

**Southeast Florida Coral Reef Initiative (SEFCRI)
 Land Based Sources of Pollution (LBSP)
 Technical Advisory Committee (TAC)
 Meeting #12
 Report of Proceedings
 May 6 - 7, 2010**

**National Coral Reef Institute
 NSUOC Oceanographic Center
 8000 North Ocean Drive
 Dania Beach, Florida**

TAC Members	Affiliations	Day 1	Day 2
Joseph Boyer	Southeast Environmental Research Center, FIU	X	X
Richard Dodge	NSUOC Oceanographic Center (NSUOC)		
Phil Dustan	College of Charleston, South Carolina	X	X
John Fauth	University of Central Florida	X	X
Piero Gardinali	FIU	X	X
Dale Griffin	United States Geological Survey (USGS)		
Vladmir Kosmynin	Florida Department of Environmental Protection (FDEP), Bureau of Beaches and Coastal Systems	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	X	X
Esther Peters	George Mason University	X	X
Michelle Wood	National Oceanic and Atmospheric Administration (NOAA-AOML)		
Gene Shinn	University of South Florida	X	X
Alexander Soloviev	NSUOC	X	
Peter Swart	University of Miami, Rosenstiel School of Marine and Atmospheric Science (RSMAS)		

Organizing Committee Members present:

Ken Banks Broward County Natural Resources Planning and
 Management Division, Environmental Protection and
 Growth Management Department (EPGMD-NRPMD)

Nancy Craig Broward County EPGMD-NRPMD

Richard Harvey U.S. Environmental Protection Agency (EPA)

Linda Brien	FDEP, Southeast District
Cheryl Miller	Coastal Eco-Group
Wendy Wood-Derrer	NSUOC
Chantal Collier	FDEP Coral Reef Conservation Program (CRCP)
Katharine Tzadik	FDEP-CRCP

Invited Guests:

Troy Craig	FDEP-CRCP
Alison Moulding	NSUOC
Chris Maingot	NSUOC
Dana Wusinich-Mendez	NOAA CRCP
Koty Sharp	Ocean Genome Legacy Foundation
Deb Caraco	Center for Watershed Protection
Joe Lopez	NSUOC
Greg Hendricks	U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
Ed Wright	USDA-NRCS
Jeff Schmidt	USDA-NRCS
William Anderson	FIU
Song Gao	NSUOC

Meeting Summary

DAY ONE, Thursday, May 6, 2010

Meeting Guidelines

Chantal Collier, FDEP-CRCP, welcomed members and guests to the 11th SEFCRI TAC meeting and presented the goals and objectives of the LBSP TAC group. Each member then introduced themselves and their respective affiliations. Chantal introduced the newest member of the CRCP and TAC organizational committee, Katharine Tzadik, FDEP-CRCP. Katharine will be working with LBSP focus area projects and the incorporation of climate change into the program, as well as acting as a facilitator for the meeting.

Katharine reviewed the meeting guidelines for the facilitator roles, guidelines for discussion, and consensus rules. Hard copies of the meeting guidelines, agenda, and an outline of each SEFCRI LBSP Local Action Strategy (LAS) project were provided in a folder for each member. The public was invited to fill out comment cards for the opportunity to speak during the public comment period and have any comments noted in the meeting minutes. Any comments or materials for distribution must first be given to the TAC staff. Attendees were requested to complete meeting evaluation forms before they left for the day. Katharine reviewed the agenda for the day.

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. A variety of techniques are being used to connect coral health back to causal LBSP and their effects on coral reefs. The targeted time for the completion of the project is the end of this year. There are two components to the project. The field component involves assessing coral condition at multiple levels of complexity. Contaminant and cellular diagnostic analyses at the cellular level, lesion regeneration, mortality, etc. at the organismal level, and species richness, evenness, percent cover, and index of biotic integrity at the community level, are being performed. The laboratory component supports the field component and involves the sampling of pore and reef-level water and sediments from each site and running diagnostic toxicity tests on them. All of the samples from all monitoring sites have been collected, and all analyses for the multiple-level assessments have been completed with data in-hand. The exception is at the cellular level, where there are more samples that can be analyzed with current funds. Optimum samples will be selected from this larger set before they are analyzed. There are also sediment samples, sediment cores, and water samples still in storage.

Richard Harvey and Piero Gardinali asked if the sediments are stored according to regulations for analysis of organics for comparison with post-oil spill sediments. John replied that all samples are stored in certified containers with background levels recorded and frozen. Chantal Collier informed the members that she will be providing an update on the oil spill in the Gulf of Mexico based on the latest information during the discussion period. She understands that there are many questions regarding the sampling protocols, but the spill is still a private issue and has not yet been federalized. There has been much discussion among all the agencies concerning the sampling protocols following the oil spill. The west coast of Florida is responding to executive orders for pre-spill sampling by the governor county by county, and south Florida is subject to the same method of initiating action at this time.

The toxicity tests using brine shrimp have been abandoned because they are not sensitive to any toxins in the experiment. This part of the experiment has been replaced by a sea urchin developmental assay, which has proven more sensitive, but there has been no evidence of toxicity at any of the experimental sites. In some control sites, which have been selected as relatively unimpacted sites, results have shown higher toxicity levels than the experimental sites which have been chosen as sites that are impacted. Reciprocal transplants are the next step after toxicity tests with a companion lab experiment with Dr. Alison Moulding.

Esther Peters asked what the duration of the reciprocal transplants will be. John responded that they will be as long in duration as possible. Currently the steps and timeline of this portion of the experiment are still undetermined. The plan is to deploy the transplants in the spring and monitor them for the following six months to complete the project. The transplanted corals will still be present at the sites for monitoring in subsequent years. Tissue samples and biomarker samples are also being collected from

the corals for use in tandem with the samples already obtained to assess responses, such as cytochromes that respond to specific xenobiotics. Valerie Paul asked where the intended transplant sites will be. John responded that they will be part of a three-way transplant at three deeper-water sites.

Phil Dustan stated he is working with a group interested in looking at the microbial assemblages on corals. The genetic factors in the zooxanthellae of *Porites astreoides* indicate a population bottleneck in South Florida corals relative to the Bahamian population and that the larvae are not coming from the Keys. More money and effort should be spent on genomic studies of corals in the region. Phil added there are a number of coral species in the region where only adult individuals have been found, and in some cases, only very large adults. This indicates a diminishing remnant population and supports the hypothesis of a bottleneck event occurring for corals in the area. Valerie made the point that the life histories of each coral species must be considered, and that *Porites astreoides* is a brooder, dropping larvae very near the adult. The condition of *Porites astreoides* should therefore not be assumed for all coral species in the area. Joe Boyer asked what contaminants are being tested for. John replied that the list is still being selected based on hypotheses based on the outcomes of the data. Valerie inquired about the selection of the third reef for the sites for the transplants. John answered that these sites had the greatest variation in coral regeneration rates across temporal scales.

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

The purpose of LBSP *Projects 8 and 9: Establish a sub-work group responsible for generating required maps* is to establish a sub-work group and acquire overlay information to map the benthic habitats of Miami-Dade and Martin Counties.

Katharine Tzadik, FDEP-CRCP, provided the updates for these projects on behalf of Brian Walker, NSUOC. Geographic Information System (GIS)-based geo-referenced benthic habitat maps are being created with this project for the southeast Florida region and the maps are being designed to be made more compatible with other regional maps and incorporate coral reef acoustic regional mapping. There is a two-phased mapping approach. Phase I is used for mapping between reefs and involves visual interpretation of sunshaded Light Detection and Ranging (LIDAR) bathymetry and aerial photography. Phase II is used for mapping within reefs and involves acoustic ground discrimination with the use of QTC, Echoplus, and biosonics. Of the four counties being mapped in the southeast Florida region, the LIDAR and both Phase I and Phase II have been completed for Broward and Palm Beach Counties. The LIDAR and Phase I are complete for Miami-Dade County, with Phase II planned for June, 2010. LIDAR reflights are being processed for Martin County and Phase II is not yet funded. The LIDAR reflights were performed to fill in gaps in data for Martin County. Almost 100% coverage is expected from the combination of both surveys. High resolution hillshaded images were produced from the 2008 processed data for Martin County. Initial polygons will be drawn using this image once the reflight data are processed and delivered. Preliminary ridge-shallow polygons have been started, with ridge-deep to follow for the contribution to SEFCRI regional

illustration for marina signage. NOAA CRCP has funded a quantitative groundtruthing effort of the Martin County maps for 2011. The contract is in place for the acoustic mapping of Miami-Dade County. The planned start date is July 2010, with initial survey planning already begun. The objective of the concept trials in the acoustic mapping of Miami-Dade County is to detect and discriminate between *Acropora* and gorgonian canopies and has had promising results. Future considerations for the mapping project are the adaptation of a new classification scheme to a single regional map, the updating of Broward County maps with improved definition from the new LIDAR data and improved knowledge of reef status and *Acropora* habitat associations, and the use of acoustic ground discrimination for improving variation within reefs.

