manages the park's museum and archival collections. He has held a variety of positions within the NPS being his most recent ones a position working with asset management for the Caribbean Parks (San Juan National Historic Site, Virgin Islands National Park, Salt River National Historical Park and Ecological Preserve and Buck Island Reef National Monument), and acting assignments in San Juan in Interpretation and Visitor Services and Facility Management. Mr. López oversees a CESU Task Agreement with the University of Puerto Rico, Rio Piedras Campus, for the conservation of historic artillery objects.

Opportunities to Partner with Tribes through the Bureau of Indian Affairs Programs *by Rachael Novak*

Abstract Id: ***19*** *Submitted:* ***October 9, 2016*** *Event:* ***Annual Meeting of the South Florida Caribbean Cooperative Ecosystem Studies Unit (SFC CESU)*** *Topic:* ***South Florida CESU***

The Bureau of Indian Affairs (BIA) mission is to: "*... enhance the quality of life, to promote economic opportunity, and to carry out the responsibility to protect and improve the trust assets of American Indians, Indian tribes, and Alaska Natives.*" *The BIA's* Tribal Climate Resilience Program (TCRP) joined CESUs throughout the U.S. to enhance support tribes and trust managers to consider climate change resilience in their project design to address climate risks and supports resilient ocean and coastal management. Rapid climate change threatens to degrade tribal resources and undermine the economies, health and safety of American Indian communities. The TCRP focuses on supporting tribal and BIA managers that make project design decisions with training, information and tools, expert advice, and funding to support climate adaptation planning, vulnerability assessments, travel support, ocean and coastal management, youth engagement, and capacity building. The partnership with CESUs helps to increase access to technical expertise for tribes and BIA staff as they consider how to incorporate climate change considerations into programs and projects. This presentation will discuss the needs in this region and a route to potential partnership with tribes and the BIA through the BIA Climate Awards Program and this CESU.

Presenting Author Biography

Rachael Novak (Navajo) is the BIA's Climate Science Coordinator for the Tribal Climate Resilience Program. She is responsible for enhancing the delivery of and access to climate science for federally recognized tribes to improve resilience. Prior to joining the BIA, Rachael worked on water quality criteria development at the U.S. Environmental Protection Agency. Rachael holds an M.S. in Geosciences from the University of Arizona, a B.S. and B.A. in Environmental Science and International Studies (respectively) from Oregon State University.

Caribbean Parks – Managing Visitor Use and Climate Change Impacts to Vulnerable Ecosystems

by Zandy-Marie Hillis-Starr | Clayton Pollock

Abstract Id: ***27*** *Submitted:* ***October 20, 2016*** *Event:* ***Annual Meeting of the South Florida Caribbean Cooperative Ecosystem Studies Unit (SFC CESU)*** *Topic:* ***South Florida CESU***

Each park unit is defined by its distinct natural and cultural resources and each has its own management challenges and research needs. In the Eastern Caribbean, located on the island of St. Croix, U. S. Virgin Islands are 3 National park units - Christiansted NHS (1952), Buck Island Reef NM (1961), and Salt River Bay NHP & EP (1992).

Buck Island Reef NM (BUIS) is a 176-acre tropical dry forest island situated off the 1.5 miles off the north shore. The monument was established for the unique elkhorn (*Acropora palmata*) coral barrier reef surrounding the eastern two-thirds of the island and was expanded in 2001 adding over 19,000-acres of submerged lands becoming the first fully protected marine area in the NPS. The Monument includes an Under Water Trail were visitors can snorkel through coral reefs and recreational areas off West Beach. BUIS has been the site of several long term research and restoration programs including island-wide exotic predator and invasive plant control, endangered species translocation projects, and nesting sea turtle saturation tagging and monitoring. These terrestrial projects require further investigation as new questions and management actions are developed to address the impacts of sea level rise and dynamic erosion patterns. Climate change also has implications for the marine resources contained within the Monument. BUIS is one of the few Caribbean reefs with living *Acropora* stands and large areas designated as critical habitat but is still threatened by a variety of coral diseases, invasive species including lionfish and *Halophila stipulacea* sea grass, absence of reef fish species, poor coral recruitment, seasonal coral bleaching/disease impacts, and illegal poaching. Perhaps one of the greatest park needs is determine its efficacy as a successful and fully functional MPA within first 30 years.

Salt River Bay located on the north shore of St. Croix is a co-managed, multi-use park with federal, territorial and private lands all included within the park 1035-acre boundary. The park provides a ridge-to-reef watershed through a mangrove estuarine bay that is protected by a coral reef starting at 30 feet that extends down to and east and west wall into a submarine canyon that terminates into the Puerto Rican Trench. The estuary is under significant threat from uplands non-point and point sources of pollution which has impacted the bay. Currently SARI is listed as an impaired body of water by EPA for low DO and bacteria. The estuary supports a variety of birdlife, migratory and coastal, but status information is minimal. SARI has begun exotic invasive plant control on 50 acres on federal lands on the east side and is undertaking a substantial landscape level restoration project. Feral and NNI animals are a threat within the park. Marine threats include overfishing, lionfish, invasive sea grass, erosion, sea level rise, and pollutants (boat building operation and live aboard boats and substantial numbers of sunken vessels). SARI is a complex park with wide range of issues – NPS is working on federal lands where they can and coordinating with territory address the water quality within the bay.

