regional perspective. Initially, choosing sites by opinion of where more information was needed was considered, but a stratified random design was chosen, which is consistent with the roles of SECREMP to get a larger view of the area. Geographic area and reef habitat were selected first, with random points generated within these areas. Both inshore and offshore sites were selected. The sites were visited to see if the point was viable and met the general criteria. Palm Beach County currently has two sites identified in addition to two selected in Miami-Dade County.

Dale Griffin and Vladimir Kosmynin asked about the method of selection of sites, and whether they were being selected and rejected based on a priori knowledge of the site. Chantal reasserted that the criteria for the site must be met within the stratified random method of selection. The objective is to get an understanding of regional status and trends. If the site was unique and did not represent the area, it was rejected.

Information on this and other projects can be viewed at
http://dep.state.fl.us/coastal/programs/coral/reports

Presentation: Update – LBSP Project 21: Conduct a technical workshop to evaluate the outcomes of LBSP Project 3/19
The objective of *LBSP Project 21:A technical workshop to evaluate the outcomes of LBSP Combined Project 3 & 19* is to assess the data collected in *LBSP Combined Project 3 & 19: Survey agencies about LBSP programs and best management practices.*

Chantal Collier, FDEP CRCP, presented the update for this project. Fred McManus, EPA, began the study by mailing out surveys to agencies that have existing guidelines and best management practices (BMP's) in place for pollution-generating activities. Since

then, over one hundred surveys have been sent out, with a 33% retrieval rate. Interviews have also been conducted with the parties that returned surveys. During the interviews additional information about the programs in place was acquired as well as any additional programs that may have been left out of the survey. All of the data has been compiled into a database and has been reviewed by the Center for Watershed Protection (CWP), hired directly by NOAA. CWP developed a report outlining their findings in gaps in best management practices and provided recommendations to fill the identified gaps. Workshops are going to be held next year to present the findings and extract more information from meeting participants about hot spot issues of concern in south Florida. The data collected during the workshop will incorporated into the initial report.

Nick was asked to expand on the goals of the workshops. He stated that identifying areas of concern are important outcomes, so that follow-up projects (*LBSP 23*) can be effectively constructed.

Presentation: Update – LBSP Project 24: Educate and inform stakeholders, including the general public, about the value and importance of the coral reef ecosystem of southeast Florida, land-based sources of pollution, pollution impacts on the resource, and the strategies recommended to address the problems
The purpose of *LBSP Project 24: Educate and inform stakeholders, including the general public, about the value and importance of the coral reef ecosystem of southeast Florida, land-based sources of pollution, pollution impacts on the resource, and the strategies recommended to address the problems* is to educate and change stakeholders' behaviors in an effort to reduce LBSP impacts on coral reefs through working in close cooperation with the Awareness and Appreciation focus team.

Nick Gadbois provided the update for the outreach project. Brochures have been developed for public outreach addressing LBSP and the coral reef ecosystem in southeast Florida. Cheryl Miller having developed the first fertilizer brochure for the project. Cheryl's brochure has been revised to include information about pesticide and herbicides and their impacts on water quality and coral health. The target audience is the purchasers of fertilizers, pesticides, and herbicides. The brochures will be distributed at local retail chains and nurseries. A second brochure is currently being developed that provides information about the southeast Florida watershed and its associated coral reefs. A technical writer is being used to insure proper language use and format for the public. Reaching retail chains, mom-and-pop shops, and nurseries will also be a main focus of effort. Recommendations for usages and less harmful alternatives will be suggested. Partnering with other outreach efforts in the 4-county area (Miami-Dade, Broward, Palm Beach, and Martin Counties) is also an objective.

Phil Dustan related through his own experience that radio shows talk shows, and other forms of public outreach through the media can be used. Broward County has people who can reach the target audience. It was commented that fertilizers have a lot of phosphorous, which consumers do not realize adds no benefit to their lawns. A few well-placed letters to retail chains could be very effective. Nick added that handing out soil test kits was also considered. Piero Gardinali pointed out that sales interactions often

result in the most powerful herbicides and pesticides being sold to customers to fulfill their requests for effectiveness on a wide range of insects and plants. A gallon of something that "kills everything" is being pushed as a good product to use.

Presentation: Update – LBSP Project 25: Establish a long-term regional water quality monitoring program (pilot project)
The purpose of *LBSP Project 25: Establish a long-term regional water quality monitoring program (pilot project)* is to to establish a long-term regional water quality monitoring (WQM) program for the southeast Florida coral reef system.

