

1ST Annual Science Forum



Program & Abstracts

June 3RD, 2003

Rosenstiel School of Marine and Atmospheric Sciences
University of Miami
Miami, Florida

SFC-CESU Science Forum – June 3, 2003

University of Miami RSMAS

Slab Seminar Room

- 0800 Registration
- 0830 Welcome & Introduction O. Brown/ P. Swart
- 0845 BISCAYNE NATIONAL PARK RESEARCH NEEDS. Rick Clark and Richard Curry, National Park Service.
- 0900 CURRENT HAPPENINGS IN THE SOUTH FLORIDA/ CARIBBEAN INVENTORY & MONITORING NETWORK. Matt E. Patterson, National Park Service.
- 0915 BISCAYNE BAY'S MANGROVE SHORELINE FISHES. Joseph Serafy, University of Miami RSMAS.
- 0930 DEVELOPMENT OF A FISHERY MANAGEMENT PLAN FOR BISCAYNE NATIONAL PARK. Jerald S. Ault¹, Steven G. Smith¹, James A. Bohnsack², Rick Clark³, Todd Kellison³, and Jim Tilmant³. ¹University of Miami RSMAS, ²NOAA Fisheries, ³National Park Service.
- 0945 RESTORATION OF CARIBBEAN CORAL REEFS WITH CULTURED CORAL LARVAE. Alina M. Szmant, University of North Carolina at Wilmington.
- 1000 BREAK
- 1015 DISEASES IN CARIBBEAN CORAL REEFS: CURRENT STATUS AND INFORMATION GAPS. Ernesto Weil, University of Puerto Rico.
- 1030 TOWARDS SCIENCE-BASED MARINE RESOURCE MANAGEMENT FOR DRY TORTUGAS NATIONAL PARK. Jerald S. Ault¹, Steven G. Smith¹, James A. Bohnsack², Tom Schmidt³, Doug Morrison³, Bill Perry³, and Jim Tilmant³. ¹University of Miami RSMAS, ²NOAA Fisheries, ³National Park Service.
- 1045 HIGH-RESOLUTION COASTAL OCEAN MODEL AND APPLICATION TO CORAL REEF ECOSYSTEMS IN WESTERN BOUNDARY CURRENT. Jerome Fiechter, University of Miami RSMAS.
- 1100 A PRACTICAL GUIDE TO THE SHALLOW WATER SPONGES OF SOUTHEAST FLORIDA, THE BAHAMAS AND NORTH CARIBBEAN SEA. Charles G. Messing, Nova Southeastern University.

- 1115 SCIENCE PROGRAMS AND NEEDS FOR SOUTH FLORIDA ECOSYSTEM RESTORATION. I. Lorraine Heisler, US Fish and Wildlife Service. ^{RE}
<http://www.fws.gov/R4/ea/yesub.htm> → South FL Multi-Species Recovery Plan
- 1130 PLACE-BASED RESEARCH: A USGS INITIATIVE. Nicholas Funicelli, US Geological Survey.
- 1145 GLOBAL WARMING, DISTURBANCE ECOLOGY AND RESTORATION ECOLOGY OF MANGROVE ECOSYSTEMS IN EVERGLADES NATIONAL PARK: OPPORTUNITIES FOR STUDENT RESEARCH. Thomas J. Smith, Kevin R. T. Whelan and Gordon H. Anderson, US Geological Survey.
- 1200 LUNCH
- 1300 FISH HABITAT ASSESSMENT PROGRAM (FHAP): LINKS SEAGRASS DYNAMICS IN FLORIDA BAY WITH ENVIRONMENTAL VARIABILITY. Michael J. Durako¹, J. Hackney¹, J. Kunzelman¹, R. Dean¹, J. B. Landry¹, M. O. Hall², and M. Merello². ¹University of North Carolina at Wilmington, ²Florida Marine Research Institute.
- 1315 WEB-BASED INTERACTIVE ARCHIVE OF CARIBBEAN-WIDE CORAL COLLECTIONS INCLUDING SITE-MAPS, COLLECTION INFORMATION, AND X-RADIOGRAPHIC PRINTS. Kevin P. Helmle¹, Richard Dodge¹ and Peter K. Swart². ¹Nova Southeastern University, ²University of Miami RSMAS.
- 1330 THE UTILIZATION OF ION MOBILITY SPECTROMETRY AND ANNULAR DENUDER TECHNIQUES TO EXPLORE THE DEPOSITION OF AMMONIA IN COASTAL ECOSYSTEMS. LaToya Luse¹, Larry Robinson¹, and Tilden P. Meyers². ¹Florida A&M University, ²NOAA, Atmospheric Turbulence & Diffusion Division.
- 1345 COASTAL APPLICATIONS OF HYPERSPECTRAL IMAGERY. Katherine A. Milla, Florida A & M University.
- 1400 BIRD CONSERVATION PRIORITIES IN SOUTH FLORIDA AND THE CARIBBEAN. J. Keith Watson, US Fish and Wildlife Service.
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- 1415 THE USE OF SCIENCE IN GULF OF MEXICO DECISION MAKING INVOLVING CLIMATE. Dremal Worthen, Florida A & M University.
- 1430 COOPERATIVE ECOLOGICAL STUDIES FOR LINKING SCIENCE AND MANAGEMENT. Frank J. Mazzotti, University of Florida.
- 1445 BREAK

- 1500 UNDERREPRESENTED POPULATIONS AWARENESS OF FISH ADVISORIES AND FISH CONSUMPTION ISSUES. Richard Gragg, III, Florida A & M University.
- 1515 AN ASSESSMENT OF MERCURY EXPOSURE FOR MULTIPLE TROPHIC LEVELS IN GREATER EVERGLADES ECOSYSTEM. Sekeenia Haynes^{1,2}, Kenneth Rice, ¹Jon Wiebe¹, Shane Ruessler¹, Carla Wieser¹, Timothy Gross¹, Richard Gragg², Frank Mazzotti³, Ted Lange⁴, ¹US Geological Survey-FISC, ²Florida A&M University, Environmental Sciences Institute, ³University of Florida, ⁴Florida Game and Fresh Water Fish Commission
- ~~1530~~ OVERVIEW OF CERP NEEDS RELATIVE TO BISCAYNE BAY. Sarah Bellmund, National Park Service.
- 1545 BIG CYPRESS NATIONAL PRESERVE: AN ECOSYSTEM MANAGEMENT AND RESEARCH OVERVIEW. Bob Sobczak and Don Hargrove, National Park Service.
- 1600 LANDSCAPE MODEL OF RIDGE AND SLOUGH TOPOGRAPHY: INTEGRATION OF HYDROLOGY AND BIOLOGICAL PROCESS. John C. Volin¹, J. Givnish², Paul H. Glaser³, and Dr. Jacqueline Gallagher¹. ¹Florida Atlantic University, ²University of Wisconsin-Madison, ³University of Minnesota.
- 1615 MONITORING SEAGRASS ABUNDANCE AND BIODIVERSITY IN BISCAYNE BAY. Jeremy Montague and Gil Ellis, Barry University.
- 1630 MEASURING NUTRIENT CONCENTRATIONS IN GROUNDWATER DISCHARGE TO THE SOUTHERN EVERGLADES AND FLORIDA BAY. René M. Price¹, Jim Happell², and Zafer Top², ¹Florida International University, ²University of Miami RSMAS.
- ← 1645 DEVELOPMENT OF AN INVASION INDEX AND REMOTE IDENTIFICATION TECHNIQUE FOR ASSESSING *LYGODIUM MICROPHYLLUM* ON TREE ISLANDS IN THE ARTHUR R. MARSHALL LOXAHATCHEE NATIONAL WILDLIFE REFUGE. Faith Clarke, Florida A & M University.
- 1700 CLOSING REMARKS/ ADJOURN SWART