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 local, state, and federal agencies.

Katharine Tzadik, FDEP gave the update for this project. This has been an ongoing project maintained and hosted by FWRI and is planned to remain so until the end of 2010. Efforts are being made by Katharine and others to make the IMS a user-friendly information tool. It is possible this system can be upgraded into a more interactive tool by the end of 2010. Chantal added that there is potential to incorporate the outcomes of some of the other SEFCRI projects into the platform, especially the results of some Maritime Industry and Coastal Construction Impacts (MICCI) team projects. The incorporation of this new data must be planned before new money and resources will be allocated to making improvements. Valerie Paul asked if the IMS webpage is up and complete for viewing. Chantal responded it is, but it is a bit cumbersome and not as user-friendly as the intended final product which will be available once the funding and resources are allocated for the improvements to be made.

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, presented the status update for the project on behalf of Dave Gilliam. The project began in 2003 and there are a number of partners involved, including FWC, DEP, NOAA, Broward County, Miami ERM, Palm Beach County ERM, and NCRI at NSUOC. The principal investigators (PI's) for the project are members of the FDEP through the CRCP, FWRI through their coral program, and Dave Gilliam at NCRI at NSUOC. Most of the funding is coming from the national level through NOAA CRCP, as well as the three aforementioned regional partners. The purpose of CREMP/SECREMP is to provide relevant and timely information on trends and status of Florida's coral reef and hard bottom resources. Chantal reviewed the chronological SECREMP project history, beginning with the establishment of 10 sites in Miami-Dade,

Broward, and Palm Beach Counties in 2003, which lead up to the current and continued monitoring of 17 sites through 2011 in the three counties and Martin County. The DEP CRCP site has all relevant information on this project for viewing. The sites are being monitored in the summer season for long-term trends and additional sites were chosen and added with additional funding. All of these sites are tied into the water quality monitoring which occurs quarterly. The combination of the original and new sites has helped extend monitoring to the northern and southern extents of the SEFCRI region. The goals of the additional site selection were to select locations that would fill in gaps in data in the SEFCRI region and cover the range of habitat types from the nearshore ridge complex to the outer reef. Brian Walker of NSUOC used existing benthic habitat maps to identify viable reef areas in locations where there were gaps in data and defined random points. Recon dives were then performed at these points to find sites that met the criteria for site selection. Remarketing of the sites is now occurring in anticipation of this summer's sampling.

Phil Dustan questioned the total number of points used to determine the sites that will represent the SEFCRI region because it is a low number compared to the Keys. Chantal said that attempts are being made to expand the project, but this is not possible with the current level of funding. John Fauth suggested seeking out additional funding. Chantal replied that this may be difficult given the present state of economic resources. Margaret Miller made the point that CRCP considers monitoring of corals once a year is adequate, however this may not be often enough. Valerie Paul added that more frequent monitoring may capture some of the dynamic changes that coral reefs undergo throughout the year. Chantal rebutted the quarterly water quality monitoring linked to coral monitoring will provide a better understanding of these types of patterns and that the protocols for monitoring are under review for improvement. Judy Lang commented that the underwater video and photo mosaic technique approach developed in Pam Reid's lab at RSMAS would provide a greater amount of information over larger areas for each monitoring site. Vladimir argued video monitoring techniques are not much faster or more efficient than the use of sound. Phil Dustan related the usefulness of panoramic photographs of coral reefs in the Keys in his experience. A 40% drop in coral cover was discovered, and there was very little interest or effort put into monitoring by government agencies, despite ample funding available. It appeared interest moved away from coral population ecology, which should be the focus of monitoring efforts. Recruitment, population size, and mortality are the important variables to measure. The number of coral monitoring sites was decreased in the Keys and it resulted in a failure to capture the changes occurring to those coral reefs. Phil also added that with global climate change, it is especially important that monitoring efforts be ramped up.

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* is to educate and change the stakeholders' behaviors in an effort to reduce LBSP impacts on coral reefs through working in close cooperation

with the Awareness and Appreciation focus team, specifically with herbicide, pesticide and fertilizer use.

Troy Craig, FDEP-CRCP, provided the update for this outreach project. Two brochures have been developed. One brochure describes best practices for herbicide, pesticide, and fertilizer use for home gardens and lawns. Alternatives to fertilizers and chemical pesticides and herbicides are included in the information. The document has been sent to the University of Florida for final review. The second brochure is a watershed brochure that is in a basic design stage. A distribution list has yet to be developed for the first brochure, and to assess how effective this distribution list will be. Potential recipients are nursery and garden stores and centers, such as those at the Home Depot and Lowe's. The content of the brochure includes information on the function of a watershed and what factors affect it. Troy can send a copy via email to anyone interested in viewing and commenting on the brochure.

Troy was asked whether the brochure is up on the Project 24 website for viewing. Chantal and Troy responded that the brochure will not be put on the website until the final product is complete. Phil Dustan commented people generally do not understand that urbanization results in deforestation, and this concept should be somehow conveyed in the brochure. Troy responded that Miami-Dade County is working on a one million tree canopy cover project and is moving away from the palms and more into the foliated native trees and pines. The Adopt-A-Tree program is losing funding, so perhaps the brochures will help bring needed interest to the topic. Phil suggested a move towards carbon credits redeemed from homeowner's taxes for larger trees on properties should be started. This would in turn reduce the area coverage of lawns in the region. It was commented that many trees have been cut down due to damage caused by trees to properties and power lines during hurricanes. Margaret Miller stated conveying the idea of paved and impervious surfaces and how they alter the water cycle is important. Judy Lang suggested including aerial photographs of the debris and harmful runoff coming out of the inlets at low tide. Troy added that the brochure will hopefully boost the project for the storm water drains. Dan Clark, Cry of the Water, suggested the use of tiles on storm drains with images of environmental/aquatic themes. Esther Peters commented that there are no incentives to recycle in Florida and landfills are growing larger and larger. Troy responded the public is only going to take interest in recycling if it is presented as an economically viable option. Vladimir related that in some areas, glass bottles are being used to renourish beaches with sand, while at the same time, sand is being sought out for the manufacturing of glass. Troy stated Florida does have very good recycling facilities and treatment plants in other areas of Florida. South Florida has the technology and people to accomplish the same, but the public must have an interest in participating. Recyclables that are not cleaned or sorted properly by homeowners will go to the landfill.

Presentation: Update – LBSP Project 25: Establish a long-term regional water quality monitoring program

The purpose of *LBSP Project 25: Establish a long-term regional water quality monitoring program* is to establish such a program for the southeast Florida coral reef system.

Katharine Tzadik, FDEP-CRCP gave the update for this project. The project is being carried out jointly by NSUOC and FIU. Water samples are being collected and analyzed from the 17 SECREMP sites. Surface and at-depth samples are being collected. The first year has been funded by the NOAA CRCP and the request for funding for the second year has been presented and granted for year two. The second quarter samples have been collected, the third quarter samples are scheduled for early June, the fourth quarter for September, and first quarter year two for December 2010. Chantal Collier thanked Richard Harvey and the EPA for providing funding in conjunction with NSUOC and FIU for year two and the possibility to incorporate more sites.

John Fauth asked how many samples have been analyzed to date. The first three quarters have been analyzed. Joe Boyer added that the project team is also partnering with Facebook and the data will be up on the water quality monitoring website.

Presentation: Update – Project 32: Identify sources and signals of land-based pollutants in southeast Florida using stable isotopes as sewage signals in octocorals and macroalgae/*Lyngbya* 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/Lyngbya tissue* is the use of stable isotopes to trace and identify the links between pollution and coral reef resources.

Bill Anderson, FIU, presented an update of the project. Primary producers are collected and analyzed for nitrogen and carbon isotope content to understand their varying nutrient concentrations and identify their anthropogenic sources. A cyanobacterium, *Lyngbya*, and a macroalga, *Dictyota*, are the target species. N-fixation will also be measured in the cyanobacterium because this process causes variations in nitrogen isotope concentrations in nitrogen-fixing organisms and is necessary for a correct interpretation of the results of the nitrogen stable isotope analyses. The results show elevated $\delta^{15}\text{N}$ levels near sewage outfalls. Nutrient limitation causes enrichment in heavier isotopes of nitrogen, so the effects of this process on nitrogen stable isotope analyses is also being investigated. Primary producers will also discriminate or fractionate more in nutrient-rich environments which results in higher $\delta^{15}\text{N}$ levels. Seasonal surveys will be carried out along transects at monitoring sites. Temporal variations occur in stable isotope levels in these organisms on seasonal scales. The sites include the Hollywood sewage outfall, Port Everglades Inlet, and four reference sites at the biomarker sites.