Joe Boyer, Florida International University, presented the update of the water quality monitoring program. Dave Gillian and Richard Dodge, Nova Southeastern University, are heading the project. The goal is to set up a long-term water quality monitoring program in the SEFCRI region. Other outcomes include the establishment of baselines for other research projects in the area. Very little water quality assessment has been done in the area. Identification of impacts from upstream management activities is an objective. Quarterly sampling will take place at the 17 SECREMP Sites from surface and at depth. Attempts will be to include a larger area using the Florida Aerial Coastal Environment (FACE) program which will be conducting monthly samplings near the SECREMP stations. A stratified random design is going to be used to help coordinate the FACE and the SEFCRI water quality monitoring efforts. Temperature-salinity, oxygen, and light curves will be generated, so that density can be calculated. Surface and bottom grab samples will be analyzed for nutrient concentration.

Dale Griffin asked about the validity between the techniques of acidifying versus freezing samples. Joe replied that the QA for the technique being used in the project (freezing) was accepted in the Keys since 2005, so it is assumed that it will be used in this study area as well. There are many different variations on the sampling preservation techniques in the literature. Dale reasserted that the DEP must follow their own standards or the methods will be called into question later on. Acidifying the samples was the agreed upon technique by the DEP. Joe added there is a proposal in for a second year of the project which will include an additional 5 sites.

Presentation: Update – LBSP Project 30: Determine the flux of pollutants from oceanic sources to coastal waters
The purpose of *LBSP Project 30: Determine the flux of pollutants from oceanic sources to coastal waters* is to quantify pollutants from oceanic sources entering the reef environment and contribute to the development of a mass balance budget for the region.

Nick Gadbois, a FDEP member, gave an update of the upwelling study. Originally, this project was proposed for July, 2010. Alex Soloviev, Nova Southeastern University, has ten years worth of data that has not yet been analyzed and there is one more year of monitoring intended. Grant money or other funding will be sought for the completion of these objectives.

Presentation: Update – LBSP Project 32: Identify sources and signals of land-based pollutants in southeast Florida using stable isotopes as a sewage signal in octocorals and macroalgae/*Lyngbia* tissue

The purpose of *LBSP Project 32: Identify sources and signals of land-based pollutants in southeast Florida using stable isotopes as a sewage signal in octocorals and macroalgae/Lyngbia tissue* is the use of stable isotopes to trace and identify the links between pollution and coral reef resources.

Nick Gadbois presented the update for the isotope study. This project will begin in the next few months. The purpose of the project is to identify sewage signals in macroalgae and cyanobacteria. The Smithsonian Marine Station will be collecting samples and the Florida International University (FIU) lab will be running samples for stable isotope analysis. The fractionation and assimilation factors for a cyanobacterium *Lyngbya* and a macroalga *Dictyota* will be measured for carbon-13 and nitrogen-15 isotopes over one year. A dosing experiment will take place at the Smithsonian lab. Algae samples and water will be collected from the sample locations, including the Hollywood outfall and Port Everglades inlet. The experimental samples will be compared to algae raised in "clean" water. Fractionation and nutrient information will be gathered. An *in situ* measurement of fixation rate in natural conditions will also be conducted with Niskin bottles.

Gene Shinn asked about who is heading the study. Nick replied that Valerie Paul, Smithsonian Institute, and Bill Anderson, FIU, will be leading the study.

Presentation: Update – LBSP Project 33: Identify sources and signals of land-based pollutants in southeast Florida using human enteroviruses as an indicator of fecal contamination

The purpose of *LBSP Project 33: Identify sources and signals of land-based pollutants in southeast Florida using human enteroviruses as an indicator of fecal contamination* is to identify the links between pollution and coral reef resources using human enteroviruses as indicators of fecal contamination.

Dale Griffin, United States Geological Survey (USGS), presented the update for the use of microbial markers for the detection of human waste in the marine environment. The study area is offshore of Broward County. Sponge tissue, coral mucus, and water column samples were tested for different groups of human viruses. Viruses screened included enteroviruses and adneoviruses. They are found in very high densities in human feces. Plumes and areas near outfalls were analyzed for indicator bacteria. The highest impact overall has been found nearshore in the proximity to inlets. Port Everglades is a major source of human fecal contamination both nearshore and offshore. Nearshore and offshore sponges and the water column have been found to contain human viruses. Coral mucus is sticky and on the surface of corals and therefore accumulates viruses, whereas sponges are bioaccumulative of these indicators. Outfalls and ports are another source of these pollutants. The accumulation of these indicators on the surfaces of sponges in their mucus secretions will be compared to internal accumulation within sponge tissue.

Dale was asked about the effects of swimmers at beaches to the results of the study. He responded that nearshore sites are almost all positive. The outfalls are less positive due to the effectiveness of chlorine on bacteria added during the treatment process and its comparatively reduced effectiveness on viruses. The inlets are sources of fecal pathogens along the beaches. Dale added that 50-100 mL of water is swallowed by swimmers during a swim and the infectious dose of most of these viruses is only 1 mL ingested, so there is a human health risk.