POSTER PRESENTATIONS

- P-1 TIME SERIES ANALYSIS AND STATISTICAL MODELING OF SALINITY AND CANAL DISCHARGES IN BISCAYNE NATIONAL PARK. Jiangang Luo¹, Joseph Serafy¹ and Sarah Bellmund², ¹University of Miami RSMAS, ²National Park Service.

- P-2 MEASUREMENT OF WATER VELOCITY AND SUSPENDED SOLIDS CONCENTRATIONS IN THE VICINITY OF TREE ISLANDS IN EVERGLADES NATIONAL PARK . Jose Bazante¹, Helena M. Solo-Gabriele¹, Michael Ross¹, Daniel L. Childers², Sherry Mitchell³ and Lynn Leonard⁴, ¹University of Miami, Dept. of Civil, Architecture and Environmental Engineering, ²Florida International University, ³National Park Service, ⁴University of North Carolina at Wilmington.
- P-3 INFORMATION MANAGEMENT INITIATIVES IN SUPPORT OF SOUTH FLORIDA ECOSYSTEM RESTORATION. Gail P. Clement, University of Miami, RSMAS.

Platform Presentations

Current Happenings in the South Florida / Caribbean Inventory & Monitoring Network.

Matt E. Patterson, National Park Service.

The South Florida / Caribbean Inventory and Monitoring Network was established in the Fall of 2000 and consists of seven national park units. These include Big Cypress National Preserve, Biscayne National Park, Buck Island Reef National Monument, Dry Tortugas National Park, Everglades National Park, Salt River National Historic Site and Ecological Reserve, and Virgin Islands National Park. The National Park Service has initiated vertebrate and vascular plant inventory work for 32 networks of parks, consisting of a total of 270 National Park units across the country. These same parks are in various stages of planning for long term base funded monitoring to examine ecosystem health. The South Florida / Caribbean Network is looking at both marine and terrestrial monitoring activities, to complement initiation of marine protected areas and South Florida Ecosystem Restoration, to name just a few management activities. Future projects include efforts towards marine conceptual modeling and website development.

Biscayne Bay's Mangrove Shoreline Fishes.

Joseph E. Serafy, University of Miami RSMAS.

The objective of this project was to conduct visual fish censuses along the mangrove-lined shorelines of BNP, with emphasis on providing

baseline data on mainland (ML) and leeward key (LK) mangrove fish assemblages. Here, a preliminary results are presented pertaining to 10 consecutive wet-dry seasons, beginning in 1998 and ending in 2003. Fish assemblages associated with ML mangrove shoreline habitats differed in several respects from those on the leeward side of the Bay's islands and keys (LK). The ML mangrove shorelines consistently harbored less fish taxa than LK shorelines, but harbored higher densities of several euryhaline forms (i.e., killifishes and livebearers). Densities of fishes that are typically associated with coral reef habitats (i.e., snappers, grunts and great barracuda) tended to be higher within LK versus ML mangrove shorelines. For the most part, seasonal changes fish diversity and in the densities of dominant taxa were shoreline-specific, with wet season increases being the most common temporal pattern. Comparison of the average sizes of the dominant taxa revealed more similarities than differences for fishes inhabiting ML versus LK shorelines. We suggest the quantitative data presented here be given due consideration in efforts to establish the "baseline" condition of Biscayne Bay shoreline fishes.

Development of a Fishery Management Plan For Biscayne National Park.

Jerald S. Ault¹, Steven G. Smith¹, James A. Bohnsack², Rick Clark³, Todd Kellison³, and Jim Tilmant³. ¹University of Miami RSMAS, ²NOAA Fisheries, ³National Park Service.

Biscayne National Park (BNP) is in the process of developing a Fisheries Management Plan (FMP) in cooperation with the State of Florida Fish and Wildlife Conservation Commission (FWC) to address declining fish populations in BNP waters

related to prolonged, substantial and increasing regional fishing pressures that threaten fisheries sustainability. In the initial stages of the FMP process, a site characterization of fisheries resources and habitats in BNP was commissioned by NPS to the University of Miami RSMAS to provide assessment of the current status of fisheries resources within Park waters (Ault et al. 2001). Principal findings from the site characterization were: (1) populations of most exploited reef fish species, notably groupers, snappers, and grunts, are overfished and have been for decades, with resultant continued declines in spawning stocks that threaten future resource sustainability; (2) future fishery management planning must consider the fact that while adults of these overfished species reside principally in the offshore coral reefs, their juveniles utilize many inshore areas as prime nursery grounds, including seagrass and hardbottom habitats in Biscayne Bay and mangrove shorelines along the western mainland and eastern barrier islands; and (3) precise high-resolution spatial data on species abundance, size structure, and habitats for conducting subsequent analyses of policy alternatives were insufficient to meet Park objectives for the FMP. Minimally, as currently identified by early scoping, an effective FMP in BNP waters needs to include policies designed to: (1) prevent further fisheries resource declines; (2) rebuild depleted spawning stocks to sustainable levels; and, (3) protect critical nursery and adult habitats essential for productivity of harvested species and for species critical to ecological function, while at the same time enabling Park visitors to engage in diving, fishing, boating and other recreational activities. In support of these resource management goals, subsequent research highlights have included: 2000-2001. Initial characterization of sustainability status of exploited reef fish stocks; 2002.- Spatially-intensive fishery-independent diver visual survey of reef fishes, macroinvertebrates, and

benthic habitats; 2002.- Survey of Park user perceptions of present status of fisheries resources and view of proposed management alternatives; 2003.- Aerial survey of boater use and spatial distribution; and, 2003. Cross-validation of Florida hogfish fishery status using a variety of fishery-independent and fishery-dependent population models and stock assessment techniques. These phases in our statistical data assimilation and analyses provide critical inputs for targeted management scenario testing to evaluate the impacts of proposed policy alternatives on the sustainability of BNP fisheries resources to reduce exploitation pressures, protect critical nursery areas, mitigate habitat degradation, and aid in recovery of BNP fisheries.

