12th International Symposium on Biogeochemistry of Wetlands

April 23-26, 2018

Coral Springs, Florida, USA

www.conference.ifas.ufl.edu/biogeo2018

About the Symposium

Wetland biogeochemistry is dynamic and involves cycling or exchange or flux of materials between living and non-living components of an ecosystem. Biogeochemistry is an interdisciplinary science which includes the study of interactive biological, geological and chemical processes regulating the fate and transport of nutrients and contaminants in soil, water and atmospheric components of an ecosystem. Biogeochemistry also provides a framework to integrate physical, chemical and biological processes functioning in an ecosystem at various spatial and temporal scales. This international symposium provides a framework for scientists to share technical information on various topics related to coupled biogeochemical cycling of macro-elements and associated organic and inorganic contaminants. The goal is to improve our understanding of the role wetlands perform in regulating and mitigating impacts of global climate change and sea level rise.

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Welcome Letter

Greetings and Welcome to Coral Springs!

The Wetland Biogeochemistry Laboratory, a research unit within the UF/IFAS Soil and Water Sciences Department, is very excited to host the 12th International Symposium on Biogeochemistry of Wetlands, April 23-26, 2018. We welcome your participation in this symposium.

The objective of this international symposium is to provide a framework for scientists to discuss new topics related to biogeochemistry of nutrients and other contaminants in freshwater and coastal wetlands. The focus of the symposium will be on "Protecting the Future of Water." Wetland systems serve as sinks, sources and transformers of nutrients and other chemical contaminants and therefore can have a significant impact on water quality and productivity of ecosystems. The primary driver of these processes is ecosystem biogeochemistry, and includes the intersection of chemical, physical and biological processes in the soil and water column. These processes operate at various spatial and temporal scales. Our location here in Coral Springs, Florida can't help but remind us of the fragile nature of our wetland systems. South Florida's Everglades, recognized internationally, encompasses nearly 18,000 square miles of the southern tip of the Florida peninsula – from the Kissimmee River basin all the way south to the shores of Florida Bay and the Gulf of Mexico. Historically this vast, free-flowing, shallow river of grass provided clean water and pristine habitats, supported numerous wading and migratory birds, as well as Florida Panthers, manatees and deer. However, the system has been widely impacted by levees, canal-associated drainage projects and nutrient loading, primarily phosphorus. We hope you will take an opportunity to see this amazing wetland in person while you are here.

While listening to the exciting research being presented, remember that the International Symposium on Biogeochemistry of Wetlands is an opportunity for all of us to meet new colleagues, reunite with old ones, and learn what research is ongoing around the globe. The Conference Planning and Program Committees worked diligently to develop a wide ranging and inclusive lineup of talks and posters focused on wetland biogeochemistry. We hope you enjoy the program of presentations and have an opportunity to teach others about what you do and where you work.

Finally, a few words of appreciation. We would like to first thank our generous Sponsors listed on page 7, whose financial support is critical to making this conference a reality. We are also grateful to those who gave of their time and expertise to organize and moderate sessions, and to share their expertise with us. Further, we would be remiss without thanking all of the many individuals recognized on page 6, who volunteered their personal time and energy to organize and plan this conference. And of course, we would also like to thank those who submitted abstracts, are giving talks and are presenting posters. Were it not for you and the work you do, we would not have had the privilege of organizing such a great symposium.

Have a great week, enjoy yourself, and when you leave, we trust you will take away new information, new connections, and new tools and knowledge you can use to advance wetland science in your respective corners of the globe.

Best regards,

Todd Z. Osborne

Conference Chair
Whitney Laboratory for Marine Bioscience
University of Florida

John R. White

Conference Co-Chair
Oceanography & Coastal Sciences Department
Louisiana State University

Committee & Organizer Recognition

Planning Committee

Dr. Todd Z. Osborne, ***Conference Chair****, Assistant Professor,* UF/IFAS Soil and Water Sciences Department, University of Florida, Whitney Laboratory for Marine Bioscience, St. Augustine, FL, USA

Dr. John R. White, ***Conference Co-Chair****, Professor*, Louisiana State University, Department of Oceanography and Coastal Sciences, Baton Rouge, LA, USA

Dr. K. Ramesh Reddy, *Conference Advisor*, *Graduate Research Professor and Chair*, UF/IFAS Soil and Water Sciences Department, Gainesville, FL, USA

Program Committee and Session Organizers

Professionals from the wetlands biogeochemistry science community organized sessions on topics relevant to their restoration programs. This process took several months and numerous volunteer hours. We would like to thank the following individuals for their time, effort and expertise on behalf of the symposium.

Session #	Organizers
1, 4	**Dr. Patrick Megonigal**, Smithsonian Environmental Research Center, Edgewater, MD, USA
2	**Dr. David Krabbenhoft**, U.S. Geological Survey, Middleton, WI, USA
3	**Dr. Ilka Feller**, Smithsonian Environmental Research Center, Edgewater, MD, USA
5, 8	**Dr. Patrick Inglett**, University of Florida, Soil and Water Sciences Department, Gainesville, FL, USA
6	**Dr. Lauren Kinsman-Costello**, Kent State University, Kent, OH, USA
7	**Dr. Sue Newman**, South Florida Water Management District (SFWMD), West Palm Beach, FL, USA
9	**Prof. Curtis Richardson**, Duke University Wetland Center, Durham, NC, USA *– and –* **Dr. Jeff Chanton**, Florida State University, Tallahassee, FL, USA
10, 14, 18	**Dr. Gail Chmura**, McGill University, Montreal, Quebec, Canada
11	**Dr. Todd Osborne**, University of Florida, Whitney Laboratory for Marine Bioscience, St. Augustine, FL, USA
12	**Ms. Kimberli Ponzio**, St. Johns River Water Management District (SJRWMD), Palatka, FL, USA
16	**Dr. John White**, Louisiana State University, Baton Rouge, LA, USA
20	**Dr. Odi Villapando**, South Florida Water Management District (SFWMD), West Palm Beach, FL, USA
23	**Dr. Anna Knox**, Savannah River National Laboratory, Aiken, SC, USA
24	**Dr. Jacob Berkowitz**, U.S. Army Corps of Engineers, Vicksburg, MS, USA

Sponsor Recognition

Thank you to all of the organizations that supported this premier event.
This symposium would not be possible with you.

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Louisiana State University | College of the Coast & Environment

OTT Hydromet

Picarro, Inc.

University of Central Florida | National Center for Integrated Coastal Research

University of Florida Office of Research

UF/IFAS Research

UF/IFAS Soil & Water Sciences Department

Bronze Sponsors

City of Orlando

University of Florida, Whitney Laboratory for Marine Bioscience

Sponsor Descriptions

Please join us in thanking all of our sponsors for investing their time, resources and finances in support of the symposium.
We could not have done it without you.

Silver Sponsors

DB Environmental, Inc.

DB Environmental, Inc., (DBE) is a wetland research firm with substantial expertise in aquatic biogeochemistry, hydrology and modeling. For decades, DBE has been a key scientific consultant on some of the world's largest and most prominent wetlands treatment. DBE's problem-solving efforts for both government and private clients have included enhancement of vegetation communities, development of long-term soil management practices, and optimization of hydraulic and water quality characteristics.

Louisiana State University (LSU) College of the Coast & Environment

www.lsu.edu/cce/

LSU is at the forefront of coastal environmental issues. Its coastal legacy dates back three-quarters of a century. Consulting and collaborating on coastal research on every continent, the College of the Coast & Environment equips graduates with multi-disciplinary tools to address real-world issues, and leads research to better understand the causes, impacts (unanticipated, forecasted, and actual) and restoration strategies for today's most pressing coastal and environmental challenges/threats.

Louisiana Sea Grant

www.laseagrant.org/

Louisiana Sea Grant, based at Louisiana State University, is part of the National Sea Grant Program, a network made up of 33 programs located in each of the coastal and Great Lakes states and Puerto Rico. Sea Grant Programs work individually and in partnership to address major marine and coastal challenges. LSU was designated the nation's thirteenth Sea Grant College in 1978. Louisiana Sea Grant had its Program Review in October 2015, conducted by the National Sea Grant Office/NOAA, and LSG was rated as "exceeds expectations by a substantial margin in some areas/aspects."

OTT Hydromet

www.ott.com

Designing answers by providing sustainable solutions that go beyond the expectations of Hydromet professionals to support them in making informed decisions for caring for the world's water resources and forecasting surface weather. OTT Hydromet Group offers the combined strength and expertise of leaders in the fields of General Meteorology, Weather Critical Operations, as well as Water quality and Quantity.

Picarro, Inc.

www.picarro.com

Picarro is the world's leading provider of stable isotope and gas concentration measurement systems for many scientific applications. The ultra-precise and easy-to-use instruments are deployed across the globe offering unmatched performance and enabling scientists around the world to measure GHGs, trace gases and stable isotopes found in the air, water, and land.

University of Central Florida (UCF) National Center for Integrated Coastal Research

www.ucf.edu/faculty/cluster/sustainable-coastal-systems/

The mission of the National Center for Integrated Coastal Research is to assess natural and human-related impacts to the health, restoration, and sustainability of coastal systems; conduct long-term, integrated, multi-disciplinary research with strategic external partners; communicate findings in an effective and efficient way; communicate information to the general public; and train the next generation of scientists to enter the workforce as science emissaries, with interdisciplinary skills.

UF/IFAS Research

www.research.ifas.ufl.edu/

The research mission of UF/IFAS, conducted under the auspices of the Florida Agricultural Experiment Station (FAES), is to discover new scientific knowledge, encourage innovative study and create applications based on sound science that address challenges facing agriculture, natural resources, and interrelated human systems in Florida, our country, and the world.

UF/IFAS Soil & Water Sciences Department

www.soils.ifas.ufl.edu/

Soil and water are vital resources in urban, agricultural, and natural ecosystems. The Soil and Water Sciences Department (SWSD) provides highly visible leadership in teaching, research, and extension/outreach programs as related to improving the productivity of agriculture with environmentally sound management practices, improving water quality, and protection and conservation of natural resources. Our department is one of the few in the nation that offers comprehensive research and educational programs (molecular to landscape level) involving terrestrial, wetlands and aquatic ecosystems of the landscape. In addition to traditional on-campus educational programs, we use innovative e-technologies to offer educational programs to place-bound students. Our graduates and postdoctoral fellows are well placed at universities, state and federal agencies, and private industry.

UF Office of Research

www.research.ufl.edu/

Research at UF plays a significant role in advancing our fundamental understanding of the universe, generating creative breakthroughs that lead to technologies with positive benefit, creating opportunities for economic growth in the state, and changing the trajectory of young people through education. The Office of Research is committed to facilitating the research and scholarship successes of our faculty and students by creating effective collisions between researchers and funding opportunities, marketing our research capabilities to collaborators and funding agencies, and forging institutional relationships with external stakeholders.

Bronze Sponsors

City of Orlando

www.cityoforlando.net/wetlands/

The City of Orlando's Water Reclamation Division owns and operates the Orlando Easterly Wetlands, which is one of the first large scale constructed wetland treatment systems designed to polish reclaimed water. The City of Orlando and the Orlando Easterly Wetlands are proud to sponsor the 12th International Symposium on Biogeochemistry of Wetlands.

University of Florida Whitney Laboratory for Marine Bioscience

www.whitney.ufl.edu/

The University of Florida Whitney Laboratory for Marine Bioscience, located in St. Augustine, FL, uses marine models to study fundamental problems in biology and then applies that knowledge to issues of human health, natural resources and the environment. We do this by performing research in 10 faculty led labs, training future scientists, promoting and providing lifelong learning and advancing conservation through our Sea Turtle Hospital and Oyster Restoration Initiative, and other environmental programs.

Plenary Sessions

Tuesday, April 24, 2018

8:30am – 10:00am | Royal Poinciana

Welcome Address

Jack M. Payne, Ph.D.

Senior Vice President for Agriculture and Natural Resources
University of Florida Institute of Food and Agricultural Sciences (IFAS)
Gainesville, FL, USA

Plenary Presentation

Coastal Environmental Settings as a Model to Explain Global Controls of Carbon Storage in Mangroves

Robert R. Twilley, Ph.D.

Executive Director, Louisiana Sea Grant College Program
Professor, Oceanography and Coastal Sciences, Louisiana State University
Baton Rouge, LA, USA

Presentation Description

Mangrove forests are found in dynamic coastal landforms controlled by physical forcings (e.g. river, tides and waves) and geomorphic evolutionary processes (e.g. rate and source of sediment input, and rate of relative sea-level change). Combined, these processes create a range of clastic coastal environments spanning from prograding to transgressive embayed shorelines. Dr. Twilley's presentation will discuss how the environmental drivers - wave power, tidal and fluvial processes - along with regional climate, produce conspicuous coastal environmental settings, including deltas, estuaries, lagoons and karstic landforms. Built on the ecogeomorphogy framework, the coastal environmental setting approach recognizes hydrology, geomorphology, and climate as main components to macrosystem-scale variation in coastal wetland's ecological processes. Hence, each coastal setting has a conspicuous environmental signature that controls both the type and rate of sediment supply to the coastline, nutrient load and limitation (e.g. nitrogen-to-phosphorus stoichiometric ratio), organic matter diagenesis, and, ultimately, C storage in vegetation (above- and belowground biomass) and soil pools. This presentation will further discuss how considering nitrogen (N) and phosphorus (P) density in soils may represent conditions limiting macrosystem-scale C stocks, C-N-P stoichiometric interactions may enhance or weaken the carbon-climate feedback. Thus, reconciling site-specific mechanisms regulating C:N:P stoichiometry with macrosystem-scale processes in mangrove ecosystems is key to advance conceptual models that can improve our capacity to predict global C stocks and rates of sequestration in these and other coastal wetlands.

Wednesday, April 25, 2018

8:30am – 10:00am | Royal Poinciana

Impacts of Hurricane Irma on the Everglades and South Florida Ecosystem

Nick G. Aumen, Ph.D.

Regional Science Advisor - South Florida
Center for Collaborative Research, US Geological Survey
Davie, FL, USA

Plenary Presentation

Carbon Remineralization and Burial in the Coastal Margin: Linkages in the Anthropocene

Thomas S. Bianchi, Ph.D.

Jon and Beverly Thompson Endowed Chair of Geological Sciences
Department of Geological Sciences, University of Florida
Gainesville, FL, USA

Presentation Description

Continental margin systems collectively receive and store vast amounts of organic carbon (OC) derived from primary productivity both on land and in the ocean, thereby playing a central role in the global carbon cycle. The land-ocean interface is however extremely heterogeneous in terms of terrigenous inputs, marine primary productivity, sediment transport processes and, depositional conditions such as bottom water oxygen levels. Continental margins are also highly dynamic, with processes occurring over a broad range of spatial and temporal scales. The rates of organic carbon burial and oxidation are consequently variable over both space and time, hindering our ability to derive a global picture of OC cycling at the land-ocean interface. In this presentation, Dr. Bianchi will review the processes controlling the fate of organic matter in continental margin sediments with a special emphasis on “hot spots” and “hot moments” of OC burial and oxidation. In addition, he will present a compilation of compositional data from a set of illustrative settings, including fjords, small mountainous river margins, large deltaic systems and upwelling areas.

Biographies

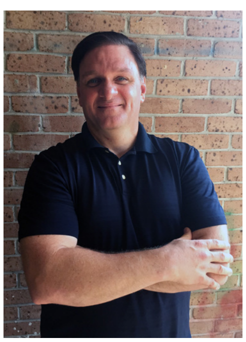
Symposium Chairs

Todd Z. Osborne, Ph.D., *Conference Chair*

Assistant Professor of Coastal Biogeochemistry
University of Florida, Whitney Laboratory for Marine Bioscience
St. Augustine, FL, USA

My interest in environmental science was catalyzed by continual exposure to the wonders of the natural world at a young age which, in turn, led to degrees in biology, environmental engineering and biogeochemistry. As a faculty member at the Whitney Laboratory for Marine Bioscience in St. Augustine, FL, I seek to meld my scientific interests and training with a lifelong passion for the environment. Arguably, there is no better way to do this than to investigate the intricate ecological processes that define coastal ecosystems.

Estuaries lie at the nexus of freshwaters (rivers, streams, wetlands) and the ocean. These incredibly complex and ecologically important ecosystems are experiencing effects of global climate change in ways that we are only just beginning to understand. Defining the biogeochemical processes and the resulting cascade of ecological effects that climate change brings to our coastal ecosystems is at the center of my research focus. Carbon sequestration, mangrove range expansion and coastal eutrophication are issues of great importance locally and globally and are thus the priority areas of interests for my research program. In addition to estuarine research, I have been very active in the Everglades Restoration arena in the last 15 years and maintain active research in that incredible ecosystem. A co-appointment in the Soil and Water Sciences Department at the University of Florida affords me the opportunity to continue research in many diverse aspects of the Florida Everglades, from agriculture and nutrient management to landscape biogeochemical cycles.



John R. White, Ph.D., *Conference Co-Chair*

John and Catherine Day Professor of Oceanography & Coastal Sciences
Wetland & Aquatic Biogeochemistry Laboratory, Louisiana State University
Baton Rouge, LA, USA

My research interests in the environment were forged at an early age as I wandered along the beaches of New England collecting rocks and sand dollars, which eventually led to degrees in Geology, Geological Oceanography and Soil and Water Science. At LSU for the past 14 years, I am engaged in research in a coastal setting that intersects the largest river discharge deltaic system in North America with the largest coastal marsh system in the lower 48 states. A high relative sea level rise rate, due to coupled global eustatic sea level and regional subsidence, has led to a dramatic loss of coastal wetland area. This dynamic setting, from freshwater to brackish to marine, allows us to investigate natural and anthropogenic stressors on biogeochemical functions including carbon sequestration, water quality function, greenhouse gas release rates, primary production and phosphorus cycling in the context of wetland creation, wetland restoration and coastal hypoxia.

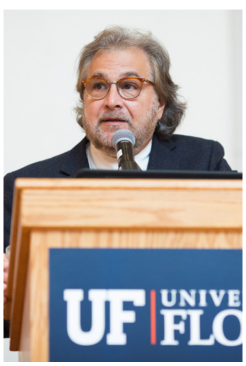
The results of this research are used to inform policy makers as part of the Coastal Restoration Program in Louisiana on effective measures as the state seeks to overcome almost of century of coastal land loss. I currently serve as the Associate Director of the Coastal Studies Institute at LSU, on the Governor's Steering Committee on the State Master Plan for Louisiana and on the US Environmental Protection Agency Board of Scientific Counselors for Safe and Sustainable Water Resources.

Plenary Speakers

Nicholas G. Aumen, Ph.D.

Regional Science Advisor - South Florida
Center for Collaborative Research, U.S. Geological Survey
Davie, FL, USA

Dr. Nick Aumen is Regional Science Advisor for the US Geological Survey (Southeast Region), overseeing the Greater Everglades Priority Ecosystem Sciences program. This program, involving USGS scientists nationwide, provides high quality science in support of Everglades restoration. Nick was an aquatic ecologist for 15 years with Everglades National Park, leading an interagency team of scientists tracking restoration progress. Prior to his National Park Service position, Nick was the Research Director at the South Florida Water Management District, directing a team of 120-plus scientists conducting research in support of ecosystem restoration. Nick received his B.S. and M.S. in biology at the University of West Florida, and his Ph.D. in microbial ecology at Oregon State University. He was a faculty member in the Biology Department at the University of Mississippi, and was a tenured Associate Professor of Biology when he returned to Florida. Nick presently is an affiliate faculty member at Florida Atlantic University (Department of Geosciences), and at the University of Florida (Soil and Water Sciences Department). He also served five years on the national Board of Directors of the Sierra Club, a 120-yr-old environmental organization with more than 750,000 members, and served two terms as its Vice-President and one as Treasurer.

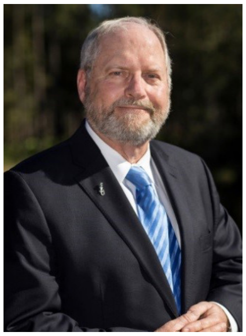


Thomas S. Bianchi, Ph.D.

Jon and Beverly Thompson Endowed Chair of Geological Sciences
Department of Geological Sciences, University of Florida
Gainesville, FL, USA

Dr. Tom Bianchi is a full professor and holder of the Jon and Beverly Thompson Endowed Chair in Geological Sciences at the University of Florida (UF), Gainesville, Florida. Before joining UF I held full professor positions at Tulane University and Texas A&M University. My general areas of expertise are organic geochemistry, chemical oceanography, and global carbon cycling in aquatic ecosystems. I have published over 210 articles in refereed journals and am sole and/or co-author of 7 books, with another book on Chemical Oceanography of the Gulf of Mexico - due out in 2018. I am currently Editor-in-Chief of the journal Marine Chemistry, and have served as an Associate Editor for numerous other journals. I am the recipient of two Fulbright Research Awards, became a Fellow of the American Association for the Advancement of Science (AAAS) in 2012, and in 2017 was named Geochemical Fellow of the Geochemical Society (GS) and The European Association of Geochemistry (EAG), and Fellow of the Association for the Sciences of Limnology and Oceanography (ASLO).

Many of the central issues in research concerning global climate change involve understanding the exchange and transport of organic and inorganic pools of carbon – in the context of the global carbon budget. If we are to successfully balance and model global carbon fluxes, it is important to understand the dynamics of carbon cycling in the most productive environments. In general, the most productive environments are located in land-margin ecosystems such as watershed soils, freshwater, and marine coastal systems. During the past few years my research has centered on organic carbon cycling from source-to-sink with work focused on the transport of soils in watersheds of large river systems to coastal environments. Dr. Bianchi has used state-of-the-art techniques to determine the role of terrestrial versus aquatic carbon sources in the overall carbon cycles of these ecosystems.



Jack M. Payne, Ph.D.

Senior Vice President for Agriculture and Natural Resources
University of Florida Institute of Food and Agricultural Sciences (IFAS)
Gainesville, FL, USA

Jack Payne is the Senior Vice President for Agriculture and Natural Resources at the University of Florida and the Administrative Head for the Institute of Food and Agricultural Sciences. Prior to his current position he served as a Vice President at Iowa State University, and, previous to Iowa State, he was a Vice President and Dean at Utah State University. Jack also has experience at two other land-grant institutions: Pennsylvania State University, where he served on the faculty of the School of Forest Resources, and, later, at Texas A&M University, where he served as a faculty member in the Fisheries and Wildlife Department.

After leaving Texas A&M University, Payne had a long career with Ducks Unlimited (DU), as their National Director of Conservation. While at Ducks Unlimited, some of his successes included the development of DU's private lands program with agriculture, the development of a national conservation easement program and the expansion of their Mexican program to Central and South America.

Payne received his M.S. in Aquatic Ecology and his Ph.D. in Wildlife Ecology from Utah State University and is a graduate of the Institute for Educational Management at Harvard University. He is a tenured professor in the Department of Wildlife Ecology and Conservation at the University of Florida.

Robert R. Twilley, Ph.D.

Executive Director, Louisiana Sea Grant College Program
Professor, Oceanography and Coastal Sciences, Louisiana State University
President, Coastal and Estuarine Research Federation (CERF)
Baton Rouge, LA, USA

Dr. Twilley is Executive Director of Louisiana Sea Grant College Program and professor in the Department of Oceanography and Coastal Science at LSU. For the past two years, Robert has served as President-of Coastal and Estuarine Research Federation, an international organization of scientists and managers that focus on coastal issues. In 2017, Dr. Twilley received the National Wetlands Award in Science Research, presented at the Botanic Gardens in Washington DC by the Environmental Law Institute. At LSU, Dr. Twilley has been a Distinguished Professor in Oceanography and Coastal Science, served as Associate Vice Chancellor of Research, Director of the Wetland Biogeochemistry Institute, and founder of the LSU Coastal Sustainability Studio. During his tenure at University of Louisiana at Lafayette, Robert served as Vice President of Research, was a Distinguished Professor in Biology Department, and developed the UL Lafayette Center for Ecology and Environmental Technology.

Robert Twilley has developed a career balancing productive contributions in university research, leadership in university program development, and science communication associated with public policy concerning the value of ecosystem restoration. Robert also served the state of Louisiana in several capacities as science advisor to coastal restoration planning projects including Louisiana Coastal Area (LCA) plan, 2007 and 2012 Louisiana Coastal Master Plans, and regional planning following Hurricanes Katrina and Rita known at Louisiana Speaks. He initiated the development of the Coastal Emergency Risk Assessment (CERA) software to visualize storm surge forecasts of coastal flooding associated with tropical cyclones. Robert Twilley has been instrumental in developing strong communication and collaboration with several state, federal and non-governmental organizations (NGO) in supporting the role of science in large scale ecosystem restoration projects. He has testified in several US House and Senate subcommittee hearings and worked with staff from several congressional and state subcommittees, along with briefings to EPA, CEQ, OSTP, DOI, NOAA and OMB to develop policy for coastal restoration programs.