John Fauth pointed out the sites will be the same sites as those of the reciprocal transplants. Bill responded that sessile plants are useful for this purpose because they are good at integrating nutrients and are easier to collect than sediment traps. Bill continued that the species will need to be identified with collection. Valerie Paul mentioned the use of genetics is a way to positively identify the species. Initial sampling is planned to begin in May. Brian Lapointe inquired whether the influence of upwelling and analyzing water samples are being considered and measured because it produces a similar enriched signal to that of pollution. Bill replied he would like to have these included in the analyses, but

there is not enough to fund it. The signal method using enriched stable isotope tracers works very well, especially with the high variability observed in natural abundance. Furthermore, there are only five labs that can perform this analysis well. John Fauth offered the suggestion of breaking the SECREMP sites into equal groups and sampling them annually on a seasonal rolling schedule, so that dynamic changes can be observed, especially with the stratified selection of the sites. For example, the timing and conditions of *Lyngbya* blooms and upwelling events could be observed. Phil Dustan asked if the use of a site in the Bahamas has been considered. Bill responded that more sites would be helpful, but current funding does not allow for this.

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.

Katharine Tzadik, FDEP-CRCP, presented the update for this project. Erin Lipp reported that the final report is due in the summer. The target viruses were genogroups 1 and 2 noroviruses, which are the top agents of gastroenteritis in adults. The results show that coral reefs in the region are being exposed to microbial components of human sewage and the most important sources are outfalls. The most abundant and diverse noroviruses were found at Port Everglades. Corals (25%) and sponges (40%) analyzed show exposure and accumulation of human fecal constituents.

Presentation: Quantification of adverse effects of nutrients and carbon dioxide on corals

The purpose of the project *Quantification of adverse effects of nutrients and carbon dioxide on corals* is to understand how increased levels of nitrate, phosphate, and carbon dioxide affect growth rates and recovery potentials of corals with applications for determining the effects and healthy limits of exposure to corals communities in the region.

Dr. Alison Moulding, NCRI-NSUOC, provided the information and results of this study. This presentation is a combination of the thesis and doctoral work of Abigail Renegar, NCRI-NSUOCNSUOC. Nutrients can have both direct and indirect effects on corals, including decreases in calcification, growth rate, fecundity, fertilization, settlement rates, and destabilization of symbiosis. It is important to understand and quantify the effects of carbon dioxide concentrations on corals because the partial pressure of carbon dioxide in high latitude waters may reach 730-1020 ppm by the year 2100. This will lead to undersaturation of calcium carbonate in the water, which is the compound that corals use to form their skeletons. These conditions are associated with slower growth, weaker skeletons, and increased erosion of corals, as well as advantageous for non-calcifying organisms/calcite producers. An increase in yellow band disease is also associated with increased nitrate levels. Abigail tested the effects on growth rate and recovery potential of

A. cervicornis after exposure to various levels and combinations of nutrients, carbon dioxide, and stress. A total of 192 coral branch tips were placed in 16 tanks, with two tanks per treatment. The treatment types were different combinations of a control, nitrate enrichment, phosphate enrichment, and increased carbon dioxide. There were four treatment periods of four weeks each. Buoyant weight was measured weekly to determine growth rate. The results show the effect of both phosphate and nitrate enrichment as negative and concentration-dependent. The negative effect of increased carbon dioxide was greater than that of nutrient enrichment and the effect of nitrate and phosphate enrichment and increased carbon dioxide is greater than the effect of either nutrient enrichment or carbon dioxide increase alone. Recovery from nutrient enrichment, increased carbon dioxide, and stress is slow and would make full recovery prolonged. Abigail also examined the effects of wound repair of *Montastraea cavernosa* and *Porites astreoides* in increased levels of nutrients and carbon dioxide. Coral fragments were wounded with a rotary tool and allowed to heal for 14 days under experimental conditions in a captive experiment. The treatments included a control, increased nitrate, increased phosphate, increased carbon dioxide, and a combination of increased nitrate and phosphate. The wounds were made with a similar diameter and photographs were taken to measure wound healing. The phosphate treatment resulted in a significantly lower healing capability than the other treatments in *Montastraea cavernosa*, with all wound healing greater than 55%. The phosphate treatment for *Porites astreoides* was also significantly lower than the other treatments and the control was significantly higher, with the wound healing capabilities below 25% for all treatments. It should also be noted that 15% of the *Montastraea cavernosa* wounds healed completely, while none of the *Porites astreoides* wounds healed completely for all treatments.

Margaret Miller made the point the rotary tool may have removed some skeletal structure and that *Porites astreoides* has a more porous skeleton. The degree of skeletal disruption may have affected the results. Alison responded that Abigail believes the healing process may be different between the species, resulting in different healing times. Phil Dustin and others inquired about the levels of nutrients chosen for the treatments because they are much greater than those found in natural settings. Alison replied the high levels were chosen to insure responses were induced. Continuing research includes ultrastructural and histological quantification of healing stages and cell types involved in repair and variability in response to elevated nutrients and carbon dioxide and investigating the effects of increased nutrient and carbon dioxide levels on larval settlement, early calcification, and symbiotic relationships. Phil Dustan made the point that moving of a coral during experiments reorients the zooxanthellae and results in a reduction in growth. Piero Gardinali commented that the period of the control treatment at the beginning of the experiment overlaps with an acclimation phase and may have caused the observed low growth rate. John Fauth commented that it should be noted the number of units of analysis is the number of tanks, not individual corals, to avoid a pseudoreplication issue. In the first experiment, time and concentrations are both increasing. The different concentrations should be represented at different times to avoid confounding the results. Using the initial growth rates as covariants in calculations, the “noise” from variable initial growth rates can be scaled back for better comparison of growth response to treatment effects. Agricultural science has examples of well-designed experiments that

use orthogonal factorial designs. Piero added that the corals that die during the wound-healing experiment must be included in the calculations because the number of corals at the start of the experiment is not the same as those at the end of the experiment. Esther Peters commented that the experiment is a fairly classical toxicological design. Brian Lapointe added that some of the observed effects may have been caused at least in-part by seasonal fluctuations in background nutrient levels of the seawater such as ammonium.

Presentation: LBSP Project 21 – Conduct a technical workshop to evaluate the outcomes of LBSP Project 3/19

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

Deb Caraco, Center for Watershed Protection, provided the information for this project. The Center for Watershed Protection is a nonprofit organization which works with local, state, and federal governments to provide tools to communities to protect lakes, rivers, streams, and estuaries. The websites of this organization are:

www.cwp.org and
www.stormwatercenter.net

The goals of projects 3 and 19 are to find out what programs are in place for southeast Florida to control LBSP, how effective they are, and in what areas can practices be improved. The results of surveys sent out to nonprofits, and local, state, and government agencies resulted in a database of over 66 projects and 100 programs. The assessment of these programs and projects is the goal of this project which started in 2008. Phase I has been completed, and involved analyzing the database for gaps and creating a report summarizing results and recommendations. Phase II is currently being worked on, involving the managing of two half-day workshops for the groups and agencies that responded to the survey and other stakeholders. The report will then be revised based on feedback from the workshops. An “Eight Tools” approach to watershed protection has been created for development in watershed areas. Gaps in the data include few responses from local government in Miami-Dade County and insufficient data to make quality judgments on programs and projects, especially in land-use planning. There are many programs and activities in southeast Florida, but these programs are often not coordinated across the region. Although the region has significant land conservation areas, smart growth programs are in their infancy. Water conservation is emphasized in many programs, which is a crucial issue for the future. Some goals of the report are the reduction of pollutant loads to the reef ecosystem, water consumption, and climate change impacts on the reef system, the restoration and protection of natural areas and quality and quantity of groundwater. Other goals include improving the understanding of the linkages between watershed management, water quality, and the health of the reef, fostering the cooperation of agencies and stakeholders, and encouraging the enjoyment and appreciation of the reef system and natural resources of southeast Florida. The report

has 40 recommendations within the 8 tools framework and highlights successes and examples of these recommendations.

Brian Lapointe commented that there are components of smart growth in southeast Florida, for example the use of injection wells for storm water and wastewater. Deb replied that the city planning pieces of smart growth are in their infancy, while most counties appear to have a smart growth office, however, in terms of land use planning, there wasn't much there. The incorporation of drinking water, wastewater, and storm water, along with a water shortage is important for thinking and planning in this region. Troy Craig asked who the target audience is. Deb responded the workshop is for storm water and watershed practitioners. Phil Dustan asked whether the carbonate soil system behaves differently from other soil systems. Deb answered the problems with karst topography are that it leads to sink holes and there is an immediate connection between storm water and groundwater, leading to contamination. Gene Shinn related the results of a dye experiment performed in the belt of lakes west of Miami and how the results showed the very rapid movement of water horizontally through the watershed in that area much faster than models had predicted. Stephanie Clark, Cry of the Water, mentioned she would like to see a draft of the report and agencies who participated in the research during the comment period. She also believes nonprofit organizations and educators should have a role in the workshops and meetings as stakeholders. Troy replied that some are nonprofits and some of the missing data was filled in from nonprofit organizations. Dan Clark, Cry of the Water, added increasing density in a small, built-out area is still allowing population increase and additional urban sprawl and small, local water district managers are ill-informed. Deb conceded the goals and issues in this project cannot be disentangled from the Everglades Restoration Project. John Fauth recommended looking to the programs from the USDA and ranching community to the west for examples of good water management practices.