Presenting Author Biographies

Zandy-Marie Hillis-Star has over 36 years of experience in natural resource management and

research in the U.S. Caribbean and has published papers on a range of species and resource issues including sea turtles (Eretmochelys imbricata), non-native invasive pest control (Rattus rattus), coral reef ecology (Acropora palmata), including long-term monitoring, effects of hurricanes, coral bleaching, and as part of her responsibilities at NPS Christiansted NHS 18th-19th century historic Danish Structures – subterranean termite control. She received her BA from University of Maine (1980) and began her career in marine science at FDU West Indies Laboratory, St. Croix VI in 1978. Chief of Resource Management and Research for three national park units in St. Croix, U.S. Virgin Islands for 28 years she is responsible for critical long term research and monitoring programs and restoration of NPS first fully protected marine area - Buck Island Reef NM, a 176-acre tropical dry forest island and 19015-acres submerged lands. She is the natural resource specialist/biological lead for the development of the General Management Plan/EIS for Buck Island Reef NM MPA which will guide park management for the next 20 years. As Program Coordinator for Buck Island Sea Turtle Research Program, 1987-2015, responsible for critical hawksbill sea turtle research/ monitoring program for USFWS index population recovery resulting in the increase in nesting hawksbill population from 12 females (1997) to over 65 (2014); development of sea turtle monitoring protocol with USGS and development of long-term database program (2002-2015). Island–wide control of non-native invasive plants (2004-ongoing) and non-native invasive animals, black rat, 1999-2001 which lead to successful translocation project for globally endangered St. Croix Ground Lizard (Ameiva polops) in 2007. The current population has successfully colonized over half the island through population growth from 57 translocated adults to over 1450 individuals (2013). In addition she is responsible for cultural resource program including museum collections, archives, historic preservation, and both natural and cultural resource compliance for all three parks. She works closely with NPS units in the South Florida/Caribbean group, SFC Inventory and Monitoring Program, GVI Department of Planning & Natural Resources, Coastal Zone Management, St. Croix East End Marine Park. She is NPS Salt River Bay NHP & EP technical lead to develop world-class marine research and education center in collaboration with DOI Coral Reef Program, and partner universities UVI, UNCW, USC, and Rutgers.

Clayton Pollock is the Biologist and Park Dive Office for Christiansted NHS/Buck Island Reef NM/Salt River Bay NHP & EP, St. Croix, VI, National Park Service. He has experience in tropical dry forest monitoring, exotic plant management and treatment, mangrove-marsh ecotone and vegetation community monitoring, St. Croix ground lizard monitoring, and exotic animal management. He received his BS from Eastern Connecticut State University and his MS in Marine and Environmental Sciences from the University of the Virgin Islands.

NON-FEDERAL PARTNER

ABSTRACTS

(in presentation order)

IBBEAM – Integrated Biscayne Bay Ecological Assessment and Monitoring *by Diego Lirman | Joan Browder | Sarah Bellmund | Joe Serafy*

Abstract Id: ***13*** *Submitted:* ***October 9, 2016*** *Event:* ***Annual Meeting of the South Florida Caribbean Cooperative Ecosystem Studies Unit (SFC CESU)*** *Topic:* ***South Florida CESU***

The Integrated Biscayne Bay Ecological and Assessment and Monitoring (IBBEAM) program tracks the ecological status of central and southern Biscayne Bay's shallow nearshore habitats (< 500 m from shore) to gauge the effectiveness and impacts of the Comprehensive Everglades Restoration Project (CERP) and the Biscayne Bay Coastal Wetlands (BBCW) project on: (1) water quality (with an emphasis on salinity patterns); (2) submerged aquatic vegetation (SAV); (3) epifaunal fishes and invertebrates; and (4) mangrove-associated fishes. The centerpiece of this program is the development of a suite of performance measures that respond dynamically to changes in salinity and freshwater deliveries into littoral habitats. The selected indicators include: 1) a salinity suitability index; 2) the percent cover of the segrasses *Thalassia* and *Halodule*, 3) the abundance and distribution of pink shrimps and the goldspotted killifish in associated with SAV communities; and 4) abundance and distribution of goldspotted killifish, gray snapper, and yellowfin mojarra in mangrove habitats. These indicators are combined using statistical and spatial models to develop Habitat Suitability metrics used to assess the status and trends of the Bay's nearshore environments, evaluate project impacts, and support adaptive management.

Presenting author biography

Joan Browder is one of four principal investigators of IBBEAM and a fishery research ecologist at the Southeast Fisheries Science Center of NOAA Fisheries. Her monitoring and assessment focus in IBBEAM is the epifauna, which consists of shrimp, crabs, and small fish living on or just above the bay bottom, usually in the seagrass canopy. She samples with a 1 m2 throw trap. She began working with pink shrimp and other epifauna of Biscayne Bay in 2002. Her work with pink shrimp began in Florida Bay a few years earlier. Dr. Browder received her PhD in the Systems Ecology program of H.T. Odum in the Environmental Engineering School at the University of Florida. She received her Bachelors and Masters of Science degrees at the University of Miami.