Post-Conference Field Trip

Loxahatchee Impoundment Landscape Assessment (LILA)

10216 Lee Road
Boynton Beach, FL 33437

Thursday, April 26, 2018 | 12:00 PM – 5:30 PM | Cost to Participate: $50.00 [Limited to 15 people]

Description

The Loxahatchee Impoundment Landscape Assessment (LILA) is located on the grounds of the Arthur R. Marshall Loxahatchee National Wildlife Refuge in Boynton Beach, Florida. LILA is a working, 80-acre model of the Everglades ecosystem. This "living laboratory" gives experts an opportunity to research and apply restoration techniques on a small, controlled scale before taking them into the 1.7 million-acre Everglades ecosystem.

Field Trip Itinerary

Thursday, April 26, 2018	
12:00 PM	Immediately after closing plenary, go to the bus loading zone at Marriott [Conference Center Entrance]
12:15 PM	Board Bus and Depart
1:00 PM	Stop at Visitor Center for Overview of Refuge and LILA
1:15 PM	Welcome Introduction and Overview to the Refuge
1:30 PM	Begin Walking Tour around LILA
2:45 PM	Arrive at canoe outpost - sign out canoes and life jackets
3:00 PM	Canoe into the Refuge
4:15 PM	Bus picks group up at canoe outpost Pit-stop at Visitor Center before departure
4:45 PM	Depart for Hotel
5:30 PM	Arrive at Coral Springs Marriott

We Provide: Transportation, lunch, refreshments and canoe rental with life jacket.

You Bring: Sunscreen, insect repellent, water bottle, old tennis shoes or water shoes that can get wet. Light clothing that dries quickly is ideal. Weather will be hot – dress accordingly. You may also want to bring a camera and binoculars. LILA tours entail about a 1.5 mile walk and include a tour of two tree islands and a walk around two macrocosms.

Comfortable shoes are a must!

Agenda-at-a-Glance

Monday, April 23, 2018	
4:00pm-6:00pm	Poster Presenters and Sponsors Set Up Displays (Orchid Ballroom)
4:00pm-7:00pm	Registration Open (Conference Center Foyer and Palm Room)
6:00pm-8:00pm	Welcome Reception (Breeze's Terrace)
Tuesday, April 24, 2018	
7:30am-8:30am	Morning Refreshments (Orchid Ballroom)
7:30am-5:00pm	Registration Open (Conference Center Foyer and Palm Room)
8:30am-10:00am	Opening General Session (Royal Poinciana)
12noon	Lunch Buffet (Orchid Ballroom and Breeze's Terrace)
10:30am-5:00pm	Three Concurrent Sessions (Royal Poinciana, Ibis and Egret)
5:00pm-7:00pm	Poster Session Reception (Orchid Ballroom)
Wednesday, April 25, 2018	
7:30am-8:30am	Morning Refreshments (Orchid Ballroom)
7:30am-5:00pm	Registration Open (Conference Center Foyer and Palm Room)
8:30am-10:00am	General Session (Royal Poinciana)
12noon	Lunch Buffet (Orchid Ballroom and Breeze's Terrace)
10:30am-5:00pm	Four Concurrent Sessions (Royal Poinciana, Ibis, Egret & Sandpiper)
5:00pm-7:00pm	Poster Session Reception (Orchid Ballroom)
Thursday, April 26, 2018	
7:30am-8:30am	Morning Refreshments (Orchid Ballroom)
7:30am-12noon	Registration Open (Conference Center Foyer and Palm Room)
8:30am-10:00am	Three Concurrent Sessions (Royal Poinciana, Ibis & Egret)
10:00am-10:30am	Poster Presenters and Sponsors Remove Displays
10:30am-12noon	Closing General Session (Royal Poinciana)
12noon	Symposium Concludes
12:00noon-5:30pm	**Optional Post-Conference Field Trip** to Loxahatchee Impoundment Landscape Assessment (LILA). Shuttle departs from Conference Center Entrance.

Detailed Agenda

Monday, April 23, 2018	
4:00pm-6:00pm	**Poster Presenters and Sponsors Set Up Displays** [Conference Center - Orchid Ballroom]
4:00pm-7:00pm	**Symposium Registration Open** [Conference Center - Palm Foyer]
6:00pm-8:00pm	**Welcome Reception on Breeze's Terrace** *(Please plan to arrive in time to join us!)*

Tuesday, April 24, 2018	
7:30am-5:00pm	**Symposium Registration Open** [Conference Center - Palm Foyer]
7:30am-8:30am	**Morning Refreshments in Poster & Sponsor Display Area**
8:30am	**Opening General Session** [Royal Poinciana] **Introductory Remarks** ***Dr. Todd Osborne,*** Assistant Professor, University of Florida/IFAS Soil and Water Sciences Department, Whitney Laboratory for Marine Bioscience, St. Augustine, FL, USA *-and-* ***Dr. John White,*** Professor, Louisiana State University, Department of Oceanography and Coastal Sciences, Baton Rouge, LA, USA
8:45am	**Welcome Address** ***Dr. Jack Payne,*** Senior Vice President for Agriculture and Natural Resources, University of Florida/IFAS, Gainesville, FL, USA
9:00am	**Plenary Presentation** **Coastal Environmental Settings as a Model to Explain Global Controls of Carbon Storage in Mangroves** ***Dr. Robert Twilley,*** Executive Director, Louisiana Sea Grant College Program Professor, Oceanography and Coastal Sciences, Baton Rouge, LA, USA
10:00am-10:30am	**AM Refreshment Break in Poster & Sponsor Display Area** [Conference Center - Orchid Ballroom]

Tuesday, April 24, 2018 *(continued)*			
	Concurrent Sessions [10:30am - 12:00noon]		
	Session 1	**Session 2**	**Session 3**
	Royal Poinciana	**Ibis**	**Egret**
	Methane and Nitrous Oxide Cycling in Wetlands and Upland Forests (Part 1)	**New and Emerging Tools and Techniques for the Study of Biogeochemistry in Wetlands**	**Shifts in Foundation Species**
10:30am	**Pat McGonigal**	**David Krabbenhoft**	**Ilka Feller**
	Introduction & Overview	**Introduction & Overview**	**Introduction & Overview**
10:35am	**Sunitha Pangala** Large Methane Emissions from Amazon Floodplain Trees	**Brian Bergamaschi** Tidal Wetland Biogeochemistry in High Definition: Using High-Frequency Measurements to Estimate Biogeochemical Rates	**Samantha Chapman** Warming Facilitates Mangrove Encroachment and Alters Belowground Processes
10:50am	**Kristofer Covey** Methane in Upland Forest Trees	**Collin Eagles-Smith** Flow Cytometry as a Novel, Rapid, Screening and Research Tool For Methylmercury Production Activity in Aquatic Ecosystems	**Catherine Lovelock** Fluctuating Sea Level and Habitat Change in Western Australia
11:05am	**Mari Pihlatie** Plant-Mediated Methane and Canopy Exchange in a Boreal Upland Forest	**Sarah Janssen** From Cellular to Global: Using Mercury Stable Isotopes to Understand Mercury Cycling and Sources	**Loraé Simpson** Effects of Nutrient Enrichment on the Carbon Dynamics in the Salt Marsh - Mangrove Ecotone
11:20am	**Kazuhiko Terazawa** Vertical Patterns of CH4 Emission along Tree Stems of *Alnus japonica* and *Fraxinus mandshurica*	**Brett Poulin** Molecular- and Atomic-Level Approaches to Characterize Dissolved Organic Matter: Insights for Mercury Bioavailability in the Florida Everglades	**Anne Ola** The Roots of Blue Carbon in Mangrove Forests: The Effects of Soil Properties on Stilt Root Development in *Rhizophora stylosa*
11:35am	**Joost van Haren** Large Methane Emissions from Palm Stems in Amazonian Peat and Flood Lands	**William Orem** Methods of Sulfur Analysis in Wetlands and Applications to Studies of Mercury Biogeochemistry	**Emily Dangremond** Extreme Events and Historical Regime Shifts in the Mangrove-Salt Marsh Ecotone
11:50am	**Q&A**	**Q&A**	**Q&A**
12noon-1:30pm	**Group Luncheon Buffet**		

Tuesday, April 24, 2018 *(continued)*

	Concurrent Sessions [1:30pm - 3:00pm]		
	Session 4	**Session 5**	**Session 6**
	Royal Poinciana	**Ibis**	**Egret**
	Methane and Nitrous Oxide Cycling in Wetlands and Upland Forests (Part 2)	**Wetland Enzymes in a Changing Environment (Part 1)**	**The Novel Biogeochemistry of Ubiquitous Understudied Urban Wetlands**
1:30pm	**Sunitha Pangala** **Introduction & Overview**	**Patrick Inglett** **Introduction & Overview**	**Ashley Smyth** **Introduction & Overview**
1:35pm	**Pat Megonigal** Methane Emissions from both Wetland and Upland Trees across a Flooding Gradient	**Colin Jackson** What Controls Microbial Enzyme Activity in Wetlands?	**Alexander Reisinger** Challenges of Connectivity Within Urban Landscapes: Examples From The Baltimore Ecosystem Study
1:50pm	**Zhiping Wang** Methane Emissions from the Stems of Living Trees in Upland Forests	**Patrick Inglett** Warming Rate Drives Microbial Nutrient Limitation and Enzyme Expression	**Lauren Kinsman-Costello** Urban Stormwater Wetlands As Novel Biogeochemical Systems: Elevated Salt and Sulfate
2:05pm	**Rodrigo Vargas** Automated Measurements of CO2, CH4, and N2O Fluxes from Tree Stems and Adjacent Soils	**Hojeong Kang** PH Controls Phenol Oxidase and DOC Leaching From Global Peatland	**Eban Bean** A Little Retro: Valuing an Undersized Urban Stormwater Wetland Retrofit
2:20pm	**Paul Brewer** High-Frequency Tree CH4 Flux Measurements Reveal Relationships with Tree Physiology and Environmental Properties	**Chris Freeman** Sequestering Carbon in Wetlands Through Enzyme Suppression	**Ariane Peralta** How Do We Manage Microbiomes to Promote Urban Wetland Functions?
2:35pm	**Christopher Schadt** Methanogenic Archaea Dominate Mature *Populus deltoides* Heartwood Habitats	**Q&A**	**Monica Palta** Accidental Urban Wetlands: Biogeochemical Processes in Unexpected Places
2:50pm	**Q&A**		**Q&A**
3:00pm-3:30pm	**PM Refreshment Break in Poster & Sponsor Display Area** [Conference Center - Orchid Ballroom]		

Tuesday, April 24, 2018 *(continued)*			
	Concurrent Sessions [3:30pm - 5:00pm]		
	Session 7	**Session 8**	**Session 9**
	Royal Poinciana	**Ibis**	**Egret**
	Methane and Nitrous Oxide Cycling in Wetlands and Upland Forests (Part 3)	**Wetland Enzymes in a Changing Environment (Part 2)**	**Agents and Causes of Peat Stability and GHG Ratios Across Moisture, Temperature & Latitude Gradients**
3:30pm	**Dongqi Wang** **Introduction & Overview**	**Kanika Inglett** **Introduction & Overview**	**Curtis Richardson and Jeff Chanton** **Introduction & Overview**
3:35pm	**Ashley Smyth** Time Series Soil Oxygen Data Help Identify Hot Spots and Hot Moments of Greenhouse Gas Emissions From Wetlands	**Stephanie T. Castle** Linking Microbial Extracellular Enzyme Activities with Rates of Plant Litter Decay	**Jeff Chanton** A Global Latitudinal Gradient in Peatland Organic Matter Chemistry
3:50pm	**Dongqi Wang** Effects of Temperature Increasing On the Nitrous Oxide Emission from Intertidal Area along the East China Coast	**Nic Vermeulen** Use of Bacterial Transformation in Processing Non-Biodegradeable Plastics	**Curtis Richardson** Chemical Controls on Carbon Sequestration and GHG Flux Along A Boreal To Tropical Gradient
4:05pm	**Jeroen De Klein** Greenhouse Gas Emissions from Wetlands with Different Vegetation Type	**Zuhair AlQulaiti** Hydrological Variation and Enzymic Decomposition in Wetlands	**Maite Martinez-Eixarch** Greenhouse Gas Emissions and Carbon Sequestration in Mediterranean Rice Fields and Wetlands: The Ebro Delta Case
4:20pm	**Iikka Haikarainen** Methane Fluxes of Trees and Forest Floor under Two Different Water Level Condition in Forestry Drained Peatland in Southern Finland	**Kathleen Pietro** Microbial Enzyme Activity in a Stormwater Treatment Ares in Response to Inflow Flow Conditions	**Hongjun Wang** Does An 'Iron-Gate' Regulate Drought Effects On Peat Decomposition?
4:35pm	**Q&A**	**Kanika Inglett** Stoichiometric Controls of Microbial Enzyme Activities on Nutrient Cycling In Wetlands	**Neal Flanagan** Thermal Alteration of Peat By Low-Severity Fire Reduces Net Carbon Loss To Microbial Respiration
4:50pm		**Q&A**	**Q&A**
5:00pm-7:00pm	**Poster Session Reception I** *(Poster presenters at ODD NUMBERED BOARDS to be available for questions and discussion from 6pm - 7pm.)*		

Wednesday, April 25, 2018	
7:30am-5:00pm	**Symposium Registration Open** [Conference Center - Palm Foyer]
7:30am-8:30am	**Morning Refreshments in Poster & Sponsor Display Area** [Conference Center - Orchid Ballroom]
8:30am	**General Session** [Royal Poinciana] **Introductory Remarks** ***Dr. K. Ramesh Reddy,*** Graduate Research Professor and Chair, UF/IFAS Soil and Water Sciences Department, Gainesville, FL, USA
8:40am	**Impacts of Hurricane Irma on the Everglades and South Florida Ecosystem** ***Dr. Nick Aumen,*** Regional Science Advisor - South Florida, Center for Collaborative Research, U.S. Geological Survey, Davie, FL, USA
9:00am	**Plenary Presentation** **Carbon Remineralization and Burial in the Coastal Margin: Linkages in the Anthropocene** ***Dr. Thomas S. Bianchi,*** Jon and Beverly Thompson Endowed Chair of Geological Sciences, Department of Geological Sciences, University of Florida, Gainesville, FL, USA
10:00am-10:30am	**AM Refreshment Break in Poster & Sponsor Display Area**

Wednesday, April 25, 2018 *(continued)*				
	Concurrent Sessions [10:30am - 12noon]			
	Session 10	**Session 11**	**Session 12**	**Session 13**
	Royal Poinciana	**Ibis**	**Egret**	**Sandpiper**
	Blue Carbon: Improving Data Applied to IPCC Emission Factors and Carbon Markets (Part 1)	**Biogeochemical Responses to Saltwater Transgression Events in the Marine Environment**	**Wetland Management Effects on Carbon Sequestration and Greenhouse Gasses**	**Coastal Processes (Part 1)**
10:30am	**Gail Chmura**	**Todd Osborne**	**Kimberli Ponzio**	**Loraé Simpson**
	Introduction & Overview	**Introduction & Overview**	**Introduction & Overview**	**Introduction & Overview**
10:35am	**Junsung Noh** Capacity Change in Organic Carbon Storage in Intertidal Flat During Drainage After Reclamation: Case Study in Saemangeum, Korea	**Jayantha Obeysekera** An Overview of Global and Regional Sea Level Rise Projections: Means and Extremes	**Janet Ho** Characterizing Biogeochemical Shifts in Two Shrub Encroached Marshes under Different Historical Disturbance Regimes in the St. Johns River, FL	**John Nyman** How Nutrients Interact With Stresses, such as Flooding and Salinity, to Affect Wetland Plant Growth and Leaf Tissue Stoichiometry
10:50am	**Gail Chmura** Blue Carbon Losses with Salt Marsh Drainage	**Benjamin Wilson** Drivers and Mechanisms of Peat Collapse in Coastal Wetlands	**Dave Sumner** Role of Hydroperiod and Fire on Carbon Dynamics of a Subtropical Peat Marsh	**Shelby Servais** Effects of Increased Salinity on Microbial Processing of Carbon and Nutrients in Brackish and Freshwater Wetland Soils
11:05am	**Andre Rovai** Global Controls of Carbon Storage in Mangrove Soils	**Lisa Chambers** Short-Term Response of Freshwater Wetland Soils to Saltwater Intrusion	**Brian Benscoter** Shifting Fire Regimes and the Future of Peatland Carbon Storage	**Katie Bowes** Sediment Phosphorus Speciation and Distribution in Coastal LA Sediments: Implications for Hypoxia and Food Web Dynamics
11:20am	**Guangcheng Chen** Considerations in Blue Carbon Accounting with Mangrove Restoration - Case Studies from South Fujian, China	**Scott Neubauer** Persistent Saltwater Intrusion Alters Ecosystem Carbon Cycling In Tidal Freshwater Marshes: Comparison of Results from In Situ Manipulations in Virginia and South Carolina	**Angelique Bochnak** Subsidy Stress Gradient in a Peat-based Floodplain Marsh	**Joshua Papacek** Have We Reached a New Normal?: Nutrient Cycling and Bloom Dynamics in the Northern Indian River Lagoon
11:35am	**Havalend Steinmuller** Fate of Soil Carbon Following Sea Level Rise-Induced Coastal Wetland Submergence: a Microcosm Experiment	**Todd Osborne** Translating the Effects of Sea-Level Rise in Urban Systems to the Coastal Ecosystem Interface	**Barclay Shoemaker** Carbon Cycling and Potential Soil Accumulation within Coastal Forested Wetlands	**Shaofeng Pei** Nutrient Dynamics and Their Interaction with Phytoplankton Growth in the Aquatic Areas of Coastal Wetland in Liaohe Delta, China
11:50am	**Q&A**	**Q&A**	**Q&A**	**Q&A**
12noon-1:30pm	**Group Luncheon Buffet**			

Wednesday, April 25, 2018 *(continued)*				
	Concurrent Sessions [1:30pm - 3:00pm]			
	Session 14	Session 15	Session 16	Session 17
	Royal Poinciana	Ibis	Egret	Sandpiper
	Blue Carbon: Improving Data Applied to IPCC Emission Factors and Carbon Markets (Part 2)	Nitrogen and Phosphorus Dynamics in Aquatic Systems	Hydrological Restoration: Reconnection of Wetland Ecosystems	Coastal Processes (Part 2)
1:30pm	Gail Chmura	Kevin Grace	John White	Lisa Chambers
	Introduction & Overview	Introduction & Overview	Introduction & Overview	Introduction & Overview
1:35pm	**Derrick Vaughn** Blue Carbon Sequestration Within a Northeastern Florida Intertidal Wetland - Response to Climate Change and Holocene Climate Variability	**Hilary Flower** Shifting Ground: Landscape-Scale Modeling Of Soil Biogeochemistry under Climate Change in the Florida Everglades	**Greg Noe** Nutrient and Sediment Inputs Change Soil Structure and Biogeochemistry in Floodplain Ecosystems: A Cross-Study Synthesis	**Tianna Picquet** Novel Interactions May Affect Range Expansions: Is Heavy Ungulate Browsing Restraining Mangrove Advance On The South Texas Coast?
1:50pm	**Elise Morrison** The Role of Priming Effects on the Conversion of Blue Carbon to CO_2 in the Coastal Zone	**Paul Julian** One Of These Things Is Not Like The Other. Evaluation of Wetland Nutrient Stoichiometry and Homeostasis in a Subtropical Treatment Wetland	**Sara McMillan** Effects of Floodplain Restoration on Nitrogen and Phosphorus Dynamics in Agricultural Watersheds	**Derek Detweiler** Phytosterols as Tracers of Terrestrial and Wetland Carbon to Ten Thousand Islands, Florida, USA: Implications for Trophic Resource Usage in the Eastern Oyster, *Crassostrea Virginica*
2:05pm	**Amy Borde** Measuring Continuous Greenhouse Gas Fluxes from Pacific Northwest Tidal Wetland Sediments Following Salt-Water Intrusion	**Sara Phelps** Reevaluating the Consequences of Land Use: Accelerated Dissolution of Geologic Phosphate Deposition in Humic Lakes	**Natalie Peyronnin** Rebuilding Mississippi River Delta: Operating a Sediment Diversion to Balance Ecosystem and Social Needs	**Hayley Craig** Factors Controlling Diversity and Composition of Soil Microbial Communities in Mangroves
2:20pm	**Thomas Mozdzer** Nutrient Enrichment Alters Blue Carbon Pools and Processes	**Alina Spera** Effect of Hydrologic Restoration on Coastal Wetland Soil Properties	**Nia Hurst** Reducing Nitrogen Removal Uncertainty for Operation of Mississippi River Sediment Diversions: Nitrate Reduction Rates In Turbulent Flow Conditions	**Michael Wessel** Developing a Nutrient Management Strategy for Southwest Florida Tidal Creeks by Linking Source Water Concentrations, Instream Processes, and Estuarine Dynamics
2:35pm	**Siyuan Ye** Carbon Sequestration and Its Controlling Factors in the Temperate Wetland Communities Along the Bohai Sea, China	**William Mitsch** Sustainably Solving Legacy Phosphorus and Nitrogen in Landscapes with Wetlands and Wetlaculture	**John White** Evaluating Nitrate Reduction in a Hydrologically Restored Bottomland Hardwood Forest: Is Reconnection Improving Water Quality Function?	**Jessica Vaccare** The Impacts of Corexit EC9500A on Wetland Microbial Activity and Community Structure in Barataria Bay, LA., USA
2:50pm	Q&A	Q&A	Q&A	Q&A
3:00pm-3:30pm	PM Refreshment Break in Poster & Sponsor Display Area			

Wednesday, April 25, 2018 *(continued)*				
	Concurrent Sessions [3:30pm - 5:00pm]			
	Session 18	**Session 19**	**Session 20**	**Session 21**
	Royal Poinciana	**Ibis**	**Egret**	**Sandpiper**
	Blue Carbon: Improving Data Applied to IPCC Emission Factors and Carbon Markets Part 3	**Influence of Large-scale Restoration on Biogeochemical Processes**	**Biogeochemical Studies Toward Improving Performance of the Everglades Stormwater Treatment Areas**	**Treatment Wetlands**
3:30pm	**Gail Chmura**	**Fred Sklar**	**Odi Villapando**	**Mark Sees**
	Introduction & Overview	**Introduction & Overview**	**Introduction & Overview**	**Introduction & Overview**
3:35pm	**Joseph Smoak** Coupled Soil Carbon Measurements and Remote Sensing to Quantify Above and Belowground Carbon Stocks in Mangrove Forest of the Ten Thousand Islands Region of Southwest Florida, USA	**Sue Newman** Restoration of Biogeochemical Characteristics through Active Management of the Nutrient-Enriched Everglades (CHIP)	**Len Scinto** Settling and Entrainment Properties of Particulates in the STAs	**Carles Ibanez** Dynamics of Metals, Nutrients, Sediments and Carbon in Mediterranean Constructed Wetlands Receiving Agricultural Runoff
3:50pm	**Joshua Breithaupt** Are Carbon Burial Rates in the Coastal Everglades Higher Now Than They Were a Century Ago?	**Erik Tate-Boldt** Biogeochemical Drivers of Aquatic Ecosystem Metabolism under an Altered Flow Regime in an Everglades Marsh	**Patrick Inglett** Hydrologic Flow Effects on Microbial Stoichiometry and Enzyme Activity in the Everglades Stormwater Treatment Areas	**Li Zhang** Hydrological Regime Impacts on Macrophyte Communities of Urban Stormwater Treatment Wetlands in Southwest Florida
4:05pm	**Jeffrey Kelleway** What is the Carbon Sequestration Potential of Australia's Coastal Floodplain Forests?	**Colin Saunders** Flow Impacts on P and OM Cycling across Everglades Ridge and Slough: Lessons from Landscape Budgets in the DECOMP Physical Model and Shark Slough, ENP	**Lauren Griffiths** Nutrient Retention via Vegetative Uptake and Sedimentation in Created Wetlands in Subtropical Florida	**Taylor Nesbit** Seasonal and Hurricane Irma Effects on the Hydrologic Regime of A Constructed Urban Stormwater Treatment Wetland Complex in Southwestern Florida
4:20pm	**Bong-Oh Kwon** Carbon Storage Capacity of Estuarine Tidal Flat and Salt Marsh in the West and South Coasts of Korea	**Christa Zweig** Active Management Influences on Biogeochemistry in a Nutrient-Poor Wetland	**Mike Jerauld** Phosphorus Flux in the Everglades Stormwater Treatment Areas	**R. Thomas James** Effects of Hydrology, Time and Inflow Concentration on Phosphorus Discharge from a Periphyton-Based Stormwater Treatment Area
4:35pm	**Stephen Crooks** Inclusion of Coastal Wetlands in United States Inventory of Greenhouse Gas Emissions and Sinks	**Mark Cook** Faunal Contributions to P Cycling and their Influence on Restoration of the Everglades	**Odi Villapando** Biogeochemical Response of Selected STA Flow-ways to Different Flow Scenarios	**Ronald Corstanje** Big Data Applied to the Stormwater Treatment Areas in The Everglades, Mapping Out System Resilience
4:50pm	**Q&A**	**Q&A**	**Q&A**	**Q&A**
5:00pm-7:00pm	**Poster Session Reception II** *(Poster presenters at EVEN NUMBERED BOARDS to be available for questions and discussion from 6pm - 7pm.)*			