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

The purpose of *Project 27 – Quantify the flow rate and amount of pollutants being transported to reef communities by groundwater* is to quantify pollutants from groundwater entering the reef environment and contribute to the development of a mass balance budget for the region.

Dale Griffin, USGS, provided the update for the submarine groundwater discharge (SGD) study. The objective is to determine the sources and amount of SGD in the environment offshore from Broward County. Water samples are analyzed for 64 waste compounds, 16 pharmaceutical products, the enterobacterium Salmonella spp., coliphages, human enteroviruses, nutrients, radon, and methane. Inshore, offshore, inlet, and plume sites are being analyzed. The boils, or outfalls, appear not to be the main source of viruses, but are a source of bacteria. Salmonella and enteroviruses found nearshore could be entrained from the Port Everglades plume in surface sediments as opposed to SGD, supported by the significant presence of enteroviruses near the ports when compared to outfalls. The radon and methane are consistent with marine water, not freshwater, and other compounds are consistent with wastewater. Future studies should include pinpointing pulses of freshwater. These and other data implicate the inlets and the outfalls as the only significant input of freshwater in the area.

Presentation: SeaKeeper's Port Everglades Shipping Channel Observatory (PESCO) installation and approaches to studying coastal upwelling (LBSP Project 29)

The purpose of *LBSP Project 29: Determine the flux of pollutants exiting ocean inlets and net flux to reef communities* is to quantify flow through the Port Everglades channel with simultaneous estimates of concentrations of anthropogenic waste in the inlet.

Chris Maingot, Nova Southeastern University, gave the update for this project on behalf of Alex Soloviev, Nova Southeastern University. It is a collaborative effort of FIU, AOML (Atlantic Oceanographic and Meteorological Laboratory), and BCEPD (Broward County Environmental Protection Department). The goals of the project are the determination of nutrient loading in Port Everglades, nutrient upwelling, and the path of coastal pollution. The data will be collected by a SeaKeeper unit, which is composed of steel units, a computer, and sensors. Salinity, pH, ocean and barometric pressure, and wind speed and direction will be recorded. A satellite link reports information every hour and a wireless link reports to the Nova Southeastern University network. Operations include temperature and salinity measurements to give an idea of freshwater plumes,

weather conditions, horizontal flow, and nutrient flux. Joe Boyer will be retrofitting the Seakeeper to collect water samples for nutrient analysis.

Next, Chris discussed the upwelling along Florida's East Coast. Upwelling of the Florida current is inhibited on the western boundary, but sufficient wind stress can drive upwelling. Bottom and surface acoustic Dopplers are in place south of the port and off of Pompano. Diel vertical migrations of zooplankton and reversals of current flow due to meandering of the Florida Current have been detected. During Hurricane Wilma, strong southern winds caused mixing and extreme mixed water movement. An upwelling event was detected with a four-degree drop in seawater temperature. Frontal boundaries and the interaction of the Florida Current and countercurrent can be viewed with sonar measurements. These may also be a cause of upwelling. Future work includes more measurements and determination of other factors that may be responsible for the observed upwelling events and the effects on the ecosystem.

Esther Peters, George Mason University, asked whether there were any plans in place to investigate the effects on the ecosystem of these upwelling events. He replied there are none that he is aware of currently in place.

Presentation: Stress banding in southeast Florida corals: A record of anthropogenic influence

The purpose of the project *Stress banding in southeast Florida corals: a record of anthropogenic influence* is to examine the record of environmental changes in the stress banding patterns of corals in the southeast Florida region and identify links to pollution and human activities.

Kevin Hemle, NOAA/AOML, presented the update for the stress banding project in the region. Cores are cut from large, old corals, cut into slabs, and X-rayed for annual density bands and long-term chronology. The high density bands appear dark and form from late July to October and grow on an annual basis. Bands have been found to correlate with El Nino, bleaching, cold winters, and known coral mortality events. Corals continue growing through times of stress and can show indications of stress on the ecosystem. The changes in the observed banding patterns observed in the cores from this study indicate a clear time frame of stress, but there is still debate whether there are ultimately anthropogenic causes. LBSP can affect the variables that cause changes in banding, such as salinity, turbidity, carbonate chemistry, etc. Changes in the amount of freshwater discharge from ports and inlets may correlate with banding patterns. Construction of canals may also be an anthropogenic activity partially responsible for the observed variations. Although discharge and coral skeletal density are negatively related, calcification in the corals did not change, the structure changed, with corals not as upward-growing. Canal construction during the period of the 1940's to 1970 have been identified as a high stress period in some corals. Temperature changes do not appear to affect coral growth, with salinity changes being the main cause for changes in coral growth. The same observed responses are found in various species of coral and extend throughout the southeast Florida region. Identifying the causative factors for stress banding in corals and the anthropogenic influence on these factors over the time period

recorded in the cores will be important outcomes of this study for southeast Florida coral ecosystems.