The Wild Nitrogen Isotope Story of Southern Dade County: Possible Implications for Nitrogen Cycling

by Peter K Swart | Meredith Jennings | Sarah Bercovici | Amber Carter

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The biota of the southwestern portion of Biscayne Bay, adjacent to the South Dade Land Fill and the headquarters of the Biscayne National Park, are dominated by an elevated nitrogen isotopic signal, normally indicative of pollution by anthropogenic sourced nitrogen. An alternative explanation is that this signal is caused by fractionation during assimilation from a pool of elevated concentration of inorganic nitrogen. In this presentation we have combine the nitrogen isotopic data from algae collected in Biscayne Bay with analyses of dissolved inorganic nitrogen and algae collected throughout Miami-Dade County. These analyses reveal algae in the canals south of the Homestead air force base with $d^{15}N$ values up to +20‰. We suggest that these values are not related to sewage, but rather the incredibly elevated nutrient level, particularly in the areas associated with the cultivation of plants for landscape purposes. These elevated concentrations of DIN with their associated elevated N isotopic values are discharged into Biscayne Bay. Some of this signal finds its way into the cooling canals at the Turkey Point facility, where evaporation further elevates the concentration.

Presenting Author Biography

Dr Peter K Swart is the Lewis Weeks professor of Marine Geosciences at the Rosenstiel School of Marine and Atmospheric Sciences at the University of Miami. He has been working in South Florida for over 30 years and is an expert on the geochemical process taking place in the Everglades, Florida Bay, and Biscayne Bay. In particular he was one of the first to point out the impact of the Flagler railway on the changes which have taken place in Florida Bay and has been an advocate of the use of stable isotopes of nitrogen, hydrogen, carbon, and oxygen to reveal natural and anthropogenic process influencing our region. From 2000 to 2015 he was the director of the South Florida and Caribbean Cooperative Ecosystems Studies Unit.

Impacts and consequences of water flow from land on macroalgal community structure *by Ligia Collado-Vides*

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Submerged aquatic vegetation, macroalgae and seagrasses, provide a series of valuable services to coastal ecosystems; from engineering and stabilizing sediments, to food and shelter for upper trophic levels. Community structure is the result of interacting processes that control the species dynamics; particularly in coastal ecosystems macroalgae and seagrasses communities respond to salinity, temperature and nutrient availability as major environmental and bottom-up drivers. The coastal bays of South Florida are located downstream of the Florida Everglades, where a comprehensive restoration plan is impacting the hydrology of the region, directly affecting salinity and nutrient availability for seagrasses and macroalgae. The Marine Macroaglae Research laboratory at FIU, focus its efforts in understanding the impacts and consequences of salinity variability and nutrient availability to the submerged aquatic vegetation structure and dynamics.

Our studies in Biscayne Bay demonstrate that the flow of water from land have strong impact on macroalgal community structure. Distinctive macroalgal assemblages characterize salinity regimes along close to shore habitats, for example low-salinity regimes have been dominated by *Chara hornemannii* and a mix of filamentous algae; while brackish regimes have been dominated by *Penicillus capitatus*, *Batophora oerstedii*, and *Acetabularia schenckii*; and marine regimes have been dominated by *Halimeda incrassata* and seagrasses. These communities can be disturbed as salinity regimes change, or by the increase in nutrients availability facilitating the rapid growth of opportunistic species. Our studies show that macroalgal tissue-nutrient content is variable across the bay, but consistently high N and N:P values are found, demonstrating high nitrogen availability and phosphorus limitation in this region.

Coastal waters enriched with nutrients experience rapid macroalgal growth, with green macroalgal blooms becoming a common problem. In the case of Biscayne Bay, we have reported the persistence of a bloom formed by two opportunistic species of the green macroalgal genus *Anadyomene*. High levels of sucralose in the water and high level of ∂15N in macroalgal tissue, demonstrate that anthropogenic sources of N are sustaining this green macroalgal bloom. Consequences of this bloom in the bay are the reduction and elimination, in some sites, of seagrasses and calcareous algae, shifting the community structure towards a massive drifting *Anadyomene* spp. dominated community. Loosing important structural and engineering species can result in the loss of ecosystem life supporting services. Our results demonstrate that water flowing from land in Biscayne Bay is promoting a shift in community structure that requires immediate attention; there is a need for the design and implementation of strategies for the control of deliver of nutrients to the bay, and develop restoration programs for affected sites.

The combination of distinct macroalgal community structure, related to specific water quality conditions, and their nutrient status can be used as community-level indicators that can be incorporated in adaptive management frameworks. Small changes before a shift is established can help prevent drastic impacts related with water flow from land. Monitoring, evaluation of impact and restoration of subaquatic vegetation should be continued and implemented in coastal bays that are

and will be directly affected by water management policies.

Presenting Author Biography

Dr. Ligia Collado-Vides is a Senior Lecturer and Researcher at FIU's Department of Biological Sciences. Her research emphasis lies in the ecology of tropical macroalgae, commonly known as seaweed. Her present research is focused on understanding the causes and consequences of bottom up drivers that facilitate shifts from coral and seagrass dominated communities into macroalgae dominated communities as a result of changes at global and local scales. Her team analyzes the distribution and long-term dynamics of macroalgal communities in the Florida Keys and Mexican Caribbean; and works to provide a link between the research results and its applications in marine conservation, particularly in Marine Protected Areas in the Caribbean. In addition Dr. Collado-Vides has strong teaching portfolio including courses on Marine Botany, Coral reef Biology and Marie Protected Areas.