Thursday, April 26, 2018			
7:30am-12noon	**Symposium Registration Open** [Conference Center - Palm Foyer]		
7:30am-8:30am	**Morning Refreshments in Poster & Sponsor Display Area**		
	Concurrent Sessions [8:30am - 10:00am]		
	Session 22	**Session 23**	**Session 24**
	Royal Poinciana	**Ibis**	**Egret**
	Biogeochemical Processes in South Florida Ecosystems	**Contaminant Removal in Wetlands**	**Wetland Soil Biogeochemistry in Created and Restored Environments**
8:30am	**Mike Jerauld**	**Anna Sophia Knox**	**Jacob Berkowitz**
	Introduction & Overview	**Introduction & Overview**	**Introduction & Overview**
8:35am	**Kevin Grace** Nutrient Exchange Dynamics Following Sediment Resuspension in South Florida Wetlands	**Matt Huddleston** Savannah River Site's A-01 Constructed Wetland System: A Model for Sustainable Aquatic Risk Mitigation	**Christine VanZomeren** Biogeochemical Response of Coastal Wetland Soil to Thin Layer Sediment Application
8:50am	**Jennifer Cooper** Influence of Mineral Precipitation and Aquatic Vegetation on Phosphorus Removal in Canal Water from the Everglades Agricultural Area	**Anna Sophia Knox** Metal Mobility and Retention in Constructed Wetland Sediment	**Jacob Berkowitz** Rapid Formation of Potential Acid Sulfide Soils Following Wetland Restoration – A Cautionary Tale
9:05am	**Barry Rosen** The Role of Cyanobacteria in Nucleating the Precipitation of Calcium Carbonate in the Everglades: Vaterite and Aragonite	**Michael H. Paller** Using DGT to Measure Bioavailable Metals in A Constructed Wetland Treatment System	**Kim Oldenborg** Impacts of Sediment Dredging on Phosphorus Dynamics of a Restored Riparian Wetland
9:20am	**Hanh Nguyen** Microbial Composition of Everglades Stormwater Treatment Areas is Linked to Sulfur Cycle	**Xiaoyu Xu** Do Constructed Wetlands Remove Metals or Increase Metal Bioavailability?	**Hongjun Chen** Dissolved Oxygen Sag Events in the Phase I Area of The Kissimmee River Restoration Project
9:35am	**Richard Baker** Biogeochemistry of Trace Elements in Card Sound, Florida, Inventory and Annual Turnover Circa 1973	**Sanjana Banerjee** Turning a Liability into an Asset: Can We Use the Invasive Apple Snail Pomacea Maculata In Biomonitoring Of Metal Contamination In Freshwater Marshes?	**Masanori Fujimoto** Spatial Variability in Microbial-Mediated Biogeochemical Processes in Everglades Stormwater Treatment Areas
9:50am	**Q&A**	**Q&A**	**Q&A**
10:00am-10:30am	**AM Refreshment Break** **Poster Presenters and Sponsors Remove Displays**		
10:30am-12noon	**Closing General Session**		
12noon	**Symposium Concludes**		
12noon-5:30pm	**Optional Post-Conference Field Trip – Loxahatchee Impoundment Landscape Assessment (LILA)** *Participants to gather in lobby next to registration to prepare for departure.*		

Poster Display Information

Poster presentations play a key role in the exchange of information at BioGeo 2018. Considerable time will be dedicated for viewing them. Posters will be on display throughout the conference in the Poster & Sponsor Display Room (Orchid Ballroom). This is the primary gathering spot where morning, mid-day and afternoon refreshments are served. The agenda also features an evening Poster Session Reception on Tuesday & Wednesday. These networking functions maximize opportunities for discussion amongst poster presenters, attendees and sponsors.

- Formal poster sessions are scheduled Tuesday (5pm–7pm; session 1) and Wednesday (5pm–7pm; session 2).
- Poster presenters are to stand at their poster during the assigned poster session. **Please do not stand at your poster during the poster session in which you are not assigned.**

POSTER SET UP	**Monday, April 23 | 4:00PM – 6:00PM** Posters may be set-up upon arrival at the hotel any time during these hours, but *no later than* 10:30am Tuesday, April 24. All posters are on display throughout the conference. Posters are to be removed Thursday during the mid-morning break.
POSTER SESSION 1	**Tuesday, April 24 | 5:00PM – 7:00PM** (Presenters at ODD NUMBERED BOARDS are to stand at their posters 6pm-7pm.)
POSTER SESSION 2	**Wednesday, April 25 | 5:00PM – 7:00PM** (Presenters at EVEN NUMBERED BOARDS are to stand at their posters 6pm-7pm.)
POSTER REMOVAL	**Thursday, April 26 | 10:00AM – 10:30AM**
** Organizers are not responsible for lost posters not removed from the boards, and discarded by the board vendor.*	

Poster Directory

(Presenters listed in alphabetical order by last name)

Poster No.	First Name	Last Name	Organization	City	ST	Country	Abstract Title
5	Kaylee	August	University of Florida	Gainesville	FL	United States	Soil Nutrient Enrichment Post Hydrologic Management: A Temporal Analysis Of Taylor Slough
6	Regina	Bledsoe	East Carolina University	Greenville	NC	United States	Greenhouse Gas Potential of a Constructed Stormwater Wetland
32	Ashley	Booth	Louisiana State University	Baton Rouge	LA	United States	Understandings Mechanisms For Marsh Sustainability in the Face of Sea Level Rise
35	Bahram	Charkhian	South Florida Water Management District	West Palm Beach	FL	United States	Restoration Benefits Observed From the Biscayne Bay Coastal Wetlands Project
7	Michael	Chimney	South Florida Water Management District	West Palm Beach	FL	United States	Long-Term Treatment Performance of Constructed Wetlands Built for Everglades Restoration
30	Jeroen	de Klein	PBL Neth. Environmental Assessment Agency	The Hague		Netherlands	Towards a Global Model for Wetlands Ecosystem Services
8	Brittany	Dolan	Florida Gulf Coast University	Fort Myers	FL	United States	Comparison of Heat Flux Reduction in a Wetland Modular Rooftop Garden System and a Xeric Rooftop Garden System in Southwest Florida
19	Bobby	Duersch	Florida Atlantic University	Boca Raton	FL	United States	Phosphorous Analyses Including P-31 Nuclear Magnetic Resonance Spectroscopy in the C51 Basin and Northern Everglades
25	Rebecca	Flock	College of Western Idaho	Nampa	ID	United States	Investigation of Ecosystem Services Provided by Seasonally Emergent Wetland Between an Agricultural Drain and Irrigation Catchment in Southwest Idaho
27	Rachel	Harris	Loxahatchee River District	Jupiter	FL	United States	Enterococci in Wrack Sediments and Surface Water
20	Jordan	Heiman	Missouri State University	Springfield	MO	United States	What is the Metal Content of Gravel Bar Vegetation in a Contaminated River?
33	Nia	Hurst	University of Central Florida	Orlando	FL	United States	Hurricane Irma: Biogeochemical Responses in a Mangrove Encroached Florida Salt Marsh

Poster No.	First Name	Last Name	Organization	City	ST	Country	Abstract Title
23	Colin	Jackson	University of Mississippi	University	MS	United States	Temporal Patterns in Enzyme Activity and Bacterial Community Structure of the Phyllosphere of the Wetland Macrophyte *Typha Latifolia*
31	Alex	Johnson	Purdue University	West Lafayette	IN	United States	Effects of Floodplain Restoration in Agricultural Watersheds on Phosphorus Dynamics
24	Paul	Julian	University of Florida	Fort Pierce	FL	United States	River Runs Through It: Evaluation of Groundwater and Surface Water Connectivity and its Implication on Riparian Biogeochemistry and Ecology
36	Christopher	Kavanagh	National Park Service	Key Largo	FL	United States	Effects of Hurricane Irma on Coastal Everglades Waters in Florida Bay
16	Sydni	Law	East Carolina University	Greenville	NC	United States	Carbon Budget of an Eastern North Carolina Coastal Freshwater Wetland Following Phosphorus Addition
34	Jing	Liu	Florida Atlantic University	Boca Raton	FL	United States	Assessing Significant of Different Environmental Drivers Impact Coastal Wetlands Elevation Change in Louisiana
14	Xin	Liu	Institute of Subtropical Agriculture, Chinese Academy of Sciences	Changsha	Hunan	China	Dynamics of Soil Nitrogen Accumulation Following Vegetation Restoration in a Typical Karst Catchment
3	Bryan	Locher	University of Central Florida	Orlando	FL	United States	Impacts of Restoration on Biogeochemistry of Intertidal Oyster Reefs in the Indian River Lagoon, Florida
9	Cristina	Lopardo	Florida Gulf Coast University	Fort Myers	FL	United States	Constructed Wetlands for Saltwater Aquaculture Wastewater Treatment Using a Floating Treatment Wetland Bioreactor System and Wetlands Modified with Biodegradable Plastics
29	Luka	Ndungu	Florida Gulf Coast University	Fort Myers	FL	United States	Microscale Hydrogen Peroxide Measurements of Cyanobacterial Blooms in Southwest Florida Lakes
15	Chukwuebuka	Nwobi	School Of Geosciences, University Of Edinburgh	Edinburgh		United Kingdom	Mangrove Forest Biomass Estimates, Community Structure and Classification in the Nigerian Niger Delta
13	Danielle	Ogurcak	Florida International University	Miami	FL	United States	Variation in Carbon Storage and Nutrients in Mangrove Peats Across Puerto Rico
2	Eliska	Rejmankova	University of California, Davis	Davis	CA	United States	Ecological Consequences of Invasive Plant Species Introduction to Volcanic Lakes in Central America: An Example of Lake Atitlan, Guatemala

Poster No.	First Name	Last Name	Organization	City	ST	Country	Abstract Title
12	Andres	Rodriguez	University of Florida	Gainesville	FL	United States	Changes in Carbon and Nitrogen in a Drained Subtropical Wetland. The Case of the Everglades Agricultural Area
4	Tracey	Schafer	University of Florida	Gainesville	FL	United States	Effects Of Hurricane Irma on Dissolved Organic Carbon Fluxes Along a Salinity Gradient
10	Mark	Sees	City of Orlando	Christmas	FL	United States	The Orlando Easterly Wetlands – 30 Years of Constructed Success
1	Dagmara	Sirova	Biology Centre CAS	Ceske Budejovice		Czech Republic	How Can the Invasive Submersed Macrophytes Stay So Highly Productive in a Nitrogen Limited Lake? Molecular Analysis of Associated Diazotrophs May Provide the Answer
21	Sabrina	Tabassum-Tackett	University of Louisiana at Lafayette	Lafayette	LA	United States	Bioaccumulation and Effects of Cadmium in Three Phytoplankton Species: *Akashiwo Sanguinea*, *Heterosigma Akashiwo*, & *Coscinodiscus Sp*
11	Mohsen	Tootoonchi	University of Florida	Davie	FL	United States	Evaluating Different Salts as Proxies For Brackish Water in Sea Level Rise and Climate Change Research
28	Hidetoshi	Urakawa	Florida Gulf Coast University	Fort Myers	FL	United States	Complete Genome Sequencing Revealed the Evolution, Adaptation and Cosmopolitan Distribution of *Nitrosospira Lacus*
26	Joost	van Haren	University of Arizona	Tucson	AZ	United States	Species Influence on Methane Emissions from Tree Stems from Amazonian Peat and Flood Lands
22	Arioene	Vreedzaam	Anton de Kom University of Suriname/ Tulane University	Wanica		Suriname	Mercury Deposition in Rivers of Suriname
17	Zhiping	Wang	Institute of Botany, CAS	Beijing		China	Methane Emissions from the Stems of Living Trees in Upland Forests
18	Junbin	Zhao	Florida International University	Miami	FL	United States	Extreme Events Alter C Dynamics Across the Florida Everglades

PDHs for Engineers and Continuing Education

CEUs & PDHs for Attendees with Professional Certifications

If you are a licensed engineer or maintain a professional license issued by a society, an association, an occupational licensing board or a department of professional regulation within your state, you may be eligible to earn Continuing Education Units (CEUs) for your participation in this conference. You will need to contact the appropriate authority who manages your professional certification to verify your organization or individual state's licensing requirements, and to confirm what documentation is required. While we are not approved as an official CEU provider, your state may recognize this event as a qualified program, and you may be eligible to earn CEUs for your participation.

Record of Attendance Log at Registration Desk

A Record of Attendance Log will be maintained at the Conference Registration Desk where you can sign in and sign out each day and create a record verifying your daily attendance. Within 30 days upon conclusion of the conference, we will email you a "Certificate of Attendance" indicating the actual number of contact hours you accrued based on your participation hours recorded in the attendance log. It is your responsibility to compile all necessary paperwork and provide it to the appropriate licensing board or professional organization with whom you are certified, and to confirm this program content is acceptable based on their individual standards.

IMPORTANT NOTE: In general, one Continuing Education Unit (CEU) is defined as 10 hours of instruction. One hour is calculated as 50 minutes of face-to-face instruction. If you have any questions regarding CEU requirements as they pertain to your professional certification or license, please directly contact the appropriate licensing board within your state. The University of Florida, Office of Conferences & Institutes and its employees are not authorized to act on your behalf or to provide consult regarding CEUs.

Additional Information

Free Internet Access

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Abstract Compilation

The following abstracts are listed alphabetically by presenting author's last name.
Presenting author names appear in **bold.**

HYDROLOGICAL VARIATION AND ENZYMIC DECOMPOSITION IN WETLANDS

***Zuhair AlQulaiti*[1]**, *Christian Dunn*[1], *Tim Jones*[1] *Sandrine Hugron*[2], *Line Rochefort*[2], *Chris Freeman*[1]
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Despite covering only 3% of the Earth's land surface, boreal and subarctic peatlands store about 15-30% of the world's soil carbon as peat. Historically, peatlands have contributed to global cooling on a millennium timescale. Whether peatlands will continue their function as net C sinks remains uncertain, and depends on the impact of environmental factors, not least of which is hydrological conditions. This issue is particularly important in Canada, where more than 12% of the land area is covered by peatlands, which means around 56% of organic carbon stored in that soil, and thus Canada was selected as the focus of this study. Hydrological conditions can radically influence decomposition in peat, and such conditions are anticipated to become more extreme under changing climate. Moreover, the impairment of enzyme activities (through the enzymic latch) in wetlands has an important role in increasing carbon sequestration by reducing the decomposition of organic matter. The main objective of this study is to determine the effect of the fluctuation water table level on the decomposition under the following conditions:

1) Stable water table between 0 and -5 cm (Control)
2) Stable water table between -10 and -15 cm
3) Stable water table between -20 and -25 cm
4) Fluctuating water table between +5 and -35 cm over 10 days cycle period,
5) Fluctuating water table between +5 and -35 cm over 30 days cycle period.

These treatments created substantial changes in the enzyme activities associated with decomposition, with the greatest impacts seen in the systems experiencing the greatest hydrological variability. Our findings suggest that climate change towards a climate system with more hydrological variability threatens to destabilize our peatland carbon stores. The interdependency of respiration rates, transport, and air filled porosity, changes in water content near saturation will most likely have a strong impact on rates of respiration in the unsaturated zone of many peat soils.

BIO: *Zuhair AlQulaiti*, is a PhD student with 3 years of experience of wetland enzyme research. He is developing experience in studying carbon cycling, the influence of decomposition on greenhouse gas emissions.

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SOIL NUTRIENT ENRICHMENT POST HYDROLOGIC MANAGEMENT: A TEMPORAL ANALYSIS OF TAYLOR SLOUGH

***Kaylee August**[1,2], Paul Julian[1], and Todd Osborne[1,2]*
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Taylor Slough, a dominant drainage feature in northeastern Everglades National Park, is a landscape with predominantly marl and organic soils. The slough receives flow from rainfall and water control structures directly north. Water management practices varied in intensity and scope from the 1960's to the early 2000's, resulting in variable phosphorus (P) loading to the slough which has contributed to vegetation shifts from sawgrass to cattail. New best management practices (BMPs) lead to highly reduced P concentrations in the water column, however, recent studies have identified variability of topography, hydrology, and ecology to be significant factors driving P enrichment. This study aims to compare two sampling periods to further assess P enrichment and cattail expansion by evaluating soil properties. Soil nutrient properties (total carbon (TC), total nitrogen (TN), total phosphorus (TP), inorganic P, loss on ignition (LOI), and bulk density (BD)) were collected on two separate occasions (2007 and 2013) in the wet season. The study observed a consistent range of values for all soil nutrient properties in 2007 and 2013, while almost all (except bulk density) had lower overall mean concentrations for 2013. The later sampling exhibited greater inorganic P (21-620 mg kg^{-1}) spread in the soil as compared to 2007 (90-354 mg kg^{-1}). Bulk density displayed increased spread in the 2013 sampling period as compared to 2007, with ranges from 0.13-1.29 g cm^{-3} and 0.06-0.31 g cm^{-3} respectively. The rainfall and stage data show lower averages in 2013 as well. The lower stage and rainfall averages in 2013 lead to greater variability of inorganic P, but decreased the overall average of TP in the soil. Though stage/rainfall was lower, inorganic phosphorus fractions were greater in spread in 2013 and BD increased. In conclusion, lower stage and rainfall lead to increased oxidation of organic materials and greater variability of inorganic P fractions within the system. The loss of the historic organic soils could lead to the ever-increasing enrichment of the Everglades, potentially expanding cattail presence in Taylor Slough.

BIO: Kaylee August is a graduate student at the University of Florida Soil and Water Sciences Department and the Whitney Laboratory for Marine Biosciences under Dr. Todd Osborne. Her research involves phosphorus enrichment and cattail expansion in Taylor Slough of the Everglades National Park.

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BIOGEOCHEMISTRY OF TRACE ELEMENTS IN CARD SOUND, FLORIDA INVENTORY AND ANNUAL TURNOVER CIRCA 1973

Joseph L. Gilio *Presented by:* ***Richard Baker***

Joseph L. Gilio, independent researcher, Palm City, FL, USA

An inventory of trace transition elements Vanadium [V], Copper [Cu], Cadmium [Cd], Lead [Pb] was developed for the Card Sound ecosystem circa 1973. This work determined metal concentrations of water and organisms collected and analyzed in 1973 [this study] with simultaneous studies of geology, sediment and plant and animal populations and productivies using the same Card Sound grid by respective experts during 1970-73. This subtropical calcareous based, moderately flushed embayment was then on the fringes of rapid development from the Miami metroplex and nearby nuclear power plant. Organisms and water samples (this study) and sediment analysis by Pellenbarg,1973 were analyzed by atom reservoir atomic absorption spectrophotometry. The procedure eliminated matrix interference. Accuracy compared to NBS Orchid Leaves was Fe @ 95%, Cu@ 92%, Zn@96%, Cd@100% and Pb@ 98%; In 1973, no biological NBS standard for V existed. Significant differences within given species trace metal concentrations existed based on location within Card Sound. For mass model development and biological fluxes, such aerial differences were combined to produce a three-box model of organisms, water, and total sediments of Card Sound, Florida.

This model incorporated the entire sediment volume masses of mean depth of 46 cm. Such a small total sediment volume of calcareous sediment was expected to magnify the influence of the ecosystem's biota in the interactions between sediment, water and biota and their radionuclides. In agreement with other studies, the total ecosystem mass of V, Fe, Cu, Zn, Cd, and Pb were highest in sediment; whereas water mass for V and Fe were greater than the total biota standing stock. Biota mass balance for Cu Zn, Cd and Pb were greater than water column but less than sediment. Thalassia testudinum [turtle grass] had trace element standing stock highest for all elements, followed closely by sponges, with large rooted calcareous algae approximately an order of magnitude lower. Corals were lacking. Phytoplankton, epiphytes, and invertebrates constituted minor components of the biological trace element inventory. Trace elements sinks in Card Sound ca. 1973 were sediment and biota.

A major forcing function for trace transition movement from sediment and water was net primary production of turtle grass and its epiphytes, respectively, through 790 g (dry wt.)/m^2/yr or 82 % of the biological dry wt. matter production of the sound [Thorhaug, 1973]. Annual net primary and secondary production incorporated 2.1 X more Fe and 8.9 X more V than all other biota. Net photosynthesis production across all primary produces –seagrasses, epiphytes, calcareous algae- incorporated (Kg /yr) Fe [1.8 $x10^{4]}$; Zn [3.5 x10 ^{3}]; V [1.3 x10 ^{3}]; Cu [3.7 x 10 ^{2}]; Pb [3.5 x l 0 ^{1}]; and Cd [1.0 x l0 ^{1}]. Turtle grass blade multiplication and growth accounted for major movement of Fe, Pb, and Cd from sediments into this species and its seasonal blade death and decay return to the sediment. Taxonomic biota groups concentrated trace elements in decreasing order of Fe, Zn, V, Cu, Pb, and Cd. Turtle grass sediment uptake yielded residence times of 15 days for Zn and 230 days for Cd. All others- Fe, V, Cu and Pb sediment residence times ranged from centuries to millennia. Zn nutrient limitation is probably avoided especially if turtle grass dynamic" pumping" from water also exists, then implications for radionuclide releases from nuclear power plants into such carbonate rich thin sediment areas indicate high mobility of Zn 65 from sediment into the biological food chain. Tidal water dynamics transported 1.2X Fe and 53X copper into and out of Card Sound than biological incorporation. Tidal exchange dynamics indicate oceanic exchanges directly with a small part of Card Sound, so that biological cycling of trace elements appears more important than tidal flushing. Tidal exchange netted outflows of Zn and Cd and a net inflow of Fe, Cu, and Pb. Card Sound water concentrations influenced by tidal exchange mass balance dynamics compared oceanic flushing with biological turnover [days/kg/day] –Fe [50/49], Zn [25/9.5], Cu [13/1.0], Pb [44/0.096], Cd [60/0.027].

This research originally represented dissertation requirements for the Doctor of Philosophy degree in Marine Science at the Rosenstiel School of Marine and Atmospheric Science, University of Miami, Florida and was performed between 1971 -73. Assistance of Drs. Douglas Segar and Robert Pellenbarg are gratefully acknowledged. This paper originally was prepared for the Sea Grant symposium on Biscayne Bay, Miami, Florida April 1976. Peer review delay prevented its inclusion in the original bound symposium.

BIO: Mr. Gilio, an active retired PWS Emeritus, taught at FIT –Jensen Beach, founded, ran and sold Wetlands Management Inc. He designs and researches water quality improvement for lakes and wetlands. A 4,700 ac. Housing projects achieved TMDL for TP. PLAN GO supplemental to CERP at www.joegilio.com

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TURNING A LIABILITY INTO AN ASSET: CAN WE USE THE INVASIVE APPLE SNAIL *POMACEA MACULATA* IN BIOMONITORING OF METAL CONTAMINATION IN FRESHWATER MARSHES?

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The apple snail *Pomacea maculata* is an invasive species that has recently been introduced and is now present in several Louisiana marsh areas. The introduction and range expansion of this species are bound to have a variety of ecological consequences. One potential effect is that the presence of this species will modify the biogeochemical cycling of metals. However, the introduction may also have a favorable aspect by providing us with a species that may be well suited for biomonitoring for environmental contaminants such as heavy metals.

