

First Annual Conference
of the
The Walt Dineen Society
A forum for communicating about South Florida Ecosystems



May 22-24, 1997
The Roz & Cal Kovens Conference Center
Florida International University
North Miami, Florida

Dineen Web site:
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The Walt Dineen Society
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First Annual Conference
May 22-24, 1997

PROGRAM

Thursday, May 22, 1997

9:00 - 10:30	Welcome and Plenary Session
10:30 - 11:00	Coffee Break
11:00 - 12:00	Online Demonstrations
12:00 - 13:00	Lunch
13:00 - 14:30	Session I: Upland Plants
14:30 - 15:00	Coffee Break
15:00 - 16:15	Session II: Environmental Management
17:00 - 19:30	Session III: Posters

Friday, May 23, 1997

9:00 - 10:15	Session IV: Wetlands
10:15 - 10:45	Coffee Break
10:45 - 11:45	Session IV: Wetlands, cont'd
11:45 - 12:45	Lunch

... continued ...

Friday, May 23, 1997, cont'd

12:45 - 14:15	Session V: Bird Studies
14:15 - 14:30	Coffee Break
15:00 - 16:30	Session VI: Bird & Other Animal Studies
17:00 - 19:30	Social Hour

Saturday, May 24, 1997

9:00 - 10:15	Session VII: Marine Ecology
10:15 - 10:45	Coffee Break
10:45 - 12:00	Session VII: Marine Ecology, cont'd.
12:00 - 13:00	Lunch
13:00 - 17:00	Roundtable discussion

Adjourn

The Internet Booth (located in the Lobby) is open to all registrants from 8:30 to 19:00 each day of the conference.

Come by to get assistance in preparing your presentation for the Web; check e-mail or see a demo; or just schmooze with our friendly, helpful, and <shameless_lack_of_humility> knowledgeable </shameless_lack_of_humility> staff!

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Daily Schedule of Sessions

Thursday May 22

OPENING SESSION

TIME	PRESENTER(S)	TITLE
9:00 - 9:30	Dan Childers SERP	<i>Welcome And Introductory Remarks</i>
9:30 - 10:30	COL. Terry Rice District Engineer, USACE - Jacksonville	<i>Perspectives On Everglades Restoration</i>
11:00 - 12:00	Gail Clement and Kass Evans EIN & DL, FIU Libraries	<i>The Universe of Everglades Information -- from your desktop,laptop, anytime you want it!</i>

SESSION I: UPLAND PLANTS

TIME	AUTHOR(S)	ABSTRACT #	TITLE
13:00- 13:15	Doren et al.	97101	<i>Effects of Hurricane Andrew and fire season on mortality of South Florida slash pines in Miami Rock Ridge savannas: Implications for long-term viability and management of natural reserves</i>
13:15- 13:30	Whelan et al.	97102	<i>Short term response of two cypress communities (Taxodium Distichum var. Imbricarium (Nuttall) Croom) in Everglades National Park to the effects of Hurricane Andrew</i>
13:30 - 13:45	Surdick and Frederick	97103	<i>Environmental variables affecting wading bird foraging success in the Everglades</i>
13:45 - 14:00	Carrington and Mullahey	97104	<i>Effects of time since burning on saw palmetto (Serenoa repens) flowering and fruiting</i>
14:00 - 14:15	Lee	97105	<i>Red coloration in leaves of Everglades plants</i>
14:15 - 14:30	Cox and Roberts	97106	<i>Flowering and fruiting response of Asminina tetramera Small following resource management of mature sand pine scrub in southeast Florida</i>

continued

SESSION II: ENVIRONMENTAL MANAGEMENT

TIME	AUTHOR(S)	ABSTRACT #	TITLE
15:00-15:15	Owen et al.	97201	<i>Spatially explicit environmental databases: an integrated tool for protection of natural areas</i>
15:15-15:30	Bennett et al.	97202	<i>A scientific framework for private development of an ecotourism program</i>
15:30 - 15:45	Abbott and Nath	97203	<i>Southern Golden Gate Estates hydrologic restoration plan</i>
15:45 - 16:00	Laha et al.	97204	<i>Feasibility of discharging treated municipal wastewater into the Florida Everglades</i>
16:00 - 16:15	Meeder et al.	97205	<i>The L-31E Freshwater diversion pilot project</i>

SESSION III: POSTERS 17:00 - 19:30

AUTHOR(S)	ABSTRACT #	TITLE
Hicklin	97301	<i>Saw Palmetto (<i>Serenoa repens</i>) (bartr.) Small: an economically important plant of Florida</i>
Brashear and Stoddard	97302	<i>Autumn raptor migration through the Florida Keys</i>
Mazzotti et al.	97303	<i>Populations, habitats and landscapes: multi-scale applied ecological studies for restoration of south Florida ecosystems</i>
Gongora and Jaffé	97304	<i>Characterization and speciation of organic pollutants in the Miami River</i>
Hernandez and Jaffé	97305	<i>Molecular characterization of organic matter in sediments and biomass from the Florida Everglades and the Florida shelf</i>
Anderson et al.	97306	<i>Horizontal surface and soil water salinity gradients across the mangrove/marsh ecotone</i>
Reyes et al.	97307	<i>Water budget and nutrient exchange at the Everglades' salinity transition zone</i>
Coronado-Molina et al.	97308	<i>Structure and litterfall of a dwarf <i>R. Mangle</i> forest in Taylor River Slough</i>
Sutula et al.	97309	<i>Material exchange between a major mangrove tidal creek and northeastern Florida Bay</i>
Park	97310	<i>Mapping of pre-drainage (ca. 1850) Everglades landscapes and hydrology; comparison with the natural system model</i>
Kieckbusch	97311	<i>A synopsis of foraging behaviors of herons and egrets</i>

Daily Schedule of Sessions**Friday May 23****SESSION IV: WETLANDS**

TIME	AUTHOR(S)	ABSTRACT #	TITLE
9:00 - 9:15	Wu et al.	97401	<i>Sawcat probability model and the effects of a delayed Everglades restoration program on the distribution of sawgras.</i>
9:15 - 9:30	Sklar and Newman	97402	<i>A conceptual model for soil phosphorus availability in hydrologically altered wetlands of the Everglades</i>
9:30 - 9:45	Fitz et al.	97403	<i>Evaluating Everglades ecosystem dynamics with spatial simulation models</i>
9:45 - 10:00	Daoust et al.	97404	<i>Evaluating the role of phosphorus as a mechanism to induce ecosystem state change in freshwater wetlands of Everglades National Park: short-term results after one year of enrichment</i>
10:00 - 10:15	Brandt and Kitchens	97405	<i>Are tree islands in Loxahatchee National Wildlife Refuge small and circular or large and elongated and oriented in the direction of flow?</i>
10:45 - 11:00	McVoy	97406	<i>Soil-based estimation of pre-drainage (ca. 1850) Everglades landscapes and their hydrology</i>
11:00 - 11:45	Dong et al.	97407	<i>Modeling periphyton and phosphorus linkages in the Everglades</i>
11:45 - 12:00	Bern et al.	97408	<i>The contribution of carnivory to the nitrogen and phosphorus growth needs of the bladderwort, <i>Utricularia foliosa</i></i>

SESSION V: BIRD STUDIES

TIME	AUTHOR(S)	ABSTRACT #	TITLE
13:00- 13:15	Mealey et al.	97501	<i>Serum chemistry analysis of bald eagle and osprey nestlings in Florida Bay, Everglades National Park</i>
13:15- 13:30	Gawlik	97502	<i>A test of environmental factors constraining the use of foraging sites by wading birds (Ciconiiformes) in the Everglades</i>
13:45 - 14:00	Frederick	97503	<i>Measuring avian reproduction on an ecosystem scale: reproductive success measures are poor predictors of annual productivity of Everglades wading birds</i>
14:00 - 14:15	Bouton et al.	97504	<i>Effects of chronic, low concentrations of dietary methylmercury on appetite and hunting behavior of juvenile great egrets</i>
14:15 - 14:30	Salatas and Frederick	97505	<i>Energetic requirements of nestling wading birds</i>

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SESSION VI: BIRD & ANIMAL STUDIES

TIME	AUTHOR(S)	ABSTRACT #	TITLE
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15:15- 15:30	Browder et al.	97602	<i>Water bird usage of Florida Bay</i>
15:30 - 15:45	Eklund et al.	97603	<i>Population biology of the riverine grass shrimp, <i>Palaemonete paludosus</i> and its response to water-level change in Everglade marshes</i>
15:45 - 16:00	Mumford and Fry	97604	<i>Food web structure in Lake Okeechobee</i>
16:00 - 16:15	Morrison and Bean	97605	<i>Benthic macrophyte seasonality in the Everglades-Florida Bay ecotone: Influence of freshwater inflow</i>
16:15 - 16:30	Comiskey et al.	97606	<i>SIMPDEL: A spatially explicit individual-based simulation model for Florida panther and white-tailed deer in the Everglades and Big Cypress landscapes</i>

Daily Schedule of Sessions**Saturday May 24****SESSION VII: MARINE ECOLOGY**

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9:15- 9:30	Byrne and Meeder	97702	<i>Ground water delivery to Biscayne Bay</i>
9:30 - 9:45	Halley et al.	97703	<i>Seagrass facies and phases recorded in the sediments of Florida Bay</i>
9:45 - 10:00	Oehm et al.	97704	<i>The effects of nutrient enrichment on soil microbial processes in mangroves</i>
10:00 - 10:15	Ross et al.	97705	<i>The southeast saline Everglades revisited: vegetation and soil changes during the last century</i>
10:15 - 10:30	Coffee Break		
10:45 - 11:00	Smith et al.	97706	<i>Patterns of growth and recruitment in mangrove forests following catastrophic disturbance in relation to soil nutrients</i>
11:00 - 11:15	Davis and Childers	97707	<i>Salinity and organic matter transformations as controls on wetland-water column interactions in a south Florida mangrove</i>
11:15 - 11:30	Willsie et al.	97708	<i>Seagrass monitoring in the Florida keys National Marine Sanctuary</i>
11:30 - 11:45	Telesnicki et al.	97709	<i>Water use in mangrove communities of Biscayne National Park, FL</i>
11:45 - 12:00	Rose and Fourqurean	97710	<i>Spatiotemporal patterns of the seagrass <i>Thalassia testudinum</i> in the Florida Keys National Marine Sanctuary</i>

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Session: Upland Plants**Abstract #:** 97101**EFFECTS OF HURRICANE ANDREW AND FIRE SEASON ON MORTALITY OF SOUTH FLORIDA SLASH PINES IN MIAMI ROCK RIDGE SAVANNAS: IMPLICATIONS FOR LONG-TERM VIABILITY AND MANAGEMENT OF NATURAL RESERVES**Robert F. Doren¹, William J. Platt², and Harold H. Slater³¹ South Florida Natural Resources Center, Everglades National Park, 40001 SR 9336, Homestead, FL 33034² Louisiana State University, Department of Plant Biology, Baton Rouge, LA 70803-1705³ Caribe Research Institute, 1034 Gibraltar Road, Key Largo, FL 33037**ABSTRACT**