Population Genomics of South Florida and Caribbean Tephrosia taxa: shell mound and pine rockland connections? *by Eric von Wettberg*

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Several populations of *Tephrosia,* the hoarypeas (Fabaceae), exist in South Florida and the neighboring Caribbean Islands. These taxa occur on a variety of substrates, from pine rocklands to shell middens. To clarify relationships in this group, and to elucidate the conservation status of populations in Everglades National Park and Big Cypress Preserve, we used restriction site associated DNA sequencing (RAD-SEQ) on 94 samples from South Florida (Russel Key in Everglades, three stands in Big Cypress, Chapman Field, and Ludlam Pineland) and Puerto Rico (Sierra Bermeja, Cabo Rojo, and Conuco). Restriction Site Associated DNA sequencing generated 6278 single nucleotide polymorphisms (SNPs). Analysis of variation in SNP markers by the Bayesian STRUCTURE algorithm and principle coordinate analysis both separated the samples into three groups, one representing the populations from Big Cypress (, a second represented by Ludlum pineland, and the third both Russel Key (a shell midden), Chapman Field (a pine rockland), and the three Puerto Rican populations (pine rocklands). From these patterns we infer three taxonomic groups, with the Big Cypress stands forming distinct taxa, putatively *T. seminole* or *T. curtissi*, Ludlum being *T. floridiana*, and Russel Key, Chapman Field, and Puerto Rico all belong to *T. angustissima*. Diversity is generally low across these taxa, and suggestive of low effective population sizes and historical bottlenecks.

Presenting Author Biography

FIU Associate professor, evolutionary ecologist and conservation geneticist, Eric Von Wettberg works to restore resilience and genetic diversity in wild crops including chickpea and pigeonpea throughout the world, including Turkey, Ethiopia, India and the Caribbean, as well as in Florida and Caribbean native plants such as Tephrosia and Pseudophoenix. A PhD in Ecology and Evolutionary Biology, Fulbright scholar and NIH National Research Research Service Award recipient, Von Wettberg currently chairs the Botanical Society of America Genetics committee. The author of over 40 articles, Von Wettberg currently teaches evolutionary biology and conservation genetics.

Effects of water management on water and soil quality in Taylor Slough.

by Paul Julian | Todd Osborne | Rex Ellis | Jimi Sadle

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The Florida Everglades have been undergoing restoration for the better part of three decades. Restoration efforts include re-establishing historic hydrologic connection to remnant and isolated wetlands throughout the Greater Everglades ecosystem. Alteration of ecosystem hydrology and anthropogenic pressures upstream have resulted in the degradation of water quality within the Everglades system which in turn compromises the systems ecology. In addition to hydrologic restoration, restoration activities with an emphasis on water quality improvements have been vital to restoring the Everglades ecosystem. As such, much has been learned concerning the effects of nutrient enrichment in this historically oligotrophic peat accreting wetland system, including the cascade of ecological effects that follows elevated phosphorus conditions, such as shifts in plant community structure, habitat value, and soil quality. Recent investigations into the role of water management in the biogeochemical cycling of phosphorus and carbon in the Taylor Slough region of Everglades National Park (ENP), suggests that natural processes and management strategies are the cause of soil phosphorus enrichment. Taylor Slough is located in the south eastern portion of ENP and comprises the second largest drainage within ENP. The uniqueness of Taylor Slough is characterized as a seasonally inundated marl-dominated, ultra-oligotrophic (<<10 µg L^{-1} Total Phosphorous) wetland. Historic water quality data within the upper portions of Taylor Slough in combination with spatially explicit and transect sampling of surface soils provide an extensive inventory of the extent of phosphorus enrichment (>500 mg kg^{-1} Total Phosphorus) in soils across the Taylor Slough area. Taylor Slough has experienced a significant change in hydrology over a two-and-a-half-decade period in concert with restoration activates upstream resulting in changes in water quality conditions within the slough. Isolated areas of elevated concentrations of soil organic carbon and phosphorus in the slough in combination with water quality trends has challenged the phosphorus-cattail eutrophication paradigm despite the elimination of point-source discharge into Taylor Slough for the past decade-and-a-half. The combination of a possible natural enrichment process in combination with recent hydrologic restoration and water quality trends in the slough suggests that more investigation and vigilant management of Taylor Slough is needed.

Presenting Author Biography

Paul Julian is a doctoral student with the University of Florida Soil and Water Sciences Department in the Wetland Biogeochemistry Laboratory where he is studying nutrient biogeochemistry and aquatic productivity in wetlands, rivers and estuaries. Additionally, Paul is employed with the Florida Department of Environmental Protection Office of Ecosystem Projects where he participates in multi-agency regulatory and science review team and assists the State of Florida in Everglades restoration efforts by providing technical and policy related guidance.

Metacommunity structure of South Florida forests foreshadows their response to climate change *by Michael Ross*

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Dry tropical forests in the continental United States reach their best development in South Florida, in locations where flooding and freezing temperatures are rare. These include not only the Florida Keys and the southeastern mainland coast, but also climatically-buffered “tree islands” in the interior Everglades, surrounded by an extensive marsh or pine forest matrix. Along with close analogues in the “coppice” of the Bahamas, these iconic ecosystems represent intra-regional hot spots of floral and faunal diversity. In this study, we examined spatial variation in tree composition within this network of forest fragments, which may hold clues to the potential for northward movement of tropical tree species along the Florida peninsula in response to climatic warming. We performed an analysis of metacommunity structure among 145 south Florida forests, tested for associations with selected climatic, hydro-edaphic, and geographic variables, and characterized the northern range distributions, successional status, and dispersal mechanisms associated with the species assemblages.