Several comments were made about the effects of the atmosphere, freshwater flow, and climate versus anthropogenic influences on the variables that affect banding in corals as the ultimate cause of observed patterns. Kevin replied that the abrupt endpoint around 1971 is not characteristic of climatic change and indicates an anthropogenic source. There has not been this type of a dark band in the past 300 years of coral cross-sections. Kevin will be looking at stable isotopes for freshwater indicators and therefore evidence of LBSP introduced from runoff, outfalls, and other freshwater sources. Piero Gardinali asked about the use of laser ablation techniques for the stable isotope analyses. Kevin responded that there is no funding in place beyond the conventional nitrogen stable isotope analyses. Dale Griffin asked if there were any large-scale cooling events. The Pinatubo eruption event is visible in Pacific coral records, probably due to a change in light. Nitrogen stable isotopes are being analyzed for detecting the change from organic to synthetic fertilizers.

Presentation: Marine and Estuarine Goal Setting for South Florida (MARES) project

The purpose of the *Marine and Estuarine Goal Setting for South Florida (MARES)* project is to develop an integrated ecosystem assessment that contributes to South Florida's ecosystem restoration goals.

Joe Boyer, Florida International University, gave the update for the development of a socioecological model for the south Florida marine and coastal environments. The attempt is to integrate the human dimension and social science into restoration and management. The goal is to develop quantitative ecosystem indicators is also a goal. Driver Pressure Space Impact Response (DPSIR) models will be used for incorporating the social component. The development of a suite of indicators could be reported to the US Coral Reef Task Force (USCRTF) to give an idea of how restoration is progressing. Spatial and temporal features of the ecosystem are covered. Chlorophyll, periphyton, algal blooms, fish, wading birds, etc. are used as indicators and reported to the Department of the Interior for the Everglades Restoration. South Florida is being divided into several different regions; St. Lucie River Estuary and Indian River Lagoon, Loxahatchee Watershed, Lake Worth Lagoon, Biscayne Bay, Florida Bay, Everglades Mangrove Estuaries, Big Cypress, Caloosahatchee Estuary, Southwest Florida Shelf, Southeast Florida Shelf, and Florida Keys and Dry Tortugas. Normal, borderline, and problem thresholds for the different regions are being developed. An intended goal is the development of a report card approach of marine systems in Florida delivered through facilitated workshops, outreach, press kits, websites, audience polls, and reports. The first workshop will be on developing a conceptual ecological model for the Keys sanctuary region at FIU in December. Efforts will be made to include all participants in developing the model in publications. The southwest shelf will be the focus of workshops in the summer of next year, then the SEFCRI region.

For information on the workshop at FIU, contact Pam Fletcher through

Joe was asked how this information will be used. He responded it will produce a synthesis of what science is known for use by managers and policy-makers. An important function of the project is to get the science and information to the right people for action to take place and responses to occur. NOAA will use it to prioritize funding. The current indicators in the Everglades are rudimentary. Chantal Collier commented the project has important management value in that it links the different policy-making areas in south Florida. Joe added that if one can talk the language of upper management and not just science, a response in policy will happen before the motion dies. Economists and social scientists are being brought into the project for this purpose. Piero Gardinali commented that the reaction may not be favorable to a report card that is entirely red. Joe responded that the presenter and nuance is important in modifying the impact on the environment.

Presentation: Microbial source tracking for southeast Florida coral reefs
The purpose of the project *Microbial source tracking for southeast Florida coral reefs* is the analysis of microbial contaminants to determine the host sources of microbial contaminants in the southeast Florida reef environment and guide managers in identifying LBSP impacting reefs.