Presentation: Observation of temperature and salinity variability in the Port Everglades channel

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.

Alex Soloviev, NSUOC, gave an update of the project. SeaKeeper's International Society gave \$75,000 and equipment to the NSUOC for research. NSUOC decided it would be useful for a mass balance project with a subsidy from NSU. The plume exiting the Port Everglades channel is a source of pollution affecting local coral reefs. The project is a collaboration of FIU, AOML, NSUOC, and Broward County EPGMD. Flow measurements, water samples by bottle sampler, and meteorological, salinity, and water temperature measurements are being taken in the channel. Data from the conductivity, temperature and depth recorder (CTD) and met station are uploaded every hour to the National Data Bouy Center (NDBC). Salinity is the most complex parameter to measure and it is affected by ship wakes and thunderstorms. The project website can be found at:

www.nova.edu/ocean/pesco

Phil Dustan made the point that positioning the sensors to be sensitive to thunderstorms instead of trying to avoid this may give an estimate of runoff from thunderstorms. Alex continued that the observations will continue until the end of September.

Alex also presented the information of one of his master student's thesis, Chris Maingot, NSUOC. The study is examining the characteristics of ocean circulation in southeast Florida, funded by the project "Hydrodynamics and Remote Sensing of Far Ship Wakes." The outcomes of this project may be important in determining the dispersal of the oil spill in the region. Frontal boundaries in the southeast Florida ocean system are relatively sharp and separate coastal waters from the Gulf Stream. Frontal boundaries are zones of convergence in surface waters between two water masses, usually have elevated nutrient levels and biological production, and are visible on the surface with high resolution synthetic aperture (SAR) imagery and observable in the water column with profiling sonar. Sub-mesoscale vortices sometimes occur at the boundary, but are rare. The boundary is usually well-defined. The instruments are set at a depth of one meter and include an RDI Workhorse Monitor ADCP, a General Oceanics CTD, and a Hummingbird Quad Beam Sonar and Global Positioning System (GPS) unit. Wakes were created and measured with sonar and reef and frontal boundaries can be viewed in images created. Features detectable by SAR include ship wakes, natural slicks, surfactant releases, and sharp frontal interfaces. The mostly impenetrable front separating coastal and Gulf Stream waters is therefore most likely impenetrable to the oil spill, but the presence of an eddy will allow the oil to cross into coastal waters. These eddies also affect cross-shelf transport of nutrients and pollutants between the water masses.

Phil Dustan asked if the ADCP was placed below the surface and could the oil be observed passing on the surface? Alex responded this has not been tested yet, but it is known there are some problems with reflections when an ADCP is placed well below the surface and the upper two meters are not visible. Alex added in winter the coastal waters slowly move south and in summer the coastal waters move north. This is the time of the year when it switches and the direction of flow will direct the oil spill toward south Florida or up coastal areas of the state to the north. Valerie Paul asked if the direction of Port Everglades plume switches from north to south in the same manner. Alex answered it does. Dan Clark, *Cry of the Water*, inquired about a product Corexit being put on the oil spill and whether it sinks the oil to 30 meters depth. Gene Shinn responded it dissolved the oil as detergent dissolves grease. Alex added micelles of oil are created, which are essentially very small bubbles of oil in the seawater.

Presentation: Maritime Industry and Coastal Construction Impacts (MICCI) Focus Team Update

The purpose of the *Maritime Industry and Coastal Construction Impacts (MICCI) Focus Team* is to identify and implement ways to avoid and minimize the impacts on coral reefs from coastal construction and maritime industries operating in the southeast Florida region.

The MICCI Local Action Strategy has five years of projects. MICCI Projects 1, 2, and 3 are included in year one. The completion of MICCI Project 1, an evaluation of agencies at all levels to improve compliance and enforcement of regulations that protect coral reef resources and minimize impacts, has been delayed due to the technical nature of the review. Its completion is anticipated for the fall of 2010. MICCI Project 2, the development of guidelines for restoration and response to coral reef injuries, and MICCI Project 3, the identification and evaluation of existing and emerging technologies for coastal construction, are complete. Year two includes MICCI Projects 6, 18&19, and 26. MICCI Project 6, the development of Best Management Practices (BMP's) in a field manual for construction, dredging, and filling near coral reefs, and MICCI Project 26, the designing of a template in Excel for preparing cumulative impact sections of project reviews and assessments for use in creating permits, are complete. The trial runs for MICCI Project 26 are expected to begin in the fall of 2010. MICCI Projects 18&19, which involve working with agencies at all levels to build and manage artificial reefs, has a draft currently under project team and public review. The latter two projects are lead by Dr. Bill Lindberg and Dr. Bill Seaman, University of Florida. Year three includes MICCI Projects 7&11 and MICCI Project 8. MICCI Projects 7&11 are to create an electronic database for use in inter-agency permit review and to create a guidance document analysis of the database information for beach dredge and fill projects. Permits have been entered into the database for these projects and the guidance document is under final review and its completion is expected in June. MICCI Project 8 is an anchorage study of the Ports of Miami and Palm Beach. The final draft is currently under review. About 25% of the anchorage of the Port of Miami is directly over the coral reef tracts and has been so since 1968. The project team is working with stakeholders in Miami to try to modify the anchorage sites. According to habitat maps, Palm Beach County has a large percentage of sandy bottom, whereas Miami-Dade County has seagrass, coral, hard bottom, and other resources. The final draft is due this summer.

Gene Shinn asked when the dredging in Port Everglades is scheduled to begin. Nancy responded she is only aware the updated timeline for the draft for their environmental impact statement and it is due next year. The construction would begin a considerable time after that. Gene also asked about the construction of a gas pipeline in the SEFCRI region. Nancy replied the governor had vetoed its construction.

Year four includes MICCI Projects 4, 21, 23, and 24, MICCI Projects 9&25, MICCI Projects 27, 47, and 48, and MICCI Projects 14, 15, and 16. MICCI Projects 4, 21, 23, and 24 involve initiating rulemaking to streamline regulatory processes for all agencies, develop recommendations for compliance and enforcement based on needs analysis, ensuring compliance by increasing enforcement review and action, and conducting education and outreach to enforcement agencies. Permit writing and permit enforcement appear not to be interpreted in the same way by participating agencies. The development and use of a common language for use by agencies writing permits and enforcing them is a goal. The draft documents are under revision and the project has been extended to November 2010, the contractor is Dr. Ken Lindeman, Florida Institute of Technology. The goals of MICCI Projects 9&25 are to identify management options to prevent anchoring, grounding, and accidental impacts to coral reefs and hard bottoms with buffer

zones, buoy marker systems, and improved nautical charts and enforcement. The aims of these projects are also to evaluate and initiate programs such as “adopt-a-buoy” and to promote awareness, participation, and funding for reef protection activities. Phase I for MICCI Projects 9&25 was completed in 2009, with Phase II anticipated to begin in the summer of 2010. One of the outcomes of these projects is the installation of mooring buoys for the first time in Miami-Dade County. MICCI projects 27, 47, and 48 involve coastal construction monitoring. Literature reviews for protocol development, interviews with contractors/permitters, and environmental consulting agencies will all be components of the project. The project deadline has been extended one year to June, 2011. The contractor is Dr. Alison Moulding, NSUOC/NCRI. MICCI Projects 14, 15, and 16 are a study to evaluate reef recovery following injury and mitigation structures in the region. Phase I, a review of historical grounding sites in Broward County, is due for completion in June, 2010. Phase II, the same review for Miami-Dade and Palm Beach Counties, is due for completion in June, 2011. Year five includes MICCI Projects 5, 10, 12, and 13. These projects involve developing coastal construction workshops and improved reporting processes and agency responses of resource impacts.

SEFCRI deliverables of final projects and reports can be viewed at:

<http://www.dep.state.fl.us/coastal/programs/coral/reports/>

Presentation: Microbiology of Coral Larvae

The purpose of the project *Microbiology of coral larvae* is to identify the types of bacteria present in corals at different stages of development and their relationship to coral health.