Forest patch size was the strongest single correlate with composition and species richness, but mean January temperature and a neighborhood index denoting degree of isolation from other patches contributed significantly to regression models. The species-by-site matrix was highly nested, with trees common to small upland fragments in the Everglades interior representing a distinct subset of the richer assemblages found in sites closer to the coast. Interior forests were smaller, more isolated, and subject to cooler minimum temperatures than more coastal forests, and were comprised primarily of early-successional, animal dispersed species.

While warming winter temperatures may relax some constraints on the northward migration of tropical species through the region, sea level rise will raise ground water levels, decreasing the size and number of suitable mesic patches, and increasing their isolation. The result will be a loss in tree species diversity, especially among late-successional, edge-sensitive species.

Presenting Author Biography

Dr. Mike Ross is a plant community ecologist in the Department of Earth and Environment and the Southeast Environmental Research Center at Florida International University. His academic training is in Silviculture and Forest Biology, studying at Utah State and Virginia Tech. After post-doctoral research in Alberta, he studied environmental law at Vermont Law School, then joined a National Audubon Society research team working to preserve the ecosystems of the Florida Keys. His interests have centered on environmental controls on plant community composition and structure, the involvement of these controls in the successional process, and the implications of these dynamics for resource management. Presently, his research is directed toward restoration of the mixture of forested and herbaceous coastal wetlands of the greater Everglades ecosystem. He and his collaborators are also working on climate change effects on coastal habitats, disturbance

ecology (including hurricanes and fire), plant-soil relationships, and remote sensing of vegetation.

Liana abundances rebound over a fourteen-year period in a subtropical secondary wet forest: Land-use legacies and hurricane recovery

by J. Aaron Hogan

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Liana abundances are increasing in most Neotropical forests, creating a need for a better understating of factors influencing their demographics. Several studies have focused on understanding liana dynamics in secondary forests, confirming that lianas favor disturbed sites and can negatively impact the natural succession of tree communities. We analyzed two demographic censuses of the liana community from different aged forest communities in subtropical montane wet forest in Puerto Rico from 2001 and 2015 to examine how land-use legacies interact with two natural hurricane disturbances to influence liana abundances and reproduction. The younger secondary forest area was “cut-over” prior to 1936, whereas the more primary forest was only selectively logged. In 2001, liana abundances in secondary forest with greater historical land use were approximately half of what they were in more primary forest with less past land use. By 2015, liana abundances had rebounded disproportionally in secondary forest areas with a greater past land use, supporting the idea that liana abundances increase as the forest stand matures. Liana biomass continued to increase in the more primary forest areas where lianas were more abundant in 2001. Trends in liana and vine fecundity rates from 1993 to 2015 mirrored the demographic trends in the liana community, with areas of secondary forest having greater (four-hundred fold in the of *Marcgravia rectiflora* Triana & Planch) flower and seed production of both vines and lianas. Our findings show that environmental resource conditions (i.e., light availability) for liana and vine recruitment are best in young to middle-aged secondary forests, where forest structure has developed to support greater liana loads. Consistent with many recent findings in the liana literature, our results support the idea that disturbance creates turnover in forest structure, manipulating the abiotic environment to favor early-succesional species, including lianas.

Presenting Author Biography

J. Aaron Hogan is a tropical plant ecologist. After obtaining a B.Sc in Ecology from the University of Denver in 2011, and wile working for Greenpeace and making pizzas, decided to make the life-changing decision to move to Puerto Rico. 5 years later and after measuring thousand of tropical trees in affiliation with both the Luquillo LTER and the US Forest Service International Institute of Tropical Forestry, he is back in the USA pursuing a PhD at Florida International University. His research interests are centered on the resistance and resilience of tropical forests to climate change. His interests include plant systematics, statistics, juggling, running, chess, and collecting pocket knives.

6000 years of human-environment interaction in southwestern Puerto Rico *by*

William J. Pestle | Carmen Laguer-Díaz | Ali Pourmand | Isabel Rivera-Collazo | Richard Kanaski

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All known life is predicated on the existence of liquid water. For humans living on islands, the water-life equation is more complex in that there must be a sufficiency of freshwater, while seawater must be kept at bay. Southwestern Puerto Rico stands as a particularly interesting example of the balance required to sustain human life on oceanic islands, and provides a unique opportunity for building a deep history of human-water(s) interaction in the insular Caribbean. We present here the results of the preliminary stage of our archaeological and paleoclimatological investigation of long-term human environment interaction in southwestern Puerto Rico, work that takes as its primary focus the Cabo Rojo and Laguna Cartagena National Wildlife Refuges. We also discuss the vision of our planned future research on humans and water in the region. Ultimately, we seek to characterize the intertwined dynamics of freshwater, saltwater, and human social, economic, and cultural systems in the Subtropical Dry Forest of southwestern Puerto Rico over the last 6,000+ years. An understanding of the deep history of human-water(s) interaction in Puerto Rico's southwest will form a fundamental building block in the broader knowledge of the interplay of humans and natural systems in the Caribbean, will help to inform local policy makers in decisions concerning land and heritage management, and can guide efforts in building resiliency for coming changes in climate (aridity and sea-level rise).