Restoration of Caribbean coral reefs with cultured coral larvae.

Alina Szmant, University of North Carolina at Wilmington.

Reef building corals on Caribbean coral reefs have suffered a major decline in abundance and health since the late 1980s, due to bleaching stress, diseases, and storm damage. Recovery of these coral populations has been hampered by poor coral recruitment success, in part due to the overgrown state of Caribbean coral reef substrates ever since the 1983 mass mortality of the grazing sea urchin *Diadema antillarum*, and also potentially because of a reduced supply of coral larvae. As the abundances of adult hermatypic corals decrease, together with reduced fecundity due to higher levels of physiological stress, the supply of larvae may limit coral recruitment success. I have been developing and applying methods to capture coral

spawn as it is released into the water column, culture the larvae to competency, and then used these larvae to re-seed reef substrates that have impoverished coral cover. By concentrating the supply of available larvae on the reef surfaces that need to recover, much of the mortality and dilution associated with a planktonic larval stage are reduced. Cultured larvae can also be used to conduct experiments to learn more about the environmental and biological factors that affect coral recruitment success. My present efforts are concentrating on the *Montastraea spp* and *Acropora spp.* species groups, that have been the major Caribbean reef builders.

Diseases in Caribbean coral reefs: Current Status and Information Gaps.

Ernesto Weil, Department of Marine Sciences, University of Puerto Rico.

Over the past few decades, coral reef communities have been subjected to increasingly stressful conditions from a variety of natural and anthropogenic impacts (e.g. bleaching events, local habitat degradation, over-fishing and pollutant input), which have resulted in significant losses of hard coral cover in all reef regions. Of particular concern is the increasing prevalence of coral diseases on reefs worldwide, but especially in the Caribbean, where disease outbreaks have played a significant role in the loss of key reef organisms, coral cover and spatial heterogeneity, and have produced significant changes in community structure and dynamics. Today, disease of coral reef organisms stands out as one, if not the most important factor in the deterioration of Caribbean coral reefs. The emergence and prevalence of diseases/syndromes in the Caribbean in the past few decades appears to be unprecedented in the

geological record. Twenty two (76%) of the approximately twenty nine reported diseases and syndromes affecting 106 coral species and 10 octocorals worldwide are found in the Caribbean. However, the associated pathogens have only been identified for seven of these diseases [BBD, WP-II, WBD-II, WPX, ASP, algal tumors (TUM) and red band disease (RBD)] and Koch's postulates have only been fulfilled for three of them (WP-II, WPX and ASP). Recent data from a three year project in which more than 50 reef sites in nine geographically distant localities were surveyed throughout the wider Caribbean, indicate that WP-II, YBS, BBD, ASP, and DSS-I have a much wider geographic distribution than previously believed, while other diseases/syndromes such as DSS-II and WPX, have more limited distributions. Forty two scleractinian coral species (close to 60% of the described, zooxanthellate coral species for the region), 3 hydrocorals; 10 octocorals, 11 sponges and three crustose algae species are being affected by at least one disease/syndrome. Overall, WP-II is the most virulent with a wider host range of 39 species, followed by BBD with 21, DSS-I and RBD with 14, YBS, tumors and DSS-II with 11, 10 and 8 respectively. The host range of ASP has expanded to at least eight common octocoral species. Field observation clearly show that contagion can occur across colonies of the same species, colonies of different coral species and even, across different groups of organisms. Some of the diseases have become chronic in some localities (ASP and YBS) producing significant tissue and colony mortalities over the years. Susceptibility of species is highly variable. Three coral species are susceptible to eight different diseases/syndromes, while twelve species are susceptible to two, six to five and seven to just one disease/syndrome. What is really significant here is that the

main reef-building genera (i.e. *Montastraea*, *Colpophyllia*, *Diploria*, *Porites* *Siderastrea*, and *Undaria*) are being affected by at least five (and up to eight) diseases/syndromes in many localities in the wider Caribbean. The average incidence of diseases at the coral community level seem to be low in general and highly variable across reef sites and geographic localities. Significant variability in the average prevalence of diseases (all diseases pooled at the community level) at spatial and temporal scales were found in nine geographically distant localities during the last three years. Over this time, average prevalence values have ranged from 0.931 % (∇ 0.14) in Bermuda and 16.21 % (∇ 1.55) in Jamaica in 1999, to 4.28 % (∇ 0.46) in Bermuda and 6.60 % (∇ 0.93) in Puerto Rico in 2001 to 6.28 % (∇ 0.64) in Puerto Rico and 10.91 % (∇ 1.57) in Akumal, Mexico in 2002. The total average prevalence of disease for 28 reef sites was 5.28 % (∇ 1.2). With the exception of Venezuela and Mexico, the average disease prevalence in octocorals was significantly higher in five of the nine localities. Over time, average prevalence of diseases have increased significantly in Bermuda (from 0.931 % in 1999 to 4.28 % in 2001), Puerto Rico (2.13 % in 1999 to 6.60 and 6.28 % in 2001 and 2002 respectively) and in Venezuela (3.07 % in 1999 to 5.81 % in 2001). Even though Caribbean reef-related diseases have been studied since the early 1970's, our knowledge of their **pathology** (isolation and identification of the pathogen), **etiology** (macroscopic signs and relationships between the host and pathogen), and **epizootiology** (local and geographic distributions, environmental correlates, host ranges, incidence, impact, vectors and natural reservoirs, and spatial and temporal variability in incidence, rate of advance and impact, etc) of most coral reef diseases is limited. One major concern is that marine pathogens can be moved faster and for longer distances by

human activities. Another concern is how to protect coral reef communities from diseases, since marine reserves are unlikely to protect coral reef organisms from regional-scale, water-borne pathogens such as the ones that have caused mass mortalities in the Caribbean. Managers are mostly concerned on how are we going to develop remediation mechanisms and/or effective management programs. To do this, we need to fill the information gaps in order to understand the dynamics of disease infections, their transmission and spread, host susceptibilities and resistance, and epidemiological models need to be developed for some of the most destructive syndromes. Without a concerted research effort to understand all these aspects of coral diseases, as well as how to mitigate their impacts, the future of tropical coral communities is in jeopardy.