Koty Sharp presented the information about this project. It is a contribution to the Ocean Genome Legacy Organization, a nonprofit, publically funded organization created to protect the genetic diversity of the world’s oceans. An Ocean Genome Resource is being created, which is a cryogenic biorepository of marine organisms, along with an accompanying research program. Taxonomic experts from around the world are being employed for species identifications and a full-time staff is employed for database entry and analysis. The goal of the Ocean Genome Resource is for it to be a means to make genetic material of marine organisms freely available to researchers and managers. The sample sources are from small-scale and network field collections, as well as larger, group collections.

Gene Shinn asked if a complete genome of a coral has been completed yet. Koty responded when a sample of tissue is taken the entire genome is present in that sample. John Fauth mentioned the Bio-blitz event in Biscayne National Park would be a useful opportunity for sample collection for the project. Vladimir Kosmynin asked if any plants have been collected. Koty replied there are macroalgae in the collection, but no plants are included to date. Esther Peters inquired whether coral skeleton and associated bacteria and fungi are also included in the samples. Koty replied coral tissue is separated from the skeleton with a buffer solution before extraction, therefore no endolithic tissue is analyzed. The fixing process is only for genetic analysis, not for histology. However, it

may be useful to fix for associated microorganisms in the future. Phil inquired about the funding source. This project is funded by the Kaplan Foundation and other small fellowships and private foundations such as the Phillip-Gillette Foundation. Koty added the archive system is unique in that it is intended as an entirely public access system via website.

Koty continued with describing the importance of genome-enabled research. She has been mainly participating in molecular techniques moving towards metagenomics. One of her research goals is to identify what the healthy states of the microbiology of corals looks like versus the unhealthy, diseased states. What is the change in the relationship between the microbes and host corals that causes diseased conditions? Are new bacteria introduced or do existing bacteria take over? This field is in its infancy. Bacteria are present in all tissues of healthy and unhealthy corals. There is evidence for benefits to the corals from these very diverse assemblages, including atmospheric nitrogen fixation, providing available nitrogen, protection against pathogens, and general nutrient cycling and waste removal. The questions that remain are how do these relationships form, whether the bacteria enter from the water column, if there are inherited components in the coral hosts, what the normal baseline levels are, and how the bacteria in healthy coral contribute to their health. Gene sequencing is made difficult by the very complex assemblages of microbes on corals. The approach this research project uses is to examine juvenile stages, which have far less complexity to their associated microbial assemblages. Gametes are collected with mesh tents, fertilized, and raised in captivity to different larval stages. The bacteria have few morphological distinctions and are difficult to separate and cultivate. Molecular-based probing analysis provides a solution because it helps identify target bacteria in animal tissue. A probe is a small, single-stranded sequence of DNA that will find and attach to the target complimentary sequence in the bacterial host DNA that has been opened into single strands as well. The probe is a species-specific DNA sequence created from a known sample of target bacterial DNA. When the probe is marked with a fluorescent “flag,” or molecular component that will fluoresce, it becomes a visual indicator of the target bacterium which can be viewed as fluorescent areas in the coral larva. Bacteria in *Fungius scutaria* have been found around the mouth and gastric cavity of the developing coral before the zooxanthellae are present in the coral. They are similar to the bacteria found in *Porites*. Mass spawning corals do not acquire bacteria until they attach and settle on a substrate. *Porites* is a brooding coral and bacteria are present in larvae at the base of the ectodermal layer. It appears to inherit bacteria and maintains an association with it between its cells. Is there any specificity and stability with the bacterial associations of *Fungius scutaria* and *Porites*? Koty collected *Porites* from newly released to 11-day stages of development. There have been sequences that most closely match those found in the mammalian gut. A high-throughput fingerprinting method is being used, which shows peaks of characteristic sequences for bacteria taxa. In *Porites astreoides*, there appear to be two peaks representing a *Roseobacter* and a *Marinobacter* constant at all developmental stages, and other transients and incidentals. The *Roseobacter* is very similar to the bacteria found in the larvae of the other coral species examined in this study.

Margaret Miller asked if there was any parental correlation in the larvae that may have been a factor in the results. Koty responded she would like to look into this further. A question was asked about the species of *Roseobacter* found. It is in a clade that is associated with dinoflagellates and not free living. Koty continued that settlement rates were checked in the presence of these bacterial types to assess the relationship of the corals to the bacteria. The results show better settlement rates with the *Roseobacter* present. Brian Lapointe made the point that settlement rates are affected by the biofilm already present on the substrate and this may have affected the results. Esther Peters inquired whether any analyses have been done on adult corals. Koty responded 11-day old corals was the maximum age. Esther Peters added the characteristic that makes *Porites* different than other corals is the presence of bacterial aggregates in the tentacles. Phil Dustan asked if bacteria in coral mucus has been analyzed. Koty would like to begin doing this. Piero Gardinali inquired about how the genomes will be made available to the public. Enough sample DNA is collected and archived to give out for polymerase chain reaction (PCR). Genome amplification techniques are being looked into for use in this project. There are under 5,000 specimens currently available in the archives, but the number is growing rapidly. Vladmir Kosmynin asked how correct identifications are ensured. Voucher specimens and contact information of the identifiers are with each archived specimen. Esther Peters stated the taxonomic information in the system will have to be modified or integrated with a taxonomic system as taxonomy changes and it would be interesting to see how bacterial assemblages change with cell differentiation of coral larvae.

Presentation: State of Florida Numeric Nutrient Criteria Development Update

The purpose of the project *State of Florida Numeric Nutrient Criteria Development* 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 the update of this project via conference call. The EPA has made a formal determination that numeric nutrient criteria are necessary for estuarine and coastal waters. The criteria will be proposed by the EPA on January 14, 2011 and finalized in October, 2011. The first round of scientifically defensible protective criteria values from the DEP is due to the EPA in June, 2010. To accomplish this, the DEP has been engaging local organizations, stakeholders, and experts from around the state. The data from discussion and exploration is being compiled and supported by scientific study. The DEP will also ensure the information is accessible to the FDEP and EPA for consideration when developing the proposed numeric nutrient criteria. Nutrient causal parameters, supporting variables such as hydrodynamics, salinity and dissolved oxygen, biological response variables such as community structure type and quality, and cause-effect relationships such as biological responses to anthropogenic nutrients, will be identified and described. The desired outcomes are the development of numeric loading or concentration targets needed to protect or restore the system and the linking of criteria to designated use for healthy, well-balanced biology. The criteria may be used for source control and impairment assessment. Currently, the trophic status, aquatic life use support status,

biological resources or endpoints, and approaches to quantifying criteria have been assessed for roughly 30 systems in south Florida. The southeast coral reef tract from Key Biscayne to Vero Beach has been classified as oligotrophic. There are some declines in corals, benthic algal growth, invasive species (*Caulerpa*), but they have not been positively linked to nutrients. The largest elkhorn coral colony and pillar coral reside in this area. The biological endpoints are: calcification, growth, and stress recovery of stony corals; chlorophyll; and macroalgae. The approaches to quantifying the criteria include multiple lines of evidence, literature, laboratory dosing studies, survey observations, and the determination of a relationship between anthropogenic sources and observed conditions.

Russ posed the question for any other biological indicators that show a response to the human input of nutrients, not just stressors. Valerie Paul responded phytoplankton and chlorophyll *a*. Phil Dustan commented that the settlement of larvae is influenced by the substrate type and condition and how this could be untangled for its use as a biological indicator. It was discussed that benthic algae reduces coral recruitment and top predators eat herbivores. Brian Lapointe suggested the addition of nitrogen stable isotopes to link algal growth to land based sources of pollution and this would be the best method due to the lack of historical data available about algae in the area. Russ questioned whether algae are truly the causative factor to the apparent decline in the health of the coral reef tract in south Florida. Brian Lapointe responded that macroalgae have a very large coverage in the area where he works, Phil Dustan agreed. John Fauth stated sponges are biological indicators for nutrient enrichment, with the increase of boring sponges with nutrient levels. Russ posed the question whether anthropogenic nutrient inputs have been specifically tied to adverse biological response. Brian Lapointe commented the historical isotope data for gorgonians shows an upward trend in heavier isotopes, indicating an increase in wastewater exposure. Russ urged the compilation of all the information discussed and its peer review by the EPA. Physical smothering, abrasion, and the changing of substrate from algae decrease coral recruitment. Russ posed the question of how else corals can be influenced by nutrients. It was replied nitrogen and phosphorous affect coral growth and calcification. Phil Dustan commented microfilamentous algae trap sediment on the edges of coral and smother it. Russ asked if a depth-to-seagrass target would be appropriate for this area and whether there is an assimilative capacity for nutrients in the area. Valerie Paul answered there is assimilative capacity in algae, but it is not wise to foster its growth. Russ asked what taxa have been affected by anthropogenic inputs, what are the mechanisms, and do any nutrient loading models exist? Brian Lapointe responded eutrophication studies with corals have been done and those numbers are in very close agreement. Several TAC members agreed there are currently no nutrient loading models in place for the region. Russ asked whether overfishing (grazer reduction) relates to nuisance algal growth in southeast Florida. Brian Lapointe responded that grazer fish are not targeted in this area as much as in other parts of the world and he has not seen a reduction in grazers in southeast Florida related to algal blooms. In fact, there have been population explosions of sea urchins possibly caused by a top-down trophic cascade. Deb Caraco asked if the nutrient criteria are being developed to account for the projected change in carbon dioxide levels and global warming in the future. Russ responded there has been discussion about keeping aragonite

growth up and keeping the pH of the oceans from becoming too acidic. However, it was decided it was best to focus on direct cause and effect based on current evidence. The project team welcomes contributions from local experts for the development of nutrient criteria. Russ asked if there are any examples of sites that have not been affected by anthropogenic inputs. Valerie replied there are not, due to ubiquitous human activity. Lapointe commented this is the reason a number of researchers are collecting data in the Bahamas. Gene Shinn added it is wise to look to more distant places such as Rum Key and San Salvador for reference sites. Russ suggested the lower Keys, but the TAC responded negative. He also suggested the Dry Tortugas and Valerie Paul commented this location is better. Phil Dustan made the point the oil spill will eliminate many locations as reference areas. A report will be drafted and brought to the EPA, the EPA will conduct a peer review, and the criteria will be proposed in October 2011.