Presenting author biography

William Pestle is an Assistant Professor in the Department of Anthropology at the University of Miami and an expert in archaeological applications of stable isotope analysis. He has active archaeological research projects in southwestern Puerto Rico and the Atacama Desert of northern Chile and has published extensively on Caribbean archaeology, paleodiet, isotopic research methods, and human-environment interactions. His academic background includes degrees in Classical Archaeology (B.A.) and Human Osteology and Paleopathology (M.Sc.) and a Ph.D. in Anthropology. His research efforts have been supported by the National Science Foundation and National Endowment for the Humanities, among others.

Are hydroscapes landscapes? A behavioral landscape-ecology framework for connectivity in aquatic ecosystems

by Joe Parkos | Joel C. Trexler

Abstract Id: ***6*** *Submitted:* ***October 9, 2016*** *Event:* ***Annual Meeting of the South Florida Caribbean Cooperative Ecosystem Studies Unit (SFC CESU)*** *Topic:* ***South Florida CESU***

Behavioral responses to landscape structure, such as habitat edges, area, and configuration, and subsequent emergent patterns of connectivity are mostly known from terrestrial environments. In particular, the application of this conceptual framework to submerged landscape structure has only been applied to a limited range of aquatic ecosystem types. We used a conceptual model of behavioral landscape-ecology as a framework for analyzing functional connectivity from fish movement in a hydroscape where structural connectivity varies seasonally from annual droughts. The Florida Everglades is a spatially extensive wetland with hydroscape structure from artificial elements, such as canals, and local to regional scale variation in topography that shapes spatiotemporal patterns of hydrology. How the natural and artificial hydroscape structure in this wetland affects connectivity from fish movement is not well known, adding uncertainty to outcomes of proposed restoration measures. We used radio telemetry techniques to quantify the movement patterns of three species of large-bodied piscivorous fishes within areas characterized by different hydroscape patterns. Statistical models of hydroscape structure at multiple scales was extracted from an integrated network of monitoring gauges and hydrology models and confronted with empirical data on movement scales and directions, including movement between canals and marshes.Florida Gar, the most abundant predatory fish, made longer, more directed movements when structural connectivity was decreasing during droughts than during the increased connectivity characterizing the rainy season. During receding water, Florida Gar movement patterns were shaped by the distance and direction they needed to move to reach drought refuge habitats. Scale, timing, and direction of functional connectivity between marshes and canals were influenced by spatial patterns of hydrology bordering each canal. Permeability of the borders between canals and marshes to fish movement and the scale of hydroscape structure affecting magnitude and direction of connectivity were both greater for an invasive species, the Mayan Cichlid, than for Florida Largemouth Bass, a commercially important native predator. These quantified links between fluctuating hydroscape structure and functional connectivity scale up to metapopulation and metacommunity dynamics at annual and long-term time scales. A major goal of Florida Everglades restoration is to recreate more natural hydrological patterns, including reconnecting regions where flow is currently blocked by canals and levees. A hydroscape perspective on connectivity provides a framework for predicting the impacts of climate- and water management-related changes to hydrology in the Florida Everglades.

Presenting Author Biography

Dr. Joe Parkos has over twenty years of experience as a fish biologist, combining field investigations and experiments to address issues related to aquatic invasive species, restoration, and fisheries management. He earned his M.S. and Ph.D. degrees at the University of Illinois at Urbana-Champaign and is currently a postdoctoral research associate at Florida International University

(FIU). At FIU, Dr. Parkos has investigated how drought, water management, and altered landscapes affects the movement and long-term dynamics of native and invasive fishes in the Florida Everglades. He is also developing a model-based approach for improving interpretation of multimethod sampling data used in monitoring studies.

Regional ocean modeling in support of ecosystem studies around South Florida and in the greater Caribbean

by Matthieu Le Hénaff | Villy Kourafalou | George Halliwell | HeeSook Kang | Michael Mehari | Yannis Androulidakis | Robert Atlas

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The Ocean Modeling and OSSE Center (OMOC), formed from the collaboration between the University of Miami's Rosenstiel School of Marine and Atmospheric Science (UM-RSMAS) and NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) in Miami, implements ocean modeling for a) regional biophysical applications and b) observation array design and evaluation. OMOC products are based on the HYbrid Coordinate Ocean Model (HYCOM) and include simulations of the Atlantic hurricane region (ATL-HYCOM) at 1/25° resolution (~4 km), simulations of the Gulf of Mexico (GoM-HYCOM) at 1/50° resolution, and simulations of the Florida Straits, South Florida and Florida Keys (FKeyS-HYCOM) region at 1/100° (~900 m). The GoM-HYCOM and FKeyS-HYCOM perform near-real time simulations and provide 7-day forecasts. The greater Caribbean is included in the ATL-HYCOM simulations, with applications on hurricane-ocean interactions and evaluation of specific observational strategies to improve hurricane forecasts. GoM-HYCOM simulations are used to study the evolution of the Loop Current and the associated eddy field, as well as their influence on physical connectivity among remote Gulf ecosystems. As an example, an episode of long-distance export of river waters from the Mississippi River down to the Florida Keys area in the summer of 2014 will be shown. This event was particular, as characterized by advection of river waters along the shelf edge of the northern and eastern Gulf, and not along the Loop Current, as is the case in most previously documented export episodes. Biogeochemical capabilities are currently added to this GoM-HYCOM configuration, to study biophysical connectivity at the Gulf scale. The FKeyS-HYCOM simulation is the highest resolution available around South Florida and the Florida Keys, thus suitable to support coral reef studies. It extends to Cuba and the Bahamas and has been used to characterize the meandering of the Florida Current and the associated eddy dynamics, as well as their influence on coral fish larvae transport. This presentation will provide a brief overview of these modeling capacities and how they can be useful for physical-biological interaction studies.