Towards Science-Based Marine Resource Management for Dry Tortugas National Park.

Jerald S. Ault¹, Steven G. Smith¹, James A. Bohnsack², Tom Schmidt³, Doug Morrison³, Bill Perry³, and Jim Tilmant³. ¹University of Miami RSMAS, ²NOAA Fisheries, ³National Park Service.

Dry Tortugas National Park (DTNP), established in 1935, is recognized as a unique area encompassing a pristine marine environment with nationally significant natural, scientific, and cultural resources. DTNP and the Tortugas region lies upstream in the northward currents that have been instrumental in providing the Florida Keys and south Florida with the young and adults of a host of marine species that help sustain the multibillion dollar fishing and tourism industries. The expansion of human

populations, overfishing, and habitat degradation in the Keys have elevated the importance of the Dry Tortugas as an upstream source area for replenishing fishery resources throughout south Florida. Over the past several years, DTNP has developed a new General Management Plan (GMP) designed to enhance the cultural and recreational experiences of Park visitors as well as to conserve, and some cases improve, the status of living marine resources and their habitats in the Park. Scientific research spearheaded by investigators at the University of Miami RSMAS and NOAA Fisheries has been instrumental in development of this GMP. After an initial site characterization to synthesize historical data on fisheries and habitats in the Tortugas region, large-scale fishery-independent diver visual surveys were conducted to address major data gaps. These surveys data were then used to assess the fishery status of exploited reef fish stocks, and to evaluate the efficacy of marine protected areas for enhancing the prospects of long-term sustainability of Tortugas reef fish populations. These results were used to evaluate a variety of management strategies for the GMP. Analytical Hierarchy Process modeling, which can accommodate both quantitative and qualitative types of information, was then applied to identify the management alternative that best achieved a balance between enhancing the visitor experience at DTNP while minimizing visitor impacts to marine and cultural resources in the Park. As a product of this research, a special Research Natural Area (RNA) within DTNP covering about 46 square miles was proposed as a complement to the 151 square mile Tortugas ecological reserve (no-take marine reserve), recently established by the National Oceanic and Atmospheric Administration (NOAA) in waters surrounding the Park. Now that the GMP is ready for implementation, our research is focusing on developing scientific programs to monitor and

assess the performance of the new management measures in achieving the desired outcomes.

High-Resolution Coastal Ocean Model and Application to Coral Reef Ecosystems in Western Boundary Current.

Jerome Fiechter, University of Miami RSMAS.

The East Florida Shelf – Princeton Ocean Model (EFS-POM) is implemented as part of the Southeast Atlantic – Coastal Ocean Observing System (SEA-COOS) program. With a high-resolution of ca. 2-6km horizontally and 25 terrain-following levels, the model is used to study the variability of the Florida Current under synoptic atmospheric forcing for periods of several years. Sea surface temperatures and coastal sea levels are compared with observations from moored buoys and tide gauges. EFS-POM also serves as a source for open boundary conditions to drive a nested model of the Dry Tortugas domain. With horizontal resolutions of less than 1km, this local model is aimed at predicting the influence of physical variables such as temperature, salinity and turbulence on coral reef communities. In addition to the Eulerian fields, a Lagrangian approach is used to investigate transient circulation patterns and provide some insight about possible pathways and rates for larval dispersion and recruitment at both local and regional scales.

A Practical Guide to the Shallow-water Sponges of South Florida, the Bahamas and Northern Caribbean Sea.

Charles Messing, Nova Southeastern University.

Sponges (chiefly Demospongiae) often account for a greater proportion of diversity, taxonomic richness and biomass than any other macrofaunal group on shallow (<40 m) hard bottoms in South Florida, the Bahamas and Northern Caribbean Sea. Although the fauna is relatively well known compared with that found elsewhere in the tropics, the practical taxonomic literature (i.e., sources useful to non-specialists for monitoring, initial assessments of degradation, and for making management decisions about restoration and conservation) is seriously inadequate. Although Ruetzler (pers. commun.) estimates that several hundred species exist here, and Pomponi (pers. commun.) suggests that ~150 species may account for ~95% of sponges encountered, the guide perhaps most widely used by non-specialists (Humann 1992) includes only 55 demosponge species and lacks figures of the spicules and fiber arrangements that are often critical for positive identification. This project proposes to produce a practical interactive taxonomic guide to the shallow-water sponges of southern Florida, the Bahamas and northern Caribbean Sea: 1) suitable for use by environmental managers, parataxonomists, advanced students, teachers and professional scientists (i.e., with simplified terminology), 2) including photographs & drawings, illustrated keys, descriptions of whole organisms and their diagnostic components (e.g., spicules), and notes on ecology and distribution, and 3) available in CD-ROM and web-based formats. Taxonomic coverage will include 150-170 species and span all regional shallow-water habitats (i.e., reef,

hard bottom, seagrass bed, mangrove). The proposed guide will support priority categories of management, monitoring, research and conservation by permitting more accurate benthic habitat characterization and analysis of associated biological community structure.

Science Programs and Needs for South Florida Ecosystem Restoration.

I. Lorraine Heisler, US Fish and Wildlife Service, South Florida Field Office, Vero Beach, Florida.

Large-scale efforts are underway to protect and restore natural ecosystems across south Florida. Three major program areas that define science needs for the Fish and Wildlife Service (Service) are the Comprehensive Everglades Restoration Plan (CERP), multi-species recovery of south Florida's threatened and endangered species, and resource management on National Wildlife Refuges. For the CERP, a system-wide Monitoring and Assessment Plan has been developed, and a multi-agency team is working to launch this monitoring effort during the coming year. The South Florida Multi-Species Recovery Plan has identified recovery-related science needs, with current priorities focused on several key species and communities. Science needs for refuges include development of strategies for control of exotic plants, fire management, and conservation of target species and habitats. The Department of the Interior (DOI) is currently developing a science plan for south Florida that integrates DOI science needs related to hydrologic restoration, water quality, resource management, and multi-species recovery. The DOI science plan will inform funding and prioritization of science needs in coming years, and will identify

multiple opportunities for cooperative scientific efforts focused on south Florida ecosystem restoration.

Global Warming, Disturbance Ecology and Restoration Ecology of Mangrove Ecosystems in Everglades National Park: Opportunities for Student Research.

Thomas J. Smith, Kevin Whelan and Gordon H. Anderson, US Geological Survey.