Presentation: Atmospheric aerosols

The purpose of the presentation *Atmospheric aerosols* is to explain the importance of current research examining aerosol compositions, formation, and the possible negative effects of aerosols on the coral reef systems in southeast Florida.

Katharine introduced Dr. Song Gao, a newly appointed atmospheric chemist at NSUOC, to the TAC members and guests, who presented the information on this topic. There is a significant amount of influence and interaction between the atmosphere and oceans. Aerosols are particulate matter from volcanic sources, dust, smog, and many other types from both natural and anthropogenic sources. They affect global climate on regional and global scales. In Florida, dust comes over from Africa, and satellite images show extensive dust systems exist worldwide. Aerosols affect the level of solar radiation entering the atmosphere and cloud cover. The effects of aerosols are largely unknown when compared to greenhouse gases. It is uncertain whether aerosols cool or warm the earth, with the prevailing belief they have a cooling effect. The characteristics that need to be studied are number, size, microstructure, and composition (chemistry). Composition studies are important for determining the origin and evolution of these particles, as well as their effects on human health, disease, and toxicity effects. Red tides in the west coast of Florida and perhaps algal blooms may be initiated by the transport of African dust to the region. Therefore, aerosols can have negative effects on ecosystems and coral reef systems. Dr. Gao is working on a full survey of aerosols, with a goal of classification into individual chemical species. Currently, only 15% of aerosols can be positively classified to chemical species. This is due mainly to the vast number of unidentifiable organic species that exist in the atmosphere, including microbes such as bacteria and fungi. Methodologies include lab simulations, field sampling, and measurements. In a chamber, different precursor molecules are added along with atmospheric gases such as oxygen and carbon dioxide. The compounds in the aerosols produced from reactions that occur in the chamber are identified with mass spectrometry. After structures are identified, mechanisms can be proposed about how they formed. A series of polymerization steps is used to form more complex species. If a particle in the atmosphere becomes acidic, it can form a greater number and range of chemical species in subsequent reactions. Different areas of the world have varying degrees of complexity to their atmospheric aerosol compositions. For example, the China-Korea-Japan area has urban pollution, forests

burning, dust, sea salt, and other species from all sources. The southeastern U.S. has a much simpler scenario, with vast areas of forest which emit known chemicals and interspersed cities. Coupled with meteorological studies, trajectories of chemical sources are mapped. Urban Shanghai aerosols are abundant in high molecular weight and nitrogen-containing species. The formation of chemical species originating from pollution not containing oxygen was a novel find in this area. In the southeastern U.S., sulfur dioxide from power plants, forest emissions, and photochemistry create a scenario where a wide range of chemical species can form. These aerosols can then enter the ocean. Oceans are known to emit dimethylsulfide, which is known to produce sulfate aerosols. It is not known if dimethylsulfide can lead to organic molecules. This will be part of Dr. Gao's upcoming work at NSUOC. Polluted and unpolluted water samples in the area will be collected for analysis, with the Caribbean being used as a reference site. Another worthwhile study is to examine aerosols where dust, organic species, and a high level of photochemistry are present. Dr. Gao concluded with the importance of understanding aerosol distributions and their effects on marine systems, coastal water quality, acidity, algal blooms, and corals.

Vladmir commented some positive effects of aerosols include the transport of minerals such as iron. Gene Shinn stated the red soil in the Bahamas called pineapple loam provides material for pottery and supports most of the agriculture in the Bahamas. It is African dust that has been deposited there where the rest of the soil is limestone. Esther Peters added there is a red dust record in the corals in the Keys. Gene commented mercury, arsenic, and beryllium-7 are present in the African dust that makes it to the southeastern U.S. and Caribbean. Piero asked whether the sediment in corals can be analyzed for chemical species composition. Dr. Gao replied it can with the use of filtering techniques.

Public Comment

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

Discussion: General

Chantal Collier, DEP, provided an update on the oil spill in the Gulf with current information from the DEP. The flow of oil is estimated at 5,000 gallons per day with much speculation on the correct number. It is a spill of national significance, but it has not yet been federalized and is still a private matter with British Petroleum (BP). However, there will be state and federal responses to the spill. Currently 7,500 personnel are involved in the response, with 2,000 volunteers, 200 vessels, and nearly 2,400 barrels of oil recovered to date. 156,012 gallons of dispersants have been used with 230,000 gallons available. Nine staging areas have been instated to protect shore areas and 486,000 feet of containment booms have been deployed with another 6-8,000 feet available. 91,400 feet have been deployed in the Pensacola area with another 50,700 feet available and 17,000 in Panama City with 45,000 on order. There are 285 BP contractors working in the Pensacola area, with a new staging area about to be set up in Panama City. The state emergency center is at a level two response, or partial response level. The DEP is the lead agency in Florida for response to natural resource protection. There have been two executive orders from the governor's office (1099 and 10100) issuing states of

emergencies in many counties on the west coast of Florida. The state of emergency response team is conducting daily calls with county emergency teams and their partners to ensure communication and information flow. There are also state emergency response team representatives along with national headquarters DEP staff at the U.S. Coast Guard sector Mobile office. There are six DEP liaisons on their way to the counties on the west coast of Florida. There are representatives from BP and the U.S. Coast Guard also present at state emergency operation centers. Most actions are based on established, existing plans. A group Volunteer Florida is assisting with the coordination of pre-landfall cleanup efforts and a state executive order has authorized pre-incident sampling. Water quality and sediment sampling is occurring along the west coast of Florida. FWC is handling the sampling inventory and mapping of habitat. Chantal handed out a quick reference list with phone numbers and websites for information regarding the spill, response efforts, health concerns, and other related topics.

Closing Remarks

Katharine Tzadik asked if there were any closing remarks for the day. There were none.

The meeting was adjourned at 5:07 pm.

DAY TWO, Friday, May 7, 2010

Meeting Guidelines

Katharine Tzadik, FDEP-CRCP, welcomed the TAC members, presenters, and observers to the second day of the meeting. She introduced herself and Chantal Collier, FDEP-

CRCP, as the facilitators of the meeting. Katharine reviewed the roles of the facilitators and observers and guidelines for participation. The public was invited to fill out comment cards and submit them to the staff for an opportunity to speak during the public comment period. Written comments must be submitted for inclusion in the meeting minutes. Attendees were reminded to fill out and hand in meeting evaluation forms at the end of the meeting.

Michelle Wood is the new director of AOML in Miami and attended the meeting via conference call. Tom Carsey from NOAA AOML is the director of the ACE program introduced himself and also audited the meeting via conference call. The TAC member and guests introduced themselves and Katharine reviewed the agenda for the day.

Presentation: Update NOAA-CRCP Management Priorities

The purpose of the presentation *Update NOAA CRCP Management Priorities* is to present the goals and objectives from a refocusing of NOAA-CRCP coral reef management priorities based on the needs of the coral reef management community in Florida.