We are currently conducting research that will provide insights into both aspects of the snail's introduction. In the laboratory, snails were maintained in water at a range of levels of a metal such as copper (Cu) and the metal levels are being quantified in their gills, lung, kidney, gut, digestive and reproductive glands. Results of these analyses will provide an indication whether the snails are efficient metal bioaccumulators and what tissues are best suited for biomonitoring. In order to determine the relationship between metal bioaccumulation in the apple snail and metal levels and distribution in the environment, we are comparing metal levels in snail tissues, plants, sediment and water collected from two sites that differ in physicochemical parameters.

Levels of the metal lead (Pb) are also being quantified in shells and operculum, with a novel method employing Particle Induced X-Ray Emission (PIXE) which will provide information on patterns of accumulation of lead.
The research is ongoing; results will be presented at the meeting.

BIO: Sanjana Banerjee is a PhD student working in Environmental Toxicology under the guidance of Dr. Paul Klerks. Originally from India, she graduated with B.S. and M.S. degrees in Zoology. She is interested in the ecotoxicological consequences of the introduction of the invasive snail *Pomacea maculata* and their use as biomonitors.

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A LITTLE RETRO: VALUING AN UNDERSIZED URBAN STORMWATER WETLAND RETROFIT

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Legacy stormwater systems primarily designed for efficient drainage have led to channel erosion and sedimentation as well as nutrients and pathogen exports that have degraded and impaired urban streams. Current regulations for most municipalities require stormwater control measures to address the impacts of increased impervious cover. However, developed landscapes can constrain retrofit options as existing infrastructure and available space prevent certain options while limiting the size of other options. Under-sizing stormwater control measures is a possible solution for retrofitting urban watersheds if the scalability of functions can be understood better. Greens Mill Run is a coastal plain stream impaired by excess stormwater runoff from the urban core of Greenville, North Carolina. At nearly 50% impervious, East Carolina University's (ECU) main campus is a significant contributor of stormwater volumes and nutrient loads. In 2013, a dry detention basin was regraded to construct the Mark Brinson Stormwater Wetland on ECU's campus. Due to topographic and infrastructure limitations the wetland was only 20% of the typical full design size for the contributing watershed. Flow monitoring and water quality sampling of inflows and discharges were performed between August 2015 and August 2016. Water quality treatment lagged behind conventional credits, however flood mitigation and other ecosystem services provide typically unquantified value as well. The low residence time limited water quality treatment. However, other functions (flood reduction, habitat, education, etc.) have provided ecosystem services and value that can commonly be overlooked.

BIO: Dr. Bean is an assistant professor and extension specialist of urban water resources engineering at the University of Florida. Much of his work focuses on urban stormwater management. Prior to his current position, he spent four years at East Carolina University as an assistant professor in the Engineering Department.

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SHIFTING FIRE REGIMES AND THE FUTURE OF PEATLAND CARBON STORAGE

Brian W Benscoter
Florida Atlantic University, Davie, FL, USA

Disturbance is of critical ecological importance from populations to ecosystems. Natural systems have an inherent capacity to respond to natural disturbances, often adapting their core attributes to include disturbance in their ecology. But what happens when the disturbance itself becomes disturbed? Where do the bounds of this capacity lie and what are the consequences of exceeding these thresholds? In wetlands, the interplay of fire and drought exert considerably influence on their ecology and carbon cycling, particularly peatlands of boreal and tropical biomes. Their thick, carbon-rich organic soils have adaptive protection mechanisms that decrease soil combustion risk during wildfire, even while in some cases promoting intense surface or canopy fire behavior. However, the dense organic soils can become vulnerable fuels during severe drought, leading to scenarios of more severe fire effects and potentially compromised post-fire ecosystem resilience. Plant invasions, particularly by shrubs, further compromise ecosystem resilience by altering fire behavior and ecosystem recovery. Carbon storage in peatlands is the result of a delicate balance between storage and loss with a fine margin sensitive to extremes. Therefore, identifying tipping points in regime change for disturbance and its underlying drivers is critical for protecting the resilience of these valuable ecosystems.

BIO: Dr. Benscoter is Associate Professor of Wetland Plant Ecology at Florida Atlantic University and Vice-Chair of the South Atlantic Chapter of the Society of Wetland Scientists. He has over 15 years of experience researching wetland fire ecology and carbon cycling from sub-arctic to sub-boreal biomes.

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TIDAL WETLAND BIOGEOCHEMISTRY IN HIGH DEFINITION: USING HIGH-FREQUENCY MEASUREMENTS TO ESTIMATE BIOGEOCHEMICAL RATES

***Brian A. Bergamaschi**, Bryan D. Downing, Tamara E.C. Kraus*
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Tidal wetlands are hydrodynamically complex, varying over temporal scales from minutes to decades and spatial scales from centimeters to kilometers. Our understanding of fundamental biogeochemical processes in these environments is often biased by sampling strategies that alias the intrinsic signal by sampling at spatial and temporal intervals far too coarse to capture true variability, to accurately quantify flux or to adequately relate process rates to spatial and temporal scale. We have been using measurement techniques aimed at improving our understanding of biogeochemical processes, both to provide insight into mechanisms driving changes as well as to improve society's ability to manage and improve our aquatic resources. However, many challenges remain for improving our understanding of biogeochemical processes in these complex environments.

Recent developments in field instrumentation have improved our ability to resolve chemical, isotopic and compositional differences directly in the environment, making measurements rapidly enough to avoid aliasing the signals of physical and biological processes. Measurements using such instrumentation fundamentally alter our understanding of biogeochemical processes, and call into question the accuracy of monthly, weekly, and even daily sampling to assess flux, as well as the ability of laboratory mesocosms to characterize environmental process rates adequately. We will present three examples of using such instrumentation to determine biogeochemical rates.

We will show how we used in-situ optical instrumentation in combination with acoustic measurements to quantify constituent fluxes (Hg, MeHg, DOC) as well as examine changes in sources and processes over daily to seasonal scales in a tidal marsh. We will also show how we used data from paired in-situ, high frequency (15-minute) sensors to evaluate rates of change in nitrate concentration, and then to estimate water column nitrification rates. Finally, we will show how we used the relationship between spatial variation of water residence time and concentration to assess environmental rates, using transects of hydrogen and oxygen isotopes in water (δ^2H, δ^{18}O) to estimate residence time. These isotopes are unique tracers for evaporation and thus may be used in conjunction with independently determined evaporation rates to evaluate water residence times. The relationship between residence time and change in concentration provides a direct measurement of rate.

Although these and other methods represent provide improved means of understanding and quantifying biogochemical rates and processes, substantial challenges remain. For example, methods for establishing the spatial scale of interactions, for long-term assessment and for comparing and extrapolating measured values across spatial scales are needed. We will discuss opportunities for improvements in existing methods and directions in the incorporation of high frequency measurements into wetland biogeochemical studies.

BIO: Dr. Bergamaschi is a biogeochemist with the USGS, and adjunct faculty with CSUS in Sacramento. He graduated from University of Washington, where he studied the cycling of natural organic material, between skiing and climbing trips. His interests mainly lie in developing new methods to quantify biogeochemical rates and in messing around on boats.

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RAPID FORMATION OF POTENTIAL ACID SULFIDE SOILS FOLLOWING WETLAND RESTORATION – A CAUTIONARY TALE

Jacob F. Berkowitz, *Christine VanZomeren*
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Many coastal wetlands contain iron sulfide (FeS) minerals, which may generate substantial acidity (soil pH<4.0) during drought or disturbance due to oxidation and formation of sulfuric acid. The formation of iron sulfides occurs following microbially driven reduction of Fe^{3+} and SO_4^{2-} under anaerobic conditions, with subsequent chemical complexation of Fe^{2+} and S^{2-}. Globally, increasing numbers of salt marshes show signs of degradation due to fragmentation, lack of sediment inputs, and storm damage which may be exacerbated by sea level rise and increasing storm frequency/intensity. As a result, resource managers seek to restore marshes via introduction of sediment to increase marsh elevation and offset degradation. However, the rapid formation (<12 months) of FeS materials has been documented in several marshes following restoration activities that introduced sediment onto the marsh surface; leading to concerns regarding restoration outcomes and potential soil acidification. To investigate these reports a laboratory microcosm study monitored the formation of FeS following simulated restoration activities. Results indicate that FeS layers developed within as few as 16 days, encompassing up to 30% of the soil profile within 3 months. Factors influencing FeS formation included hydropattern, soil oxidation-reduction potential, and concentration driven diffusion gradients of Fe^{2+} and S^{2-}. Permanently inundated conditions resulted in the highest FeS content observed, compared to drained and simulated tidal experimental treatments. The study highlights the need to consider biogeochemical factors resulting in potential FeS formation and soil acidification during restoration planning, implementation, and monitoring.

BIO: Dr. Berkowitz is a research soil scientist and team leader for wetlands research at the US Army Corps Engineer Research and Development Center. His work supports wetland biogeochemistry, assessment, and restoration across the United States resulting in the publication of >50 journal articles, book chapters and technical reports.

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CARBON REMINERLAIZATION AND BURIAL IN THE COASTAL MARGIN: LINKAGES IN THE ANTHROPOCENE

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The majority of organic carbon (OC) in the global ocean is buried in the coastal margin. In particular, river delta and non-deltaic shelf regions bury an estimated 114 Tg C year^{-1} and 70 Tg C year^{-1}, respectively, with only ca. 6 Tg C year^{-1} buried in the open ocean. While there has long standing general agreement that continental selves represent the largest sink of both terrestrial (OCterr) and marine (OCmari) OC in the global ocean, our understanding of the spatial and temporal complexity of this region continues to evolve. For example, fjords are now more recognized as "hotspots"of carbon burial with recent estimates suggesting fjord surface area-normalized OC burial rates are at least five times greater than other marine systems and one hundred times greater than the entire ocean average. Here, I will compare and contrast some of the key molecular biomarkers that have been used to date to track OC across different depositional environments (e.g., large river deltas and fjords) and explore how margin-type, residence time of transport, reservoir dams, redox, priming effects, and molecular stability, impact the utility of using different biomarkers in coastal OC cycling. Finally, I will focus on important critical zones within the aquatic continuum from land-to-sea and examine how more attention is needed better understand OC cycling in these new dynamic interfaces in the Anthropocene.

<u>BIO:</u> Dr. Bianchi is currently a full professor and holder of the Jon and Beverly Thompson Endowed Chair in Geological Sciences at the University of Florida (UF), Gainesville, Florida. Before joining UF I held full professor positions at Tulane University and Texas A&M University. My general areas of expertise are organic geochemistry, chemical oceanography, and global carbon cycling in aquatic ecosystems. I have published over 210 articles in refereed journals and am sole and/or co-author of 7 books, with another book on *Chemical Oceanography of the Gulf of Mexico* - due out in 2018. I am currently Editor-in-Chief of the journal *Marine Chemistry*, and have served as an Associate Editor for numerous other journals. I am the recipient of two Fulbright Research Awards, became a *Fellow of the American Association for the Advancement of Science (AAAS)* in 2012, and in 2017 was named *Geochemical Fellow of the Geochemical Society (GS) and The European Association of Geochemistry (EAG)*, and *Fellow of the Association for the Sciences of Limnology and Oceanography (ASLO).*

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GREENHOUSE GAS POTENTIAL OF A CONSTRUCTED STORMWATER WETLAND

***Regina B. Bledsoe*[1]**, *Eban Z. Bean*[2], *and Ariane L. Peralta*[1]
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[2]University of Florida, Gainesville, FL, USA

Impervious surfaces in urban areas increase stormwater runoff leading to nuisance flooding. Constructed stormwater wetlands (CSWs) are designed to capture stormwater runoff and mitigate flooding in urban areas. CSWs can also provide the additional benefit of removing nutrients and pollutants (i.e., ecosystem service). However, a negative consequence of nutrient cycling can occur when environmental conditions support alternative microbial functions such as greenhouse gas (GHG) production (i.e., ecosystem dis-service). Few studies have addressed this tradeoff between ecosystem functions in constructed wetlands. The objective of this study is to characterize seasonal GHG rates and denitrification potential in permanently inundated compared to shallow areas within an urban CSW. We hypothesized that permanently inundated areas will have higher GHG rates than shallow land areas, but that shallow areas will have similar denitrification potentials to deep pools. Our study site is a 0.05 ha CSW that is adjacent to a 2.3 ha parking lot on East Carolina University's campus in Greenville, NC. The CSW is divided into five main zones (% surface area): shallow land (35%), shallow water (35%), deep pools (10%), forebay (10%), and outlet pool (10%). We measured GHG fluxes for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from the inlet to the outlet in permanently saturated pools and shallow areas throughout the wetland. We collected water monthly for nutrient analysis (e.g., ammonium, nitrate, phosphate) and soil seasonally for moisture, pH, and inorganic N concentrations. We also determined denitrification potentials of soils using lab-based denitrification enzyme assay (acetylene block method). Preliminary results indicate permanently inundated pools have the highest production of GHGs, while shallow land areas produced the lowest rates of GHG production. Shallow land soils and permanently saturated sediments were similar in potential denitrification rates. This indicates that when shallow land is saturated, then anaerobic denitrification can proceed to support complete nitrate removal. Deep pools are favorable in CSWs to reduce sediment loads and support denitrification processes; however, these deep pools are major sources of methane. Thus, increasing shallow land area within CSWs may reduce tradeoffs in ecosystem functions by increasing complete nitrate removal via denitrification but limiting methane production.

BIO: Regina Bledsoe is a PhD student in the Interdisciplinary Program of Biological Sciences at East Carolina University. She is a National Science Foundation Graduate Research Fellow and a North Carolina Sea Grant and Water Resource Research Institute Fellow. Current projects involve understanding how microbial communities participate in wetland nutrient cycling.

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VEGETATION RESPONSE AND ELEVATION CHANGE IN A PERTURBED HYDROLOGIC REGIME: THE SUBSIDY-STRESS GRADIENT IN A PEAT-BASED FLOODPLAIN MARSH

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Flood control projects are often faced with conflicting management objectives. Wetland restoration based on environmental hydrologic criteria can be at odds with stage elevations and frequencies resulting from flood control strategies in the watershed. Increased hydroperiods have been shown to decrease cover of emergent species and create a gradient that alters vegetative community structure; while decreased hydroperiods result in upland species encroachment and peat loss by subsidence. Prior to flood control levee construction in 1991, Fort Drum Marsh Conservation Area (FDMCA) was bordered by an incomplete agricultural levee that allowed unregulated drainage of the FDMCA to the surrounding flow-way. After levee construction, inundation frequencies in several vegetative communities were increased by up to 15% from estimated historical averages. These altered hydroperiods were anticipated to result in herbaceous marsh vegetative community die-off with a shift to an open slough community, as well as increased soil accretion rates. To determine the implications of flood control management activities in a peat-based floodplain marsh, we monitored the vegetative community structure, soil characteristics, and elevation in the FDMCA before and after levee construction. Results from these data indicate that the perturbed hydrologic regime in FDCMA elicited a vegetation response that maximized belowground productivity; resulting in a rise in surface elevation of approximately 1.1 centimeters per year. This rate is approximately 40% greater than accumulation rates measured before management action in FDMCA. Additionally, total acreage of vegetative communities observed in post-management surveys was within 1% of the acreage observed before levee construction. Considering Odum's perturbation theory on stress-gradients, the altered hydroperiods with the FDMCA did not result in a stress to vegetative communities; rather, it provided a subsidy that resulted in increased water storage without a loss in function. Therefore, allowing a system sufficient time to respond to an input is an important consideration when measuring restoration success. As such, we suggest that post-project monitoring is vital to successfully understanding ecosystem response. As natural resource management strategies adapt to changing climate conditions, long-term monitoring will be necessary to evaluate the success of management actions and provide data for incorporation into future approaches.

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UNDERSTANDING MECHANISMS FOR COASTAL MARSH SUSTAINABILITY IN THE FACE OF SEA LEVEL RISE

***Ashley R. Booth*[1]**, *Sammy L. King*[2], *and J. Andrew Nyman*[1]
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Coastal wetland loss is prevalent in the Chenier Plain of Texas and Louisiana, a region influenced by altered hydrology, subsidence, and saltwater intrusion. These wetland losses are projected to become more dramatic with increasing sea level rise associated with climate change. Historically, marshes were able to keep pace with sea level rise by gaining elevation through negative feedback systems that promoted accretion during periods of inundation. Now, altered hydrology and reduced sedimentation are common in Chenier Plain marshes and may be affecting rates of marsh accretion. Management practices designed to improve wildlife habitat such as water level manipulation, prescribed burning, and herbicide usage also affect processes governing marsh elevation, though the mechanism of how this occurs is only partially understood. Ultimately, any changes to the balance between elevation gains and losses within these systems will influence sustainability in relation to sea level rise.

Managed marsh impoundments are particularly vulnerable, as water level drawdowns designed to increase annual plant production have led to significant elevation losses at multiple sites. These losses are initially due to increased organic decomposition as the marsh surface is exposed to air. As drawdowns continue to occur and elevation decreases, drainage becomes more difficult and vegetation becomes stressed. Stressed plants decrease their belowground productivity and accretion, and inadequate accretion combined with increasing decomposition rates contribute to eventual marsh loss. In impoundments that can no longer drain, plant communities often initially transition to flood-tolerant, perennial emergents that grow in monodominant stands and produce little food for waterfowl. Despite their apparent lack of wildlife value, there is some interest in managing impounded marshes for perennial emergent vegetation in the hope of increasing soil elevation and long-term marsh sustainability.

To that end, our study will examine the effects of perennial plant community type (*Phragmites australis, Scirpus californicus,* and *Typha* spp.) and water level on changes in processes that govern marsh surface elevation. We will also evaluate the interplay of these processes on the feedback systems that influence elevation and, ultimately, marsh sustainability. At J.D. Murphree Wildlife Management Area in Port Arthur, Texas, in a permanently flooded impoundment, rod-surface elevation tables will be used to assess changes in surface elevation. Feldspar marker horizons, root and rhizome decomposition bags, and ingrowth cores will be used to measure accretion, nutrient dynamics and decomposition rates, and belowground productivity, respectively. In a nearby impoundment that is periodically drawn down, soil carbon flux will be measured in each of the three perennial plant community types. By examining the relationships between the processes that drive marsh sustainability and evaluating the influence of plant community and water level on marsh surface elevation, we will gain a better understanding of how marshes behave under permanently inundated conditions. Ultimately, we hope to inform alternative management strategies that will increase soil elevation gains in coastal marshes in the Chenier Plain and globally, thereby bolstering these dynamic ecosystems against increasing sea level rise.

BIO: Ashley R. Booth is a PhD Student studying coastal wetland ecology at Louisiana State University. She has a background in veterinary medicine and completed a Master's thesis on endocrine disruption in blue crabs in 2016. Her research interests include coastal land loss, ethnobotany, and science communication.

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MEASURING CONTINUOUS GREENHOUSE GAS FLUXES FROM PACIFIC NORTHWEST TIDAL WETLAND SEDIMENTS FOLLOWING SALT-WATER INTRUSION

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Coastal and fluvial wetland ecosystems near the landward limits of salt water can function as depositional regions for terrestrial nitrogen (N) and carbon (C) bound for the ocean. Long-term trends indicate that salinity is migrating substantially landward in many regions, and is predicted to do so in coming decades in the Pacific Northwestern USA. Changing hydrologic and salinity regimes at the intersection of river-basin and coastal-nearshore processes in turn can produce shifts in soil bio-chemistry. The impacts of these shifts on C and N cycling depend in large part on microbial community function. In this study, we sought to discern the sensitivity of coastal wetland soils to altered hydrologic and salinity regimes. Our overarching goal was to quantify shifts in CH_4, CO_2, and N_2O fluxes from a tidal freshwater wetland community in response to salt water intrusion. Understanding the effects of large-scale disturbances on the function of coastal wetlands as greenhouse gas sources or sinks is critical to improving process-rich models of climate change effects. Changes in porewater salinity are expected to overwhelm the salt tolerance of some plant and microbial communities. However, the magnitude and time frame of responses to saltwater intrusion by soil microbial communities in these ecosystems, as measured by greenhouse gas flux, are not well studied. We aimed to address this knowledge gap through hypothesis-driven experiments on intact soil cores in the ambient coastal environment.

Based on the variable tolerance of microbial taxa to salinity, we hypothesized that sudden changes in salinity regimes would affect community functions including the emission of greenhouse gases. We used a coupled cavity ring-down spectrometer and automated chamber system suitable for sampling rapidly changing conditions. We conducted a greenhouse gas flux experiment outdoors at a coastal laboratory in three, 4-month phases. Each phase continuously sampled six 15 cm-deep by 15 cm-diameter tidal freshwater wetland soil cores on an hourly basis. We compared freshwater and 4 ppt salinity treatments under saturated and tidal (periodic saturation) conditions in different combinations during the phases.

We found that the C contribution from CO_2 was suppressed by the saturated treatment compared to the tidal treatment, and the tide-in condition was suppressed compared to the tide-out condition in both the 4 ppt treatment and freshwater treatment. When the tide was out the 4 ppt treatment suppressed the evolution of C as CO_2compared to the freshwater treatment. The 4 ppt condition suppressed C as CH_4 compared to freshwater under saturated conditions. Further, tidal inundation suppressed C flux as CH_4 compared to saturation and both negative and positive fluxes occurred. The contribution of N from N_2O spiked as the tide shifted in the 4 ppt and the freshwater treatments, however the magnitude was lower in the freshwater treatment.

These results indicate that under a sea level rise scenario, saltwater influx at a 4 ppt level would suppress C evolved as CH_4 and to a lesser degree CO_2. Saturation, when achieved, would also suppress C evolved as CO_2. However, the contribution of N from N_2O would increase with salinity, spiking during tidal fluctuation.

BIO: Amy Borde is a senior research scientist with more than 20 years of experience in wetland ecology. She has extensive experience with wetland research, particularly evaluating the effects of varying environmental conditions on wetland response.

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SEDIMENT PHOSPHORUS SPECIATION AND DISTRIBUTION IN COASTAL LA SEDIMENTS: IMPLICATIONS FOR HYPOXIA AND FOOD WEB DYNAMICS

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Excess loading of phosphorus (P) and nitrogen (N) into aquatic systems leads to degradation of water quality and diminished important ecosystem services. In the Northern Gulf of Mexico (NGOM), excess P and N loading has led to a seasonally present hypoxic area with less than 2 mg/L O2 in bottom waters, approximating 26,000 km2 in size in 2017. A sequential extraction (SEDEX) method was performed on surficial sediments from five different coastal and shelf sites as a function of distance from the Mississippi River mouth in the NGOM. To better quantify temporal variability in P distribution and speciation, samples were collected during both low (August) and high (May) river flow regimes. Sequential extraction techniques have been successful in separating pools of P into exchangeable or loosely sorbed P, Fe-P, Authigenic-P, Detrital-P, and Organic-P. Preliminary analyses suggest that May P concentrations are significantly higher than August P concentrations. There was no consistent trend in P concentration with sediment depth. The 0-10 cm sediment interval was characterized by a mean moisture content of 58.7% ± 12.1% and a mean bulk density of 0.582 ± 0.275 g/cm3. Continued monitoring of sediment P speciation and cycling is critical for understanding coastal eutrophication and informing effective nutrient management strategies to combat hypoxia.

BIO: Katie Bowes is a Graduate Research Assistant in the Wetland and Aquatic Biogeochemistry Lab at Louisiana State University. Katie's research focuses on phosphorus speciation and distribution in coastal Louisiana as a function of seasonal hypoxia.

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ARE CARBON BURIAL RATES IN THE COASTAL EVERGLADES HIGHER NOW THAN THEY WERE A CENTURY AGO?

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Sea-level rise (SLR) is likely to have deleterious effects on soil organic carbon (SOC) in coastal wetlands because of increasing salinity and water depths that will cause alterations to biogeochemical cycling and vegetation distribution and productivity. However, SLR also has beneficial effects on SOC, and has been necessary for the accumulation of extensive peat soils in coastal wetlands over past millennia. Changes in rates of SLR have been shown to drive variability in vertical accretion rates in coastal wetlands over centennial timescales, which suggests that a similar effect may be discernible for OC burial rates. In southwest Florida the rate of SLR recorded at the Key West tide gauge averaged 2.3 mm yr^{-1} from 1913–2012, but may be accelerating as the average rate from 2003–2012 was 6.3 mm yr^{-1}. We consider whether this potential acceleration in the rate of SLR has influenced rates of soil accumulation and ultimately OC burial at two sites that are 9 km and 18 km upstream from the Gulf of Mexico in the coastal Everglades. Each site consists of riverine mangroves that border interior freshwater/brackish marshes. At each site we compared rates of SOC burial in the mangrove and marsh stations over the past 100 years to assess whether rates vary as a function of vegetation type. Additionally, we utilized soil core profiles of SOC burial rates, nutrient ratios (total Nitrogen and total Phosphorous), stable isotopes ($\delta^{13}C$ and $\delta^{15}N$), and total lignin content to quantify acceleration of rates within each core.