A \$7.8 billion, 36 year, Everglades restoration program will greatly influence the hydrological flow affecting more than 100,000 ha of mangrove ecosystem. The mangrove ecosystem of Everglades National Park is affected by small-scale lightning gaps, large-scale hurricane disturbances, changes in hydrological flow and apparent sea level rise. To understand changes in mangrove ecosystems it is important to determine how mangroves respond to these factors. This project attempts to thoroughly understand the role of these forcing functions upon the south Florida mangrove ecosystems. To understand these factors it is critical to have a large scale and long term research effort that can adequately sample at an appropriate scale. This type of large-scale project allows for ample opportunity for developing relationships with educational facilities to allow for practical field research experiences to undergraduate students. It is beneficial to have undergraduates that have a unique experience with this ecosystem for both practical professional development and as good will advocates for this critical ecosystem. Additionally, we benefit from aid in collection of this important data.

Web-based interactive archive of Caribbean-wide coral collections including

site-maps, collection information, and X-radiographic prints.

Kevin P. Helmle¹, Richard Dodge¹ and Peter K. Swart². ¹Nova Southeastern University and ²University of Miami RSMAS.

Over 300 coral cores and samples lie archived at Nova Southeastern University (NSU) and the Rosenstiel School of Marine and Atmospheric Science. The bulk of these samples are from numerous collecting expeditions of South Florida and the Florida Keys. These samples contain hundreds of years of historical growth and proxy environmental records. The aim is to develop a modern interactive database of coral samples to facilitate future research using these valuable coral records. Corals collected on a recent cruise of the windward and leeward islands of the Caribbean have been assembled into a preliminary version of the proposed database:

<http://www.nova.edu/ocean/ncri/case/cores/index.html> This web-based tool would provide a means of bringing this important resource of paleoenvironmental and paleoclimatic data into the twenty-first century and making it readily available to interested researchers.

The Utilization of Ion Mobility Spectrometry and Annular Denuder Techniques to Explore the Deposition of Ammonia in Coastal Ecosystems

LaToya Luse¹, Larry Robinson¹, and Tilden P. Meyers². ¹Florida A&M University, ²NOAA, Atmospheric Turbulence & Diffusion Division.

Ammonia emissions contribute significantly

to nitrogen inputs in aquatic and terrestrial ecosystems. Through wet and dry deposition, atmospheric ammonia (in various forms) may cause fundamental changes in the biological activity of an ecosystem. Exact concentrations of atmospheric ammonia have been difficult to quantify due to errors resulting from cross-contamination, short resolution times, etc. Annular denuder systems (ADS) coupled with relaxed eddy accumulation (REA) instrumentation will be deployed during field experiments in several coastal locations to quantify atmospheric ammonia fluxes. An ion mobility spectrometer (IMS) will also be employed during these excursions to continuously monitor the atmospheric concentration of ammonia. The IMS system should provide an increase in the accuracy and sensitivity of atmospheric ammonia measurements. The resulting data from both methodologies will supply information concerning the magnitude of ammonia deposition in coastal areas to various atmospheric modeling efforts. The primary objectives of this study are to (1) develop an IMS protocol for atmospheric ammonia sampling; (2) utilize ADS and IMS methodologies in sampling excursions in coastal locations; (3) compare the resulting data sets from both techniques; and (4) employ the results in the development of atmospheric deposition models.

Coastal Applications of Hyperspectral Imagery

Katherine Milla, Florida A & M University.

The evolution of high spectral resolution sensor technologies has created new opportunities for broad scale analysis and monitoring of coastal environments. Unlike multispectral techniques, which collect reflectances from only a few, relatively broad regions of the visible and

infrared regions of the spectrum, hyperspectral remote sensing has the ability to discriminate and record reflectances from numerous (as many as 500 or more), narrow bands.

The increased spatial resolution of hyperspectral sensors, and increase in the number of commercial airborne sensors, has enabled more detailed and sophisticated applications of coastal remote sensing. Some of these applications include water quality assessment (i.e., suspended sediments (turbidity), chlorophyll, temperature, dissolved organic matter (DOM)), evaluation of coastal bathymetry, monitoring health of coral reefs, monitoring submerged aquatic vegetation, habitat assessment, and coastal hazard evaluation.

Through the NOAA-sponsored Environmental Cooperative Sciences Center the FAMU remote sensing laboratory is currently involved in the collection and analysis of hyperspectral imagery from five National Estuarine Research Reserves. The goal of this project is to develop conceptual models of human impacts to the Reserve ecosystems. Image analysis will involve detailed classification of the imagery and construction of a spectral library of coastal vegetation.

Bird Conservation Priorities In South Florida And The Caribbean.

J. Keith Watson, US Fish and Wildlife Service.

The avifauna of South Florida and nearby Caribbean islands represents a **diverse**, rare, but often poorly understood **biological** component of these areas. Once plentiful species such as American Kestrel, Brown-headed Nuthatch, Crested Caracara, **Sandhill** Crane, White-crowned Pigeon, **Swallow-**

tailed Kite, Snail Kite, Cape Sable Seaside Sparrow, Wood Stork, Mangrove Cuckoo, Black-whiskered Vireo, and Cuban Yellow Warbler and their habitats have been subject to tremendous changes in habitat condition and availability, hydrology, introduction of exotic species, and other threats. Consequently, populations of some of these species are locally extirpated, Federally listed, or thought to be declining. Partners in Flight (PIF) has established a set of habitat and bird conservation priorities designed to be the focus of regional conservation activities, including research and monitoring, through cooperatively based partnerships, such as the National Park Service's Inventory and Monitoring Program and the Cooperative Ecosystem Study Unit. Through coordinated efforts, the birds of South Florida and the Caribbean can better be understood and their population status improved

Use of Science in Gulf of Mexico Decision Making, Involving Climate Change

Dremal Worthen, Florida A & M University.

The effects of global warming on the gulf coast have been well documented. The populations living in costal counties are directly affected by environmental changes there, and many millions more are affected by the Gulf's capacity as a source of energy, food, and recreation. Although considerable work has been done to document the impacts of climate change and of human activities on the physical environment of the Gulf, it has been difficult to differentiate effects of climate change and effects of human activity. There are also uncertainties associated with estimates of the extent of projected climate changes, such as sea level rise and extreme weather patterns. Nevertheless, the overall effects of climate change and human activity are indisputable.