While natural disturbances have influenced the biota of the Everglades for centuries, anthropogenic disturbances are much more recent phenomena. This de novo combination of natural and anthropogenic disturbances constitutes a new environmental stress affecting ecosystems. In this study, we explore these interactions as they apply to reserve management using savannas dominated by south Florida slash pine (*Pinus elliotti* var. *densa*) as our model system. We also explore the interactions and relationships between Hurricane Andrew (the natural disturbance) and pre-hurricane fire regimes (potential anthropogenic disturbance) and their interactive effects on south Florida slash pine stands. We evaluated the effects of distance from the coast, size of the pine area, hydrology (as average depth to water by wet- and dry-season), time since last fire, size-class, and season of fire, on the mortality of pine. We sampled 15 sites within Everglades National Park (ENP) and southern Metropolitan Dade County (MDC) within the eyewall path of Hurricane Andrew, which crossed the tip of southern Florida on August 24, 1992. We assessed two types of mortality in each plot. Direct mortality included trees killed during the hurricane. Extended mortality resulted from deaths over the subsequent 24-30 months of trees still alive immediately after the hurricane (i.e., those not included as direct mortality). Results of our study indicate strong interactive effects on the pinelands, resulting from the combination of anthropogenic fire regimes and natural large-scale disturbances such as hurricanes. Both direct and extended mortality of pines were significantly higher in sites burned during the dry season than in sites burned during the wet season or unburned. Our analyses support the hypothesis that fire season (of the major environmental variables that could be accounted for) explains over 80% of the variability. These results indicate that anthropogenic alterations of fire regimes resulted in trees damaged by the hurricane becoming more susceptible to death from post hurricane stressors, possibly indicating that fire manipulation far outside normal regimes shifts environmental conditions away from those that occurred during the evolution of the species. The consequence of management of fire outside the natural season may mean the loss of significant portions of south Florida's slash pine savannas and has serious implications for management of natural reserves elsewhere.

Session: Upland Plants

Abstract #: 97102

SHORT TERM RESPONSE OF TWO CYPRESS COMMUNITIES (TAXODIUM DISTICHUM VAR. IMBRICARIUM (NUTTALL) CROOM) IN EVERGLADES NATIONAL PARK TO THE EFFECTS OF HURRICANE ANDREW

Whelan, K.R.T., Oberbauer, S.F., and Koptur, S.

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ABSTRACT

Hurricane Andrew passed over Southern Florida on August 24, 1992, with sustained winds of 230 kph causing massive damage to the natural areas. We investigated the damage sustained as well as the short term recovery response of Taxodium distichum var. imbricarium (Nuttall) Croom within two cypress communities in Everglades National Park to the effects of Hurricane Andrew. In the cypress dome communities damage as well as recovery were size dependent. Basal area increment was significantly different depending on recovery response and site. Mortality was size dependent. Mortality findings were greater than previously reported with 3.1% mortality in the initial survey and 7.4% mortality after a three year period. Within the dwarf cypress forest communities findings were similar except basal area increment was not dependent on recovery response. Mortality was not size dependent. For both communities it was found that the damage sustained interacted with recovery response. The ability to predict mortality using diameter at breast height using logistic regression produced a significant model. However, the practical application of the model has some short comings. This work found that the forest structure of cypress domes and dwarf cypress forest communities differs in response to hurricane damage.

Session: Upland Plants

Abstract #: 97103

ENVIRONMENTAL VARIABLES AFFECTING WADING BIRD FORAGING SUCCESS IN THE EVERGLADES

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ABSTRACT

Large populations of breeding wading birds have been suggested as key indicators of Everglades restoration, and breeding success has been linked directly with availability of food. However, factors driving food availability are poorly understood, and knowledge of these factors may have direct implications for water and vegetation management strategies. Through direct observation of foraging success and foraging conditions, we are attempting to identify the combinations of environmental conditions (primarily water depth, vegetation density and prey density) which influence foraging success of wading birds in freshwater Everglades marshes. We are measuring foraging success of birds feeding at 17 sites throughout the Water Conservation Areas and Everglades National Park, where bimonthly prey density measurements are already underway by collaborators Joel Trexler and Frank Jordan. Measurements of vegetation, water depth, temperature and clarity, weather, substrate and social context are also made at the time of observation.

During winter and spring of 1996 and 1997, we conducted over 1,500 observations of Wood Storks, White Ibis, Great Egrets and Snowy Egrets at a variety of sites throughout the Everglades. Several significant univariate correlations were found between capture rate and various environmental variables: Snowy Egrets (periphyton coverage, emergent vegetation, water depth and wind speed); Great Egrets (flock size, periphyton coverage, emergent vegetation, water depth and water temperature); and Wood Storks (time of day, water depth, water temperature and wind speed). Along with daily foraging observations, monthly aerial surveys are conducted at each site to measure their relative attractiveness to wading birds. If the impacts of various environmental variables on wading bird foraging success can be identified, this study may help us become better stewards of the Everglades and increase our knowledge of wading bird ecology.

Session: Upland Plants

Abstract #: 97104

EFFECTS OF TIME SINCE BURNING ON SAW PALMETTO (SERENOA REPENS) FLOWERING AND FRUITING

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ABSTRACT

Previously virtually ignored, saw palmetto (Serenoa repens) now enjoys a "spot in the limelight," thanks to recent market demand for its berries. In response to continued interest in harvesting saw palmetto berries, research on saw palmetto began at the University of Florida in 1996. One of the research objectives is to quantify effects of burning on saw palmetto flowering and fruiting. In September 1996 we began a study on the effects of time since burning on saw palmetto flowering and fruiting. We quantified fruiting in 18 flatwoods and dry prairie sites that burned during the growing season either in 1996, 1995, 1994, 1993, 1992, or before 1991. Saw palmettos in sites burned in 1996 generally were not fruiting by September to October. In sites burned in all other previous years, fruit yield per site ranged from 19 kg/ha to 2700 kg/ha. Although we expected that sites burned one year previously and over three years previously would have higher fruit yields, we saw no consistent pattern in fruit yields with time since burning. Our results suggested, however, that past burning frequency may influence saw palmetto fruiting. Lowest fruit yields occurred in sites that historically burned every two to three years, while the highest yields occurred at sites that have burned every eight to ten years. We plan to quantify flowering and fruiting in the study sites for two more years. In the next two years, we will determine both if patterns of fruiting are consistent with the pattern (or lack of pattern) seen in the first year, and if fruiting levels are consistent with flowering levels within years.

Session: Upland Plants**Abstract #:** 97105**RED COLORATION IN LEAVES OF EVERGLADES PLANTS**

David W. Lee

Department of Biological Sciences, Florida International University,
University Park, Miami, Florida 33199**ABSTRACT**

Leaves frequently develop red coloration during development, at maturity, and during senescence. Most plants produce anthocyanins (usually cyanidin glucosides) as the basis of this color, but members of the Caryophyllales (as *Pisonia*, in the Nyctaginaceae) produce nitrogenous pigments, betacyanins. Hypotheses about the function of this coloration have been hampered by the lack of experimental data as well as poor knowledge of the taxonomic and tissue distribution of these pigments in leaves. I have initiated a broad comparative survey and here report on results from 98 species native to the Everglades. 44 species (41.8 % of the total) produced anthocyanins, and one species, *Pisonia aculeata*, produced betacyanin. 24 taxa produced anthocyanins early in development, 5 taxa during senescence, and 9 taxa produced anthocyanins at both stages. Three taxa, all aquatic, produced anthocyanins in the lower epidermis of mature leaves. Most taxa produced pigmentation in the mesophyll tissue (usually in the palisade), inconsistent with the traditional hypothesis of protection against UV-B. Of those taxa producing anthocyanins in development and senescence, most retain a single tissue location (usually the palisade), but some taxa are developmentally plastic. A broader survey will facilitate a phylogenetically weighted analysis, and more direct studies will benefit from species that are polymorphic for such coloration, as *Chrysobalanus icaco*.

Session: Upland Plants

Abstract #: 97106

FLOWERING AND FRUITING RESPONSE OF ASIMINA TETRAMERA SMALL FOLLOWING RESOURCE MANAGEMENT OF MATURE SAND PINE SCRUB IN SOUTHEAST FLORIDA

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ABSTRACT

Fire management techniques and mechanical manipulations were applied to a mature sand pine scrub community in Jonathan Dickinson State Park in southeast Florida. The research was conducted in 4.05 hectares of scrub on the Atlantic Coastal Ridge for the management of listed species in scrub habitat. The primary focus was Asimina tetramera Small (four-petal pawpaw), a federally endangered species that showed reduced flowering and fruiting under the closed canopy of Pinus clausa (sand pine). Following management applications in May 1996, more Asimina tetramera plants flowered in the burn treatments (>53%) compared to plants in the non-burn treatments (<34%). The chi-square value of 16.55 was significant at the .05 level. In addition, more flowers per plant were produced following treatments than were produced in 1995 or 1996 (ANOVA, $p < .0001$). Monitoring will continue to determine whether flowering response changes over time. Land managers with small parcels of scrub habitat with listed species will benefit from the results of this study.

Session: Environmental Management

Abstract #: 97201

SPATIALLY EXPLICIT ENVIRONMENTAL DATABASES: AN INTEGRATED TOOL FOR PROTECTION OF NATURAL AREAS

Dianne Owen¹, Frank J. Mazzotti¹, Carol Morgenstern², and Jack Makemson³

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²Broward County Parks and Recreation Division, 100 NW 38th Street, Oakland Park, FL, 33309

³Imtech, 11751 NW 12th Street, Pembroke Pines, FL, 33026

ABSTRACT

Readily accessible information about the location and spatial relationship of resources in urban natural areas is vital to the successful management of these fragmented, isolated and frequently disturbed habitat patches. Recent developments in geographic information systems (GIS) and global positioning systems (GPS) have allowed for the development of methods to collect, manage, manipulate and display spatially referenced geographic data. For natural area managers the significance of knowing where resources are located, or where activities (e.g. management or recreational) are taking place is apparent. The challenges are: how to simplify a complicated technology so that it is easily applied and how to structure the diverse information gathered into an appropriate relational database.

To meet these challenges a spatially explicit environmental database (SEED) has been created in Broward County, Florida, as part of an Environmentally Sensitive Lands (ESL) Program. A GIS/GPS platform was developed using PC-based SPANS GIS software, PCI EASI/PACE image analysis software and a Trimble Pro XL GPS with Pathfinder software. Traditional GIS coverages including soils, topography, hydrology and land cover formed the base layers upon which features such as archaeological resources, historical land cover, listed species, management areas and monitoring stations were mapped. Monitoring stations included photo plots and integrated vegetation (species composition and horizontal and vertical structure) and faunal (birds, butterflies and their habitat relations) sampling. The Flamingo Road ESL site SEED was used as a tool to minimize the potential impacts of human use on sensitive resources by analyzing the spatial relationships among plant communities, archaeological sites, soils and wildlife populations.