Average rates of SOC burial in the mangrove sites were higher than in the marsh sites for both locations over the last 100 years and in the most recent decade. Lignin burial rates increase in recent years, and suggest that rates of SOC burial are greater now than they were a century ago at these locations. Similarly, a sharp decrease in TN:TP ratios over the past century in the marsh core 9 km upstream from the Gulf of Mexico indicates that SLR may be influencing the acceleration by supplying P-rich marine water. These findings suggest that the SOC burial capacity of these wetlands is likely to increase in the coming decades because of continuing acceleration within the sites as a function of SLR and as mangroves encroach on marsh locations. However, increased burial rates will occur only so long as wetland vegetation and soil can keep pace with accelerating SLR.

BIO: Dr. Breithaupt is a postdoctoral scholar in the Aquatic Biogeochemistry Lab of Dr. Lisa Chambers at the University of Central Florida.

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HIGH-FREQUENCY TREE CH_4 FLUX MEASUREMENTS REVEAL RELATIONSHIPS WITH TREE PHYSIOLOGOY AND ENVIRONMENTAL PROPERTIES

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Emissions of CH_4 from the stems and shoots of living upland trees is a recent discovery with significant implications for CH_4 budgets. Forest soil CH_4 uptake is the greatest terrestrial CH_4 sink, but studies have shown this may be partially or fully offset by tree CH_4 emission.
Our ability to quantify and constrain this tree source has been hampered because the ultimate biological source(s) of CH_4 is unclear and because it is demanding to make frequent measurements of these fluxes across a full ecosystem.

We measured CH_4 fluxes from two species (*L. tulipifera, F. grandifolia*) of living tree stems (30-120 cm, diameter at breast height) in an Eastern North American deciduous forest over 150 consecutive days. We built an automated gas manifold that sampled each tree at two hour intervals, quantifying CO_2 and CH_4 chamber headspace concentrations with a laser spectroscope (Los Gatos Inc. – ABB).

We observed wide intraspecific differences in average flux rates and diurnal dynamics, even between adjacent individuals. Tree CH_4 fluxes ranged from mildly consumptive to moderately productive and were sensitive to ambient CH_4 concentration. Ongoing analyses indicate that soil and tree moisture increase tree CH_4 emission on multi-day time scales. We observed a relationship between CO_2 and CH_4 stem emissions which may be due to coincident changes in mobility (i.e., transpiration) or production (i.e., respiration and methanogenesis) of gases.

Our results indicate the primary CH_4 source is likely within the tree tissues, not in soil or groundwater. They also provide promising signs that tree CH_4 flux, which is currently demanding to measure at ecosystem scales, may be able to be estimated with more easily quantified environmental properties like soil moisture and rates of ecosystem respiration.

BIO: Dr. Brewer is a CH_4 biogeochemist and microbial ecologist, he is currently a Smithsonian post-doctoral fellow. Previously, he studied soil greenhouse gas fluxes and nutrient cycling in agricultural and grassland soils with Joseph von Fischer at Colorado State University.

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LINKING MICROBIAL EXTRACELLULAR ENZYME ACTIVITIES WITH RATES OF PLANT LITTER DECAY

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Although plant litter decomposition is a complex process influenced by a multitude of organisms and environmental factors, microbial activity and extracellular enzyme expression are eventually the rate-limiting step of plant litter decay. While many authors have attempted to link microbial enzyme activity to rates of plant litter decay through a range of ecosystems, relationships between the two in wetland ecosystems remain unclear. To better understand the link between enzyme activity and decay in wetlands, we performed a meta-analysis of reported leaf litter decay rates in relation to expression of extracellular enzyme production by microorganisms. To further elucidate these relationships, we investigate whether, in nutrient limited environments, enzyme activity aimed at obtaining a limiting nutrient may correlate more strongly with rates of litter decay than activities of other enzymes. Using Spearman's Rank correlation coefficients, we found a significant positive correlation between enzyme activities and rates of plant litter decay. Specifically, plant litter decay was strongly correlated to relative nitrogen and sulfur enzyme activity, regardless of nutrient limitation, however there was no relationship between relative phosphorus enzyme activity and litter decay in all environments. Better knowledge of relationships between litter stoichiometry and extracellular enzyme activities will improve our understanding of nutrient limitation of decomposition processes and relative relationships between microbial extracellular enzyme activity and plant litter decay.

BIO: Dr. Castle is a postdoctoral scholar whose research explores the interface between wetland restoration, plant ecology and biogeochemical cycling. She received her Ph.D. in Ecology at UC Davis studying plant litter decomposition, microbial enzyme activity and nitrogen fixation processes in restored wetlands of California.

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SHORT-TERM RESPONSE OF FESHWATER WETLAND SOILS TO SALTWATER INTRUSION

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Sea level rise exposes many freshwater coastal wetland soils to gradual increases in salinity, as well as more frequent salinity pulsing events. The unique chemistry of seawater has the potential to significantly alter soil microbial communities, physiochemical properties, and biogeochemical cycles. Of particular concerns is the effect of saltwater intrusion on soil organic carbon (C) cycling, because the balance between C inputs and losses are a key factor in determining the likelihood a coastal wetland will be able to accrete vertically at a pace sufficient to persist with rising sea levels. Additionally, the soil organic matter also contains vast stores of nutrients (e.g., nitrogen and phosphorus) that may undergo accelerated mineralization following saltwater introduction. Several laboratory-scale studies have been conducted on freshwater wetland soils from varying locations in attempt to better understand the short-term mechanistic response of soil microbial community function and soil physiochemical properties to seawater additions. Key findings indicate that the intrusion of low-salinity seawater (~3.5 to 10 ppt) has the potential to significantly accelerate microbial activity, resulting in increased losses of total C (mainly as CO_2) and nitrogen (mainly as NH_4^+), without any suppression of CH_4 production. In contrast, the effects of low-salinity seawater on phosphorus and dissolved organic C production in freshwater wetland soils are variable and site-dependent.

BIO: Dr. Chambers is an Assistant Professor in the Biology Department at the University of Central Florida and the Principle Investigator of the Aquatic Biogeochemistry Lab. Her research focuses on biogeochemical cycling in wetlands and coastal ecosystems with a particular interest in responses to perturbations (e.g., sea level rise, storm surge, restoration, vegetation community shifts).

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A GLOBAL LATITUDINAL GRADIENT IN PEATLAND ORGANIC MATTER CHEMISTRY

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Peatlands contain around one third of the global soil carbon, with the greatest concentration occurring at high latitudes, and a warming climate is predicted to impact the carbon balance within these systems. While high latitude peatlands seem to be the most sensitive to climate change, a global picture of peat organic matter chemistry is required to improve models of greenhouse gas emissions fueled by peatland decomposition. As a part of the Global Peatland Microbiome Project (GPMP), around 2000 samples of peat were measured with Fourier transform infrared spectroscopy (FTIR) to examine the organic matter functional groups of peat. Carbohydrate and aromatic content, as determined by FTIR, are useful proxies of decomposition potential and recalcitrance, respectively.

Our research questions were as follows:
-Will carbohydrate content of peatlands near the equator be lower than those at high latitudes?
-Will aromatic content of peatlands near the equator be higher than those at high latitudes?
-What does the distribution in peat chemistry mean in terms of a warming climate?

Relative to higher latitudes, lower latitude peat had less carbohydrate content and more aromatic content based on FTIR spectra peak heights. The larger carbohydrate content of high latitude peatlands indicates greater potential for lability and resultant mineralization to form greenhouse gases, whereas the composition of low latitude peatlands is consistent with their apparent stability. Other variables such as elevation and pH can more directly influence carbohydrate and aromatic content, but the overall trend shows peat at lower latitudes is more decomposed than peat at higher latitudes. The combination of low carbohydrates and high aromatics at warmer locations near the equator could foreshadow the organic matter composition of high latitude peat transitioning to a more recalcitrant form with a warming climate.

BIO: Jeff Chanton is on the faculty at Florida State University in the Department of Earth Ocean and Atmospheric Science. He is interested in the controls on organic matter preservation and lability.

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WARMING FACILITATES MANGROVE ENCROACHMENT AND ALTERS BELOWGROUND PROCESSES

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Climate change alters coastal wetland ecosystems both directly through chronic warming and indirectly via influences on plant community structure. In terrestrial ecosystems, both warming and climate-induced plant changes have been shown to alter root dynamics, decomposition and microbial functioning. Though we are beginning to understand the implications of mangrove encroachment for marsh ecosystem processes, we don't yet understand how processes such as belowground carbon storage and soil elevation maintenance will respond to direct climatic warming. Though drivers of both mangrove encroachment and soil elevation differ across the globe, examining the effects of warming on plant and microbial processes can potentially advance our mechanistic understanding of the coastal belowground environment.

Using two passive warming experiments, we measured aboveground plant growth, root dynamics, decomposition rates, carbon stocks, and microbial communities with the goal of examining future wetland soil elevation maintenance and carbon storage. Warming chambers, placed at the ecotone between mangroves and salt marshes in eastern Florida, warmed the air temperature by an average of 2°C. Warmed plots produced two times more salt marsh biomass and taller mangroves with more leaves. Mangroves also rapidly took over the marsh in plots that were warmed. We were surprised to find that warming seems to decrease salt marsh root biomass, particularly in deeper sediments. Conversely, warming dramatically increased root biomass in areas where shrubby mangroves had invaded marshes. These warming-induced increases in root biomass resulted in increased relative surface elevation in less than two years. Despite these increases in organic matter due to the interaction of warming and mangrove encroachment, mangrove roots can decompose 70% more rapidly than marsh roots after one year. Further, mangrove encroachment also changes the soil microbial community structure by decreasing the amount of obligate anaerobic microbes, potentially indicating that soil oxygen availability is higher, which may also alter organic matter decomposition rates. As both mangrove encroachment and warming continue to take hold in some coastal ecosystems, we need a better understanding of the balance of root biomass accumulation and organic matter decomposition, which will be important for maintaining wetland resilience to inundation.

BIO: Samantha Chapman is an ecosystem ecologist and the Anne Quinn Welsh Honors faculty fellow at Villanova University. Sam uses global change experiments and mechanisms lab techniques to investigate coastal and terrestrial forest ecosystems.

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RESTORATION BENEFITS OBSERVED FROM THE BISCAYNE BAY COASTAL WETLANDS PROJECT

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The purpose of the Biscayne Bay Coastal Wetlands (BBCW) project is to contribute to the restoration of Biscayne Bay and adjacent coastal wetlands as part of a comprehensive plan for restoring the south Florida ecosystem. The project redistributes freshwater from existing point source canal discharges to coastal wetlands adjacent to Biscayne Bay providing for a more natural and historic overland flow to remnant tidal creeks. The project will improve the ecological function of saltwater wetlands and the nearshore bay environment by improving salinity conditions for fish and shellfish nursery habitat.

The Water Resources Reform and Development Act of 2014 authorized the Biscayne Bay Coastal Wetlands Project. Elements of these projects have been constructed and operated over the last 5 years.
BBCW Phase 1 is composed of three components: Deering Estate, Cutler Wetlands and L-31E Component. In advance of congressional authorization, the South Florida Water Management District (SFWMD) constructed the Deering Estate Component and installed culverts for the L-31E Component. By expediting the completion of these project features, hydrologic improvements and environmental benefits are already being realized.

Comparison of ecological monitoring data collected during the last six years with previous baseline data, indicates that the project is trending towards success. There is improved water quality to the bay as fresh water is redirected from canals to wetlands via the L-31E Culverts and the Deering Estate Component. Additionally, point source fresh water discharges have been reduced. Monitoring results clearly demonstrate improved hydrologic conditions in response to operation of the Deering Estate pump station (S-700). The BBCW L-31E Interim electric pump was installed in March 2016, and became operational in August 2017.There were no exceedances of Class III marine water criteria for Deering Estate Component and L-31E Culverts.

Vegetation within the vicinity of Deering Estate Flow-way is responding to improved hydrology demonstrated by die-off of upland vegetation, emergence of wetland species and expansion of sawgrass. Surface water salinity decreased to <1 in response to the pumping of fresh water from the Deering Estate Component Pump Station into the historic remnant wetlands in the vicinity of Cutler Creek. Groundwater salinity near the Deering Estate Flow-way also responded to the input of fresh water from S-700 into the historic remnant wetlands, salinity decreased to less than 10. Sawgrass mapping of 470 acres in the Miami Dade-County Preserve wetlands was performed in 2013 and 2017. During that period of time there was a 53-acre increase. The District recently, recommended changes in operation of Deering Estate Pump station using a 25cfs pumping and regime that will improve the condition for developing natural wetland hydroperiods and other recommendations that would improve sheet flow across wetlands.

This presentation will focus on recent restoration benefits in the Biscayne Bay Coastal Wetland Project.

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CONSIDERATIONS IN BLUE CARBON ACCOUNTING WITH MANGROVE RESTORATION – CASE STUDIES FROM SOUTH FUJIAN, CHINA

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Mangrove rehabilitations have been widely carried out to compensate the loss of mangrove wetlands around the world. The restoration practices also contribute to substantial benefit for climate change mitigation through blue carbon sequestration by the created mangrove ecosystem. Suitable habitat conditions, e.g. tidal elevation, substrates and salinity, and dense plantation as well would improve the biomass carbon sequestration. In China, tree mangrove species have been widely used for plantation due to considerations like availability of propagules, cost efficiency and rapid canopy coverage. Although the tree-mangrove forest has faster accumulation in biomass organic carbon (OC) stock, a recent study in South Fujian, China showed that the dwarf *Aegiceras corniculatum* shrub has more a substantial effect on the soil OC accumulation than that of a *Kandelia obovata* forest with similar age (~12-years) and plantation density, and resulted in higher soil OC stock. These suggest that the variability of mangrove species in carbon-sequestration benefit should be considered in the mangrove restorations.

In another study in in South Fujian, China, we also recorded increases in soil OC content and ecosystem OC stock (including the biomass and top 1-meter soil stocks) with forest age in the restored *K. obovata* forests. The ecosystem OC stock was 110.9 TC ha^{-1} at the non-vegetated mudflat as beginning stage of the restoration, and increased to 171.5 TC ha^{-1} at the 12-year site and to 293.6 TC ha^{-1} at the 48-year site. However, accumulation of OC in the soils leaded to increases in carbon gas emissions from the soil to the atmosphere. The warming effects of two trace gases, nitrous oxide (N_2O) and methane (CH_4), would partially reduce (~10%) the carbon sequestrated by the ecosystem in the older forest.

Moreover, anthropogenic nutrient inputs would enhance the greenhouse gas emissions from mangrove soils. For instance, discharge of wash-out wastewater from adjacent shrimp ponds rich in organic matter and nutrient into mangrove wetland had no significant effect on soil carbon dioxide (CO_2) flux; however, the discharge immediately leaded to intensive increase in soil fluxes of N_2O and CH_4, which could be respectively up to ~100 µmolN_2O m^{-2} h^{-1} and ~100 µmolCH_4 m^{-2} h^{-1}, while the fluxes at the non-discharge site were <1 µmolN_2O m^{-2} h^{-1} and <20 µmolCH_4 m^{-2} h^{-1}, respectively. Although the N_2O and CH_4 fluxes faded with sampling time, the enhancement effect lasted for 20 days. We therefore suggested that warming effect of greenhouse gas emissions form mangrove soils, especially those subjected to exogenous nutrient input would reduce the benefit of mangrove restorations in carbon sequestration and it is therefore essential to reduce discharges from various anthropogenic activities, particularly nutrient-rich wastewater.

BIO: Dr. Chen is specialized in mangrove ecology and his research interests mainly focus on the understanding the development of ecosystem structure and functions of restored mangrove wetlands, and the potential of mangrove wetlands to climate change mitigation.

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DISSSOVED OXYGEN SAG EVENTS IN THE PHASE I AREA OF THE KISSIMMEE RIVER RESTORATION PROJECT

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Dissolved oxygen (DO) availability in streams influences the growth, distribution, and structural organization of aquatic communities and thereby impacts the metabolism and productivity of aquatic ecosystems. As an indicator of water quality and the ecosystem's response to hydrologic and physical restoration, DO is one of the important performance measures being used to evaluate the status and success of the Kissimmee River Restoration Project. Since completion of Phase I construction in 2001, declines in DO concentration in the Phase I area resulting in hypoxic (1–2 mg/L) and anoxic (<1 mg/L) levels have occurred at least annually in the Kissimmee River. DO sag events are defined as starting when DO declines below 2 mg/L and ending when DO rises above 2 mg/L. Four DO sag events observed in 2016−2017 were anoxic events in which the concentration of DO declined below 1 mg/L. They were therefore potentially lethal to Centrarchids (bass and other sunfish) and would be expected to have the potential to inhibit recovery of Centrarchid populations. Three of the anoxic events were associated with increases in flow from the river's headwaters lakes caused by heavy rainfall in the Upper Kissimmee Basin; the fourth event occurred in early wet season and may have been initiated by pre-event rainfall associated with runoff from the floodplain. The effects of rapid increases in upstream discharge on photosynthesis and respiration, both alone and in concert with local rainfall, can drive and sustain hypoxic/anoxic conditions in the Kissimmee River. We hypothesize that most DO declines occur when increases in flow and rainfall reduce light penetration by increases in water depth and turbidity; physically disturb photosynthetic aquatic biota; and mobilize nutrients from soils and organic debris as dissolved organic C, N, and P, both on the inundated floodplain and in runoff from the floodplain to the river channel when flow is within channel bank; such influxes of nutrients can increase the rate of biochemical oxygen demand due to higher respiration. Daily DO data from monitoring stations in the Kissimmee River are analyzed in relation to upstream discharge and local rainfall. Potential mechanisms for these DO sag events are discussed, as are adaptive water management actions that may reduce the severity and/or duration of DO sag events.

BIO: Dr. Chen is a senior scientist with more than 15 years of experience designing and implementing wetland research projects. He has extensive experience with the Everglades restoration, stormwater treatment wetlands, and Kissimmee River Restoration Project.

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LONG-TERM TREATMENT PERFORMANCE OF CONSTRUCTED WETLANDS BUILT FOR EVERGLADES RESTORATION

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The Florida Everglades is a vast oligotrophic freshwater wetland that contains a variety of habitat types (e.g., open-water slough, wet prairie, sawgrass marsh, tree island) and dominates the landscape of south Florida. This unique ecosystem is of immense ecological importance on both a national and international level. Agricultural and urban development over the last 100+ years has reduced the present-day size of the Everglades (≈ 960,000 ha [2.4 M ac]) to only 50 percent of its original extent. In addition, portions of the Everglades have experienced eutrophication primarily due to the inflow of phosphorus (P)-rich runoff coming chiefly from the Everglades Agricultural Area (EAA). The Everglades Stormwater Treatment Areas (STAs) are a complex of five large constructed treatment wetlands operated by the South Florida Water Management District (District) that are integral components of State and Federal efforts to protect what remains of the historic Everglades. The STAs have been in operation for the past 23 years, over which time their treatment area has increased from an initial single wetland in 1994 (≈ 1,500 ha [3,800 ac]) to today's wetland complex that encompasses ≈ 23,000 ha (57,000 ac). Stormwater runoff is routed into the STAs through a system of canals, pump stations and other water control structures that are part of the District's flood-control infrastructure. Because the Everglades is P-limited, the primary function of the STAs is to reduce the total P (TP) concentration in EAA runoff to levels that are protective of the downstream Everglades ecosystem.

Treatment performance requirements mandated by the STA operating permit are based solely on reducing outflow TP concentrations. However, these wetlands process other constituents to varying degrees. For example, the period-of-record (POR) removal of TP and total nitrogen (TN) for all STA combined is 77% and 38%, respectively. The STAs routinely reduce outflow concentrations of inorganic P and N species (NO_2+NO_3, NH_4, OP_4) to method detection levels while they are much less effective at sequestering dissolved organic P and N fractions. The STAs also process other water quality parameters, such as iron, calcium and sulfate. The primary long-term storage sink in the STAs is the accretion of algal, microbial and plant biomass into the wetland sediments. Concern has been voiced that STA sediments may become saturated over time and gradually lose their ability to act as a storage sink leading to a reduction in STA treatment performance. Data presented at GEER 2017 indicated no long-term decline in TP removal in the STAs. This presentation will build on this analysis and evaluate whether there is any evidence that the STAs over their POR have experienced loss of treatment for other constituents based on an examination of cumulative inflow mass versus cumulative retained mass curves and annual areal loading rates.

BIO: Dr. Chimney is an applied limnologist with 37 years of research and monitoring experience in a variety of freshwater habitats. He holds professional certifications from SWS, ESA and NALMS. Employed at the District since 1993, Dr. Chimney has participated in numerous projects involving the STAs and other water treatment technologies.

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BLUE CARBON LOSSES WITH SALT MARSH DRAINAGE

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Salt marshes are recognized for their exceptional rates of storage of organic carbon- termed “blue carbon”. They have served as blue carbon sinks for millennia, in some locations accumulating meters of carbon-rich soil. On many coasts around the world marshes have been subjected to drainage, primarily for agriculture and presumably causing significant losses of stored organic carbon. Despite the geographically extensive nature of this practice the rate or extent of blue carbon loss with marsh drainage has been documented in few areas. We are aware of research quantifying rates of C loss from salt marsh drainage at only three sites: Venice Lagoon, Italy; the Sacramento Delta, California, USA; and the Hunter Estuary, New South Wales, Australia. In fact these were the only studies available to calculate default emission factors prepared for the Supplement to the 2006 IPCC Guidelines on National Greenhouse Gas Inventories: Wetlands.

The sites where marsh drainage was examined all have mild winter temperatures thus are likely to have more rapid annual decomposition rates and not be representative of losses from marshes on colder coastlines, such as the east coast of Canada. Freezing winter temperatures on the Canadian coast should reduce carbon losses from its drained marshes. To assess carbon loss of marshes in this region, we examined short and long-term carbon loss in drained marshes along the St. Lawrence River, Quebec. Long term carbon loss was calculated by comparing the carbon inventory of flooded and drained marshes. We simulated short term carbon loss that would occur immediately upon drainage, by deploying decomposition bags over a growing season. We found that short term decomposition of belowground biomass in the drained marsh soil was nearly twice that of the undrained soil. Long term average rates of C loss in drained soils was nearly 300 g C m^{-2} yr^{-1} lower than the IPCC default emission factor available to estimate greenhouse gas emissions with land use change.

BIO: Dr. Chmura is a professor in McGill’s Department of Geography. She has greater than 25 years’ experience researching tidal wetlands. Her research has been focused on greenhouse gas flux, carbon storage, sea level change and coastal squeeze, as well as paleo-environmental reconstruction of wetlands.

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FAUNAL CONTRIBUTIONS TO P CYCLING AND THEIR INFLUENCE ON RESTORATION OF THE EVERGLADES

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Nutrient cycles and loads are important determinants of the ecological character of wetland ecosystems, and have been greatly affected by human actions. Despite the importance of nutrients in wetlands, the varied linkages between nutrient cycles and wetland fauna have received scant attention. Here we explore some of these linkages in the context of the ecology and restoration of the Florida Everglades, an oligotrophic wetland ecosystem that has suffered half a century of anthropogenic phosphorus (P) inputs, extensive alterations to its hydrology, and declines in its populations of wildlife.

First, we examine how P levels indirectly affect fauna through impacts on habitat structure. P inputs to the oligotrophic Everglades have caused a regime shift from the original sawgrass (*Cladium jamaicense)* ridge and slough matrix to 14,000 ha of dense emergent vegetation dominated by cattail (*Typha* spp). A key constraint on ecosystem function is the high density of the emergent vegetation, which results in net heterotrophic production and limits access to wildlife. We assessed avian and aquatic faunal responses to a multi-year ecosystem-scale experiment that tested the effectiveness of chemical treatment and controlled burning as a management strategy to accelerate the recovery of a eutrophic Everglades marsh. The management strategy resulted in a significant change in the proportion of open-water habitat, dissolved oxygen concentrations, primary productivity, and aquatic metabolism. The average combined biomass of small fish and crustaceans did not differ significantly between dense emergent vegetation and created openings, but community composition did differ between treatments, with crayfish dominating in emergent vegetation and small fish and grass shrimp dominating in open water. Fish had greater whole body C and P contents (low C:P) compared with the two crustaceans. Although the management action did not alter the quantity (mg carbon m^2) or energy (kcal m^2) of fauna, the resultant shift in composition did correspond with an increase in the nutrient quality (mg P m^2 and low C:P) of fauna. The faunal community composition of the created open-water habitats in the eutrophic Everglades was similar to that of oligotrophic Everglades; however, density and biomass were significantly lower for the oligotrophic region. Moreover, fish and decapod crustaceans from the oligotrophic region were smaller and had lower whole body P contents than organisms from eutrophic regions. This suggests that consumers are P limit in the oligotrophic Everglades. These difference in the production and quality of prey fauna between the eutrophic openings and oligotrophic Everglades led to changes in the composition and abundances of waterbird communities between the areas, as well as important differences in the mechanisms driving prey availability.