The response currently being called for is adapting ion at all scales. Policy decisions that reduce demands on resources and mitigate anthropogenic stressors are the kinds of adaptations that can advance the management of environmental risks and reduce vulnerabilities to climate change. However, these decisions can be difficult ones to make and require a good information base as guide, incentive and justification. A clear understanding of the role of scientific information in this decision-making process is also necessary if that information is to be presented in the most effective way.

This research will assess how representative stakeholder groups currently use science information about global climate change; how this use varies across stakeholder groups; and what unfilled information needs these groups have. Research questions about information and stakeholder decision-making will be investigated in the context of regionally relevant topics. The study is designed to allow maximum variance across Gulf regions and endpoints. The proposed research addresses calls for research that combine science, stakeholder processes and decision making in order to improve the interface between science and stakeholder-based decision making.

In order to organize both data gathering and analysis, and to provide for systematic research platform that supports interdisciplinary research, four theoretical frameworks addressing the way information is communicated within and among governmental agencies, non-governmental organizations, and citizen stakeholder groups will serve to inform our investigation of the information uses and needs of these varied stakeholder groups. These theoretical frameworks are: construction of social

problems, agenda setting, communications theory, and social amplification of risk.

Cooperative ecological studies for linking science and management

Frank J. Mazzotti, University of Florida

Successful restoration and management of natural areas requires an applied science framework that provides science in support of critical management issues. Key features of this framework are identification and articulation of management issues, narrowing the issues down to specific scientific questions and testable hypotheses, implementing necessary studies, and synthesizing the results in a format that meets the management needs. We are taking a cooperative approach to developing and implementing such a framework. Agency staff are developing inventory, monitoring, and research plans that identify management issues and related science questions. The science questions are then being developed into specific management relevant studies by or with the assistance of scientists from agencies, and universities. Over the last four years a combination of strategies have been used to initiate research to address management needs. Strategies include modeling, monitoring and research efforts conducted through cooperative and grant agreements, and the use of interns and graduate students. The most beneficial of these studies have been the ones where there has been clear communication of needs and expectations. Communication of this type takes commitment of time for both scientists and managers, but is critical for ensuring that projects provide relevant information. Generally, neither scientists nor managers are trained in such types of interactions. Therefore, in addition to continuing to foster partnerships for addressing science needs, we also are initiating

opportunities for future scientists to develop a better understanding of management needs. Such education and training will ensure that there is core of people with the experience to facilitate communication between scientists and managers resulting in better linkages between science and management.

An Assessment of Mercury Exposure for Multiple Trophic Levels in the Greater Everglades Ecosystem

Sekeenia Haynes²¹, Kenneth Rice,¹ Jon Wiebe¹, Shane Ruessler¹, Carla Wieser¹, Timothy Gross¹, Richard Gragg², Frank Mazzotti³, Ted Lange⁴, ¹US Geological Survey-FISC, ²Florida A&M University, Environmental Sciences Institute, ³University of Florida, ⁴Florida Game and Fresh Water Fish Commission,

Mercury contamination has been identified as a potential threat to aquatic and terrestrial resources, specifically top predators that inhabit the Everglades ecosystem. American alligator (*Alligator mississippiensis*) and Florida largemouth bass (*Micropterus salmoides floridanus*) were captured from several areas critical to the South Florida Restoration and analyzed for total mercury (HgT). HgT was detected from all locations. There were spatial and temporal variability in HgT concentrations for alligators, during the 1999 and 2000 collection periods with higher concentrations in Big Cypress and the Everglade National Park areas. The highest HgT content in muscle of largemouth bass was 2462.0 :g/kg-wet wt, with the highest concentrations detected in WCA 2A, L-35A canal, and the interior reservoir of STA 6. Initial results demonstrate significant site specific exposures for HgT. Documentation of HgT exposure for biota within the aquatic

ecosystem of south Florida will serve as a critical component for future assessment of risks, the goal of which will be prevention of adverse effects on wildlife within the Everglades ecosystem.

Big Cypress National Preserve: An Ecosystem Management and Research Overview.

Bob Sobczak and Don Hargrove, National Park Service.

Big Cypress National Preserve (295,245 ha) comprises the eastern third of the Big Cypress Swamp in south Florida. It was established in 1974 for the purpose of protecting the upstream watershed that is vital to the western arm of Everglades National Park and protecting the fragile Big Cypress Swamp from development threats. In 1988 Congress passed legislation to expand the preserve's land area over 25 percent by extending its northern boundary to the Hendry and Broward County lines and extending its western boundary alongside State Road 29. These lands officially became part of the preserve in 1996.

While the preserve is often considered one of the least impacted ecosystems within the Greater Everglades Ecosystem, altered water management schemes and other anthropogenic activities over the past half century play a strong role in the current ecologic framework of the preserve. Corrective measures have been implemented by NPS staff and others over the past three decades to dampen the amplitude of non-indigenous influences on the ecosystem wherever possible. However, a number of adverse conditions continue to prevail and endanger the natural integrity of the ecosystem. There are also a number of threats

that beckon on the horizon and alongside its border, and substantial anticipation that south Florida-wide restoration initiatives will play a positive role.

This presentation provides a summary of the key events and actions that have changed the preserve's natural ecology, steps that have been taken to reduce the impact of these changes, and the science that is needed to better understand the underlying processes and threats to this ecosystem.

Landscape Mapping of Ridge and Slough Topography: Integration of Hydrology and Biological Processes

John C. Volin¹, J. Givnish², Paul H. Glaser³, and Dr. Jacqueline Gallagher¹. ¹Florida Atlantic University, ²University of Wisconsin-Madison, ³University of Minnesota.

We are developing a landscape vegetation model that is based on our hypothesis that spatially coupled positive and negative feedbacks among vegetation, peat accumulation, and hydrology, including flow, drive the self-assembly of the slough-ridge-tree island patterning of the Shark River Slough. A detailed understanding of these feedbacks is fundamental to any attempt to predict the ecological effects of proposed hydrological changes in the central Everglades – shifts in hydrology will not simply move vegetation zones up and down the existing microtopographic gradients, but alter those gradients as well, possibly quite rapidly. This project will quantify these landscape-level feedbacks for the first time,

and incorporate them in a model to predict vegetation change and landform evolution under different hydrological regimes. Our preliminary work on the characterization of the current landscape patterning of vegetation in the northeast Shark River Slough and the southern sections of WCA 3A and 3B will be presented. We mapped vegetation based on remotely sensed data encompassing approximately 45,000 Ha using georectified false color infrared photography with a resolution of 1'/'pixel. These aerial photographs were taken in February 2002, and approximately 60 km of transects have been conducted within the study area to develop the landscape map. Unsupervised and supervised classification of vegetation communities was used to develop a map of community types with a minimum mapping unit of 300 m². The detailed vegetation map will be utilized to develop a predictive quantitative model relating abiotic parameters to the composition of plant communities within the marsh and this model will be connected with a GIS landscape model that can be used to evaluate the effect of changes in various environmental parameters on landscape vegetation patterns.