Presenting Author Biography

Dr. Matthieu Le Hénaff is an oceanographer at the Cooperative Institute for Marine and Atmospheric Studies (CIMAS) between the University of Miami (UM) and NOAA. After completing his Ph.D. in Toulouse, France, which focused on the evaluation of observation arrays in European regional seas using data assimilation methodologies, he came to UM in 2009 to study the Gulf of Mexico dynamics and predictability. His studies have focused on the eddy dynamics at the edge of the Loop Current, and are based on the use of modeling tools, but also of observations, in particular space altimetry data. He has taken part to studies that investigated the dynamics that drove the spread of the oil in the Gulf after the DeepWater Horizon oil spill in 2010. He has been a member of the OMOC team since its debuts in 2010.

Coastal Ocean Observing in the Straits of Florida using HF Radar

by Lynn K. (Nick) Shay | Matthew Archer | Jorge Martinez

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Within the Straits of Florida, the Florida Current (FC) interacts with waves and winds to produce a complex environment that is difficult to forecast, and makes *in situ* data acquisition at the ocean surface and in the upper ocean challenging. To assess ocean surface conditions, high frequency (HF) radar measures the electromagnetic, back-scattered signals from surface waves resulting in both the first and second order returns. That is, first-order returns are used to map radial and vector currents as well as the wind directions and second-order returns contain the surface wave measurements as well as the signals to track ships.

As part of the Southeast Coastal Ocean Observing Regional Association (SECOORA), the Upper Ocean Dynamics Laboratory has deployed Wellen Radar (WERA) radar sites in phased array mode (based on beam forming approach) along the southeast Florida coastline to acquire ocean surface current, wave and wind data in near real time. Operating at frequencies of 12 and 16 MHz, the radars acquire data at 20-min intervals with a typical range of 80 to 120 km, and a horizontal resolution of 1.2 km. Higher temporal resolution is also possible with this beam forming system. The ability of HF radar to acquire data over a large two-dimensional area, in an operational long-term deployment, provides a unique dataset for both weather and climate events. From a broader perspective, we provide an overview of recent work, including (1) an evaluation of these remote measurements using data from an *in situ* mooring; (2) examination of how flow field is significantly altered during the passage of a frontal eddy in the coastal regime; (3) hurricane-induced current and wave response of the coastal ocean during hurricane Jeanne passage; and (4) resolving anticyclonic eddies off the coast of the Bahamas. These energetic fluctuations have important implications for transport as well cross-shelf exchange of water properties between the FC and the coastal regime, and understanding the underlying dynamics are vital for research studies focusing on both oceanographic and meteorological stressors on coral reefs as well as resolving the **king tide** that influences sea level changes along the South Florida coastline.

Presenting Author Biography

L. K. (Nick) Shay holds a Ph.D. and a M.S. in Physical Oceanography (Applied Math minor for the Ph.D. specializing in ocean response to atmospheric forcing events) from the Naval Postgraduate School, and a B.S. in Physical Oceanography from Florida Institute of Technology. He is a Professor in the Department of Ocean Sciences at the University of Miami's Rosenstiel School of Marine and Atmospheric Science and oversees the Upper Ocean Dynamics Laboratory. His interests include: experimental investigations of the ocean response and air-sea interactions and coastal oceanographic process studies. Of relevance here is the operation of high frequency radars deployed as part NOAA-IOOS program through SECOORA since 2003. Dr. Shay is a fellow of the American Meteorological Society (2012); Richard Hegemeyer Award recipient by NOAA's Interdepartmental Hurricane Committee (2016); and was part of the NASA GRIP Achievement Award (2011). Dr. Shay serves as editor-in-chief of Elsevier's Dynamics and Atmospheres journal.

Salinity Patterns in Western Biscayne National Park and Southern Biscayne Bay *by*

Sarah Bellmund | Herve Jobert | Jorge Robles-Baneres

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Salinity has been continuously sampled in Biscayne National Park since 2004. This project was implemented to answer questions related to water management and water management changes affecting Biscayne National Park and Biscayne Bay. This data has been collected in 15 minute intervals and is designed primarily to look at the effects of water management along the western shore of Biscayne Bay. Data shows high variability along the western shoreline and large changes in salinity over short temporal intervals. The Southwestern Bay can be divided into regions based on salinity and be divided into three regions; north of Black Point, between Black Point and Convoy Point, and between Convoy Point and Manatee Bay. Annual average salinity values primarily show the bay in a generally marine condition while finer scale analysis shows that critical information is lost as the 15 minute data is averaged up to season or annual periods. During the wet season of the year a relict estuarine zone up to 20 psu develops along the western portions of Biscayne National Park and may persist into the early dry season depending on the year.