Session: Environmental Management

Abstract #: 97202

A SCIENTIFIC FRAMEWORK FOR PRIVATE DEVELOPING AN ECOTOURISM PROGRAM

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ABSTRACT

Many state, regional, and local governments have discovered ecotourism as a way to promote economic development and attract tourists. Ecotourism in its truest sense, has a broader, multi-faceted purpose, with concurrent objectives involving sustainable practices such as cultural and natural resource conservation and preservation, environmental education and appreciation, and economic development. Before an ecotourism program is implemented, comprehensive planning is needed to ensure both economic and conservation success.

The recommended planning process is based upon a previously developed scientific framework, which is applicable to many natural area management issues. This strategy includes an inventory and evaluation of all resources and development of an ecotourism program contingent upon science-based criteria to ensure sustainability and conservation of resources. Furthermore, the planning process is an on-going adaptive management procedure which must be continually evaluated and modified as more information is learned about the effects of ecotourism and development.

Session: Environmental Management**Abstract #: 97203****SOUTHERN GOLDEN GATE ESTATES HYDROLOGIC RESTORATION PLAN**

Gail Abbott and Ananta Nath
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ABSTRACT

Southern Golden Gate Estates (SGGE) encompasses approximately 94 square miles of predominately wetlands in south central Collier County and is part of a failed real estate development. Construction of road and drainage canals have lead to groundwater drawdown, exotic species invasion, wetland degradation, intense wildfires and unnatural salinity levels in the downstream estuaries. The State of Florida included the area in the "Save Our Everglades" Conservation and Recreational Lands program in 1985. Approximately 40 percent of the land has been acquired. The South Florida Water Management District (SFWMD) recently completed development of a conceptual hydrologic restoration plan for SGGE. The primary objective of the study was to reduce overdrainage and restore historic sheetflow while maintaining flood protection north of the project. A continuous process hydrologic-hydraulic simulation model of the watershed was developed using the EPA's watershed modeling program Hydrologic Simulation Program-Fortran to quantify rainfall-runoff patterns and soil storage components under five alternative restoration plans. An alternative with structural components of spreader channels, canal plugs, pump stations and partial leveling of roads was recommended. After the plan was submitted to the Governor in early 1996, the State's Department of Environmental Protection initiated an inter-agency review for gaining a better understanding of the plan, roles of affected agencies, issues in need of resolution and time line for the project. Currently, the SFWMD and the Natural Resource Conservation Service are involved in an cooperative watershed planning agreement to obtain additional topographic, vegetation and soils data for analyzing the ecological impacts of restored hydrologic regimes. The hydrologic and ecologic restoration of SGGE is unique in its notable size and flood protection constraints and will require an interdisciplinary and cooperative approach among many agencies as well as a strong commitment from the public.

Session: Environmental Management

Abstract #: 97204

FEASIBILITY OF DISCHARGING TREATED MUNICIPAL WASTEWATER INTO THE FLORIDA EVERGLADES

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ABSTRACT

Municipal wastewater in Dade County is currently collected and treated in one of three existing wastewater treatment plants (WWTPs): the South District, Central District, and North District WWTPs. The Central District WWTP is located on Virginia Key in Miami and has a capacity of approximately 140 million gallons per day. Treated effluent is discharged through an ocean outfall pipeline over three miles from the shoreline. In a region experiencing growing water supply problems, including seawater intrusion, this ocean discharge of potentially reusable fresh water is considered wasteful.

This year's Senior Design Project in FIU's Department of Civil and Environmental Engineering involves the evaluation and design of a new WWTP located in west Dade that will incorporate advanced wastewater treatment to render WWTP effluent suitable for discharge into the Everglades system. This paper presents salient findings from the design project.

The WWTP being designed by the senior design class uses a pure oxygen activated sludge process in order to reduce the organics concentration (measured as BOD) in the sewage; BOD is converted to biomass which is subsequently removed in settling tanks. The treated effluent is then subjected to advanced treatment in order to reduce the nutrient (primarily nitrogen and phosphorus) concentrations. Advanced treatment again utilizes biological treatment, in this case a constructed wetlands system.

The use of wetlands for advanced treatment of municipal wastewater has been demonstrated in a pilot-scale in West Palm Beach. This project discusses the feasibility of larger-scale applications of advanced wastewater treatment including the potential benefits of wastewater reuse.

Session: Environmental Management

Abstract #: 97205

THE L-31E FRESHWATER REDIVERSION PILOT PROJECT

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ABSTRACT

Freshwater from South Dade presently is discharged directly into Biscayne Bay via the Mowry Canal. In addition to the adverse impacts of this historic change in quantity, quality, and timing of water delivery to the Bay, nearly all of the sheet flow and transverse glades flow to the Bay has been curtailed by the construction of the storm tide levee (L-31E). Loss of the historic sheet flow to the Bay has resulted in westward expansion of salt marshes to the foot of the L-31E structure and has reduced productivity and natural organic carbon export to the Bay.

The major objective of this study is to document the effects of the freshwater rediversion on both the coastal wetlands and adjacent Biscayne Bay benthic communities. Nutrient loading to both the wetlands and nearshore bay ecosystems is the major concern.

The study employs a BACI design, employing two blocks of 20 ha. Our approach is based upon an ecosystem process model in which we attempt to quantify the major pathways of nutrient movement in the system and changes in storage of the different ecosystem components. Vegetation, soils, interstitial soil waters, surface and groundwater, benthic communities and microbial processes are all addressed. In addition, hydrologic parameters, climatic factors including evapotranspiration, and flux from natural tidal channels are also being quantified.

Two major complications have occurred. The project was funded prior to Hurricane Andrew and therefore the litter load and extreme mortality of trees in the fringing environment was not anticipated. Therefore, litter decomposition studies have been initiated to address the nutrient release from mangrove wood, as well as other aspects of perturbation and recovery. In addition, a January 1996 freeze selectively killed most of the trees in the control scrub site, further complicating the eventual analysis of the control versus treatment results.

Session: Posters

Abstract #: 97301

SAW PALMETTO (SERENOA REPENS) (BARTR.) SMALL: AN ECONOMICALLY IMPORTANT PLANT OF FLORIDA

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ABSTRACT

Saw palmetto is an abundant understory plant of many Florida plant communities. A long history of medicinal use (against benign prostate swelling) along with renewed interest in herbal medicine makes saw palmetto a plant of economic interest today. The typical price for dried fruits is \$0.10-0.15 per pound. Saw palmetto quite produces a large number of flowers but sets few fruits. Four factors limiting fruit production have been identified: 1) absence of fire, 2) availability of pollinators, 3) herbivory, and 4) disease. Fire stimulates flower production in the first year, but in post-fire years 3-5, flowering and fruiting are diminished. Availability of pollinators is influenced by site, season, and weather. Direct observation of flower visitors (most commonly Hymenoptera) also revealed that dense undergrowth can hide inflorescences from potential pollinators. Herbivory by the larvae of Litoprosopus futilis (Lepidoptera) can severely damage emerging inflorescences, thereby preventing flower and fruit production. A fungal pathogen, not yet identified, causes abortion of developing fruits.

Session: Posters**Abstract #:** 97302**AUTUMN RAPTOR MIGRATION THROUGH THE FLORIDA KEYS**

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ABSTRACT

The Florida Keys are a migratory bottleneck for approximately 16 species of raptors en-route to the Antilles and South America. Project goals for our study include a complete autumn raptor migration census by species, a study of meteorological conditions affecting flight behavior, and raptor use of stopover habitat. Our primary overflight census is conducted on Grassy Key, 58 miles NE of Key West. The site is narrow (allowing observations across the entire key), not immediately before or after a water crossing (eliminating potential double counts of hesitating raptors), and is not a major forage or roost site (eliminating double counts of looping raptors). Migrating raptors fly either SW (down) or NE (back up) through the Keys. Tracking NE-bound raptors provides evidence of which species and how many individuals turn around, presumably to avoid water crossings. Weather factors affecting the raptor migration include wind direction, wind speed, cloudcover, and frontal systems. This is the first complete raptor census performed in the Keys. In 1996 (1 Sep - 15 Nov), our count exceeded 15,000 raptors, including over 1,300 Peregrine Falcons. Our one-day total of 335 Peregrines is the highest seen in North America. According to satellite telemetry studies, Peregrines from as far west as Alaska migrate through the Keys. This suggests we are observing a different subset of the Peregrine population than seen at other U. S. raptor watch-sites. Our results indicate that the Florida Keys are a major migratory flyway; thus, critical resources should be identified and protected.

Session: Posters**Abstract #:** 97303**POPULATIONS, HABITATS AND LANDSCAPES: MULTI-SCALE APPLIED ECOLOGICAL STUDIES FOR RESTORATION OF SOUTH FLORIDA ECOSYSTEMS.**

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University of Florida, Belle Glade, Florida.

ABSTRACT

Successful restoration of damaged ecosystems requires understanding ecological phenomena that occur across large spatial and temporal scales. Another scale of nature is a biological hierarchy encompassing levels of complexity from molecules to the biosphere. Hierarchical levels of interest to ecosystem restoration include genes, individuals, populations, species, guilds, communities (habitats), ecosystems, and landscapes. Our approach to applying ecological studies to ecosystem restoration efforts considers biological as well as spatial and temporal scales. Population studies focus on evaluating the effects of hydrological restoration alternatives on the endangered American crocodile. An endangered species success story in progress, more crocodiles are nesting in more places today than 20 years ago. In 1989 Broward County passed a 75 million dollar bond issue to buy environmentally sensitive lands (ESL's). To date 17 sites have been acquired. The University of Florida and Broward County Parks and Recreation Division are working cooperatively to develop management and monitoring programs for 16 sites. An important part of this program is an ecological characterization of habitats found on ESL sites. Although fragmented and disturbed Broward County ESL sites have retained valuable ecological qualities. Alligator holes, by virtue of their ability to affect plant and animal communities, are considered a critical component of the Everglades landscape. Early efforts at evaluating the ecological role of alligator holes have focused on mapping and describing alligator holes. Combining remote sensing, field biology and laser mapping in a GIS/GPS environment offers a promising technology for this landscape level project.

Session: Posters

Abstract #: 97304

CHARACTERIZATION AND SPECIATION OF ORGANIC POLLUTANTS IN THE MIAMI RIVER

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ABSTRACT

A series of surface sediments throughout the Miami River were sampled and analyzed for aliphatic hydrocarbons, polycyclic aromatic hydrocarbons and sterols. Contamination was found to be widespread with a similar distribution ranging from the upper to the lower portion of the river, suggesting uniform origins of pollutants for all sites. Alkane distributions exhibit maxima at C-17 and C-29, noting a large input of both terrestrial and algal organic matter into the river. High amounts of branched and cyclic alkanes comprising a large unresolved complex mixture also denotes the presence of anthropogenic sources. Total PAH concentrations ranged from 0.69 mg/g - 0.80 mg/g. Total mercury levels were also determined and were between 5.1 and 82.0 mg/g. Pollutant concentrations by sediment grain size showed that all compounds demonstrate a bimodal distribution with highest concentrations, however, occurring in the smallest grain size fraction. This data clearly shows that the Miami River is an important source of organic pollutants to Biscayne Bay.