Monitoring Seagrass Abundance and Biodiversity In Biscayne Bay.

Jeremy Montague and Gil Ellis, Barry University.

Barry University faculty (Silvia Macia and Jeremy Montague) have been studying selected organisms of the Biscayne Bay seagrass meadows. In 1996 they collaborated on the field measurement of biomasses of *Thalassia testudinum*, *Halodule wrightii* and *Syringodium filiforme*, as well as the field densities and dispersions of the sea urchin *Lytechinus variegates*. They continue their studies today

of seagrass chemical compositions and the hydroponic cultivation of turtle grass seedlings. These recent studies have focused on factors that might promote sustainable growth and stability in the subtidal ecosystems of Biscayne Bay.

<mailto:gclement@rsmas.miami.edu> Measuring Nutrient Concentrations in Groundwater Discharge to the Southern Everglades and Florida Bay

René M. Price¹, Jim Happell², and Zafer Top², ¹Florida International University, ²University of Miami RSMAS.

The Florida Everglades is an oligotrophic system, so even small amounts of nutrients can have a major impact on its ecology. Currently, nutrient concentrations of surface waters in the southern Everglades are being monitored as part of the National Science Foundation (NSF) Florida Coastal Ecosystem-Long Term Ecological Research (FCE-LTER) program. The central organizing principal of the FCE LTER is that hydrologically mediated delivery of nutrients to the coastal zone from surface water runoff and tidal exchange with the Gulf of Mexico is responsible for increased primary productivity and a formation of an oligohaline zone along the coast. This research proposes an additional hypothesis: that discharge of brackish, nutrient-laden groundwater to the overlying surface water contributes to the production of the oligohaline zone in the Southern Everglades.

The goal of this investigation is to provide the first estimates of nutrient concentrations

(total nitrogen and phosphorus) in groundwater discharging to the Southern Everglades. The goals of this research will be met through a combination of physical measurements, geochemical tracers, and modeling efforts. Piezometers and seepage meters will be used to provide physical measurements of groundwater discharge. The impact of TBGW and SGWD on the overlying surface waters of the Everglades and its adjacent marine systems will be determined through monitoring both groundwater and surface water for total concentrations of nitrogen and phosphorus, and dissolved concentrations of calcium. Understanding all mechanisms responsible for the cycling of nutrients in the Everglades is important in assessing the response of this ecosystem.

Development of an Invasion Index and Remote Identification Technique for Assessing *Lygodium microphyllum* on Tree Islands in the Arthur R. Marshall Loxahatchee National Wildlife Refuge

Faith Clarke, Florida A & M University.

This research investigates the utility of four-meter multispectral IKONOS satellite imagery captured in March, 2002, versus 1:24,000 scale color infrared aerial photography, taken around the same time, for recognizing *Lygodium microphyllum* and creating a density-based invasion index for its occurrence in the Arthur R. Marshall Loxahatchee National Wildlife Refuge. The relationship between selected soil properties and the spatial distribution of *Lygodium microphyllum* on tree islands invaded is also investigated. *Lygodium microphyllum* (Old World Climbing Fern) has been designated as a Category 1 Exotic Pest Plant, and a Noxious Weed. Earth Resources Data Analysis System (ERDAS), version 8.5,

image processing software was used to perform an unsupervised classification of the IKONOS data and to select random points for accuracy assessment. A traditional air photo interpretation approach and accuracy assessment technique will be used for the color infrared aerial photography.

In order to investigate the relationship between the soil properties and the spatial distribution of *Lygodium microphyllum*, twenty four soil cores were extracted from six tree islands in the northern and southern regions of the Refuge, between October 29 and November 25, 2002. In both regions, one island without *Lygodium microphyllum*, and two invaded islands were sampled. All cores were extracted according to the protocol established by the South Florida Water Management District - Everglades Division. Soil cores were analyzed for ash content, bulk density, moisture content, pH, total nitrogen, and total phosphorus. Mean values of the concentration of each soil property on invaded islands in the north were compared to the invaded islands in the south, using Statistical Analytical System (SAS), version 8.5. Similar comparisons were conducted between the island not invaded in the north, versus the island not invaded in the south.

Preliminary results of the image analysis have indicated that there are 677 hectares (1,761 acres) of tree vegetation that have been invaded by *Lygodium microphyllum*. Observations from the soil properties analyzed revealed no statistically significant differences between the tree islands in the north and south with *Lygodium microphyllum*. Significant differences were observed between the moisture content, bulk density, and ash content on the islands without *Lygodium microphyllum* in the north and south. Further statistical analysis, which

incorporates the results of the invasion index, is needed to determine the relationship between the selected soil properties analyzed and the presence or absence of *Lygodium microphyllum*.

Poster Presentations

Time Series Analysis and Statistical Modeling of Salinity and Canal Discharges in Biscayne National Park.

Jiangang Luo, University of Miami RSMAS.

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Today, seven major canals release fresh water directly or indirectly into Biscayne National Park (BNP); these discharges dominate the dynamics of salinity regimes in southern Biscayne Bay. The Comprehensive Everglades Restoration Plan (CERP) is expected to alter land runoff into Biscayne National Park, altering its salinity and nutrient regimes and other aspects of the ecosystem. Among the objectives of the CERP is the replacement of certain canals and related structures with sheet-flow-producing structures for the ultimate restoration of more natural freshwater delivery (and thus salinity) regimes. While the prediction of restoration impacts is difficult, this process begins with developing an understanding of how the current hydrographic system affects water quality. In this study, we used a time series analysis approach to examine interrelationships among canal discharges, ground and surface water levels, wind conditions and salinity regimes. Cross correlation analysis indicated that canal discharges can affect the salinities for as long as 15 days in nearshore habitats and as long as

25 days near oceanic pathes (e.g., Safety Valve). Multiple regression models were developed for 11 sites in the Bay. Models explained as much as 90% of average daily salinity variance. The multiple linear correlation coefficients (r) ranged from 0.83 for sites located near the Bay's central axis and 0.95 for nearshore sites.

Measurement of Water Velocity and Suspended Solids Concentrations in the Vicinity of Tree Islands in Everglades National Park Presentation Abstract Measurement of Water Velocity and Suspended Solids Concentrations in the Vicinity of Tree Islands in Everglades National Park.