Presenting Author Biography

Sarah is Program Manager on Water Quality and Adjacent Lands at Biscayne National Park, encompassing Ecosystem Restoration and the Comprehensive Everglades Restoration Plan (CERP). She has been involved with the science, planning, and management of various ecosystems in south Florida since 1988. As a scientist for NPS, she worked extensively in the development of both the Central and South Florida Project Comprehensive Review Study and components of the CERP, first for Everglades National Park and currently for Biscayne National Park. She is a Co-Principle on the Integrated Biscayne Bay Ecosystem Assessment and Management Project on Biscayne Bay. She received a B. S. in Biochemistry from Virginia Tech in 1982 and a M. A. in Marine Science from the Virginia Institute of Marine Science, College of William and Mary in 1988. She has worked for 5 Universities in various rolls and as a consulting scientist in the private sector.

POSTER

ABSTRACTS

Simulated U.S. Drought Response to Interannual and Decadal Pacific SST Variability

by Robert Burgman | Youkyoung Jang

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Idealized atmospheric general circulation model (AGCM) experiments by the U.S. Climate Variability and Predictability (CLIVAR) Drought Working Group were used in order to study the influence of natural modes of sea surface temperature (SST) variability in the Pacific on drought in the contiguous United States. The current study expands on previous results by examining the atmospheric response of three AGCMs to three different patterns of the idealized Pacific SST anomalies that operate on different timescales: low frequency (decadal), high frequency (inter-annual), and a pan-Pacific pattern that retains characteristics of inter-annual and decadal variability. While forcing patterns are generally similar in appearance, results indicate that differences in the relative amplitude of the equatorial and extra tropical components of the SST forcing are sufficient to give rise to differing teleconnections, leading to regional differences in the amplitude and significance of the precipitation response. Results indicate that the differences in simulated drought response among AGCMs to different cool phase (La Niña – like) SST patterns are determined by model sensitivity to changes in the relative amplitude of the equatorial and extratropical components of the SSTA forcing, the strength of the land-atmosphere coupling, and by the amplitude of internal atmospheric variability. Results indicate that the northwestern US and Great Plains regions are particularly sensitive to the extratropical component of the SST forcing. We also find evidence that when the cool phase patterns of SST combine, as they have in recent years, constructive interference leads to an enhanced drought response over the Great Plains.

Presenting Author Biography

Dr. Robert Burgman in a climate scientist and assistant professor in the Department of Earth and Environment at Florida International University. His research seeks to understand the mechanisms of climate predictability on subseasonal to decadal timescales. Within this framework, he explores two general issues: (1) Mechanisms of variability in the climate system specifically related to air-sea interactions and (2) how climate variability leads to variations in North American hydroclimate. In exploring these issues he uses a variety of research tools including coupled climate system models and observational datasets (modern surface and satellite-based records and paleo-climate records.

Fecal Indicator Bacteria (FIB), Water Quality Monitoring, and Beach Management Policies

by Elizabeth Kelly | Helena Solo-Gabriele | Ad Reniers | Zhixuan Feng | Allison Donahue | Hannah Lockwood

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Long-term datasets are available from beach water quality monitoring programs. Many times when these monitoring programs identify poor water quality, the causes are unknown, making it difficult to remove contamination sources. One approach would be to develop beach management policies that would help minimize the occurrence of contamination spikes. The objective of this study was to evaluate associations between beach water quality and beach management policies in an effort to assess approaches that minimize exceedances of fecal indicator bacteria (FIB). To address this objective, a survey was conducted to document beach management approaches for a large number of beaches (316 beaches throughout the state of Florida) and then analyzed to identify associations with FIB data (enterococci and fecal coliform). Part I evaluated county sampling and analysis policies and Part II examined beach management policies at the individual beaches. We also evaluated and classified the beaches by geomorphologic type. Results show that beach geomorphology is highly associated with exceedance of regulatory standards. For open-coast beaches (n=211), low enterococci levels were associated with sparse human densities, no homeless populations, low densities of dogs and birds, beaches with bird management policies, low densities of seaweed, those that are renourished, charge access fees, with lifeguards, beaches without nearby marinas, and those that manage storm water. Fecal coliform resulted in fewer regulatory exceedances; lower fecal coliform levels were more strongly associated with the presence of public restrooms. Through the process of collecting our beach management data, we learned that multiple agencies are charged with beach management tasks and these agencies tend to work independently, making it difficult to comprehensively develop policies that would lower FIB levels These results support that beach management policies influence FIB levels and that beach geomorphology should be considered when making beach policy decisions, along with a unifying set of standards for beach management.

Presenting Author Biography

Elizabeth Kelly is a fourth-year doctoral student at the University of Miami’s Leonard and Jayne Abess Center for Ecosystem Science and Policy. Ms. Kelly’s research goal is to evaluate water quality inland and at the beaches to explore the relationship between inland nutrient contributions and fecal indicator bacteria (FIBs) in rivers, canals, estuaries/bays, and beaches. FIBs are bacteria such as enterococci, fecal coliform, and Escherichia coli that are present in fecal material and can serve as indicators of fecal pollution and pathogens in water and sediments. Through the EPA recreational water quality criteria (RWQC), these indicators allow states to develop water quality standards that protect human health. The ultimate objective of Ms. Kelly’s work is to develop monitoring and management policies that protect the health of the Everglades, the beaches downstream, and the communities throughout the state that are affected by current and future nutrient fluctuations, whether the result of natural or anthropogenic change.