Chris Sinigalliano, NOAA, provided the update for microbial source tracking. Microbial contaminants are traced back to host organisms such as coastal domestic animals, wildlife, and humans. Use of the current EPA indicator, enterococci, has become increasingly problematic. The current indicators are also only being used for human health impacts and not ecosystem health impacts and do not indicate sources. This project adds a layer of discrimination by genetically typing the microbial contaminants to host organisms. This will help managers in determining problem source areas. Corals can experience viral infections that may also be infectious to humans. As work by Dale Griffin and Erin Lipp have shown, these indicators are potentially getting sequestered at coral reefs. Other organisms in coral reef communities can potentially be negatively impacted by microbial contaminants. The tracking of microbial contaminants is best done through genetic microbial markers. This project is involved with the FACE program and its associated sites. All six outfalls have been found to be sources of viral, microbial, and protozoan contaminants. The three northern boils appear to be the cleanest with the least amount of discharge. The three southern boils also have the greatest number of breakthrough viable bacterial, viral, and protozoan contaminants. The flow of the outfalls is turbulent and floats to the surface. Consequently, there are discrete packets of entrained material distributed. There are periodic increases of contaminants above EPA regulatory limits. Regulatory limits do not exist for environmental impacts and effects of the chronic, long-term exposure are not known. There is rapid dilution with distance, but there may be conditions in the environment where contaminants are reconcentrated. Microbial source tracking at corals is intended at the 17 SECREMP sites as an addition to year 2 of the water quality monitoring, with it already being carried out at wastewater outfalls and inlets. Markers can also act as proxies for other contaminants. Quantitative polymerase chain reaction (PCR) is being used for analysis and additional funding is being sought for more analyses.

Dale Griffin asked how this project duplicates or expands on the work of Erin Lipp. He responded that Erin's work uses more sensitive indicators and focuses mainly on viruses. Dale added that bacterial markers are promiscuous across genera and are not always reliable for use in source tracking and viral markers are more reliable. Chris replied that many of the markers have been tested for percentage of crosser activity between host organisms. The markers used are ribosomal markers and the literature has not pointed out this problem. The goal is to improve the accuracy of the overall sweep with a suite of indicators. Gene Shinn commented that coral diseases spread all over the Caribbean in the 1970's and 1980's and African dust can bring over plant, sea fan, and coral pathogens, and this factor is more important than local LBSP in many instances. Chris stated that there are multiple stressors that need to be understood and managed. African dust may be involved in the input from cloud nucleation and rain events, for which there is a study interest. The primary markers that have been found in this study are human source signals. Coastal discharges and urban storm water are major problems that need to be addressed, even if the sewage outfalls are turned off. The cost of the project was asked. Fifty thousand dollars is needed in the project for the completion of Port Everglades testing.

Discussion: Southeast Florida Coral Reefs: Impacts of Land-Based Pollutant Document

John Fauth, University of Central Florida, lead the discussion for the development of the SEFCRI white paper. He stated he has some TAC members contributions but others are still needed. Only about one page is needed for each section. Members worked on their respective sections. John recapped the work on the document and encouraged people to hand in their work for incorporation into the draft.

Public Comment

Dan Clark, Cry of the Water, and Stephanie Clark, Cry of the Water, provided verbal comments (See Appendix A).

Discussion: General

Dale Griffin asked how much more time will be needed for finalizing the second White Paper document. John Fauth responded that he hopes it will be completed before Christmas. Phil Dustan stated that a petition needs to be started to stop spear fishing by SCUBA. Trophic cascades are caused when top predators are taken from an ecosystem. It is too easy to spear fish while using SCUBA. Gene Shinn added that more fish may be taken this way than by hook-and-line. Chris Maingot commented that it will be difficult to reduce SCUBA spearfishing activities.

Closing Remarks

Nick Gadbois asked for any closing remarks for the day. There were none.

The meeting was adjourned 5:10 pm.

DAY TWO, Friday, November 13, 2009

Meeting Guidelines
Nick Gadbois, Florida Department of Environmental Protection-Coral Reef Conservation Program (FDEP-CRCP), welcomed the members, presenters, and observers to the 10th SEFCRI LBSP TAC meeting. He introduced himself and Chantal Collier, FDEP-CRCP, as the facilitators for the meeting. Nick reviewed the roles of the facilitators and observers and the guidelines for participation. Hard copies of the guidelines were provided in a folder for each member. The public was invited to fill out comment cards, submit them to the staff, and speak during the public comment period. Attendees were reminded to fill out meeting evaluation forms before end of the meeting

Nick Gadbois recapped the presentations and events of yesterday's meeting and asked if there were any questions.

Presentation: Ocean Applications of Autonomous Underwater Vehicles (AUV's) off Florida: Corals to Currents
The purpose of the presentation *Ocean Applications of Autonomous Underwater Vehicles (AUV's) off Florida: Corals to Currents* is to inform researchers of the benefits and costs of the use of AUV's in measuring indicators of pollution and other oceanographic conditions in the coral reef environment.