Second, we explore some of the mechanisms by which wildlife impact nutrient cycling in the Everglades. For example, fish and wading birds play a key role in fertilizing various wetland habitats by transporting and concentrating nutrients via their feces, nesting, and decomposing bodies. We discuss the implications of the dramatic loss of wildlife populations to Everglades nutrient cycling, as well as the potential impacts of recovering these populations through hydrologic restoration.

BIO: Dr. Cook is an avian ecologist with 22 years of experience studying waterbirds. His research focuses on how wetland processes such as hydrology and nutrient run-off affect wading bird foraging and reproductive success.

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INFLUENCE OF MINERAL PRECIPITATION AND AQUATIC VEGETATION ON PHOSPHORUS REMOVAL IN CANAL WATER FROM THE EVERGLADES AGRICULTURAL AREA

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Phosphorus enrichment has been identified as a contributor to the diminished water quality and negative ecological changes occurring in the Everglades National Park (ENP) in southern Florida. Discharges from the Everglades Agricultural Area (EAA), a former sawgrass marsh drained for agricultural use in the early 1900s, have been identified as a source of elevated P levels in the Everglades. Discharges from the EAA contain approximately 50% particulate P, predominantly from plant detrital material, with the remaining P in the more reactive dissolved form. Calcium has been assumed to be the predominant element that to precipitate with phosphorus and remove P from the mobile phase, however, direct comparative experiments of the potential for other metals (Mg, Fe, Al, Mn) to precipitate P under EAA conditions have not been tested. Additionally, floating aquatic vegetation (FAV), which can alter pH and oxidation-reduction potential, has not been examined for its potential impact on different mineral precipitations with P. To quantify the different contributions of vegetation and minerals to phosphorus removal, we performed a greenhouse level study comparing the removal of P from canal water in the presence of Ca, Mg, Fe, Al, and Mn minerals in 125 L drums. Three replicates of each mineral were seeded with FAV, while another three replicates were grown without FAV. New canal water was introduced to the drums every two weeks, with weekly or bi-weekly collection of phosphorus species, pH, oxidation-reduction potential, mass of accumulated detrital matter, mass loss of mineral, and analysis of water Ca, Mg, Fe, Al, and Mn concentrations. Calcium precipitation with total P was highly influenced by the presence of FAV, with mean total P removal increasing from 0.6 % with FAV coverage, to 37% in the absence of FAV. The magnesium treatment was not significantly affected by FAV coverage, with mean total P removal of 18% (with FAV) and 19% (without FAV). The iron was also not significantly affected by the presence of FAV, averaging 24% (with FAV) and 28% (without FAV). The presence of FAV significantly reduced total P removal in the manganese treatment from 41% (without FAV) to 10%. Removal of total P under aluminum treatment was also affected by the presence of FAV, with total P removal increasing from ~0% (with FAV) to 29% (without FAV). Our results indicate that Mn may play an important role in P removal in the EAA along with Ca, and warrants further research.

BIO: Dr. Cooper is a postdoctoral research associate working on reduction of phosphorus discharges and soil subsidence in the Everglades Agricultural Area of Southern Florida.

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BIG DATA APPLIED TO THE STORMWATER TREATMENT AREAS IN THE EVERGLADES, MAPPING OUT SYSTEM RESILIENCE

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Data analytics of large datasets are increasingly being used in the environmental studies to explore underlying factors, structures and drivers which are not immediately obvious. The combination of remote sensing, large scale sampling and sensors has resulted in larger datasets becoming more prevalent in environmental studies, including wetlands. Here we apply these methods to the Stormwater Treatment Areas (STAs). The STAs were constructed along the northern boundary of the Everglades as engineered ecological systems designed to retain P from water flowing into the Everglades. This research focused on a large data set, from 2002 to 2014 from STAs using a) pattern seeking, b) confirmatory modelling approaches and c) spectral decomposition methods to determine the stability (or resilience) of the systems. The spatial analysis found common spatial patterns forming zonal patterns of P distribution that may increasingly align with the predominant flow, path over time. Findings also indicate that the primary drivers of the spatial distribution of P in many of these systems relate to soil characteristics. The results also suggest that coupled cycles may be a key component of these systems; i.e. the movement and transformation of P is coupled to that of nitrogen (N). The spectral decomposition of outflow data was then used to determine the stability (and resilience) of these systems, illustrating how these methods can be used describe underlying data structures, and their stability over time.

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METHANE IN UPLAND TEMPERATE FOREST TREES

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Forests sequester 1.1±0.8 Pg C yr^{-1}, an ecosystem service worth hundreds of billions of dollars annually. Following the COP21 meeting in Paris, an international consensus emerged: the protection and expansion of forests is necessary to limit global warming to less than 2°C[3]. The fact that trees emit methane (CH_4), however, is underappreciated, despite the potential for these emissions to significantly offset the climate benefit of forest CO_2 sequestration. Here, we determined CH_4 concentrations in >3,000 broadleaved and coniferous trees in paired young and mature stands across 23 sites in the eastern U.S., finding CH_4 concentrations as high as 67.4% (i.e. ~375,000-times atmospheric concentrations). The highest concentrations were found in older, broadleaved trees during the growing season (18,292.2±3096.0 ppmv), with evergreen species showing only modestly elevated concentrations (21.7±14.7 ppmv). Diffusion modelling suggests that these mature broadleaved trees, in particular, are a source of CH_4 to the atmosphere, a result confirmed using chamber methods to directly measure CH_4 efflux through the bark of living and newly-felled trees. Using the 100-year global warming potential (GWP) for CH_4, we estimate that this CH_4-production pathway may reduce the collective climate mitigation value of the eastern forest by 7%. However, because concentrations vary with species identity and stand age, the climate service benefit of some forest stands could be reduced by 25% or more.

BIO: Dr. Covey is the Lead Scientist at the Ucross High Plains Stewardship Initiative, and a Lecturer in Forest Dynamics at the Yale School of Forestry and Environmental Studies. His research focuses on *quantifying the flux of methane from living trees* via *in situ* microbial methanogenesis.

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FACTORS CONTROLLING DIVERSITY AND COMPOSITION OF SOIL MICROBIAL COMMUNTIES IN MANGROVES

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Mangrove soils contain a diverse community of microorganisms that perform a vast array of ecological functions. As mangroves are naturally subject to frequent changes in environmental conditions, it is thought that high bacterial diversity in mangrove soils could ameliorate detrimental impacts associated with environmental disturbance. In mangrove forests of the New World, where plant species diversity is low, intraspecific genetic diversity of plants could play an important role in controlling the diversity of mangrove associate species including soil microorganisms. A loss of plant genetic diversity can reduce a habitat's ability to cope with disturbance and if this also leads to a reduction in microbial diversity, the problem could be compounded. Changes in microbial community composition may also have implications for nutrient cycling in these systems. Few studies have used molecular biology methods to assess microorganism diversity and composition in mangrove soils and none that we know of have looked at whether this is linked to plant genetic diversity. This study aims to assess how diversity and composition of soil microbial communities are affected by plant genetic diversity, plant species identity and habitat zone.

Leaf samples were collected from *Rhizophora mangle* and *Avicennia germinans* across different habitat zones at two sites in Florida for microsatellite analysis using markers developed for this geographic region. DNA was extracted from soil collected beneath each of the plants sampled and terminal restriction fragment length polymorphisms (T-RFLP) and Illumina sequencing were used to assess soil microbial community diversity and composition. Additional soil variables including pH, temperature, moisture and nutrient content were also assessed. This study provides much needed information on the composition of Florida's mangrove soil communities and the factors that influence them.

BIO: Hayley Craig is a PhD student investigating how plant genetic diversity and nutrient pollution influence composition and function of soil microbial communities in mangrove ecosystems.

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INCLUSION OF COASTAL WETLANDS IN UNITED STATES INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS

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The Inventory of U.S. GHG Emissions and Sinks' (*Inventory)* chapter on Land Use, Land Use Change and Forestry (LULUCF) reports C stock changes and emissions of CH_4 and N_2O from forest management, and other land-use/land-use change activities. With the release of the 2013 Supplement to the 2006 IPCC Guidelines for National GHG Inventories: Wetlands (*Wetlands Supplement*) the United States has begun working to include emissions and removals from management activities on coastal wetlands

To support the EPA, NOAA formed an interagency and science community group i.e., Coastal Wetland Carbon Working Group (CWCWG) tasked with conducting an initial IPCC Tier 1-2 baseline assessment of GHG emissions and removals associated with coastal wetlands using the methodologies described in the IPCC Wetlands Supplement.

The U.S. process of building the 2016 inventory (reporting years 1990-2014) has draws on freely available Landsat data, country-specific soil carbon stocks data derived from peer-review literature and IPCC approaches for calculating carbon stock change. Activity data in the form of land cover and landuse change is derived from a series of surveys collated under the NOAA Coastal Change Analysis Program (C-CAP). Distribution of organic soils was derived from national soil survey databases. Quantification of extent of remaining coastal wetlands and former wetlands now converted to other land use categories are key elements of the analysis. These results were derived from NOAA Coastal Change Analysis Program (C-CAP), a national LIDAR dataset to provide topography coupled with analysis of tide station data to map tidal water incursion, and extent of organic soils derived from Soil Survey mapping. Tier 2 (i.e., country-specific) level subnational / climate zone estimates of carbon stocks (including soils), along with carbon sequestration rates and methane emissions rates have been developed from literature.

Future opportunities to improve the coastal wetland estimates include: refined analysis of reference soil carbon stocks and uncertainty analysis, refined quantification of methane emissions from wetlands across the salinity gradient (including mapping of this gradient) and from impounded waters; quantification of impacts of forestry activities on wetland soils; emissions and removals on forested tidally influenced and palustrine wetlands on coastal land areas; the fate of carbon released from eroded wetlands; and the extent of seagrass along with the emissions and removals associated with anthropogenic impacts to them.

BIO: Dr. Crooks is a wetland scientist with more than 20 years of experience planning, designing, and implementing wetlands restoration projects. He serves as the Source Lead to the EPA for Coastal Wetlands.

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EXTREME EVENTS AND HISTORICAL REGIME SHIFTS IN THE MANGROVE-SALT MARSH ECOTONE

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Coastal wetlands have experienced regime shifts through major changes to their foundational species. In Florida's temperate-tropical ecotone where mangroves and saltmarshes meet, mangroves have increased in abundance since 1984. However, between 1942 and 1984, mangrove habitat expanded and contracted, indicating that mangrove expansion may not be solely attributable to recent climate change but may be an ongoing, dynamic process of expansion and contraction. In this study, we investigate the drivers of regime shifts between mangrove and saltmarsh in the temperate-tropical ecotone. We combined historical records and imagery with field observations and previous remote sensing analysis to evaluate the hypothesis that large, infrequent disturbances, namely, freeze events and hurricanes, are the main drivers of this regime shift.

In the absence of freeze events, mangroves slowly occupy the ecotone by short-distance dispersal as propagules disperse short distances from the parent plant and outcompete saltmarsh plants. Field data on propagule dispersal following Hurricane Irma in 2017 showed that propagule density can increased from 0 propagules/m in the absence of a hurricane to 4.3 propagules/m after a hurricane. This supports the idea that hurricanes can increase the speed of a regime shift by long-distance dispersal, particularly when they hit in late September to early October and track south to north along the coast of Florida. Mangroves had a rapid expansion following hurricanes in 1944 and 2004 and a range contraction following freezes in 1962 and 1977. During the 1980s, there were four severe freezes that prevented mangrove growth. Severe freezes and hurricanes are large, infrequent disturbances that shifted the foundational species in the mangrove-saltmarsh ecotone between 1942 and 2014. These disturbances likely caused similar regime shifts in earlier time periods, which is supported by historical accounts of mangrove presence in the ecotone and accounts of mangrove die-offs following freeze events. Historical records dating to the 1760s indicate that mangroves may have occurred in their present locations at previous periods. Under the current predictions for climate change, we expect a change to this natural oscillation due to warming temperatures and changes to hurricane frequency/intensity, both of which favor mangrove expansion.

BIO: Emily Dangremond has been an assistant professor at Roosevelt University since August 2016. She started studying mangroves as a PhD student at the University of California, Berkeley, where she studied *Pelliciera rhizophorae* in Panama. As a postdoc she studied precocious reproduction in mangroves at their northern range edge in Florida.

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GREENHOUSE GAS EMISSIONS FROM WETLANDS WITH DIFFERENT VEGETATION TYPE

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Natural and constructed wetlands can emit substantial amounts of greenhouse gasses (GHG). However, they also sequester carbon in biomass, and thus wetlands can be either sinks or sources of GHG (De Klein & vd Werf, 2014). The abundance and type of aquatic vegetation in wetlands is an important factor for GHG fluxes and the distribution among the various gasses. Here we studied the effect of floating and submerged vegetation in a natural wetland and in an experimental setting with microcosms. Floating vegetation can affect GHG emissions through multiple mechanisms. Firstly, a dense cover of floating vegetation (e.g. Azolla, Lemna) will generally reduce oxygen concentrations in the water column and the sediment (Veraart et al. 2011), thus promoting methane production. However, floating biomass can hamper gas exchange with the atmosphere, which reduces the actual fluxes (Kosten et al, 2016). Especially methane bubbles might be trapped in the floating roots and can be oxidised to CO_2 again before being emitted to the atmosphere. It is still unclear which of the contrasting mechanisms will prevail under different conditions.

We quantified GHG emissions in different wetlands of the Doñana National Park, in the south of Spain. Gas fluxes were measured in a single field campaign (April 2016) with a floating chamber and a field gas analyser. Nine locations were selected, in separate shallow lakes and wetlands with different types and densities of aquatic vegetation.
Secondly, lab-experiments were performed in the climatic rooms of Wageningen University. In total 26 microcosms were prepared with different vegetation: Azolla (floating), Lemna (floating), Elodea (submerged) or no plants, all treatments in triplicate. During 5 weeks gas fluxes of all microcosms were measured both in light and dark, 3 times per week.

Gas fluxes from the field measurements indicate that with abundant vegetation there is an uptake of CO_2, and with medium or low vegetation cover CO_2 is emitted, even in daytime; with the highest emission in the more open waters with few vegetation. For CH_4 it showed that the highest fluxes are measured from relative open water systems with 40-60% vegetation cover. The lowest CH_4-fluxes are observed in shallow systems with (almost) complete cover of floating and submerged/emergent vegetation. From the microcosms experiment we conclude that vegetation promotes emission of GHG. Where fluxes are almost absent in systems without vegetation, clear fluxes are measured in vegetated cosms. Highest fluxes are found in Azolla systems, both for CO_2 and CH_4. As expected CO_2 fluxes are contrasting during dark and light conditions. However, CH_4 fluxes generally do not differ between dark and light. The level of CH4 fluxes in the microcosms is well in line with fluxes in field conditions. Overall, the research suggests that the dissolved oxygen reduction by floating vegetation is a stronger effect on GHG emission than the obstructed gas exchange.

BIO: Dr. de Klein is associate professor at Wageningen University. His research topics involve nutrient and carbon cycling in aquatic systems, including GHG emissions. In addition, he has an extensive experience in (applied) water quality modelling.

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TOWARDS A GLOBAL MODEL FOR WETLANDS ECOSYSTEM SERVICES

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There is a growing interest in Wetlands for ecosystem services and biodiversity. Since 1900 two thirds of the world's wetlands have disappeared and the loss is continuing at the same pace. The remaining wetlands are threatened by hydrological changes, eutrophication, pollution and climate change.
Policy makers at both global (such as the Ramsar Convention and the CBD) and national levels are concerned about the resulting loss of biodiversity and ecosystem services of wetlands.

To what extent are, on the global scale, these services impaired, and what solutions would be optimal to solve these problems and to improve wetlands functioning? A global model of wetland functioning could provide insights, from the biophysical/ecological perspective, to sustain this decision making.

Here we present the outlines of a generic model describing the effects of climate and land-use changes on the functioning of freshwater wetlands world-wide, expressed in terms of biomass production and accumulation, water resources, water quality and GHG emissions. Core variables are water level, nutrients, carbon and vegetation. The main processes linking these are described in a generic way, accounting for climate zones and wetland types as minimally necessary for a global picture. The model is embedded in, and receives forcings from, an existing grid-based global hydrological, climate and land-use model. In this way, the impacts of climate change, land-use changes and water use on wetlands functioning can be modelled. Reversely, the model allows to simulate the contribution of wetlands to important ecosystem services. The model is now apt for validation on datasets from varying types of wetlands, for which we seek cooperation with colleagues from different parts of the world.

BIO: Dr. Janse is senior aquatic ecologist at PBL and guest scientist at the Neth. Inst. of Ecology in Wageningen, with extensive experience in ecological modelling of standing waters (e.g. *PCLake*) and working on global biodiversity modelling in integrated assessment projects.

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PHYTOSTEROLS AS TRACERS OF TERRESTRIAL AND WETLAND CARBON TO TEN THOUSAND ISLANDS, FLORIDA, USA: IMPLICATIONS FOR TROPHIC RESOURCE USAGE IN THE EASTERN OYSTER, *CRASSOSTREA VIRGINICA*

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The Ten Thousand Islands (TTI) is a mangrove-dominated wetland ecosystem in the southwest Florida Everglades. Historically impacted by drainage and channelization due to rampant agriculture and urban development, efforts under the federal Comprehensive Everglades Restoration Plan (CERP) have aimed to restore, repair, and preserve the quality of TTI's freshwater resources. This is achieved via canal, levee, and roadway removal coupled with pump station and reservoir installation for effective flood control and freshwater distribution. In order to properly guide and optimize these efforts, CERP outlines that impacts of pre- and post-restoration environmental conditions on key ecologic and economic species must be determined.

In TTI, the eastern oyster (*Crassostrea virginica*) is a valuable resource for coastal protection, habitat provision, water quality improvement, and mangrove seedling propagation. The preferred diet of this filter-feeding bivalve typically includes high quality, labile particulate organic matter (POM) such as phytoplankton rather than refractory material that may comprise allochthonous inputs of excess nutrients and pollutants. In this study, molecular biomarker analyses using phytosterols and stable isotopes were used to trace sources of terrestrially and aquatically derived organic matter from plant material, POM, benthic microalgae (BMA), sediments, and oyster digestive tissue. This approach allows for the assessment of trophic resource use in *C. virginica* prior to CERP restoration. Phytosterols in each of these sample types were used to identify possible food sources and food quality to *C. virginica* diet within three hydrologically distinct bays between wet and dry seasons.

Preliminary results indicate an input of common mangrove-derived phytosterols such as amyrin, β-sitosterol, germanicol, betulin, and lupeol as determined by leaf and sediment analyses. In the wet season, data from oyster digestive tissue revealed that cholesterol comprised nearly half of all neutral lipid extracts followed by brassicasterol, campesterol, β-sitosterol, and stigmasterol. In POM, phytol and cholesterol comprised the majority of all neutral lipid extracts followed by the above-mentioned compounds. These results indicate that during the wet season, *C. virginica* feeds mainly on autochthonous phytoplankton rather than terrestrial POM. This is evidenced by the presence of phytoplankton-derived sterols found in diatoms, prymnesiophytes, and green algae.

Sterols present in BMA and all other sample types from the dry season will be further discussed to predict how a restored hydrologic flow regime may impact *C. virginica* diet. Based on seasonal salinity changes, it is hypothesized that the dry season will exhibit an increased abundance of marine-derived phytoplankton such as dinoflagellates in POM and *C. virginica* tissue. Additionally, increased freshwater flow under wetter conditions will be shown to increase primary production, phytoplankton growth, and enhanced utilization of POM by *C. virginica.* Physiologically, the ability of *C. virginica* to selectively filter higher quality material even under the stress of altered hydrology highlights the importance of informing efforts aimed at improving overall water quality. Hence, while *C. virginica* distribution has decreased in recent decades due to multiple stresses, efforts continue to restore the hydrologic conditions in which they thrived.

BIO: Derek J. Detweiler is a graduate student at the University of North Carolina Wilmington pursuing a Master's degree in Marine Science. His research experience and interests include biogeochemical cycling in wetland ecosystems and associated impacts of altered hydrology on organic matter quality and trophic resource availability.

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COMPARISON OF HEAT FLUX REDUCTION IN A WETLAND MODULAR ROOFTOP GARDEN SYSTEM AND A XERIC ROOFTOP GARDEN SYSTEM IN SOUTHWEST FLORIDA

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Rooftop gardens have been used in many cultures throughout history and while they are currently popular in many areas of the world, they are relatively new in the United States and rare in Southwest Florida. This study utilizes two types of native rooftop gardens in Naples, Florida, a modular wetland garden system which is not used in many situations and a xeric garden system which is more widely used. Rooftop gardens can provide many environmental benefits including regulating building temperatures, reducing urban heat islands, reducing urban storm water runoff, increasing lifespans of roofs, lowering energy costs, increasing local biodiversity, and providing urban wildlife habitat. This study compares the abilities of a modular wetland rooftop garden system, a xeric rooftop garden system, and a traditional (bare) roof with no rooftop garden to reduce the heat flux into a residential building. Air temperature, rooftop surface temperature, and heat flux were measured for each of the three-rooftop systems and then compared. Results from this study indicate the wetland system has the greatest heat flux reduction capability compared to the xeric system and the bare roof. The wetland system reduced the daily movements of energy into and out of the house by 43% compared to the xeric system and by 93% compared to the bare roof. The results also indicate both the wetland system and the xeric system significantly reduce the average surface temperature of the rooftop, and reduce the variation in the surface temperatures when compared to the bare roof system. The reduction in surface temperature in the wetland and xeric systems explains the reduction seen in the heat fluxes of both systems. This study provides evidence that rooftop gardens have great potential to decrease heat fluxes into buildings and reduce cooling costs in subtropical climates like Southwest Florida.

Bio: Brittany Dolan is pursuing a Master's of Environmental Science degree at Florida Gulf Coast University with research currently focusing on rooftop gardens in Southwest Florida. In 2015, she graduated with a Bachelor's of Science in Marine Biology and Environmental Science from University of New Haven, CT.

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PHOSPHOROUS ANALYSES INCLUDING P-31 NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY IN THE C51 BASIN AND NORTHERN EVERGLADES

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Phosphorus (P) is known to be a major cause, in addition to nitrogen (N) of eutrophication in water systems. P can enter the environment through a variety of forms such as ortho-phosphate, DNA/RNA, sediment/rocks (apatites), manure, and many other anthropogenic sources. For example, excessive amounts of horse manure in the C51 basin leads to high soil P concentrations. A high amount of P leaching into water sources can then occur, leading to eutrophic conditions and large algal blooms. Through nutrient analyses and phosphorus (P) speciation studies, we hope to determine how P moves through the ecosystems that feed the Everglades, Lake Worth Lagoon and adjacent water bodies.

This research includes nutrient (P, N, Fe etc.) analyses of horse manure and bedding and the water and soils from and adjacent to canals that feed into the Palm Beach Canal (C51) as well as the Stormwater Treatment Areas (STAs) 1E and 1W. Not only will the various forms of phosphorus (DIP, DOP, POP, TP, SRP) be quantified through a modified Hedley Fractionation but the use of ^{31}P NMR (Nuclear Magnetic Resonance) will detail the speciation of P (free ortho-phosphate, pyro-phosphate, poly phosphates, esters etc.) in order to trace and determine P sources and movement. ICP-OES (Inductively Coupled Plasma- Optical Emission Spectrometry) will be used to determine total concentration for a variety of elements, notably metals, for quantitative support of spectroscopic techniques. Novel metal removal procedures for the cleanup of phosphorous containing samples without affecting the native P forms are planned. Further research is underway investigating the bioavailability of organic phosphorus compounds on cyanobacteria. Hopefully, the results of this research will aid in having stronger pollution prevention legislation enacted for restoring and protecting the Everglades. This may include locally monitored Total Maximum Daily Loads (TMDLs), new Best Management Practices (BMPs) and the-like.