Dana Wusinich-Mendez, NOAA, presented an update of the NOAA-CRCP management priorities. Through an external review, the CRCP received key recommendations for the refocusing of management priorities around understanding and addressing the needs of the coral reef management community. The efforts of the program were also spread too thin, attempting to cover all problems with coral reefs in all areas with too little financial resources to be effective. The past 2-3 years has been spent on refocusing management priorities around these recommendations. The NOAA-CRCP program manager, Katherine Andrews, worked with a group of partners within the CRCP to decide on key issues to be addressed. The key issues are fishing impacts, LBSP, and climate change. Three large working groups were created to set national-level goals and objectives around the three key issues. This set of 10-year goals and five-year objectives can be viewed at:

<http://coralreef.noaa.gov/aboutcrp/strategy/currentgoals/>

To address the need for better understanding of the needs of individual management areas distinct from national goals, management representatives from each of the seven states and territories were brought together and asked to develop their goals and objectives for coral reef conservation and management. Florida's process began a little over a year ago and ended a few months ago with the posting of the final priority document. Dana handed out copies of the final document. The four types of participants in the workshop were identified. The core managers were site managers from FDEP-CRCP, FWC, FKNMS (NOAA and FDEP), National Park Service (Biscayne, Everglades and Dry Tortugas National Parks), Florida Keys National Wildlife Refuge, St. Lucie Inlet State Park, John U. Lloyd State Park, John Pennekamp State Park, Palm Beach County, Broward County, and Miami-Dade County. The second group were other managers with broader management roles from South Atlantic Fishery Management Council, Gulf of Mexico Fishery Management Council, NOAA Fisheries (Habitat Conservation, Protected Resources, Sustainable Fisheries and Restoration Center), NOAA - National Marine

Sanctuaries, FWC, Martin County, and Monroe County. The third group were science advisors working on coral reef efforts from UM-RSMAS, FIU, FIT, NSU – NCRI, TNC, NOAA SEFSC, National Park Service, and FWC. The fourth group were legal and enforcement advisors from FDEP, FWC, and USCG. The first step in the process was a situation analysis completed by a contractor Lighthouse Consulting Group (LCG) and involved summarizing existing management goals and objectives. Comments were solicited from the other managers, science advisors, and enforcement advisors on the analysis draft. Recommendations and comments on modifications or additions to existing management plans were requested. These data were submitted to core managers in advance of the workshop and used to frame interviews with core and other managers to define initial goal areas for the workshop. The workshop was held on June 12, 2009 in Miami at AOML with the core managers group. The outcomes of the situation analysis and interviews were discussed. The group identified major theme areas for goal and objective development – integrated management of the Florida reef tract system, the impact of climate change, LBSP, and fishing, diving, and other uses. Small breakout groups were then formed by area to develop 5-7 year goals and 3-5 year objectives for the four themes. The post-workshop process included core managers voting on priority goals and objectives, review of the draft by other managers and advisors, discussion of comments, and the consideration of additional comments by the MICCI team. The resulting document has four main sections detailing the scope, development, and prioritization process, priorities, linkages to NOAA-CRCP priorities, and location-specific priorities not identified as priorities for the entire reef tract system. Dana handed out a document with the goals and objectives for Florida and national objectives listed. There was no agreement on whether to call the Florida reef tract the “Florida Reef,” “Florida Reef Tract,” “Florida Reef Ecosystem,” or other possible names. None of the climate change priorities were voted in to the priorities for Florida. The document can be viewed at:

<http://coralreef.noaa.gov/aboutcrp/strategy/reprioritization/managementpriorities/welcome.html>

Vladmir Kosmynin commented that the ecological properties of corals should be a priority in the SEFCRI region. Phil Dustan related the fact the political will and successful management of the Great Barrier Reef has been created due to everyone viewing it as a precious, national, natural resource and the same feelings should be encouraged about the Florida reef tract. Dana responded that is why the coining of an appealing name for the Florida reef tract is important. Valerie Paul mentioned this is being attempted with the Everglades and has been met with mixed success. Gene Shinn noted there are no priorities for conducting research and it is not known what is killing corals in the region. Dana replied the document outlines goals and is a preliminary step to getting research projects in place to achieve those goals. Margaret Miller and Vladmir Kosmynin noted that research focused on corals is a very weak component of the document with fisheries related research being a much larger component. Dana responded the CREIOS workshops held previously were for deciding on research and monitoring needs. Chantal added the process was agreed upon early on to treat the south Florida reef ecosystem as a whole. Vladmir Kosmynin suggested the name “South

Florida reef complex” because there is a discontinuous nature to the separate reef sections of the Florida reef tract. Phil Dustan made a note about the use of the word “rehabilitation” in the document as opposed to “conservation” given the state of the reef ecosystems. Dana explained how this was the first step of a two-step process over the course of three years. The next step is to assess the management capacity in Florida to implement these priorities. Through this assessment to be completed within the next 18 months, a targeted list will be developed to show what capabilities and resources are available for implementation of the priorities and which are needed. Gene Shinn commented three major parts of NOAA are overlapping each other in their efforts. Dana responded they are trying to work together and the focus of this project is to support the site managers of coral reefs. Piero Gardinali commented in Priority Goal 3.1, the wording for the water control statement is awkward and water control should be included in other goals and priorities besides those only targeting education. Esther Peters commended Dana and her team for tracking all the participants down and bringing them together for the creation of the document and asked if there were any consensuses between agencies about implementation of the goals and objectives. Dana responded there were for many issues and the group seemed excited about the integration of efforts across agencies. Chantal added that the common goal and challenge is the implementation of the goals. Due to the lack of a united agency to work on implementation, work has to be accomplished in respective jurisdictions. There has been more interaction across agencies and place-based managers than historically. Managers can’t always make decisions because they have to wait for decisions at the national level and managers don’t always agree. The next steps will be interesting and vital to the management of the reef tract as a whole. Esther Peters asked if the Florida Reef Management Council will bring together managers from the national level. Chantal responded negative, only from the state level. Valerie Paul added it would not work at the national level. Vladimir Kosmynin supports the involvement of local governments in management decisions. John Fauth suggested looking to the Adirondack Park Agency for guidance in successfully coordinating different management areas. They may have experience with logistical pitfalls to avoid.

Presentation: FDEP-CRCP Strategic Plan: 2010-2015 Update

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

Chantal Collier, FDEP, presented the update of the plan. The CRCP has been given preliminary approval to move forward with their key goals and objectives. The purpose of the plan is not to work at the project level, but to shape where the CRCP is going on the timeline of 2010-2015. The CRCP was established in 2004 where no such program existed previously and now has many responsibilities in 2010. Many responsibilities have grown out of Local Action Strategies (LAS) and many additional program areas such as reef injury prevention and response have expanded the role CRCP plays in the management of southeast Florida’s reef resources.. Due to its rapid growth and the scope of issues to be addressed, focusing on priorities has become an important task for the CRCP. Requesting feedback from stakeholders, events, outreach programs, and TAC meetings are efforts used to provide information and incorporate feedback into

prioritizing and strategic planning. A targeted survey has been constructed and posted as a link on the FDEP website along with an introduction of the mission and the long term goals of the CRCP for this purpose. These goals include assessing the capacity to deliver the program, education and outreach, general conservation goals, and improving and enhancing rules compliance and enforcement. The survey asks for the participant to rank a given priority of high or low importance. Hyperlinks are included with each question to provide more relevant information on the topic. At the end of each question, there is an area for comments. The survey includes all programs and partnerships, conservation strategies, and education and outreach efforts. The survey was posted two days ago and takes about 15 minutes to complete. A response is requested by May 25th for all interested participants. June and July will be used to shape the final strategic plan.

Valerie Paul inquired about the recipients of the survey. Chantal replied it was sent to a list of 5,000 people from diving clubs, fishing clubs, and others who have some knowledge of the program and reef resource issues. John Fauth asked in the case all questions come back marked as high priority, will this mean more funding to follow? Chantal replied it is possible. Vladmir commented the purpose of the project seems very logical. Chantal responded there are so many projects going on and a sufficiently small staff that results in difficulty staying engaged with every project. Efforts are being made to focus on what is most important. Dan and Stephanie Clark, Cry of the Water, commented a better response would have resulted if the public were invited to meetings.

Discussion: U.S. Department of Agriculture Natural Resource Conservation Service Initiative