Andrew Shepard, University of North Carolina, now associate director of the Cooperative Institute of Ocean Exploration Research and Technology, funded by NOAA, spoke about the use of autonomous underwater vehicles (AUV's). Andrew explained how AUV's could help expand many existing SEFCRI LBSP projects. Some of these benefits include an alternative technique for measuring benthic parameters, especially nutrients, and a reduction of time required for projects with a otherwise large number of required boat days. Other remotely operated vehicles require a tether and accompaniment, whereas AUV's do not. High Precision Untethered Geosurvey and Inspection System (HUGIN) vehicles are complex and expensive to rent, because the carrier vessel and fuel must be rented as well. AUV's are economical, have mission planning software, improved communication, 20-22 hours of battery service, improved camera quality, and smaller equipment. AUV's can perform acoustic seafloor mapping, optical mapping, Acoustic Doppler Current Profiler (ADCP) transects, cross-shelf transects, mapping of 4-D oceanographic events, measuring of algal blooms, nutrients, internal waves, pH, other parameters, and mass spectrometry of large compounds. A goal of Andy and his colleagues is to set out fleets of AUV's for simultaneous data collection as AUVcosts continue to decline. There are four glider-type AUV's in Florida, and Andy reviewed the cost per day for the various types of AUV's.

Gene Shinn asked about the National Environmental Research Park (NERP) being inactive. Andy replied that the Cooperative Institute is a replacement for the east coast NERP. West coast centers will be active until 2011. Andy was asked how an AUV would operate in the turbulent water near an outfall. He responded that strong current conditions increase error factors, but bottom recognition helps correct that. GPS and satellite

connections can be carried. Ken Banks asked about programming a path for circling. AUV's can be programmed for many different courses. Phil asked about mapping the seafloor nearshore. Andy responded that there is a risk of plowing into the bottom, so running on the surface is better, except for boat traffic and adverse weather conditions.

Presentation: State of Florida Numeric Water Quality Criteria Update
The purpose of the project *DEP Estuary and Coastal Numeric Nutrient Criteria Development Plan* is to engage local organizations, stakeholders, and experts around the state of Florida to discuss and compile data for appropriate nutrient criteria and ensure the data is available to the EPA and FDEP for the development of nutrient criteria.

Russ Frydenborg, FDEP Division of Environmental Assessment and Restoration, gave an update on the development of water quality standards and nutrient criteria for the State of Florida. The EPA has formally determined that nutrient criteria are necessary for Florida estuarine coastal waters. If the FDEP does not develop criteria by January 14th, 2011, the EPA will propose them for the FDEP. There is a collaborative effort being launched by the FDEP with the EPA. Efforts are to engage local groups, stakeholders, and local experts for the development of a set of protective criteria for specific estuarine and coastal waters. Existing and new data will be compiled and reviewed. Areas are divided and nutrient data, hydrodynamics, residence times, and biological response values will be determined. Sensitive and valuable ecological attributes and their relationship to anthropogenic nutrient input will also be determined. The goal is to have numeric nutrient target values that will protect and restore the marine system. The information would be best put into use if it is all gathered by July, 2010. People on the mailing list for water quality standards will be getting information in the project. A series of public meetings will occur through January, encouraging people to come forward and provide information. A coastal workshop is also planned for January or February.

Joe Boyer asked a question about the EPA's role in the development of criteria, and whether it is duplicative effort. Russ replied that the EPA is working with the DEP and not independently. The EPA is using spatially referenced regressions on watershed attributes (SPARROW) to develop an overall modeling approach and the DEP is looking for extant, area-specific models. Richard Harvey asked what the data requirements and limitations are for the development for the Total Maximum Daily Loads (TMDL). Russ responded that the most credible scientific data that points at protective nutrient criteria is being gathered for each area. If the data is insufficient and of poor quality, this will keep the development of the criteria from moving forward.

Ken Weaver, FDEP Division of Environmental Assessment and Restoration, provided information for the state numerical nutrient criteria development. The project is working under the Clean Water Act. In 1998, the EPA filed the Clean Water Action Plan which intended the development of numeric nutrient criteria by 2003. Since then, 22 meetings have been held. The use of dose-response relationships was the original plan for the design. Alkalinity from chlorophyll response to total phosphorous, clear stream nitrate criteria from nitrate/nitrite, macroinvertebrate and periphyton response variables, stream

diatom indices, and identification of healthy reference sites are some of the investigations and developed criteria.

Richard Harvey commented that two state agencies have intervened. Ken replied that two other water management districts have interest in joining the efforts. Gene Shinn recalled a study done in Tampa Bay that found 37% of the nitrogen input from the atmosphere, mainly from car exhaust. Ken responded that point and non-point sources need to be identified, including atmospheric components. Audra Livergood, NOAA NMFS, asked whether Outstanding Florida Waters designations (OFW) would result in more protective criteria. Ken answered that baseline nutrient criteria will be developed as part of the Antidegradation Policy, which does not necessarily incur more protective criteria. Joe Boyer asked about the need for the addition of more marine estuarine experts onto the committee. Ken responded that it is possible, and there will be a series of public meetings where new initiatives will be discussed. Interested TAC members should attend the next meeting in Tampa. The short timeline for the project is an issue.