Jose Bazante¹, Helena M. Solo-Gabriele¹, Michael Ross¹, Daniel L. Childers², Sherry Mitchell³ and Lynn Leonard⁴, ¹University of Miami, Dept. of Civil, Architecture and Environmental Engineering, ²Florida International University, ³National Park Service, ⁴University of North Carolina at Wilmington.

The overall goal of this study is to determine the importance of water flow in the formation and preservation of tree islands in the Florida Everglades. The study quantifies water velocities and determines sediment characteristics in the vicinity of 3 tree islands situated in the Shark Valley Slough in the Everglades National Park. In the process we intend to evaluate the use of acoustic Doppler meters for measuring water velocity in the unique environments of the Everglades. Spatially intensive velocity data are being taken along 3 transects that are perpendicular to the main North-South

axis of each island, using a Sontek handheld device. The first and northern-most transect is located by the island's tropical hardwood hammock (head), the second transect is located near the middle, and the third is located close to the tail of the island. Each transect has its origin to the west of the tree island and has a station every 5 meters. One Sontek Argonaut ADV autonomous velocity meter has been installed near each tree island to obtain temporally intensive velocity in three dimensions. Suspended sediment studies are also conducted along the transects. Samples are collected without filtration for turbidity, particle size distribution and number of particles analyses. The latter two are performed with a Coulter Counter Particle Size Analyzer. The gravimetric analysis of total suspended solids, volatile suspended solids and non-volatile suspended solids is being conducted by sampling with an in-line filtration system. Most of the work to-date has been done on the tree island known as Gumbo Limbo, which is the island situated near the center of the Shark Valley Slough. Thus, the results presented below correspond to this particular island. Water velocity measurements along the transects varied between less than 1 cm/s to more than 4 cm/s. The highest velocities occurred at those stations where there is an opening (due to sawgrass die-off) in all three transects. High velocity peaks were also measured inside the tree line at transects 1 and 2. In contrast, water velocities decreased dramatically inside the tree line in transect 3. The fact that transects 1 and 2 have hard wood tree cover that does not allow underwater vegetation to grow, appears to play a major role in the rapid flow. Wind velocity and direction are highly variable. Water flow is protected from wind influences inside the tree line at transects 1 and 2 but not at transect 3. Water depth was variable in all transects but there is a clear tendency for water to decrease as the center of the island is approached in

transects 1 and 2. Since transect 3 is located at the tail of the island, this tendency was not observed. Turbidity was relatively low along all 3 transects with most values being in the 0.45 NTUs to 0.55 NTUs range. The particle size distribution of most samples was exponential in nature with the largest number of particles having a smaller average diameter. Mean particle size was relatively constant, varying from 2.5 to 4.0 microns. One in-line filtration for total suspended solids was performed at 7 stations at transect 1. Results were also relatively constant between stations. Total suspended solids were in the order of 1.0 mg/L. As expected, most of the total suspended solids were volatile due to the high organic content of suspended solids in a marsh environment. Results suggest that that water velocity appears to be most strongly influenced by the medium through which it flows. Velocities were high outside the tree line in open areas of sawgrass die-off, and in some parts along transects 1 and 2 inside the tree line where the tree canopy prevents the growth of underwater vegetation. The Acoustic Doppler Velocity Meters work by generating a narrow beam of sound. Particulate matter suspended in the water then reflects the sound. The equipment measures the frequency change of the received signal and calculates the water velocity. Unfortunately the amount of suspended solids in the Shark Valley Slough is so low that the measurements have not been reliable unless suspended solids are added by stirring the bottom or by adding particulates to the water. However, it was also noted that even with acceptable values of sound to noise ratio (SNR) that are achieved by adding sediments to the water, some of the high velocity magnitudes were primarily caused by the velocity reading in the "Z" direction. We believe that the high Vz values are created by the addition of

sediments and the release of gases when the bottom is stirred. Some sediments settle at a high pace and this is interpreted by the equipment as the vertical component of velocity. Gas is released from the bottom and rises to the surface also at a high pace, again affecting Vz. All data have been revised and, for the sake of consistency, incorporate only the x and y components of velocity. Velocity measurements were taken with a dye and a ruler in areas with dense sawgrass vegetation. The results suggest that water travels faster through the sawgrass than when the same area is cleared of vegetation. Since vegetation must be removed from the vicinity of the Acoustic Doppler Velocity meter, water velocities are likely being underestimated when using the meter in areas with dense sawgrass. Further testing has to be performed to confirm these preliminary findings. If it is confirmed, a different method (other than use of the Sontek Flowtracker) will have to be developed to measure water velocity in areas that are densely vegetated. The study will continue by performing fieldwork along the transects of the other two tree islands and by analyzing the data that is being continuously recorded by the autonomous Sontek Argonaut ADV velocity meters in all 3 tree islands. Additionally, we plan to develop a method to evaluate the affect of wind on water flow. We expect to find important correlations between the variables under study that will allow us to model and understand the relationship between water flow and the creation and preservation of tree islands.

Information Management Initiatives In Support Of South Florida Ecosystem Restoration.

Gail P. Clement, University of Miami RSMAS.

To enable all stakeholders of the south Florida community to use sound science as a basis for informed planning decisions and resolution/prevention of resource-management problems, efforts to synthesize, manage and disseminate high-quality scientific information about the greater Everglades ecosystem have gained increasing support and urgency. This information management project addresses the need for timely, high-quality and relevant information through the development of a digital library for the South Florida ecosystem. The digital library and related services will provide a comprehensive and coherent information system that facilitates the exchange, analysis and use of high-quality information resources across the diverse agencies, disciplines, and communities concerned with Everglades research, restoration and resource management. Project design combines advanced information management technologies, national/international standards and best practices, and the information technology expertise of south Florida's libraries and partner agencies. The resulting digital library will provide a coherent, widely available, and enduring online repository that documents the scientific knowledge and tools created through USGS-related studies in south Florida. It will also complement and interoperate with other federal agency information systems such as the South Florida Information Access (SOFIA) (<http://sofia.usgs.gov/>), developed and sponsored by the USGS Place Based Studies Program; the National Biological Information Infrastructure (NBII) Clearinghouse (<http://www.nbii.gov/index.html>) maintained by the USGS Biological

Resources Division; and the National Digital Library (<http://memory.loc.gov>) maintained by the Library of Congress. The digital library is also designed to work together with leading state-sponsored initiatives such as "Everglades Online" (<http://everglades.fiu.edu/eol/>), "Linking Florida's Natural Heritage" (<http://susdl.fcla.edu/lfnh/>), and the Florida Data Directory (<http://als.dms.state.fl.us/~fdd/>).