Session: Posters

Abstract #: 97305

MOLECULAR CHARACTERIZATION OF ORGANIC MATTER IN SEDIMENTS AND BIOMASS FROM THE FLORIDA EVERGLADES AND THE FLORIDA SHELF

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ABSTRACT

Nine sediment samples were collected from a transect that extends from the central section of the Everglades National Park, through the Harmey River out to the Florida Shelf, to determine sources and fate and transport characteristics of the organic matter in this aquatic environment. Samples representative of the area plant communities such as mangroves, periphyton, sawgrass, and seagrass were also collected studied. All samples were analyzed for their lipid composition and a variety of biomarkers for the different sources of organic matter were identified. Preliminary results show that the molecular marker approach can differentiate between mangrove, periphyton and seagrass organic matter inputs. In addition a C-25 bicyclic diene (C₂₅:2:2) commonly thought to be a marine biomarker was identified in the samples with predominantly marine influence, while the ketone fraction was found very useful in the assessment of seagrass inputs. Clear trends of organic matter source changes were observed throughout the sampling transect.

Session: Posters**Abstract #:** 97306**HORIZONTAL SURFACE AND SOIL WATER SALINITY GRADIENTS ACROSS THE MANGROVE/MARSH ECOTONE**

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ABSTRACT

The hydrodynamics of tidal exchange and freshwater inflow are the principal physical forces that determine the mangrove/marsh ecotone in the coastal region of Everglades National Park. The effects of these hydrodynamics can be characterized by observing the soil and surface water gradients that exist between the coastal mangrove fringe and inland marshes. Near the Harney river, two surface/ground water wells were established to continuously monitor water levels and salinity. One well is located in the mangrove fringe, 30 meters from the river bank, the other well is 300 meters inland, within the coastal prairie. An elevated boardwalk spans the distance between the two wells and was used to collect intermittent grab samples of soil and surface water along the transect. Preliminary data from the two wells shows salinity differences, thus suggesting a horizontal salinity gradient due to tide and freshwater fluctuations. The mangrove fringe well is primarily influenced by the semi-diurnal tides with salinity values ranging from 35 mS in April 1996 to 10 mS in June 1996. The interior prairie well indicates dampened tidal influence with salinity ranging from 25 mS in April 1996 to 5 mS in June 1996. Intermediate soil and surface water observations have been used to quantify the horizontal salinity gradient along our transect. Small changes in the horizontal salinity gradient are suggestive of future vegetation changes of the mangrove/marsh ecotone. This study provides preliminary data in which future salinity fluctuations can be quantitatively monitored and changes in the mangrove/marsh ecotone can be evaluated.

Session: Posters**Abstract #:** 97307**WATER BUDGET AND NUTRIENT EXCHANGE AT THE EVERGLADES' SALINITY TRANSITION ZONE**

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ABSTRACT

The purpose of this project is to simulate the exchange of water and nutrient between Florida Bay and the adjacent mangrove wetlands and understand the processes that influence this exchange. Understanding the link between biological and chemical dynamics, and hydro patterns is a necessary precursor to effectively restoring Florida Bay ecological system. A dynamic process model can help to predict the effect of changing freshwater inflow to Florida Bay on the status of mangroves and nutrient availability. The transition zone ecosystem is connected both to land and sea. It is likely that the ecology of the transition zone is highly sensitive to the quantity and quality of water in the Everglades watershed and thus, sensitive to water management practices. Seaward connection is provided by the inflow of saline water driven by tides and wind events. To integrate all the ecological processes with hydraulics, a predictive model of flux of materials between mangroves and Florida bay was developed. We plan to further use this model to analyze nutrient behavior under several water management regimes.

The objectives are: (a) Quantify the exchange of water and nutrients between Florida Bay and fringing mangroves. (b) Compare patterns of water and nutrient exchange, as measured in mangrove creeks, to these patterns within the adjacent mangrove wetland. (c) Simulate nitrogen and phosphorus dynamics in the water column for three representative zones of Taylor River. The model is spatially articulated to account for nutrient kinetics in three areas or 'cells': a fringe mangrove zone, an open water area, and a dwarf mangrove. Given the hydraulic dynamics the time step is 3 hrs and length of the simulation is one year.

Session: Posters

Abstract #: 97308

STRUCTURE AND LITTERFALL OF A DWARF R. MANGLE FOREST IN TAYLOR RIVER SLOUGH

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ABSTRACT

A study was carried out in a dwarf mangrove forest, dominated by *Rhizophora mangle*, located in the northern section of the Lower Taylor Slough in the Everglades National Park. The objective of this study is to describe the structure of the forest and both spatial and temporal variations in litterfall. Two distinctive climatic seasons occur in the region: dry season (November -April) and rainy season (May-October). Average total litter fall was 183 g/m²/yr during the rainy season and 284 g/m²/yr during the dry season. There were significant differences ($p < 0.05$) in litterfall between the two climatic seasons.

The forest has a high density (7060 trees/ha), an average basal area (m²/ha) of 2.53, an average height of 1.2 m and a complexity index (CI) of 0.61. *R. mangle* accounts for 97.6% of the relative dominance and 96.7% of the relative density. The structural characteristics of this site are similar to that of Turkey Point, Florida, also a site dominated by dwarf red mangrove species (Pool et al. 1977), except that in the site in Taylor River the tree density is higher.

Session: Posters

Abstract #: 97309

MATERIAL EXCHANGE BETWEEN A MAJOR MANGROVE TIDAL CREEK AND NORTHEASTERN FLORIDA BAY

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ABSTRACT

The exchange of nutrients, organic matter, and suspended sediment between Taylor River and northeastern Florida Bay was measured to determine the potential impacts of increased freshwater flow to Florida Bay. Measurements were taken 8 times per day for a 10-day period during the months of January, May, August and November 1996. Water exchange was influenced to a greater extent by freshwater flow and climatological events such as cold fronts and tropical systems than by tidal forcing. Exports of TOC to the Bay occurred during August, January and November while TSS and POM import peaked in May. Organic forms of nitrogen and phosphorus dominated nutrient flux during the four sampling periods. Mean values of TN and TOC and N&N peaked in August, and were correlated with freshwater flow. TP, TSS, and NH₄ mean concentrations peaked during May and were associated with wind-driven resuspension of sediments in Florida Bay.

Session: Posters

Abstract #: 97310

**MAPPING OF PRE-DRAINAGE (CA. 1850) EVERGLADES LANDSCAPES AND HYDROLOGY:
COMPARISON WITH THE NATURAL SYSTEM MODEL**

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ABSTRACT

As part of an effort to support ecological restoration of the remaining Everglades wetlands, 1940's soil and vegetation surveys, in combination with historical observations and topographic survey reports from 1820-1920, were used to define the spatial extents and classifications of Everglades landscapes prior to canal drainage (c. 1850).

Average annual high and low water depths were estimated for each landscape. Data sources for water depth estimates included direct observations, narrative accounts, histosol and marl soil accretion requirements, vegetation requirements and tolerances, and fire behavior. These estimates represent long term averages; high interannual rainfall variability present in South Florida would introduce variability around these averages.

Hydroperiod for each landscape was estimated from the average annual low and high water depths with the additional assumption that these annual extrema occurred, on average, in May and October.

The results are spatial descriptions of the pre-drainage hydrology of the Everglades. In grid format, this spatial data is comparable with output from hydrologic simulation models.

Patterns of average annual high and low water from this study were compared with simulations of the South Florida Natural System Model, version 4.4. Spatial patterns were generally similar, but areas of deeper water for both high and low water conditions were more extensive in the estimates from this study.

Session: Posters

Abstract #: 97311

A SYNOPSIS OF FORAGING BEHAVIORS OF HERONS AND EGRETS

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ABSTRACT

Demand for quantified animal behaviors in ecology is increasing due to the rise of individual-based models such as the Across-Trophic-Level System Simulation which requires large amounts of behavioral data. Also the need to know how different species react to the similar conditions is important because it can show how individuals adjust their foraging tactics to conform to present conditions. I observed and quantified individual foraging behaviors of wading birds during an experiment at 15 0.2-hectare ponds adjacent to Loxahatchee National Wildlife Refuge. The experiment consisted of videotaping behaviors of birds in response to treatments of water level and fish density. Prior to the experiment, I conducted a literature search to compile a list of published behavioral categories for foraging wading birds. I observed 4 species utilizing 7 behaviors previously unattributed to those species. The majority of new behaviors were exhibited by short-legged species adjusting their feeding strategies to deeper water treatments. Differences in the range of behaviors exhibited by wading birds affected their response to environmental factors such as water depth and prey density which fluctuate seasonally in the Everglades.

Session: Wetlands**Abstract #:** 97401**SAWCAT PROBABILITY MODEL AND THE EFFECTS OF A DELAYED EVERGLADES RESTORATION PROGRAM ON THE DISTRIBUTION OF SAWGRASS**

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ABSTRACT

In the last two decades sawgrass (*Cladium jamaicense*) communities of Water Conservation Area 2A (WCA 2A) in the northern Everglades have been invaded by cattail (*Typha* spp.) communities. A spatially explicit Markov chain probability model (SAWCAT) was developed to simulate the fragmentation processes of cattail invasion (Wu et al. 1997). The model combines the effects of agricultural phosphorus (P) runoff and water depth (D) into a probability function for cattail invasion where: $\text{Prob}_{pw} = 1 / (1 + a * \exp(-b * P)) + c * D / P$; sawgrass cells are 20 x 20 m; invasion is based on the number of 1-8 adjacent cattail cells; and probabilities are expressed as, $\text{Prob}_a = [0.049, 0.052, 0.061, 0.065, 0.069, 0.072, 0.076, 0.094]$. We used Jensen et al.'s 1973 vegetation map and a cattail coverage of 4.7% (2,054 ha) as the initial condition. A spatial distribution of soil total phosphorus was simulated in the SAWCAT. Rutchey and Vilchek's 1991 and 1995 cattail distribution maps were used to calibrate the model. The simulated cattail distributions for 1991 and 1995 (15.7% and 21.0%, respectively), were very similar to actual cattail maps (13.02% and 22.17%, respectively). The model assumes that Stormwater Treatment Area-2 (STA-2) built in 1999 will reduce TP runoff to 50 ppb. However, STA construction could be delayed by two years. What could be the impacts of such a delay? SAWCAT predicted that by the year 2006 cattail will occupy about 34.8% (mean = 15,074 ha, standard deviation = 9.1 ha) of WCA-2A if STA-2 is finished by 1999. If STA-2 is finished by 2001, the model predicts a total cattail expansion of 15,387 ha by the year 2006. The delay would cause a net increase of 55 ha of cattail, 133 ha of cattail mix, and 125 ha of mixed cattail. The model also predicted that water depth might have an impact on cattail invasion but not significantly.