Presentation: FDEP CRCP Strategic Plan: 2010 – 2015
The purpose of the presentation *FDEP CRCP Strategic Plan: 2010 – 2015* was to present the FDEP CRCP goals and objectives for the next five years, as well as recap what has been accomplished to date.

Chantal Collier, FDEP, presented an update of the strategic plan for the next five years of the FDEP Coral reef Conservation Program. She reviewed the FDEP's structure and lead role in the state's management and stewardship of the environment. Florida's Coral Reef Conservation Program (CRCP) was established in May, 2004. The goals of the CRCP are to conduct research, educate and outreach, prevent injury and disease, develop management plans. There are also the U.S. Coral Reef Task Force and the U.S. All Islands Coral Reef committee through which the state's efforts are supported.

Dana Menendez, NOAA-CRCP, gave the three main areas of focus. These include climate change, LBSP, and fishing impacts. Three working groups are to provide objectives fro the national level. Ken Weaver is on the LBSP group and Chantal Collier is on the climate change group.

These objectives can be viewed at
www.coralreef.noaa.gov

State-specific issues will still be supported with the national objectives in place. This will take place with the coming together of a coral reef management community in each of the seven states and territories. The goal is for site-based managers at federal, state, and county level to agree on priorities for coral reef conservation in the state or territory. A document developed in a workshop is near completion for priorities in Florida and will be available at the end of the year and widely distributed.

Gene Shinn asked if there was any science involved in the making of these objectives. Chantal replied that it is only for management goals and objectives. Phil Dustan

commented on the need for restoration. Dana Menendez replied that this is for conservation and restoration is being addressed by other objectives at the national level. Gene Shinn commented that NMFS doesn't know what is killing staghorn coral, but they are attempting to restore it.

Chantal Collier continued with the 2004 directives and 2009 objectives. The 2004 directives included the establishment of FDEP CRCP, facilitation of the completion of 2004 SEFCRI Local Action Strategy (LAS) goals, objectives, and project lists, the organization and facilitation for SEFCRI team to implement SEFCRI LAS projects, and the support of the Office of Coastal and Aquatic Managed Areas (CAMA) director as Florida's point of contact for the U.S. Coral Reef Task Force. The 2009 objectives include reviewing accomplishments, taking stock of new FDEP CRCP responsibilities added since 2004, assessing program effectiveness, evaluation of current mandates, priorities, capacities, and roles of partners, and the development of a strategic plan for the next five years. The FDEP-CRCP has accomplished many partnerships, the expansion of SEFCRI, six years of SECREMP, mapping, vessel usage and impacts research, a marine debris removal program, and initiated the SECRWQMP in 2009. The expanded roles in the U.S. Coral Reef Task Force (USCRTF) since 1994 include a steering committee, education and outreach working group, point of contact or representative, coral injuries working group, and reports to congress. The FDEP CRCP has since become vice chair of the U.S. All Islands Coral Reef Committee (USAIC). The current mandates and priorities include 46 concurrent SEFCRI LAS projects and 12 concurrent, ongoing in-house or partnership programs. The largest SEFCRI endeavor to date is occurring, with the identification of management alternatives, including zoning strategies, for southeast Florida reefs and public workshops to develop improved management strategies. The funding priorities of NOAA CRCP has shifted to management priorities.

Richard Harvey congratulated Chantal Collier and her staff for the great job they have done and the audience applauded them.

Discussion: TAC Administrative Business
Nick Gadbois asked if there were any TAC administrative topics for discussion and any suggested dates for the next meeting. The first week of May was suggested, but that was determined to be finals time for those who teach. Late May and the week of June 1st were also suggested. It was decided that possible dated will be listed on doodle.com and responses will be used for making a decision. Thursday and Friday will likely be the days of the meeting.

Public Comment
Stephanie Clark, Cry of the Water, provided verbal comments (See Appendix A).

Discussion: General
Nick Gadbois asked if there were any comments for general discussion. There were none.

Discussion: Recap of Southeast Florida Coral Reefs: Impacts of Land Based Pollution

John Fauth, University of Central Florida, gave a recap of the SEFCRI white paper. He said he received a lot of contributions today and will send them out for comments and further contributions.

Closing Remarks
Nick Gadbois asked if there were any closing remarks. There were none.

The meeting was adjourned 5:20 pm.

No.	Action Item	Responsible Party	Due Date
1	Review the White Paper	TAC members	ASAP
2	Next Meeting Date needs to be determined	Chantal Collier	ASAP

Appendix A

Public Comment – Day 1

No written comments were provided for recording. Two observers provided verbal comments (Dan Clark, Cry of the Water, and Stephanie Clark, Cry of the Water).