Katharine sent out an email to the TAC members regarding possible opportunities with the U.S. Department of Agriculture (USDA) for discussing ideas about possible projects with agricultural lands and their associated impacts on water quality and on coral reefs. Greg Hendricks, USDA, introduced himself as a member of a technical and financial assistance agency NCRS who works with the agricultural industry to encourage good practices. The agency has the opportunity to work with private land owners in the remaining agricultural areas in south Florida. NCRS chief Dave White is interested in assisting with coral reef conservation and has set aside one million dollars for four areas to begin work. Puerto Rico received \$250,000 for nutrient and runoff analyses and investigating best practices for protecting coral reefs. Upstream from Boca Inlet and Port Everglades are also areas of focus. A cursory analysis of agricultural lands has been completed with analyses of urban areas still a goal. Phil Dustan inquired if the amount of runoff from the agricultural areas is known. Ed Write, USDA NCRS, replied NCRS does not conduct the research; however, SFWMD does have some of this data. Greg added the numbers from the small agricultural operations in south Miami-Dade are probably not available. Piero Gardinali commented that agricultural land owners may be apprehensive to participate in such studies. John Fauth stated he is involved in FRESP, a program that installs water withholding structures on agricultural properties for retaining runoff and associated nutrients. The land owners who have the structures installed receive a monetary reward. The ranchers participating in these programs are very satisfied with the arrangement. Ed Wright stated the need for a relationship developed with agricultural land owners and research entities such as the scientists on the TAC. Dan Clarke, Cry of

the Water, asked if there are any programs in place for tailwater recovery similar to the nurseries in Palm Beach County. Greg replied there are and it could be a target for other programs developed. Palm Beach and south Miami-Dade Counties have the highest concentrations of agricultural people. Greg added some out-of-the-box thinking and green and environmentally sound practices are necessary. Esther Peters asked if Greg and Ed can link the agricultural land owners to researchers. Ed replied, in some cases, yes. Phil Dustan commented there should be experiments conducted in addition to monitoring. John Fauth presented a map of agricultural land with a series of ditches with water control structures called riser boards that flood the land and retain water. Flow and nutrient information are also gathered at the site. Greg commented most are set up in this way with a separate type having a pump and this technology was started as a World Wildlife Fund (WWF) conservation innovation grant in 2005. They tried to come up with a payment for environmental services program focused on agricultural land. Now efforts are being made to understand the benefits of retaining water. Phil Dustan asked what kind of wetland vegetation grows in the wetlands created by the retained water. Greg replied it is typical native emergent marsh vegetation. Native vegetation eventually takes over. Chantal posed a question to the TAC members asking how this technology reflects back to protecting the reef. Ken Banks stated it is the micro-industries that produce the greatest nutrient load in runoff. Dan Clark, Cry of the Water, commented the Everglades Restoration Project already has the information being discussed and SEFCRI and TAC members need to communicate and get involved with them. Ed Wright stated the determination of what is agricultural land needs to be made. Greg made the note if the TAC group is interested, which it was, to move forward with what he has introduced.

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

John Fauth invited the TAC members to discuss the Quick Guide to Florida's Gold Coast Reefs for Policymakers and Managers being developed by the team. Margaret Miller suggested organizing the LBSP by those that are used by the most people on a regular basis. Valerie Paul questioned whether there were any direct impacts of power plants on coral reefs. Margaret Miller responded climate change and carbon dioxide are affected and perhaps this should be explained more explicitly. Valerie Paul suggested adding Lake Okeechobee to the part about restoring clean water running through and out of the Everglades, and whether it is misleading using the word "restore." Phil Dustan believes "rehabilitate" is a more accurate but awkward term. It was agreed to add Lake Okeechobee to this statement, albeit this area is part of the same watershed. Valerie Paul commented on the statement in the last paragraph that seaweeds are less abundant and *Lyngbya* has disappeared may be unfounded. Piero agreed the use of the word "disappeared" creates a false statement. Chantal stated the initial step of closing the outfall will reduce blooms. The closing of the outfall should be featured as a positive step toward reducing nutrient input. John said the first two paragraphs go back and forth between subject matter. He suggested introducing the reef and then talking about its economic value. Margaret Miller suggested combining the first two paragraphs. Phil Dustan commented that short paragraphs and pictures convey more material because people skim over documents. Valerie Paul and Esther Peters also suggested the use of more pictures. Valerie Paul recommended reducing the size of the authorship font on the

last page and increasing the font size in the rest of the document. Phil Dustan recommended including a picture of a child at a SEFCRI event. It was suggested to reduce the number of total pages and creating a version for the public. Chantal stated this would be too expensive to print. It was agreed the map be made larger. Phil Dustan suggested it be made longer and placed on the SEFCRI page. Valerie Paul recommended more examples of initial progress and Phil recommended monitoring sites. Chantal suggested changing “create” to “create and support” in the numeric criteria statement with unanimous agreement. Valerie Paul suggested a picture of a family snorkeling, while Phil Dustan suggested a picture of a fish kill.

The discussion moved to the User’s Guide to Florida’s Gold Coast Reefs developed by the SEFCRI TAC for use by technical staff. It was mentioned, on page 18, pollution must be tied back to coral reefs. Margaret Miller asked if the format should be standardized and offered to work on some of them. The reduction in the addition of toxic substances to landfills should be added. Dan Clark, Cry of the Water, suggested handing out waste handling and recycling brochures. Several TAC members responded that several brochures are in development already. John Fauth suggested requesting a paragraph on septic systems from Dale Griffin. Sentences on nutrients and pathogens will be added. Margaret Miller stated it should be noted in the document that wastewater treatment is needed. John Fauth commented the statement “cherish our coral reef treasures” needs some suggestions for implementation. Phil Dustan suggested outreach programs for children in schools. John Fauth asked if there are any reef festivals that take place in the region. Dan Clark, Cry of the Water, responded Oceanfest, but it hasn’t taken place in the past few years due to lack of financial resources. The Blue Expo takes place in June, but it is mostly about spearfishing. A seafood festival is held in Martin County and a marine flea market in Broward County. Chantal warned that boat shows are not a good option because the attendees are not interested. Valerie Paul suggested education and Margaret Miller suggested field trip and nature centers for implementation of the cherish statement. “Enhance experimental opportunities” should be stated. Phil Dustan stated people are allowed to spearfish with SCUBA gear and the U.S. is one of the only countries to allow this. Snorkeling with spearfishing should be encouraged in the fishing section on page 20. Vladimir Kosmyrin stated paragraph one on page 19 is unacceptable as it is. It should read “current position,” not “historical position.” Hard ground areas should be protected to evolve coral reefs. The TAC suggested Vladimir review the whole section. Margaret Miller pointed out the nutrient criteria on page 22 needs to be explained more thoroughly. The draft will be sent to the TAC for review. Phil Dustan felt page 21 is repetitive about the toxic waste and has nothing about landfills and is mostly about homes. John Fauth stated unregulated household chemicals could be presented as bullet points. Valerie Paul suggested the use of other coral reef white papers as templates. John Fauth invited emails with comments after review. Chantal pointed out there are TAC members not in attendance who could be helpful in revising the paper. Margaret Miller recommended captions and references for the pictures.

Discussion: TAC Administrative Business

Katharine Tzadik asked if there were any additional comments and suggestions for dates of the next TAC meeting. Chantal Collier stated the 11th and 12th of November have

holiday conflicts. The 4th and the 5th and the 18th and the 19th of November were suggested. The end of October has too many deadlines for many attendees. There will be a doodle call for the 4th and the 5th or the 18th and 19th of November. December is too late due to finals at colleges and universities.

Public Comment

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

Closing Remarks

Katharine Tzadik thanked the TAC members, presenters, and guests for attending the 11th SEFCRI TAC meeting and asked if there were any closing remarks. Chantal Collier thanked everyone for contributing to the white paper. The hiring of a contractor or grad student with good writing skills to wrap up the editing of the white paper was suggested. Margaret Miller pointed out the revisions will take as much time as hiring someone to edit it.

The meeting was adjourned 12:36 pm.

Appendix A

Public Comment – Day 1

No written comments were provided for recording. One observer provided comments (Dan Clark, Cry of the Water).

Public Comment – Day 2

One written comment was provided for recording. Two observers provided verbal comments (Stephanie Clark, Cry of the Water and Dan Clark, Cry of the Water).

Stephanie Clark, Cry of the Water, has an Outstanding Florida Waters application in to the DEP with Janet Klemm working on it. A downplaying of the extent of the coral reefs in Florida is occurring. The Florida coral reef tract should be called “Florida coral reef.” There are not as many nearshore reefs present as previously based on both historical data and personal experience. Construction projects are burying reefs and pushing them offshore as a result. Phil Dustan asked if there should be a restoration project to bring them back inshore. Stephanie Clark pointed out mitigation in the artificial reef project document. This creates incorrect numbers that do not represent buried reef and will foul the information contained in recommendations for regulatory staff. There should be mechanisms for inserting corrections to these numbers in cumulative impact studies or other analyses. The permits do not correctly represent the total sand used in construction projects. John Fauth agreed there should be action to investigate the actual numbers because data shows sand use is often exceeded by 50% from estimates in construction projects. Stephanie has been working with DEP to try to recover the actual numbers and document the projects with the DEP. Vladimir Kosmynin commented the projects are designed with a template and is approved for a restoration of this template, so long as the DEP is notified of the restoration activities. Stephanie responded the incorrect numbers

are still being inputted into documentation and there should be a mechanism for correction of these numbers. Dan Clark, Cry of the Water, mentioned the changing of the sand bar location. Vladimir Kosmynin stated the sandbar system is being fed by restoration projects and it migrates, naturally covering and uncovering hard bottom surfaces, however we are feeding the bar with undetermined amounts of sand. Vladimir made the point beach renourishment cannot be stopped because the laws are already in place, but we can try to modify it so its damaging effects are minimized. Stephanie made the point the natural ephemeral hard bottoms are separate from hard bottoms we have destroyed from the addition of sand. Stephanie will be emailing her Outstanding Florida Waters application and her comments to the TAC members.