Session: Wetlands**Abstract #:** 97402**A CONCEPTUAL MODEL FOR SOIL PHOSPHORUS AVAILABILITY IN HYDROLOGICALLY ALTERED WETLANDS OF THE EVERGLADES**Fred H. Sklar and Sue Newman
ESRD, SFWMD, West Palm Beach, FL**ABSTRACT**

A number of ecological models are being developed to evaluate the impacts associated with Everglades restoration. However, current ecological and water quality models for the Everglades do not include detailed soil physics associated with repeated wetting and drying of hydric soils. As part of the Everglades Landscape Model (ELM), designed to evaluate plant and nutrient structure and function, we hypothesize that the relationship between hydrology and cattail invasions in the Everglades can, at times, be explained by changes in soil nutrient content as a function of bulk density. Low water tables and the concurrent oxidation of Everglades peat, due to fire, water diversions, drought, and flood control, are thought to concentrate nutrients in the upper root zones of sedges and grasses. A STELLA™ program was developed to evaluate this hypothesis and to establish the merits of a bulk density algorithm for the ELM. The goal was to create a bulk density response parameter that was sensitive to the cumulative impacts of successive dry downs. This was accomplished by calibrating the model against soil and plant data from the Holey Land Wildlife management Area. Observations in the Holey Land suggest a spatial distribution of cattail that has been controlled by a combination of water depth and fire. We duplicated this relationship by developing a cumulative cattail suitability function that was sensitive to water depth, biologically available phosphorus, and the proportion of slough within a region. The Holey Land was divided into five regions according to depth. Each region was initialized with the proportion of sawgrass, cattail, and slough known to exist in 1990. Weekly water depths and inputs of nutrients from agriculture from 1990 to 1995 were the forcing functions. Results are not yet conclusive. However, it is clear that fire has the potential to create both the space (i.e., slough) and soil nutrient conditions required by cattail. Computer experiments continue as we refine the cumulative impact functions. We suspect that these functions, once calibrated, will have significant utility in Water Conservation Area 3A where water tables have been low and therefore, the potential for cattail invasion may be high

Session: Wetlands**Abstract #:** 97403**EVALUATING EVERGLADES ECOSYSTEM DYNAMICS WITH SPATIAL SIMULATION MODELS**

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South Florida Water Management District

ABSTRACT

Whereas Everglades restoration efforts are being initiated, the complex interactions of physical, chemical and biological processes in this heterogeneous landscape are incompletely understood. Stormwater Treatment Areas (STAs) and modifications to the water control system will alter water and nutrients across space and time within the region. Our simulation models incorporate hydrologic, nutrient, and plant dynamics in order to evaluate the spatio-temporal patterns of landscape change associated with management alternatives. In our Everglades Landscape Modeling Program, we developed a general model with scaleable code and applied it to 1) WCA2A (the CALModel) and to 2) the combined area of the WCAs, part of Big Cypress, and Everglades National Park (the ELMModel). In the current model development phase, we used CALM to analyze ecological dynamics of the wetlands of WCA2A, where data for parameterizing and calibrating the model are of the highest quality. In some examples of the model interactions and feedbacks, we saw that drydown and rewetting the soils modified bio- available nutrients which in turn affected the plant growth; altered macrophyte biomass in regions near nutrient inflows substantially affected water levels through differences in transpiration and overland flow. Under various scenarios of water and nutrient load changes associated with potential loads from the STAs, the distribution of water and soil nutrients, periphyton, and marsh graminoids were significantly different compared to the base case of no STA construction. Calibration and uncertainty analyses are underway, and the lessons learned from the CALM will be applied to the full ELM as another tool for preliminary evaluation of the C&SF Project Restudy in the next year.

Session: Wetlands**Abstract #:** 97404**EVALUATING THE ROLE OF PHOSPHORUS AS A MECHANISM TO INDUCE ECOSYSTEM STATE CHANGE IN FRESHWATER WETLANDS OF EVERGLADES NATIONAL PARK: SHORT-TERM RESULTS AFTER ONE YEAR OF ENRICHMENT**

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University Park, Miami, FL 33199

ABSTRACT

The Florida Everglades not only constitute one of North America's largest expanses of contiguous wetlands, but are also among one of its most imperiled ecosystems. Specifically, they have been divided up into three distinct regions: the Everglades Agricultural Area, a drained region used primarily for sugarcane production; the Water Conservation Areas, a large region managed by the State of Florida for water control purposes; and, Everglades National Park (ENP), the only region where conservation and protection of this unique ecosystem is given top priority. Anthropogenic activity in south Florida has altered both the natural hydrologic regime and the nutritional status of these wetlands. Past research has indicated that these changes affect natural Everglades wetlands, but are unclear as to whether one factor plays a greater causal role than the other. Since March 1996, we have been performing a nutrient enrichment experiment, using *in situ* mesocosms and two enrichment levels, in ENP to further evaluate the causal role that phosphorus enrichment plays in altering community structure and inducing ecosystem state change. Locating our experiment in ENP allowed us to eliminate the confounding effect of altered hydrologic regime since this area has been less impacted than others. Our analysis suggests that emergent macrophyte community composition remains unaffected. Those ecosystem components which cycle phosphorus more rapidly, such as soil and algal microbial processes, have, however, begun to be affected by our enrichment experiment. This suggests to us that phosphorus does play a role in causing the observed ecosystem state changes occurring in freshwater Everglades wetlands.

Session: Wetlands

Abstract #: 97405

ARE TREE ISLANDS IN LOXAHATCHEE NATIONAL WILDLIFE REFUGE SMALL AND CIRCULAR OR LARGE AND ELONGATED AND ORIENTED IN THE DIRECTION OF FLOW?

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Cooperative Fish and Wildlife Research Unit, Gainesville, Florida

ABSTRACT

Historic descriptions of tree islands in the Everglades have characterized them as being small and circular or large and elongated and oriented in the direction of historic water flow. In this study we examine that notion for one area of the Everglades, Loxahatchee National Wildlife Refuge. Size, shape, and orientation were determined for 2144 tree islands identified from 1987 satellite imagery. Tree islands ranged in size from 0.05 ha to 62 ha and represented a continuum of sizes. All circular tree islands were < 0.6 ha while elliptical tree islands ranged in size from 0.05 ha to 62 ha. Orientation of elliptical tree islands was bimodal with most oriented between 0 and 20 degrees or 150 and 180 degrees (180 = north to south). Larger tree islands showed less variance in orientation than smaller tree islands. Orientation was not correlated with flow direction predicted from elevation data alone, but appears to be more related to the large scale north to south gradient and historic patterns of sheet flow.

Session: Wetlands

Abstract #: 97406

SOIL-BASED ESTIMATION OF PRE-DRAINAGE (CA. 1850) EVERGLADES LANDSCAPES AND THEIR HYDROLOGY

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ABSTRACT

Intensive synoptic studies from the 1940s provide the best available picture of the Everglades as a whole. Accurately portraying the system as it was then, these studies also reflect any alterations caused by thirty years of canal drainage.

In the present research we developed a picture of the landscapes -- the soils, hydrology, topography and vegetation -- present prior to drainage. Development of this picture included two aspects: characterization of the landscapes and determination of their spatial extents. Soil was assumed to be the most stable aspect of each landscape. A comprehensive soil map of the Everglades published in 1948 therefore formed the basis for estimating spatial extents.

Hindcasting of the 1948 soil map and characterization of each pre-drainage landscape was based on synthesis of numerous sources: a 1915 soil survey; published studies of soil change after drainage; federal and state township surveys; historical observations of water levels and vegetation; and reports from expeditions, etc.

Results of the synthesis suggested that a large portion of the Everglades had been altered substantially by the 1940s. The ridge and slough landscape -- containing the deepest water -- originally extended continuously from the present Loxahatchee Wildlife Refuge to Shark River Slough. The sawgrass plains of the northern Everglades occupied less area than when mapped in the 1940s. Areas along the edge of the Everglades mapped as wet prairie on sandy soils were likely originally sawgrass on peat soil. Average annual variation in water depth throughout the Everglades was likely about two feet. Water depths in the sloughs of the ridge and slough landscape, on average, varied between 12 inches in May to 30 inches in October; a hydroperiod of 365 days. The sawgrass plains ranged between six inches below ground in May to 18 inches above in October.

Comparison of this study with results from the South Florida Natural System Model are presented graphically in an associated poster.

Session: Wetlands**Abstract #:** 97407**MODELING PERIPHYTON AND PHOSPHORUS LINKAGES IN THE EVERGLADES**

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ABSTRACT

Native periphyton is a key ecosystem component in the Everglades. They have been identified as extremely sensitive to phosphorus supply. Periphyton are also being considered as the basis for ecological-engineering design of periphyton storm-water Treatment areas to reduce phosphorus in agricultural runoff. We are developing a periphyton model to study the relationship between periphyton community structure, production, phosphorus and other environmental conditions. This model serves as a quantitative framework that can (a) describe the system, (b) synthesize the current ecological information from empirical studies, (c) evaluate importance of various ecological processes and parameters, (d) identify critical links and missing links in current ecological understanding, and (e) generate hypotheses and projections. The design of the model allows users to perform different analyses with a minimum effort of modification. The structural complexity of the model can be controlled in different analyses depending upon the objectives and scales of each study. The model is applicable to characterizing the phosphorus-threshold and the retention capacity of phosphorus of the periphyton storm-water treatment areas. For example, our model analyses suggest that small gradual changes in phosphorus supply in a certain range may lead to a dramatic change (bifurcation) in the community structure and biomass of periphyton. Such a range is a parameter of the phosphorus-threshold.

Session: Wetlands**Abstract #:** 97408**THE CONTRIBUTION OF CARNIVORY TO THE NITROGEN AND PHOSPHORUS GROWTH NEEDS OF THE BLADDERWORT, *UTRICULARIA FOLIOSA***

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ABSTRACT

Utricularia foliosa is a free-floating aquatic carnivorous plant found throughout south Florida's freshwater wetlands. Although there is no question that these plants are capable of capturing and digesting small invertebrate prey, the extent to which carnivory supplies nitrogen and phosphorus for growth of *U. foliosa* is unknown. In order to determine the relative contribution of carnivory to *U. foliosa*, we estimated carnivory supply of nitrogen and phosphorus versus the plant growth demand. Estimates from the published literature for other *Utricularia* species suggest that the maximum contribution from carnivory for nitrogen and phosphorus needs of these plants are 26% and 15% respectively. However our observations for *U. foliosa* show that maximal values for carnivory are closer to 8% nitrogen and 5% phosphorus. Overall, our findings show that these putatively carnivorous plants in fact obtain most of their nitrogen and phosphorus via foliar uptake. This raises the question of why these plants invest such a large percentage of their biomass in making bladders. In fact, *U. foliosa* investment in carnivorous organs (bladders) is highly variable. Trap allocation usually varies from 18.8% to 52% of the plants total biomass, but at one field site, the entire population of *U. foliosa* had no bladders. A transplant experiment showed that this plasticity in bladder production was environmentally induced. We are currently investigating the factors that control plant investment in bladders.