Acknowledgement: This research is being funded by an award to the senior author (BD) from the Everglades Foundation and that support is gratefully appreciated.

BIO: Bobby Duersch is a PhD candidate at the Department of Chemistry and Biochemistry at Florida Atlantic University. Recently, he was just awarded a scholarship of $10,000 from the Everglades Foundation to be used in implementing plans in restoring the Everglades.

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FLOW CYTOMETRY AS A NOVEL, RAPID, SCREENING AND RESEARCH TOOL FOR METHYLMERCURY PRODUCTION ACTIVITY IN AQUATIC ECOSYSTEMS

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The health risks from mercury (Hg) contamination can be difficult to characterize because Hg accumulation in food webs and associated toxicological risk is largely determined by the complex, microbially-mediated methylation process that converts inorganic mercury (Hg II) to methylmercury (MeHg; the most biologically active and toxic form of Hg). Current techniques for quantifying the influence of environmental conditions and microbial community dynamics on MeHg production rates *in situ* within natural systems are limited. Traditional techniques either depend on highly manipulated experiments, are limited to culturable taxa (a small portion of the microbial community), or are extremely laborious, challenging measurements at scales that represent ecosystem or landscape processes.

Flow cytometry is a powerful technology for rapidly and accurately enumerating individual cells in environmental samples. It can also characterize physical and physiological traits of cells using innate cell fluorescence. Originally developed for medical applications, applications of flow cytometry for environmental research have grown substantially over the past two decades. We examined the potential utility of flow cytometry for better understanding the dynamics and drivers of MeHg in freshwater ecosystems through paired measurements of speciated aqueous Hg concentrations coupled with analysis of cell density and type using flow cytometry. We collected water samples from the Hells Canyon Reservoir Complex along the Snake River, bordering Oregon and Idaho. This is a site of current intensive research on limnological and biogeochemical processes associated with MeHg dynamics. Water samples were collected from 5-15 discrete depths at 5 unique locations in the complex representing a gradient in water column stratification (from completely unstratified to strongly stratified). We examined patterns in microbial and algal cell counts, both along the extent of the reservoir complex, and with depth at each location. We also assessed the relationship between microbial indices and speciated Hg concentrations.

Preliminary results indicate that a key index of microbial activity (the ratio of high-nucleic acid:low-nucleic acid cells; HNA:LNA) varied substantially among locations and with depth. Specifically, microbial activity was highest at stratified sites, and especially in the turbidity maximum zone near the thermocline, where water density changes facilitate the accumulation of decaying algal particles. The vertical profile in HNA:LNA closely matched that of aqueous MeHg concentrations in stratified sites, but not unstratified sites. Consistent with these preliminary findings, HNA:LNA ratios were strongly correlated with aqueous MeHg concentration, both across and within stratified sites. These preliminary results indicate that flow cytometry may provide a rapid, inexpensive tool for understanding *in situ* microbial processes associated with MeHg dynamics in aquatic ecosystems.

BIO: Dr. Eagles-Smith is a research ecologist approximately 20 years of experience researching factors influencing mercury dynamics through food webs and across ecosystems. He works at the intersection of biogeochemistry, food web ecology, and toxicology to provide science support for resource management decisions.

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THERMAL ALTERATION OF PEAT BY LOW-SEVERITY FIRE REDUCES NET CARBON LOSS TO MICROBIAL RESPIRATION

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Many peatlands across the globe are subject to regimes of regularly recurring wildfires with return intervals ranging from 3 to 100 years. These peatlands are typically dominated by fire-adapted plant communities suggesting that wildfire is an integral part of peatland ecology rather than an anomaly. Peatland wildfires are typically low-severity events that occur in winter and spring when vegetation is desiccated, and soil moisture content is high. As a result, most peatland wildfires rapidly consume aboveground fuels without igniting the nearly saturated peat. In such fires, surface soil layers are subjected to flash heating with a rapid loss of soil moisture but little loss of soil organic matter (SOM). Such fires alter the chemical structure of SOM, even in the absence of combustion, through Maillard's Reaction and similar chemical processes, and through structural changes that protect SOM from decomposition. This study examines the effects of low-intensity surface fires on the recalcitrance of SOM from fire-adapted communities located in subtropical, temperate and sub-boreal peatlands. In addition, soil from a non-fire-adapted Peruvian palm peatland was examined for response to thermal alteration. The timing and temperatures of low-intensity fires were measured in the field during prescribed burns and replicated in simulated fires. The effects of fire on the chemical structure of SOM was examined with FTIR, SEM and XPS. Burned and unburned peat replicates were incubated at three temperatures (5oC, 15oC, 25oC) for more than six months. Burned replicates initially showed higher CO_2, CH_4 and NO_2 emissions. Yet, within four weeks emissions from the burned replicates dropped below those of unburned replicates and remained significantly lower (10-50%) for the duration of the experiment. In addition, thermal alteration significantly reduced the temperature sensitivity (Q10) of thermally altered peat. Thermal alteration of SOM resulted in a net long-term reduction in carbon losses to microbial respiration. Such thermal alteration of SOM might be an underestimated factor influencing carbon accretion frequently burned peatlands and could be globally relevant if climate change increases fire frequency in boreal peatlands.

BIO: Dr. Flanagan is a Research Professor with more than 20 years of experience in researching the hydrology and biogeochemistry of wetlands.

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INVESTIGATION OF ECOSYSTEM SERVICES PROVIDED BY SEASONALLY EMERGENT WETLAND BETWEEN AN AGRICULTURAL DRAIN AND IRRIGATION CATCHMENT IN SOUTHWEST IDAHO

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Non-point source nutrient loading in irrigation returns contribute to water quality impairments in freshwater systems. We investigated a seasonally emergent wetland in the transitional zone between the Bernard Drain and Lake Lowell in the Lower Boise River watershed, Southwest Idaho. We sought to characterize the ecosystem services the wetland zone provides as a means of improving the quality of the water entering the reservoir via run-off. The Bernard Drain returns agricultural irrigation waste water and has been reported to have the highest overall detection of contaminants of the 8 canals and drains entering the catchment. Lake Lowell is an 11,000-acre irrigation catchment and reservoir constructed in 1908 and designated as part of Deer Flat National Wildlife Refuge. The reservoir receives drainage from approximately 40,000 acres and provides multiple secondary services to the surrounding community as an active recreation area, breeding and migratory habitat for birds and mammals, and historic landmark.

Established over a century ago, the aging reservoir has experienced increasingly eutrophic conditions, phosphate and dissolved oxygen impairment, as well as the appearance of harmful algal blooms. Preliminary variations in soil and water quality parameters indicate that the seasonally emergent wetland reduces the transport of nitrate, orthophosphate, and sediment during the irrigation season. Additionally, the wetlands zone provides a cooling effect for the margins of the reservoir, thereby helping to mitigate some aspects of water quality impairment. These findings illustrate the value of identifying management practices that support the ability of the wetlands to continue providing its ecosystem service, especially in transitional zones between agricultural drains and the reservoir.

BIO: Rebecca Flock is an Assistant Professor of Chemistry and mentors undergraduate students in applied physical and chemical investigations of land, air, and water resources in their community and beyond. She has a background in Agricultural and Environmental Chemistry and is invested in wholistic amelioration of nutrient-impaired waterways.

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SHIFTING GROUND: LANDSCAPE-SCALE MODELING OF SOIL BIOGEOCHEMISTRY UNDER CLIMATE CHANGE IN THE FLORIDA EVERGLADES

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To support Everglades restoration planning, we provide screening-level simulations of plausible soil biogeochemical responses in the freshwater part of the Greater Everglades Ecosystem by 2060 to macroclimate change. We used three climate change scenarios: a baseline scenario of 2010 climate, and two climate change scenarios that both included 1.5 ºC warming and 7% increase in evapotranspiration, and differed only by rainfall (either increase or decrease by 10%). With these climate conditions as input, we used the Everglades Landscape Model to simulate changes to eight interactive hydro-ecological metrics important for biogeochemical evaluation.

In the increased rainfall scenario, little changed compared to the Baseline scenario, because they were hydrologically similar (i.e., much of the increased rainfall was cancelled out by increased loss from evapotranspiration). The decreased rainfall scenario produced marked changes across the system. Severe water scarcity led to diminished surface water depths that were detrimental in regions that are already too dry, and beneficial in regions that are too wet, where both vertical soil accumulation rate and soil P accumulation rate accelerated. Areas near structural water inflows exhibited load-induced declines in surface water sulfate concentration as well as phosphorus content of surface water, pore water, and soil. The area corresponding to elevated methylmercury production risk shrank in areal extent and migrated closer to structural inflow points. Surface water flow velocity slowed drastically across most of the system.

We conclude that future macroclimate changes have the potential to produce significantly different ecological responses in the freshwater remnant of the Everglades, particularly if warming temperatures and increased evapotranspiration coincide with decreased rainfall. Restoration planning must take future climate change into account.

BIO: Dr. Flower is a faculty researcher at the School of Geosciences with a specialization in ecohydrology. She studies coastal wetland responses to climate change and sea level rise using a variety of methods including field observations, laboratory experiments, and computer modeling.

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SEQUESTERING CARBON IN WETLANDS THROUGH ENZYME SUPPRESSION

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In an investigation of the potential strategies for enhancing carbon sequestration in natural wetlands, we show that a variety of novel approaches hold potential as modifiers of sequestration capacity.
Terrestrial and oceanic ecosystems contribute almost equally to an estimated sequestration of about 50% of anthropogenic carbon dioxide emissions, and thus already play a role in minimizing our impact on the global climate. Of the C sequestered terrestrially, the majority becomes part of the Earth's soil carbon stores. Northern peatlands cover just 2-3% of the Earth's landmass and yet sequester 455Pg of C, or almost 1/3 of that soil carbon. Peatland ecosystems are thus well established as powerful agents of carbon capture and storage. The remarkable preservation of ancient organic archaeological artefacts, such as bog bodies, further attest to their exceptional preservative properties. Peatlands, have higher carbon storage densities per unit ecosystem area than either the oceans or dry terrestrial systems. Past studies demonstrate that peatlands sequester carbon due to the inhibitory effects of phenolic compounds which create an 'enzymic latch' on decomposition (Freeman et al 2001, Fenner & Freeman 2011). Here we show the potential for harnessing that mechanism in a series of peatland-engineering strategies (Freeman et al 2012) in which molecular, biogeochemical, agronomical and afforestation approaches, increase carbon capture and long-term sequestration in peat-forming wetland ecosystems. Our studies consider the significance of the sequestration-enhancement approach in both natural and restored ecosystems, and in the prevention of destabilisation of ancient carbon stores (e.g. Moore et al 2013) following human impacts.

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BIO: Chris Freeman, is Head of the School of Biological Sciences at Bangor University, with more than 30 years of experience of wetland enzyme research. He has extensive experience in studying carbon cycling, the influence of wetlands on drinking water quality, and greenhouse gas emissions.

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SPATIAL VARIABILITY IN MICROBIAL-MEDIATED BIOGEOCHEMICAL PROCESSES IN EVERGRALADES STORMWATER TREATMENT AREAS

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Water quality and quantity are global issues we now face with increasing urgency. Freshwater serves as a source of drinking water, irrigation, and as habitat for aquatic fauna and flora. Non-point source nutrients from agriculture, specifically phosphorus, have caused myriad issues in aquatic ecosystems, including the Everglades. Everglades Stormwater Treatment Areas (STAs) are large-scale constructed wetlands designed to remove nutrients from the water column. Ongoing research has demonstrated that total phosphorus concentration in water has been reduced from approximately 100 µg/L in the influent to 20 µg/L in the effluent, which still exceeds the current EPA recommendation of 13 µg /L in the effluent. Accumulation of phosphorus has been observed in the STA sediments, specifically Floc and recently accreted sediment (RAS) fractions. The sediment-deposited total phosphorus concentration declines from the inlet to outlet, creating a phosphorus concentration gradient along the flow in the wetlands. Vegetation type, submerged aquatic vegetation (SAV), and emergent aquatic vegetation (EAV) have also been found to affect phosphorus sequestration. Microbes play fundamental roles in biogeochemical cycles in aquatic ecosystems such as the Everglades STAs by mediating transformation of nutrients. While microbes directly uptake nutrients from the water column, they make nutrients available for plants by decomposing and solubilizing organic matter. Large datasets have been collected over the previous years in the STAs, including nutrient concentrations and key environmental parameters (flow rate, water and sediment depth, pH, dissolved oxygen, and temperature) from multiple locations and times. However, information about microbial populations in the wetlands that govern nutrient cycles is limited. In this study, we examined microbial diversity (taxa richness) and microbial community compositions (MCC) in the sediment core and the water column along transects (from inlet to outlet) of STA-II cell 1 (EAV) and cell 3 (SAV) using 16S rRNA amplicon sequencing. Microbial diversity varied between environments (water or sediments), vegetation types, and across sediment fractions. In general, microbial diversity in water column was lower than that in sediments. The EAV cell had higher diversity than the SAV cell at each sediment fraction. Floc and RAS sediment fractions had a higher microbial diversity than other fractions in each cell. Distance from inlet did not affect microbial diversity except in the water column of the SAV cell, in which substantially higher microbial diversity was observed in inlet samples. Principal coordinate analysis suggests that MCC in water column differ from those in sediments. Within sediment MCC, vegetation types, sediment fractions and distance from the inlet had effects on MCC. Phosphate accumulating organisms (PAO), taxa which potentially play a significant role in P sequestration, were detected in the sediments, and had a distinct spatial distribution pattern across the cells and along the transects. The findings from this study help us to elucidate mechanistic processes that take place in the wetlands. This study also has implications for water resource management that seeks to balance food production and ecosystem conservation.

BIO: Dr. Fujimoto is a Research Assistant Professor in the Soil and Water Sciences Department at the University of Florida. He obtained dual Ph.D. degree in Microbiology / Ecology, Evolutionary Biology & Behavior at Michigan State University. His current research involves nutrient cycles in Florida's inland lakes and Everglades wetland systems.

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NUTRIENT EXCHANGE DYNAMICS FOLLOWING SEDIMENT RESUSPENSION IN SOUTH FLORIDA WETLANDS

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Nutrient flux characteristics following sediment resuspension were investigated for two submerged aquatic vegetation (SAV) species, Chara sp. (a macroalga), and Najas guadalupensis (a vascular macrophyte), that are common and native to shallow, freshwater environments in South Florida. These SAV species occupy much of the outflow region of Everglades Stormwater Treatment Areas (STAs), which are constructed wetlands with ultra-low target outflow concentrations (13 µg/L TP or less).

Intact sediment cores were collected from Chara and Najas beds in several STAs as well as from the nearshore region of Lake Okeechobee. The cores were reflooded in the laboratory with low nutrient water from the outflow of STA-2 Cell 3, a well-performing flow way. Surficial sediments were resuspended into the overlying water, and turbidity, phosphorus (P) and ammonia concentrations were repeatedly measured in the water column (after 2, 20, and 60 minutes, 24 hr, and 7 days). A second suspension event was accompanied by an amendment of KH2PO4 into the overlying water that increased P concentrations by 50 µg/L.

Without a P amendment, sediment resuspension resulted in increased water column total P concentrations and turbidity at the 2-minute sampling interval, compared to the reflood water prior to sediment suspension. Levels of these constituents then decreased after 20 minutes and remained relatively low in all treatments over the next 7 days. Following the P-amended suspension event, water column P concentrations also peaked 2 minutes after sediment suspension, then declined but stayed well above pre-amendment values. No difference in turbidity or water column P was observed between the Chara and Najas sediments from either Lake or STA sites. However, ammonia concentrations were consistently higher following resuspension of sediments from Chara beds, relative to Najas beds. During both P-amended and un-amended trials, water column P in all SAV sediment treatments remained higher than pre-suspension concentrations. By contrast, sediments collected from the outflow region of an STA without SAV (STA 2 Cell 1, a well-performing flow way dominated by emergent vegetation, Typha spp. and Cladium jamaicense) showed the lowest water P concentrations 20 min. to 7 d after suspension, with values equal to (or lower than) control cores without sediment. Overall, our results showed that the greatest effects of SAV sediment suspension on water column P were transient, but a small effect of resuspension persisted over time and could be significant in the low-P environment of STA outflow regions.

BIO: Mr. Grace is an Associate Scientist with DB Environmental and has over 18 years of experience in phosphorus cycling in aquatic ecosystems, treatment wetland optimization, water quality assessments and biomonitoring. He earned a MS in Soil and Water Science from the University of Florida, and lives in Gainesville, FL.

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NUTRIENT RETENTION VIA VEGETATIVE UPTAKE AND SEDIMENTATION IN CREATED WETLANDS IN SUBTROPICAL FLORIDA

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Nutrient removal by a 4.6 ha urban stormwater treatment wetland system in a 20-ha water/nature park in southwest Florida has been studied for over two years, suggesting that the wetlands are significant sinks of both phosphorus and nitrogen. The first two years of water quality studies have indicated a slightly decreasing ability for total phosphorus concentration reduction with average total phosphorus reductions of 55%, whereas nitrogen retention has remained consistent at about 26% reduction. This study is investigating the importance of vegetative and sedimentation intrasystem processes in affecting nutrient concentrations and fluxes through these wetlands. Vegetation samples are collected every six months in the dry and wet seasons to estimate productivity, biomass, and nutrient storage/retention in the vegetative tissues. Additionally, gross sedimentation measurements along with sediment nutrient analyses every six months estimate the role of sedimentation on nutrient retention. Ongoing water quality research suggests that nitrogen and phosphorus loading rates are 28.1 g-N m^{-2} yr^{-1} and 5.7 g-P m^{-2} yr^{-1}, respectively. Preliminary results suggest that sedimentation is a larger factor in nutrient retention than vegetative uptake. After one year, data suggests gross sedimentation rates of 0.26 ± 0.03 mm day^{-1} and nutrient retention of approximately 81.7 g-N m^{-2} yr^{-1} and 7.8 g-P m^{-2} yr^{-1} and. With sedimentation of nutrients higher than nutrient loading into the system, we theorize that resuspension is a major influence on the system. Ongoing research focuses on the extent to which resuspension plays a role in the nutrient storage and reintroduction to the system to attempt to determine the expected lifespan of the wetlands' nutrient retention capabilities and allow land managers to better understand how the wetland system is working to optimize nutrient retention.

Bio: Lauren Griffiths is in the Geology Ph.D. program at the University of South Florida. She is a graduate assistant at the Everglades Wetland Research Park in Naples, Florida with research focusing on water quality and nutrient cycling in created freshwater wetlands as well as carbon sequestration in mangrove systems.

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METHANE FLUXES OF TREES AND FOREST FLOOR UNDER TWO DIFFERENT WATER LEVEL CONDITION IN FORESTRY DRAINED PEATLAND IN SOUTHERN FINLAND

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Methane (CH_4) is an important greenhouse gas with increasing atmospheric mixing ratio. Boreal forests are traditionally considered a net sink of atmospheric CH_4, principally because of CH_4 oxidizing bacteria within aerated soil layer. Trees are demonstrated to be capable of emitting CH_4 from their stems, possibly by transporting anaerobically produced CH_4 from deeper soil layers. Further, trees may act as independent sources of anaerobically produced CH_4 within tree stems or aerobically in the tree aerobic processes. The investigation of this recently introduced source of CH_4 might reveal a need of reassessing CH_4 balances of the boreal forests. We measured tree stem and forest floor CH_4 fluxes on a mesotrophic drained peatland forest in Tammela, southern Finland (60°38' N, 23°57' E) during growing seasons in 2016 and 2017. Three tree species, downy birch (*Betula pubescens*), Norway spruce (*Picea abies*) and Scots pine (*Pinus sylvestris*), were selected to be studied as they represent the most common species at the boreal vegetation zone. Methane fluxes were measured from in total 25 sample trees on two different plots: a partially harvested plot where all the pines were removed to experimentally raise the water table level (WTL) and a control plot (5 trees/species/plot). We selected three birches from the partially harvested plot to measure also CH_4 flux variation in the vertical profile of the trees. To gain insight to the CH_4 dynamics, we characterized the microbial communities and quantified methanogenic and methanotrophic functional genes (*mcrA* and *pmoA*, respectively) in the peat. In addition, we measured the potential of CH_4 production and consumption from peat profile and moss samples.

The WTL at the partially harvested plot was generally 10–15 cm closer to the soil surface compared to the control plot, where the WTL depth was on average at a depth of 55 cm. Forest floor was a sink of CH_4 at both of the plots, although uptake was lower at the partially harvested plot. We found small CH_4 emissions from the stems at both plots, while higher and more dominant emissions occurred at the partially harvested plot ($p < 0.001$). Methane emissions from birches in 2017 at the partially harvested plot were higher compared to the emission rates of the same trees in 2016. The stem CH_4 emissions decreased exponentially going up at the stem vertical profile. Microbial experiments showed that anaerobic CH_4 production, CH_4 oxidation potential (under 1000 ppm CH_4) and the amount of methanogens were higher in the peat of the partially harvested plot.

The difference in CH_4 fluxes of trees between the plots suggest that WTL is a major regulator of tree CH_4 fluxes on a forestry drained peatland. This, together with the observation of higher CH_4 production potential in the peat at the partially harvested site, support the hypothesis that tree emitted CH_4 originates from the soil.

BIO: Iikka Haikarainen works as a Ph.D. student in a project focusing on forest CH_4 dynamics. His expertise is in field and laboratory measurements of CH_4 fluxes in trees and factors affecting CH_4 transport and exchange processes.

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ENTEROCOCCI IN WRACK SEDIMENTS AND SURFACE WATER

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Enterococci are gram-positive bacteria used as indicators of water quality in aquatic systems to signal a risk to public health. These microorganisms are typically associated with human and animal fecal material, and exist in a wide range of environments, from Arctic surface waters to mammalian intestinal tracts. Here, we consider microbial counts in water, sediments, and wrack (detritus and decaying vegetation) in the Loxahatchee River Estuary, a subtropical mangrove-dominated estuarine system.

Weekly surface water samples of recreational waterways (2016-2017) have indicated consistently high enterococci counts (≥ 71 MPN/100 mL per EPA) in some sections of the Loxahatchee River. From initial observations, these hot spots of microbe abundance appear unrelated to water clarity or apparent shoreline conditions. These inconsistencies prompted an investigation into the potential sources, sinks and persistence of these microorganisms. Using a simple field survey, we considered differences in enterococci counts by substrate (sediments, wrack and water). We collected surface (≤ 2cm) sediment composites along with surface water samples from 4 locations exhibiting high microbial counts. One of the locations experiences more frequent wave exposure, and a buildup of wrack is typically observed in the intertidal region. Here, we examined enterococci counts in both sediments and wrack, as well as in surface waters with increasing distances from wrack (0, 1.5 and 3 meters). Our results support previous studies of microbial presence on substrates, suggesting that in Florida's subtropical estuaries, sediments (sand, mud, and mixed) and wrack may provide habitat structure, promoting microbial growth. However, a decrease in enterococci counts with increasing distances from wrack may also indicate a positive relationship between microbial growth and organic carbon.

More work on microbial growth patterns is needed to integrate this information into the context of large-scale estuarine biogeochemical cycling and management, particularly if the persistence of enterococci in aquatic systems is linked to excess organic carbon. Our next step is to assess the longevity of microbial populations in each substrate under various environmental conditions. We also plan to use a historical dataset of water quality parameters across the Loxahatchee River to identify potential drivers of high microbial counts throughout the watershed.

BIO: The Loxahatchee River District (LRD)'s mission is to protect and preserve the Loxahatchee River watershed. LRD's WildPine Ecological Laboratory has been monitoring water quality and habitats across the river for over 25 years. Dr. Harris is a senior scientist with the Loxahatchee River District and has over 10 years of experience working in estuarine systems. Her research is varied, but projects typically address biotic-abiotic interactions and anthropogenic impacts in estuarine systems.

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WHAT IS THE METAL CONTENT OF GRAVEL BAR VEGETATION IN A CONTAMINATED RIVER?