Dan Clark, Cry of the Water, presented a Power Point of recommendations for conservation strategies to the Coral Reef Task Force. The 1989 stress band is associated with work on the water that occurred during the same time. There are no protocols for dealing with disease outbreaks of corals. The time of year in the study is not representative of reality because coral diseases happen when the water is warm. Spots on elkhorn coral follow a progression and can be detected early on. SECREMP is not quantifying dead coral and on a year-round basis. Public trust is lost when data is inaccurate because divers can see when the coral is dead. Concerning the proposed nursery transplantation project, more emphasis should be put on determining the causes of coral disease and death, not just transplantation. The silt and sedimentation caused by the dredge and fill project will have long-term impacts on coral reefs. The sand from the bypass in the inlet should be placed in staghorn coral areas.

Stephanie Clark, Cry of the Water, presented a Power Point on the update from the petition for outstanding Florida waters points from Port Everglades to Hillsboro Inlet. Dr. Ray McAllister signed the petition. An Outstanding Florida Water (OFW) designation will help reduce pollutants from unpermitted sources. Lauderdale-by-the-Sea wants to build an underwater sea park. Efforts will include no designation of take zones and delineation of activities and construction. The pier will not be affected. Elkhorn coral growth has been shown in the proposed marine park area. The Florida Fish and Wildlife Commission (FWC) is permitting this. The goals and objectives are to increase stakeholder involvement. The park will be a city-run.

Information on this project and others can be viewed at
www.globalcoral.org and www.cryofthewater.com

Phil Dustan asked about banning spear guns on the beach. Stephanie replied that no spear guns within city limits would be a good alternative. No fishing and no spearfishing in the area are favored by many people, but stakeholder involvement is needed. Chantal Collier stated that the SEFCRI mission is not being upheld by Cry of the Water. Dan Clark rebutted that NOAA has not responded to any of their requests for money for research. He also states that SECREMP is not an effective project in its methods. Locals can provide the sampling and observations, but Cry of the Water cannot carry out the science and lab work. Esther Peters found it exciting that the public has a change of view. Growth rate on the electric reef will be monitored. Gene Shinn commented that it has never been proven that coral growth rate is increased on electric reefs. Phil Dustan remarked that this is a great opportunity for people to own a piece of land in the sea. Esther Peters commended Cry of the Water for their emphasis for the need for coral reef pathologists. No federal labs currently exist for the diseases of marine organisms.

Public Comment – Day 2
No written comments were provided for recording. One observer provided verbal comments (Stephanie Clark, Cry of the Water).

Stephanie Clark commented that the FDEP-CRCP strategic plan does not address the completion of existing projects, and whether there are projects that are no longer necessary and no longer need funding. The reduction in meetings will reduce the opportunity of stakeholder and team member involvement. TAC and SEFCRI members should be involved with FDEP decisions. There was no stakeholder involvement in the choice of the new SECREMP sites. It is unclear what new insights the SECREMP sites are providing in terms of management with the same monitoring protocol.

Chantal Collier responded that all of the projects this year are either continuations of existing projects or voted on last year at the TAC meetings. Gene Shinn asked Chantal Collier what the capacities of the relationships between advocates from non-governmental organizations (NGO's) and government agencies are. NGO's can serve an advisory role to government agencies. Phil Dustan attested to the advisory role of NGO's when he recalled the same issue arising with the Coral Reef Task Force. Phil Dustan commented that curious naturalists and NGO's are getting real observations and information, whereas the agencies are politically directed. Chantal Collier rebutted that the Task Force has been working to incorporate them. Dana Menendez commented that working groups are an opportunity for non-governmental involvement. Dan Clark, Cry of the Water, stated that he sees other meetings working back towards public comment. Esther Peters asked why meetings were put off. Chantal Collier responded that there were no new decisions to be made, but future meetings are already being scheduled. Dan Clark, Cry of the Water, commented that there is improvement needed on the monitoring of staghorn coral. Transplantation is getting costly and mortality is about 50%. This will be a waste of money if coral disease is not directly addressed. Vladmir Kosmynin, FDEP, stated that monitoring diseases will produce data several times a year with no means of analysis available. He also added that the high transplant mortality rate may be a healthy number for the ecology of the species. Gene Shinn related a similar idea with overpopulation possibly being inhibited by a high mortality rate of transplants. Dan Clark, Cry of the Water, rebutted that transplantation may spread disease. Esther Peters, George Mason University, commented that she has tissue samples gathered from diseased coral, including staghorn coral, and needs the funding to begin analyses.