Session: Bird Studies

Abstract #: 97501

SERUM CHEMISTRY ANALYSIS OF BALD EAGLE AND OSPREY NESTLINGS IN FLORIDA BAY, EVERGLADES NATIONAL PARK

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ABSTRACT

The objective of this cooperative study is to determine selected clinicopathological parameters from free-ranging naturally raised young eagles and ospreys. Since knowledge of the basic physiology of wild raptors is limited, this project will contribute towards the establishment of "normal" baseline values for their blood chemistry. Blood analysis was conducted on 72 bald eagle and 66 osprey nestlings between 1992 and 1996. Nestlings were sampled between the ages of 35 and 45 days old. Five eaglets resulted in depressed levels, $<0.9 \mu\text{ml}$, of cholinesterase suggesting exposure to an organophosphate toxin. Total protein values, related to prey consumption, were 2.96 g/dl for the ospreys and 3.24 g/dl for the eaglets. Mercury values for 1993 were 0.29 ppm (eagles) and 0.81 ppm (ospreys) and for 1995 were 0.32 ppm (eagles) and 0.19 ppm (ospreys). Serum values when used in conjunction with other good ecological data offer wildlife agencies an alternative way of assessing the health of an ecosystem.

Session: Bird Studies**Abstract #:** 97502**A TEST OF ENVIRONMENTAL FACTORS CONSTRAINING THE USE OF FORAGING SITES BY WADING BIRDS (CICONIIFORMES) IN THE EVERGLADES**

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ABSTRACT

It is reported that food availability (i.e., abundance and vulnerability to capture) is the single most important factor limiting populations of wading birds in the Everglades. Constraints on the acquisition of food by wading birds are therefore the primary barriers to restoring sustainable populations to this degraded ecosystem. I manipulated two potential constraints (prey abundance and water depth) on the use of foraging sites to test the hypotheses that each component limits foraging-site use by free-ranging wading birds. I conducted the experiment in 12 0.2-ha ponds using water depth treatments of 10 cm, 19 cm, and 28 cm, and fish (Notemigonus crysoleucas) density treatments of 3 fish/m² and 10 fish/m². The temporal dynamics of site use by birds indicated species-specific differences in the ability to find food patches as well as to exploit a wide range of water depths. For example, white ibis (Eudocimus albus) and wood storks (Mycteria americana) found food patches quickly but did not utilize patches at a wide range of depths. In contrast, great egrets (Casmerodius albus) increased in abundance more slowly but occupied the entire range of depth treatments. Water depth affected the use of sites by 6 of the 8 species examined whereas fish density affected only the white-plumage social-feeding species. The degree to which a species was limited by either prey abundance or water depth was a function of both their morphological characteristics and behavioral plasticity. These results suggest that foraging opportunities in the Everglades are most limiting for white ibis, wood storks, snowy egrets (Egretta tricolor) and tricolored herons.

Session: Bird Studies

Abstract #: 97503

MEASURING AVIAN REPRODUCTION ON AN ECOSYSTEM SCALE: REPRODUCTIVE SUCCESS MEASURES ARE POOR PREDICTORS OF ANNUAL PRODUCTIVITY OF EVERGLADES WADING BIRDS

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ABSTRACT

Avian nesting success measures are often assumed to accurately reflect local breeding conditions, but the scale dynamics of such linkages are poorly understood. Between 1986 and 1995, I measured numbers of nest starts, clutch size, nest survival, hatching success, and brood size of Great Egrets, White Ibises, Tricolored Herons and Snowy Egrets throughout the central Everglades, and estimated the annual ecosystem-wide productivity of these species. The only significant correlation among these annual measures was between numbers of nest starts and total production of young, and otherwise all combinations of annual measures were uncorrelated. This suggests that years of high recruitment within the ecosystem are inadequately predicted on a landscape scale by even ecosystem-wide measurement of reproductive success measures. The lack of concordance among variables also suggests that the predictability of reproductive success is quite low at any given point during the breeding season, due to both naturally-occurring and anthropogenic disturbance events. Wading bird restoration and monitoring efforts in the Everglades should concentrate on the features that attract large numbers of birds to nest, rather than attempting to maximize nest success parameters.

Session: Bird Studies

Abstract #: 97504

EFFECTS OF CHRONIC, LOW CONCENTRATIONS OF DIETARY METHYLMERCURY ON APPETITE AND HUNTING BEHAVIOR OF JUVENILE GREAT EGRETS

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ABSTRACT

Wading birds (*Ciconiiformes*) in the Everglades are known to chronically encounter methylmercury in their diets. Based on concentrations of mercury in prey animals and measurements of food intake in wild nestlings, we estimate that Great Egrets typically encounter a minimum of 0.65 ppm in their diet. We dosed 6 captive juvenile Great Egrets with 0.5 ppm methylmercury, and 6 with placebos in their diets between 12 and 105 days of age in order to estimate the effects of this toxin during the critical growth and independence period. We tested each bird repeatedly for their ability to capture live fish in pools with contrasting and camouflage backgrounds. Placebo birds were significantly more likely to finish foraging bouts (5 fish presented sequentially) than were mercury-dosed birds. For birds which completed foraging bouts, there was no difference in time to capture fish.

Session: Bird Studies**Abstract #:** 97505**ENERGETIC REQUIREMENTS OF NESTLING WADING BIRDS**

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Due to extensive modifications of Everglades hydrology, the number of nesting attempts of all species of wading birds has declined by over 90%. Food availability may be the single most important factor that limits the distribution and nesting success of wading birds. Modeling projects designed to guide efforts to restore productive wading bird populations in the Everglades require accurate estimations of nestling food requirements. To date, the energetics of nestling wading birds remains poorly documented, simply because the logistics of measuring food intake have been difficult to obtain in the field. We have employed the labeled water technique in order to determine food intake in free-ranging Snowy Egret (*Egretta thula*) nestlings. After injecting nestlings with tritiated water and extracting blood samples in 5-d intervals, the labeled water technique, which is efficient and 95% accurate, allows us to calculate the water turnover rate. Because the water content of wading bird prey items in the Everglades is well known, the water turnover rate can be used to estimate prey consumption in nestlings. During the 1996 breeding season, we collected data from three sites in Water Conservation Areas 3A and 3B. Our results show that food intake can be measured in Snowy Egret chicks and the data imply that geographic differences do not seem to account for differences in the food amount delivered to chicks. Food amount strongly influences chick mass, independent of chick age and hatch order. Our results indicate that food amount is critical to the residual mass and possibly the fledgling condition of ciconiiform chicks which could influence post-fledging survival. We anticipate that these relationships will become better developed and more robustly tested during the 1997 breeding season.

Session: Birds&Animals Studies

Abstract #: 97601

SOURCES OF VARIATION IN ANNUAL COUNT DATA USED TO ESTIMATE THE NUMBER OF SNAIL KITES IN FLORIDA

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ABSTRACT

Since 1969 the number of Snail Kites (*Rostrhamus sociabilis*) in Florida has been monitored via a quasi-systematic annual count. Numerous biological interpretations have been derived from these counts assuming that the counts represent complete censuses. Often the interpretations have little or no regard for the inherent sources of variation in these data that could influence the validity of subsequent interpretations. Here we examine several sources of variation inherent in the annual count and present data showing how several systematic sources of variation can greatly influence the probability of detecting individuals on any given count. We suggest that capture-recapture (mark-resighting) techniques offer a reasonable alternative for estimating populations size. This approach enables explicit estimation of the probability of detecting individuals. We present preliminary results using this technique to estimate population size of Snail Kites in Florida.

Session: Birds&Animals Studies

Abstract #: 97602

WATER BIRD USAGE OF FLORIDA BAY

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ABSTRACT

An aerial census of Florida Bay conducted from an HH65 Dolphin helicopter (courtesy U.S. Coast Guard, Miami Air Station) provides the first comprehensive multi-species, baywide view of wading bird abundance, spatial distribution, and habitat use. More than two complete years' of monthly observations reveal seasonal patterns.

Objectives are to (1) determine usage of various types of bay habitat, (2) determine overall abundances, (3) compare present to past abundances for a few species that have been counted previously, and (4) compare abundances and seasonal usage of the bay to that in mangrove and freshwater areas of Everglades National Park. During the first 9 mo, we flew regularly spaced north-south transects and diverted from the flight path to circle islands within one-half mile distance. Beginning month 10, we adopted a more efficient strategy that focused on islands and nearly exposed banks. White Ibis were the most abundant wading bird species the first winter, followed by Great and Snowy Egrets. The Great White Heron was the wader that most fully used the Bay. It was consistently the most widely distributed species across Florida Bay in all months. The Great Blue Heron was less numerous than the Great White Heron, more seasonal in its occurrence, and more restricted in its distribution (mainly the western and southwestern bay). During the winter, Great and Snowy Egrets were more numerous than Great White Herons. The spatial distribution of Great Egrets was similar to that of Great White Herons. One surprise was the large number of small wading bird species using the bay. Little Blue Herons, Snowy Egrets, and Tri-colored Herons extended deeply into the bay, not just along the northern fringe .

Session: Birds&Animals Studies

Abstract #: 97603

POPULATION BIOLOGY OF THE RIVERINE GRASS SHRIMP, PALAEEMONETES PALUDOSUS AND ITS RESPONSE TO WATER-LEVEL CHANGE IN EVERGLADES MARSHES

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ABSTRACT

Palaemonetes paludosus is abundant in Everglades marshes and serves as an important link in the marsh food web. Only one other study has investigated the life history and ecology of this species in Everglades marsh habitats, but the conclusions of that study are questionable because of an inherent bias in the pull-trap sampling gear used. We used an improved sampling gear, the throw trap, to examine the responses of riverine grass shrimp to hydrological patterns in the Shark River Slough marshes of Everglades National Park, during a six year period. We analyzed shrimp density, biomass, fecundity, reproductive seasonality, and size of maturity in long-hydroperiod marshes and in hydrologically challenged, short-hydroperiod areas. Prawn density and biomass were significantly lower in areas subjected to frequent dry-downs than they were in areas with sustained flooding. Although previously published pull-trap data indicated that shrimp abundance declined during an extended high-water period, data from our study show instead that the density of P. paludosus increased during a period of prolonged high-water. Based on the results from the more accurate throw-trap gear, we conclude that frequent dry-downs will produce degraded marshes with reduced standing stocks of aquatic animals.

Session: Birds&Animals Studies**Abstract #:** 97604**FOOD WEB STRUCTURE IN LAKE OKEECHOBEE**

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ABSTRACT

Food web structures in lakes are often complex and poorly understood. We used stable isotopes to describe the food web linkages and functional similarity of fish communities at 5 sites across Lake Okeechobee. Stable isotopes provide a natural tag that allowed us to find different feeding patterns of fish subgroups within the lake. When averages for the entire fish communities were taken, the five sites sampled showed distinctive patterns of $\Delta^{13}\text{C}$ and $\Delta^{15}\text{N}$ isotopic compositions. The marsh site (MH24,000) had distinctly lower $\Delta^{13}\text{C}$ and $\Delta^{15}\text{N}$ values than the other sites, the offshore site (LZ-40) had high $\Delta^{13}\text{C}$ and $\Delta^{15}\text{N}$ values, and the other 3 sites that were close to the marsh-open water interface had intermediate isotope values. The $\Delta^{13}\text{C}$ isotope data were most useful for distinguishing which fish species feed offshore, which species use the marsh, and which species migrate between the two habitats. All sizes of black crappie were found to have similar $\Delta^{13}\text{C}$ values, indicating offshore feeding throughout their lives. In contrast, largemouth bass showed strong changes in $\Delta^{13}\text{C}$ with size, consistent with a migration from marsh to offshore areas as fish grow. The $\Delta^{15}\text{N}$ values are a trophic level indicator, with N isotope values increasing with increasing trophic level. The progression of $\Delta^{15}\text{N}$ across sites generally followed the size of the fish collected, with smaller fish from the MH site having lower values and larger fish from the other sites with higher $\Delta^{15}\text{N}$ values. Underlying these broad patterns, there was evidence for a finer-grained distribution of isotope labels, beyond the simple marsh vs. offshore contrast. The non-uniform distribution of isotope labels at the marsh site, indicated that small fish differ strongly in their foraging habits.

Session: Birds&Animals Studies

Abstract #: 97605

**BENTHIC MACROPHYTE SEASONALITY IN THE EVERGLADES-FLORIDA BAY ECOTONE:
INFLUENCE OF FRESHWATER INFLOW**

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ABSTRACT

Water management practices have altered the natural freshwater flow patterns into the mangrove ecotone zone along the north shore of Florida Bay. This study characterizes seasonal patterns of submerged macrophytes in the estuarine waterbodies in this zone. We evaluate the influence of freshwater inflow on macrophyte dynamics. This project provides information for developing and evaluating management strategies to restore more natural freshwater inflow patterns.

Two sampling regimes were used to assess benthic macrophyte seasonal abundance, distribution, and community structure: 1) at the end of wet and dry seasons on a waterbody wide scale measuring percent cover, and 2) on a smaller spatial scale, but with greater frequency (every two months, measuring biomass. Eight waterbodies, oriented along freshwater flow paths (hence, salinity gradient) from inland to Florida Bay, were surveyed. Project duration was October 1995 to December 1996 (two wet and one dry season surveys).

Submerged macrophyte abundance and distribution varied seasonally. Benthic macrophyte seasonality was related to seasonal patterns in salinity and light penetration or water clarity. However, these biological and physical patterns differed spatially and temporally. Macrophyte seasonal patterns differed among waterbodies, and even within some waterbodies. Seasonal patterns differed in the same waterbody from year (1995 wet season) to year (1996 wet season). These differences in macrophyte seasonal patterns are likely due to the relative importance of different physicochemical factors, primarily salinity and light, affecting plant growth over spatial (among waterbodies) and temporal (interannual) scales. Salinity and benthic light availability are affected by freshwater inflow patterns. Chara was the dominant species in waterbodies with median salinity <15 ppt. Halodule was abundant in waterbodies with median salinity >18 ppt.

Session: Birds&Animals Studies**Abstract #:** 97606**SIMPDEL: A SPATIALLY EXPLICIT INDIVIDUAL-BASED SIMULATION MODEL FOR FLORIDA PANTHER AND WHITE-TAILED DEER IN THE EVERGLADES AND BIG CYPRESS LANDSCAPES**

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ABSTRACT

A model has been constructed with the primary objective of assessing the relative impacts of alternative hydrologic scenarios over the next several decades on the spatial and temporal distribution of panther and deer across South Florida. This includes the capability to produce relative comparisons of mortality, reproduction, individual movement patterns and territory size across the landscape for both species. The modeling approach is individual-based, in which detailed physiological and behavioral information on deer and panther are utilized to construct rules which allow the simulation of over 30,000 individual animals across the landscape, keeping track of individual characteristics such as weight, sex, mating status, and health. The behavioral rules are coupled to a dynamic spatially-explicit hydrologic model, a vegetation model, and a variety of GIS-type inputs for roads, landuse, and feral hog density. The model operates on a daily time step, although within this time step, deer and panther movements are simulated, taking account of local water conditions, forage and prey availability. Spatially, the model makes use of vegetation data to calculate forage availability on a 100 m scale, but tracks deer and panther locations on the daily time step at 500 m scale. Validation involves detailed comparisons of deer distributions with historical data, comparison of aggregated variables such as age-dependent mortality, age-structure, body weight distribution and birth rates with available data, and comparison of model individual-movement patterns with radio collar data. A visualization program has been written to allow easy access to the radio collar information available, and provide a means to readily compare this to model output.

Session: Marine Ecology

Abstract #: 97701

ANALYSIS OF SPONGE MORTALITY IN FLORIDA BAY

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ABSTRACT

Between January 1991 and 1994 there were a series of algal bloom incidents in Florida Bay that occurred at the same time as mass mortalities or disappearances of sponges, seagrass beds, juvenile fish and shellfish. Both the algal bloom and perhaps suspended fine sediments were blamed for the sponge mortalities. The major hypotheses advanced for the sponge death were physical clogging of the filter feeding mechanism by the putative bloom cyanobacteria and its mucus or toxins produced by the cyanobacteria. (Grantham, 1993). In October 1993, four species of sponges (*Aplysina californis*, *Ircinia campano*, *Sphaciospongia vesparium*, *Appotos* sp.) were collected from a normal area east of the Marine Lab in Long Key, Florida and transplanted into the mortality area where a single species, *Cirayhydra alloclada*, was still growing. Accordingly, the sponges in this study were in three areas: 1) offshore, in the bloom area 2) inshore in a control area at the Marine Lab and 3) in a flow-thru sea water tank at the Marine Lab. Tissue was sampled daily over a five day period and fixed in Parducz's fixative or gluteraldehyde with osmium tetroxide as a postfixative and prepared for light, transmission electron and scanning electron microscopy. No physical clogging, by the dominant bloom species of cyanobacteria, *Synechococcus elongatus* or calcium carbonate particulates was found.

A special thanks to Florida Marine Research Institute, South Florida Regional Laboratory for assistance in collecting samples.

Session: Marine Ecology

Abstract #: 97702

GROUND WATER DELIVERY TO BISCAYNE BAY

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ABSTRACT

Salinity and specific nutrient concentrations exhibit an offshore profile in the upper Biscayne Bay aquifer suggestive of groundwater discharge into the nearshore bay. By 400 M the upper groundwater salinity is usually near normal marine and the benthic communities are dominated by Thalassia testudinum from that point further offshore. Initial flow measurements indicate groundwater discharge of nutrient rich waters in the inshore areas which are dominated by Halodule wrightii and Penicillus -Batophora communities and filamentous algae.

The objectives of this study are: 1) to quantify the groundwater nutrient load to nearshore Biscayne Bay, 2) identify the source of nutrients and 3) document their effects on the benthic communities. This report focuses on the groundwater aspects of this National Park and SFWMD funded research.

Fifteen pairs of wells were drilled along five transects perpendicular to The Biscayne Bay shore line from a distance of 50 to 800 M off shore. Transects are located south of Dinner Key and north of Mowry Canal. The wells at each station consist of an upper well above a semi-impermeable layer (1-3 M) and a lower well (5-7 M). Wells and surface water were sampled in June, September, 1996 and January 1997. Samples were analyzed for salinity (in the field) and the following nutrients; NO₂, NO₃, NH₄, TP, chlorophyll, TOC, TN, SRP, and APA. Upper aquifer concentration to TP and ammonia (10 to 20 times surface water concentrations) levels are high.

Biscayne Bay National Park is conducting a study to return sheet flow to the bay. This research will establish the impact groundwater has prior to the return of sheet flow.

Session: Marine Ecology**Abstract #:** 97703**SEAGRASS FACIES AND PHASES RECORDED IN THE SEDIMENTS OF FLORIDA BAY**Halley, R.B., Holmes, C.W., Prager, E.J., and Shinn, E.A
US Geological Survey, Coastal Center, St. Petersburg, Fl 33701**ABSTRACT**

Widespread seagrass mortality in Florida Bay during the past decade is unique to human memory and has raised concerns about ecosystem health. However, the sedimentary record of Florida Bay indicates great variation of seagrass cover in the more distant past. In east-central Florida Bay, sediments clearly record the presence and absence of sea grass in sediment facies deposited during the last two centuries. Sea grass and grass-free (mud) facies are defined by the texture, composition, and structure of sediment. Seagrass facies have a chaotic structure, a significant coarse fraction, and contain fossil species of carbonate-producing epibionts. In contrast, mud facies (grass-free) are characterized by sediments that have a laminated structure, less shelly fauna, and are typically finer grained than grassy areas. Seagrass and mud facies accumulate in mudbanks as deposits of locally allochthonous (transported) and autochthonous (produced in situ) carbonate sediment originating in the Bay. Mudbanks slowly migrate in response to wave-induced suspension and traction sediment transport, eroding on exposed margins and accumulating on protected sides. Mudbanks vary greatly in the amount of seagrass cover but for the past 30 to 50 years have been dominated by seagrass facies.

Several researchers have applied facies analyses to mudbank cores in order to document changes in seagrass cover in the past. Newly applied dating techniques and studies of recent erosion and accumulation indicate that in the early 1800s seagrass cover was much like that of today. However, during the mid-1800s, the influence of sea grass greatly declined, and a phase of physical sedimentation became prevalent. This physical phase dominated until the 1920s and 1930s when seagrass facies returned to the area. The phase change from physical to seagrass-dominated sedimentation during the early part of this century may be associated with decreased circulation and freshwater inflow during that time. Although the causes of seagrass loss in the mid 1800s are subject to speculation, it is clear from the sedimentary record that areally extensive changes in seagrass cover have occurred in the past.

Session: Marine Ecology

Abstract #: 97704

THE EFFECTS OF NUTRIENT ENRICHMENT ON SOIL MICROBIAL PROCESSES IN MANGROVES

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ABSTRACT

Mangrove wetlands are among the most productive ecosystems in the world and have been the subject of nutrient cycling studies for their commercial and ecological importance. This study takes place in the mangroves found in the Taylor Slough area of Everglades National Park, USA. The Everglades is a highly oligotrophic, carbonate-based system and recent work has demonstrated a phosphorus limitation in both the southeastern Everglades mangroves and the freshwater microbial community. We examine the effects of nutrient enrichment on carbon fluxes in the mangrove soils found along the salinity gradient of Taylor Slough. Triplicate soil cores are collected quarterly from creekside and inland sites at each of three locations and slurried for nutrient enrichment incubations in a nitrogen-phosphorus factorial treatment. All fluxes are calculated using carbon dioxide, methane and sulfide production and are normalized for differences in soil and water chemistry. We present preliminary results from the first year of this study and discuss the differences in carbon flux between creekside and inland sites.

Session: Marine Ecology**Abstract #:** 97705**THE SOUTHEAST SALINE EVERGLADES REVISITED: VEGETATION AND SOIL CHANGES DURING THE LAST CENTURY.**

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ABSTRACT

Holocene sea level rise has caused salt water encroachment into coastal areas for at least 6000 years, but in the last century the rate of encroachment has been altered by anthropogenic activities affecting the availability of upstream water resources. Marsh vegetation and soils, and adjacent tree island vegetation were examined in 55 sites SE of the Atlantic Coastal Ridge between Turkey Point and Taylor Slough in 1994-95. Both marsh and tree island vegetation exhibited well-defined compositional and structural gradients with distance to the coast. Since an earlier study by Egler (1952), the boundary of the mixed graminoid-mangrove and sawgrass communities shifted inland by as much as 3.3 km, and a low-productivity band appearing white on B&W and CIR photos moved interiorward by an average of 1.5 km. The shift in this "white zone" was less pronounced in areas receiving fresh water overflow through gaps in the C-111 Canal than in adjacent areas cut off from upstream water sources by roads or levees. Sub-basinal differences in response to sea level rise were also documented from changes in the vertical and horizontal distribution of mollusk assemblages, which include many good indicators of salinity. Subbasinal time lines for the transition from fresh to brackish-water assemblages were developed based on soil accretion rates from Pb210 dating methods. The rates of salt water encroachment in Joe Bay, Highway Creek, and Turkey Point subbasins were several times the rate indicated by sea level rise alone, while Taylor Slough exhibited less encroachment than predicted by sea level rise. The timing of the acceleration of saltwater encroachment, when present, also appeared to differ among subbasins.

Session: Marine Ecology

Abstract #: 97706

PATTERNS OF GROWTH AND RECRUITMENT IN MANGROVE FORESTS FOLLOWING CATASTROPHIC DISTURBANCE IN RELATION TO SOIL NUTRIENTS

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ABSTRACT

Hurricane Andrew passed over the southwest coast of Florida in August 1992 causing a gradient of disturbance in mangrove forests from minor to catastrophic. We established a series of permanent plots from Rookery Bay in the north to Flamingo in the south to measure initial patterns of mortality, continuing storm related mortality, and the growth of survivors and new recruits. Soil porewater nutrients (nitrogen and phosphorus), sulphide and salinity were measured over time at a subset of plots. Initial mortality was both size and species dependent. Larger individuals of all species were killed and Rhizophora suffered higher initial mortality than either Avicennia or Laguncularia. Continuing mortality has also been concentrated in larger size classes and has been greater for Avicennia and Laguncularia. Recruitment at most, but not all, plots has been dominated by Laguncularia. Rhizophora dominated recruitment at a single plot and Avicennia has recruited in very low numbers in all plots. Growth, measured as basal area increase, has been greatest for all species in plots subjected to intermediate levels of disturbance and least in plots suffering either catastrophic disturbance or little disturbance at all. Soil nutrient pools appear to have played a secondary role. Plots with higher levels of phosphorus had slightly higher growth rates and plots with high sulphide levels had decreased rates of growth. After five years, areas of catastrophic disturbance are not close to approaching prestorm levels of forest biomass.

Session: Marine Ecology**Abstract #:** 97707**SALINITY AND ORGANIC MATTER TRANSFORMATIONS AS CONTROLS ON WETLAND-WATER COLUMN INTERACTIONS IN A SOUTH FLORIDA MANGROVE**

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ABSTRACT

In August and November 1996, we quantified wetland-water column fluxes and processes in dwarf and fringe mangroves of Everglades National Park. We hypothesized that key organic matter transformations are maximal at 0-5 ppt, and that movement of this zone controls nutrient availability and flux. We used dwarf mangrove enclosures, in-channel mangrove flumes, prop root enclosures, and serial filtration experiments to [hierarchically] test our hypothesis. Island enclosures showed significant uptake of NH_4 (15.3 - 31.2 $\mu\text{M}/\text{m}^2/\text{hr}$) and significant release of NN (46.4 $\mu\text{M}/\text{m}^2/\text{hr}$) and TP (4.4 $\mu\text{M}/\text{m}^2/\text{hr}$). SRP fluxes varied. Flume data showed a relationship between salinity and nutrient dynamics, particularly with P exchange. Red mangrove prop roots tended to take up NH_4 and SRP while releasing NN and TP; NH_4 and NN fluxes were always greater when prop roots contained epibiont communities. We performed serial filtrations on water incubated for 2 days in the root bag enclosures; this suggested a conversion of organic P to SRP in the presence of red mangrove prop roots (with and without epibionts). Data from January 1997, which also included a time-series serial filtration experiment where fresh and saline waters were mixed to different salinities, will allow us to more fully address our hypothesis.

Session: Marine Ecology

Abstract #: 97708

SEAGRASS MONITORING IN THE FLORIDA KEYS NATIONAL MARINE SANCTUARY

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ABSTRACT

The purpose of seagrass monitoring in the Florida Keys National Marine Sanctuary (FKNMS) is to measure the status and trends of seagrass communities to evaluate progress toward protecting and restoring the marine resources of the Sanctuary. Specific objectives are: 1) To provide data needed to make unbiased, statistically rigorous statements about the status and temporal trends of seagrass communities in the Sanctuary as a whole and within defined strata; 2) To define reference conditions in order to develop resource-based water quality standards; and 3) To provide a framework for testing hypothesized pollutant fate/effect relationships through process-oriented research and monitoring. To reach these goals, four kinds of data are being collected in seagrass beds in the FKNMS: 1) Distribution and abundance of seagrasses using rapid assessment Braun-Blanquet surveys; 2) Demographics of the seagrass communities using leaf-scar counting and population demographics techniques; 3) Seagrass productivity of the dominant species of seagrass (*Thalassia testudinum*) using the leaf-mark and harvest method; and 4) Seagrass nutrient availability using tissue concentration assays. We assess both inter-annual and intra-annual trends in seagrass communities. The mix of site types is intended to monitor trends through quarterly sampling at a few permanent locations and to annually characterize the broader seagrass population through less intensive, one-time sampling at more locations. Clear spatial and seasonal patterns in productivity, demographics, distribution, abundance, and elemental content are present in the data.

Session: Marine Ecology

Abstract #: 97709

WATER USE IN MANGROVE COMMUNITIES OF BISCAYNE NATIONAL PARK, FL

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ABSTRACT

Water use for *Rhizophora mangle* & *Laguncularia racemosa* were estimated for scrub and paralic mangrove communities along a coastal gradient in Biscayne National Park, FL. Flow measurements were based on a Stem Heat Balance model. In this method, radial and vertical heat conduction are partitioned and separated from convective sap transport by measuring differential temperature over short sections of live stem trunk. Rainfall, barometric pressure, relative humidity, solar radiation, temperature, and wind speed data were collected to assess the relationships between climatic variables and stem flow. Predawn moisture stress and stomatal conductance were also measured on the same or adjacent trees through a diurnal cycle. Sap flow and stomatal conductance showed typical diurnal flow patterns. Individual sap transport rates were expressed on a leaf area basis, which allowed us to scale up observed species and site differences among individuals to the community and ecosystem levels.

Session: Marine Ecology**Abstract #:** 97710**SPATIOTEMPORAL PATTERNS OF THE SEAGRASS
THALASSIA TESTUDINUM IN THE FLORIDA KEYS NATIONAL MARINE SANCTUARY**

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33199**ABSTRACT**

In this paper we present data from an on-going seagrass monitoring program in the Florida Keys National Marine Sanctuary (FKNMS) focusing on patterns and variability of blade productivity of the seagrass Thalassia testudinum (turtle grass). Data have been collected 4 times from December 1995 through December 1996 from 26 permanently established stations in the FKNMS. Sites were surveyed using Braun-Blanquet transects, and blade productivity of T. testudinum was measured using a modification of Zieman's (1974) leaf-marking technique in 6 replicate quadrats at each site. Density, standing crop, and blade productivity, of T. testudinum is extremely variable and peaks during the summer. Productivity ranged between 0.18 - 8.31 mg SS-1 d-1 and increased by ~390 % from December 1995 to August 1996, which corresponded with increases in density (~ 40 %), abundance (~ 50 %), and standing crop (~ 87 %). Due to the large number of variables (22) and significant correlations within the data set, Principal Components Analysis was utilized to reduce the analysis to 6 independent principal components that described ~ 81 % of the total variation in the data. Temporal and spatial analysis of these components were used to describe large-scale or regional patterns of seagrass communities in the FKNMS, including the effects of seasonality, water depth, nutrient availability, seagrass density, and macrophyte species composition.

Session:

Abstract #: 97xxx

THE HERPETOFAUNA OF THE KISSIMMEE RIVER FLOODPLAIN: PRE-RESTORATION COMMUNITY STRUCTURE

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ABSTRACT

Historically, the Kissimmee River flowed 166 km from Lake Kissimmee to Lake Okeechobee across a 1.5--3.0 km floodplain. Between 1962 and 1971, the river was channelized and transformed into a series of five impounded reservoirs regulated by six water control structures. Restoration of the Kissimmee River ecosystem is slated to begin in 1999. Our current research efforts characterize amphibian and reptile communities of the channelized floodplain. We will provide an overview of the restoration project and describe the monitoring program. Data on amphibians and reptiles have been collected in three floodplain habitats: broadleaf marsh, woody shrub, and wetland forest. We sample amphibians and reptiles along three fixed transects monthly in each habitat type using visual encounter surveys. We have nine transects in broadleaf marsh, six in woody shrub, and six in wetland forest. Our sampling began in August, 1996 and we have observed eight amphibian and 3 reptile species on transects. Two orders and four families of amphibians include: Eurycea quadradigitata, Acris gryllus, Gastrophryne carolinensis, Hyla cinerea, Hyla femoralis, Pseudacrisocularis, Rana grylio, and Rana sphenoccephala. We have encountered one lizard, Anolis carolinensis, and two snake species Thamnophis sauritus, and Nerodia fasciata. In addition to describing the herpetofauna of each floodplain habitat, we will present patterns of abundance for each species in each habitat.

Session: Abstract #: 97xxx

PLANT WATER UPTAKE PATTERNS IN HAMMOCKS AND PINELANDS OF EVERGLADES NATIONAL PARK

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ABSTRACT

This study assesses temporal variability in water uptake of plants between the wet and dry seasons in hammocks and pinelands. Differences in seasonal and inter-species water uptake can be determined by natural stable isotope abundance measurements. Plants can utilize water from either upper soil layer reflecting recent rainfall events, groundwater or a mixture of both sources; each water source has a unique isotope signature which is reflected by the plants.

Three sites of different elevations were established in Everglades National Park. Each site contained adjacent communities of pinelands and hammocks. Rainfall data, groundwater and water table depths have been measured at all sites since summer 1996. We collected pre-dawn water potentials and stem samples, once each at the end of the wet (October 1996) and dry (April 1997) seasons. Water was extracted from plant samples for hydrogen and oxygen isotope analysis; subsamples of dry stems were ground up and analyzed for carbon isotopes.

In the wet season, the water table was very shallow at all sites. There was no significant inter-site difference in pre-dawn water potentials. However, vegetation in both the hammock and pineland of the most elevated site was using soil water while the lowest site was utilizing groundwater.

Hydrology is important in areas with distinct dry and wet seasons like South Florida. The amount and timing of water available per annum can determine species survival and composition in an area; knowing the source of plant water uptake will allow ecosystem managers to better predict and manage vegetation changes with hydrological manipulations.