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River bar deposits generally represent a long-term source of pollution in mining-affected rivers as contaminants are gradually released back to the channel. Big River, located in the Old Lead Belt in southeast Missouri, was subject to large-scale contamination of channel sediments and floodplain soils due to over 200 years of lead mining. Plants growing on these contaminated sediments have the potential to be exposed to high levels of metals, and their ability to absorb contaminants from soil could play a vital role in metal mobility. Previous work involving Big River has focused on metal contamination, sediment geochemistry, river channel dynamics, and metal accumulation in organisms inhabiting the river. However, little research has been conducted on metals in the vegetation of this river system. Plants are the base of the food chain and are a means of chemical uptake from sediment. Investigating metal content of plants could indicate the amount of metal that has the potential to circulate in the ecosystem. We sampled leaves, bark, branches, and stems of sycamore (most abundant vegetation) trees on gravel bars upstream and downstream of the contamination point. These samples were dried, crushed, and analyzed for metal concentrations. We also conducted vegetation surveys to estimate vegetation density and biomass on each gravel bar. Results of this work will add to our understanding of the movement of metals in a contaminated system and the potential of these metals to become bioavailable and thus transported to various levels of the food chain.

BIO: Jordan Heiman is an undergraduate student pursuing a degree in biology. She has been involved in a wetland research lab for over a year, and she has worked on three projects with the research group.

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CHARACTERIZING BIOGEOCHEMICAL SHIFTS IN TWO SHRUB ENCROACHED MARSHES UNDER DIFFERENT HISTORICAL DISTURBANCE REGIMES IN THE ST. JOHNS RIVER, FLORIDA

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High primary productivity and prevailing anaerobic soil conditions make wetlands uniquely suited to sequester carbon (C) from the landscape. Wetland disturbances such as shrub encroachment, the conversion of graminoid herbaceous marshes into woody shrub-swamps, can alter C cycling through environmental changes (litter input, microbial shifts, etc.), although few studies have determined the extent of that alteration. Furthermore, little is known on how historical disturbances (nutrient enrichment, hydrological alterations, etc.) will impact how wetlands respond to shrub encroachment.

The aim of this study was to determine how C storage is affected by willow-shrub (*Salix caroliniana Michaux*.) encroachment in freshwater emergent marshes under different management histories. Two individual regions (Lake Apopka and Moccasin Island) within the St. Johns River Basin have been historically disturbed by agricultural land use and hydrological alterations, respectively, and were selected for this study due to their concurrent restoration and willow-shrub encroachment timelines. Soil cores (0-15 cm) and leaf litter samples were collected from willow-encroached marshes, marshes adjacent to willow-encroached areas, and non-encroached marshes in each region and analyzed for physiochemical properties (bulk density, redox potential, organic matter content, total C, and lignin) and microbial responses (soil respiration, litter decomposition rates, and community composition).

In the nutrient enriched region, C sequestration decreased in willow plots compared to cattail dominated plots. An increase in aboveground C assimilation, primarily through lignin production, was observed in willow leaves compared to cattail leaves. However, soil C stocks were reduced by half in willow plots compared to cattail plots. Soil microbial and field decomposition experiments showed that C, particularly lignin, was being broken down at higher rates in willow plots, resulting in decreased soil C storage in willow plots in the nutrient enriched regions. Additionally, site hydrology (flooded all year) may have decreased willow litterfall through increasing willow litter export, resulting in decreased soil C inputs in willow plots.

The reversal of these results was observed in the seasonally flooded and hydrologically restored region. Soil C concentrations doubled in both the willow and the adjacent herbaceous plots. Vegetation C and lignin were significantly greater in willow leaves compared to sawgrass leaves. Mass decay was lower in willow plots (44.3 ± 0.7 % mass lost) than in herbaceous plots (63.0 ± 4.4 % mass lost), despite willow plots showing the greatest lignin decay. Litterfall input, increasing anaerobic conditions, and less efficient metabolic activity resulted in greater soil C storage in the willow and adjacent marsh plots in the hydrologically altered region. Ultimately, the effects of shrub encroachment on wetland C storage vary based on historical management practices and should be considered when managing shrub encroachment and maintaining ecosystem functions.

BIO**:** Janet Ho is a master's student studying how wetland disturbances alter biogeochemical processes. Janet has worked in freshwater riverine wetlands, estuaries, and ranching wetlands. Janet employs a variety of methods to understand soil microbial responses to wetland management including greenhouse gas emissions, molecular technology, and extracellular enzyme assays.

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SAVANNAH RIVER SITE'S A-01 CONSTRUCTED WETLAND SYSTEM: A MODEL FOR SUSTAINABLE AQUATIC RISK MITIGATION

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In October of 2000, a constructed wetland treatment system began receiving a combination of stormwater and wastewater from the A-01 outfall located at the U.S. Department of Energy's Savannah River Site (SRS) in South Carolina. The constructed wetland treatment system was designed to treat approximately one million gallons per day of stormwater from a 200-acre watershed (42% of total flow) and effluent from research laboratories (58% of total flow) at SRS. The A-01 outfall is an NPDES permitted discharge, and prior to construction of the wetlands, contained copper at levels toxic to aquatic organisms.

The conceptual design of the wetland treatment system was developed from pilot mesocosm studies to identify key aspects of wetland function and performance. The pilot studies determined specific design parameters such as physical/chemical characteristics of hydrosoil, appropriate hydraulic retention time, and selection of wetland vegetation effective for copper attenuation. The full-scale constructed wetland system consisted of an upstream retention basin that provided consistent flow via gravity to eight one-acre wetland cells planted with giant bulrush (*Schoenoplectus californicus*).

The A-01 constructed wetland system has been operational and NPDES compliant since 2001. Aqueous copper concentrations near the wetland outfall average approximately 6 µg/L. Sediment is the primary sink for copper in the wetland system, with copper concentrations greater in the organic-rich surface layer. Copper is generally more mobile in the floc layer than the inorganic sediment layer. Reduced mobility in inorganic sediment is associated with higher copper concentrations in residual, organic, and oxide fractions.

The A-01 constructed wetland system received recognition from the U.S. Department of Energy and U.S. Environmental Protection Agency Region 4 as a model application of sustainable technology, having saved SRS over $60 million over the life of the system.

BIO: Dr. George (Matt) Huddleston III is a Senior Technical Leader at SynTerra Corporation, a sciences and engineering firm headquartered in Greenville, South Carolina, USA, and an adjunct professor of environmental toxicology at Clemson University. Matt's interests include assessment and rehabilitation of aquatic ecosystems, ecological risk assessment, and constructed treatment wetlands.

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HURRICANE IRMA: BIOGEOCHEMICAL RESPONSES IN A MANGROVE ENCROACHED FLORIDA SALT MARSH

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Hurricanes and their associated storm surges, tidal inundation, and rainfall can have a significant impact on coastal marsh systems by delivering allochthonous sediment, nutrients, and seawater to coastal areas. Due to the rapid response of biogeochemical cycling to these disturbances, the impact is often difficult to capture and necessitates obtaining timely data both before and after storm occurrence. Several studies have examined the effect of hurricanes on coastal areas by using data measured months and years prior to a hurricane occurring, but few have data within only weeks of a storm's landfall. In the Merritt Island National Wildlife Refuge in Brevard County, FL., UCF researchers have been studying the impact of mangrove encroachment on biogeochemical cycling. The consistent monitoring of transects in Merritt Island, located within Hurricane Irma's cone of influence, provided an excellent opportunity to examine Irma's impact on nutrient cycling in a Florida salt marsh.

Hurricane Irma made landfall in the state of Florida September 10-11, 2017. Soil cores and water samples were collected along a 3-point vegetative transect, spanning the transition from marsh (*Distichlis spicata*) to mangrove (*Avicennia germinans*) dominated vegetation in the Indian River Lagoon (southeast Florida). Samples were collected less than two weeks after Irma's landfall and compared to data collected less than two weeks before landfall. Physiochemical (extractable/bioavailable nutrients, porewater nutrients, pH, and salinity) and microbial (biomass) properties were analyzed. Soil bioavailable nitrate, phosphorus, and microbial biomass generally decreased in all plots after the hurricane, while soil ammonium, pH, and water salinity increased. Porewater phosphorus and ammonium increased in the upper 15cm of soil in the *Distichlis* and transitional plots (90-600%), but decreased in the mangrove plots (40-100%). Results suggest that hurricanes have the potential to significantly alter soil and porewater biogeochemistry immediately after occurrence by increasing available nutrients, particularly ammonium, and decreasing microbial biomass, likely due to salinity stress. These results also suggest that hurricane impacts differ based on vegetation as trends were not always similar between the marsh and mangrove plots. Assessing the impact of hurricanes on biogeochemical cycling in wetlands can help to understand how storms affect short-term nutrient cycling and the potential for nutrient release.

BIO: Nia Hurst is a Lab Manager and Research Assistant in the Aquatic Biogeochemistry Lab at the University of Central Florida. Nia's research focuses on wetland biogeochemical responses to restoration with the emphasis of assessing and improving wetland ability to mitigate aquatic N pollution.

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REDUCING NITROGEN REMOVAL UNCERTAINTY FOR OPERATION OF MISSISSIPPI RIVER SEDIMENT DIVERSIONS: NITRATE REDUCTION RATES IN TURBULENT FLOW CONDITIONS

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Sediment diversions along the lower Mississippi River have been proposed to help slow the rate of wetland loss in coastal Louisiana by transferring river sediment to coastal marshes, aiding in wetland accretion. Sediment diversions can deliver a sediment subsidy to eroding Louisiana coastal wetlands, but they will also deliver significant amounts of nutrients (primarily N as NO_3) to receiving basins with potential for environmental impact. There is a paucity of data on nitrate reduction rates in the “near-field” area of diversions, where turbulent conditions impart significant shear stress on the sediment surface, suspending fine grained sediments. It is critical to determine nitrate reduction rates in this near-field environment to understand the total impact of N on diversion receiving basins and to reduce the uncertainty of nutrients delivered by river sediment diversions. Triplicate sediment cores were collected from three sites within a mudflat in an active deltaic setting in coastal Louisiana and subjected to shear stress using a flow-through erosional microcosm system for 24 hrs. Nitrate reduction rates were determined under high, medium, and zero shear stress conditions of 0.45, 0.2, and 0 Pa, respectively. Nitrate reduction rates under these conditions were 303 ± 65.6, 186 ± 55.1, and 18.7 ± 20.2 mg N m^{-2} day^{-1}, respectively, with rates increasing as shear stress application increased. These results indicate that turbulent flow conditions, indicative of large river diversions, can significantly increase nitrate reduction rates, even in a well-oxygenated water column. Results from this research can help inform diversion models and assist natural resource managers in predicting potential nutrient impacts of river diversions on coastal receiving basins.

BIO: Nia Hurst is a Lab Manager and Research Assistant in the Aquatic Biogeochemistry Lab at the University of Central Florida. Nia’s research focuses on wetland biogeochemical responses to restoration with the emphasis of assessing and improving wetland ability to mitigate aquatic N pollution.

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DYNAMICS OF METALS, NUTRIENTS, SEDIMENTS AND CARBON IN MEDITERRANEAN CONSTRUCTED WETLANDS RECEIVING AGRICULTURAL RUNOFF

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Marsh restoration is as an effective tool to remove nutrients and metals via plant uptake, microbial activity and soil accumulation. However, few studies have attempted to quantify both nutrient and metal accumulation and removal in Mediterranean restored marshes, including also accretion rates and carbon sequestration. This research aims to assess changes in water and soil metals, nutrients, sediments and carbon in oligohaline-restored marshes set in abandoned rice fields, including a first 3 yr study in small experimental wetlands and a second 2 yr study in a large-scale constructed wetland.

In the experimental wetlands two freshwater type treatments were tested: river irrigation water (IW) and rice field drainage water (DW), as well as three different water levels. Dependent variables as a function of water type and water level were tested by a partly-nested experimental design using 72 experimental units (100 m^2 each). Differences in water level did not cause significant differences in metal removal and accumulation in soil marshes in both water types. However, results showed that significantly higher Mn, Pb and Zn input from DW caused higher mean % of removal. Higher Cu concentration from IW also caused higher Cu reduction (85 %). Mean values of Co, Cr, Cu, Ni, Pb, V and Zn in soil were higher in the IW treatment characterized by higher plant biomass, whereas mean accumulation rates of As, Ba, Cr, Cu, Ni, Pb, V and Zn were higher in the DW treatment because of higher accretion rates. Higher nutrient discharge from rice field runoff caused significantly higher seasonal NH_4^+ and PO_4^{3-} reduction (80.76 ± 1.8 and 17.99 ± 3.92 % respectively). There was a seasonal export in TP and PO_4^{3-} (-45.08 ± 13.12 and -23.85 ± 8.15 %, respectively) in marshes receiving river irrigation water. Significantly lower soil redox and higher total maximum aboveground biomass in marshes receiving river irrigation water were associated with lower NO_3^- reduction and higher SiO_2 reduction (94.14 ± 0.72 and 58.54 ± 1.08 % respectively). Higher sediment discharge from rice field runoff was associated with higher C sequestration rates (126.10 ± 6.25 g m^{-2} yr^{-1}) compared with marshes receiving river irrigation water (99.44 ± 8.23 g m^{-2} yr^{-1}). Higher water levels also increased significantly PO_4^{3-} and SiO_2 removal and C sequestration rates within both water type treatments.

In the large-scale constructed wetland (45.37 ha) two different turnover rates and water levels are being tested. The ongoing study ends in 2018, so we present preliminary results of the first 2 yr (2015-2016, monthly sampling) regarding removal of metals and nutrients in water. Mean metal removal rates were positive for Al (63.62 ± 7.73 %), Fe (46.97 ± 14.75 %), Mn (30.04 ± 20.23 %) and Sr (12.76 ± 19.24 %) and negative for B (-102.27 ± 78.80 %) and As (-44.63 ± 32.27 %). Mean nutrient removal rates were all positive: NO_3^- (86.94 ± 2.83 %), NO_2^- (80.32 ± 5.26 %), NH_4^+ (46.17 ± 20.08 %), SiO_2 (39.05 ± 12.46 %) and PO_4^{3-} (31.72 ± 16.18 %). However, PO_4^{3-}, NH_4^+ and SiO_2 showed net export in some periods.

Results suggest that wetland plants likely favored soil metal adsorption through soil oxygenation and highlight the utility of restored marshes as pollution filters in coastal wetlands with significant soil accretion. This study indicates that Mediterranean oligohaline restored marshes are very efficient removing N and some metals (Al, Fe, Mn, Cu) using both river irrigation and rice field drainage waters and also provide C sequestration and sediment accretion in a context of relative sea level rise.

BIO: Dr. Ibáñez is Senior Researcher at the Aquatic Ecosystems Program of IRTA and former Head in the period 2005-2017. He has 30 years of research experience in the field of aquatic and wetland ecology, water resources and coastal management, with more than 70 papers published in peer-reviewed journals.

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STOICHIOMETRIC CONTROLS ON MICROBIAL ENZYME ACTIVITIES AND NUTRIENT CYCLING IN WETLANDS

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Nutrient availability and cycling in wetlands is dependent on activities of extracellular enzymes that form the bottle neck in organic matter decomposition. Microbes express enzymes in response to their elemental demand, therefore biomass nutrient and enzyme stoichiometry is believed to be relatively stable as microbes follow the principle of homeostasis. However, in anaerobic wetlands, carbon processing efficiency and nutrient requirements are more diverse than aerobic systems leading to altered stoichiometries and enzyme ratios. Few studies have examined these relationships in wetlands with the goal of predicting mineralization in a variety of carbon and nutrient conditions. In this study we investigate the effect of vegetation and external nutrients on microbial biomass and enzymatic stoichiometry in two contrasting wetlands systems one dominated by submerged (SAV) or emergent (EAV) aquatic vegetation, and both receiving nutrient runoff from the adjoining agriculture. Microbial biomass and enzyme ratios were flexible and varied in the two systems and did not follow predictable patterns from nutrient stoichiometry. Typical patterns were observed for microbial biomass abundances and relative enzyme activities as organic components progressed from litter to floc, and soil. Differences were observed between the two vegetation types with higher overall C:nutrient ratios and more nutrient limitation in the SAV. Results confirm the general hypothesis of increased P limitation in SAV and greater overall microbial activity in EAV. The differences between the two vegetation types is largely based on abundances of available in EAV biomass (structural carbohydrates) and potentially secondary chemical reactions (e.g., with Ca) leading to difference in microbial communities. Implications of these findings with respect to other wetlands systems and global storage models will be discussed.

BIO: Dr. K S Inglett is a Res. Assistant Professor in the Soil and Water Sciences Department at the University of Florida. Her research focuses on the mechanistic understanding of microbial processes and microbial ecology to predict their responses to environmental change.

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HYDROLOGIC FLOW EFFECTS ON MICROBIAL STOICHIOMETRY AND ENZYME ACTIVITY IN THE EVERGLADES STORMWATER TREATMENT WETLANDS

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In constructed wetlands like the Stormwater Treatment Areas (STAs), microbial processes play a key role in nutrient removal. Specifically, extracellular enzyme production regulates organic decomposition, nutrient mineralization, and indicate overall nutrient limitation. Hydrologic flow and its management directly effects nutrient distribution and loading, which likely alters microbial nutrient demand and functions such as enzymatic activity; however, there are few studies that asses the effect of flow on microbial stoichiometry and enzyme activities. In this study, microbial biomass C, N, and P and extracellular enzymes for P (phosphomonoesterase, APA and phosphodiesterase, BisP), C (β-glucosidase, BG), and N (Leucine aminopeptidase, LAP and β-N-acetylglucosaminidase, NAG) were analyzed at inflow, midflow, and outflow stations of STA 2 Cell 3 during stagnant, low, moderate, and high flow conditions. In general, enzyme activity increased from inflow to outflow, with largest increases observed in P-related enzymes. Under flowing conditions, overall enzyme activity was stimulated and accompanied by higher microbial biomass, especially at the outflow. Increased microbial biomass and P related enzyme activity indicates an effect of flow on microbial abundance and a potential role of flow in P limitation at the outflow. Comparing these results of microbial enzymes with water quality patterns and decomposition may better predict the role of microbial activity on nutrient limitation under stagnant and flow conditions.

BIO: Dr. Inglett is an associate professor of wetland biogeochemistry in the Soil and Water Sciences Department at the University of Florida. He has more than 20 years of experience working with nutrient and ecological relationships in lakes, springs, salt marshes and wetlands.

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WARMING RATE DRIVES MICROBIAL NUTRIENT LIMITATION AND ENZYME EXPRESSION

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Recent developments of enzyme-based decomposition models highlight the importance of enzyme kinetics with warming, but most modeling exercises are based on studies with a step-wise warming. This approach may mask the effect of temperature in controlling in-situ activities as in most ecosystems soil temperature change more gradually than air temperature. We conducted an experiment to test the effects of contrasting warming rates on the kinetics of C, N, and P degradation enzymes in subtropical peat soils. We also wanted to evaluate if the stoichiometry of enzyme kinetics shifts under contrasting warming rates and if so, how does it relate to the stoichiometry in microbial biomass. Contrasting warming rates altered microbial biomass stoichiometry leading to differing patterns of enzyme expression and microbial nutrient limitation. Activity (higher Vmax) and efficiency (lower Km) of C acquisition enzymes were greater in the step treatment; however, expressions of nutrient (N and P) acquiring enzymes were enhanced in the ramp treatment at the end of the experiment. In the step treatment, there was a typical pattern of an initial peak in the Vmax and drop in the Km for all enzyme groups followed by later adjustments. On the other hand, a consistent increase in Vmax and decline in Km of all enzyme groups were observed in the slow warming treatment. These changes were sufficient to alter microbial identity (as indicated by enzyme Km and biomass stoichiometry) with two apparently stable endpoints under contrasting warming rates. This observation resembles the concept of alternate stable states and highlights a need for improved representation of warming in models.

BIO: Dr. Inglett is an associate professor of wetland biogeochemistry in the Soil and Water Sciences Department at the University of Florida. He has more than 20 years of experience working with nutrient and ecological relationships in lakes, springs, salt marshes and wetlands.

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TEMPORAL PATTERNS IN ENZYME ACTIVITY AND BACTERIAL COMMUNITY STRUCTURE OF THE PHYLLOSPHERE OF THE WETLAND MACROPHYTE *TYPHA LATIFOLIA*

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An important but often overlooked aspect in wetland biogeochemical cycling is the decomposition of standing aerial dead plant matter. Critical to the decomposition of this material is the establishment of a microbial decomposer community on the leaf surface, or phyllosphere, and the concomitant release of extracellular enzymes associated with carbon, nitrogen, and phosphorus mineralization.

We determined bacterial diversity and community structure on the leaf surface of *Typha latifolia* (broadleaf cattail) over the course of a year, and assayed the activity of B-glucosidase, N-acetylglucosaminidase, and phosphatase, enzymes involved in the cycling of carbon, nitrogen, and phosphorus, respectively. Samples were taken bimonthly and also before and after rain events that could stimulate biogeochemical processes in the phyllosphere.

We found a strong seasonal pattern in extracellular enzyme activity with low activity in the spring and summer on living leaves and higher activity soon after leaves began to senesce. Over smaller time scales (1-14 days), precipitation and solar radiation were the most consistent drivers of microbial extracellular enzyme activity. While higher enzyme activity occurred on day of rain events, continuous rainfall across 3-7 day periods was associated with lowered enzyme activity. In contrast, enzyme activity was higher across dry periods with high direct and diffuse radiation.

Bacterial diversity in the phyllosphere declined following leaf senescence, while extracellular enzyme activity increased, reflecting a shift from predominantly bacterial communities on the living macrophyte surface to predominantly fungal communities on standing dead macrophytes. While the decomposition of standing dead T. latifolia is likely driven by fungal communities, climatic factors such as rainfall and solar radiation influence both the structure and biogeochemical function of bacterial assemblages in the phyllosphere of living wetland macrophytes.

BIO: Dr. Jackson is a microbial ecologist with 20 years of experience examining the structure and function of wetland microbial assemblages. He has conducted projects in wetlands ranging from the US Gulf Coast to tropical peatlands, with current research including assays of enzyme activity and next-generation sequencing of wetland microbial communities.

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WHAT CONTROLS MICROBIAL ENZYME ACTIVITY IN WETLANDS?

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Biogeochemical cycling and organic matter decomposition in wetlands is driven by the activity of microbial enzymes. Despite decades of research on microbial enzyme activity in wetlands we still have a poor understanding of how environmental factors influence the activity of these enzymes. Sediment enzyme activity has been related to parameters such as wetland vegetation type, salinity, sediment particle size, and sediment depth, as well as to microbial biomass and cell numbers. However, these relationships are often system or habitat-specific, making generalizations difficult.

In studies of saltmarshes along the US Gulf Coast, site appears to have a greater impact on sediment enzyme activity than vegetation type, suggesting that broad-scale patterns may be as, or more, important than finer-scale spatial variation. Thus, sediment enzyme activity may be ecosystem-specific and patterns of enzyme activity seen in one wetland may not be applicable to similar systems, even within the same geographic region.

While enzymes in wetland sediments have received most attention, other microenvironments, such as the surface (phyllosphere) of wetland macrophytes can show appreciable enzyme activity. This phyllosphere enzyme activity shows seasonal and temporal variation, with pulses of enzyme activity being triggered by precipitation events and a shift from living plants to those undergoing senescence and decomposition. Such changes likely correspond to shifts from a bacteria-dominated microbial community on living vegetation to a fungal-dominated community on decaying macrophytes.

Despite the advent of next generation sequencing technologies that now allow in-depth determination of wetland microbial community composition, links between microbial community structure and enzyme activity are often unclear. An ongoing challenge is to connect the genomic composition of wetland microbial communities to the "phenome", or functional manifestation of the communities' genetic capability. Assays of enzyme activity provide insight into this phenome and how it connects to wetland biogeochemistry.

BIO: Dr. Jackson is a microbial ecologist with 20 years of experience examining the structure and function of wetland microbial assemblages. He has conducted projects in wetlands ranging from the US Gulf Coast to tropical peatlands, with current research including assays of enzyme activity and next-generation sequencing of wetland microbial communities.

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EFFECTS OF HYDROLOGY, TIME AND INFLOW CONCENTRATION ON PHOSPHORUS DISCHARGE FROM A PERIPHYTON-BASED STORMWATER TREATMENT AREA

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The Stormwater Treatment Areas (STAs) are critical component of the Everglades Restoration. The Periphyton-based Stormwater Treatment Area (PSTA) was constructed at the downstream end of STA-3/4 as a pilot demonstration of the PSTA technology to achieve ultra-low level total phosphorus (TP) at the outflow. The 100-acre PSTA cell was scraped to remove muck down to the limestone bedrock. Since it began operation in 2007 the PSTA cell has achieved an average annual flow weighted mean concentration of 13 µg P/L, the current regulatory long-term limits for the STA discharge. An extensive study was conducted to determine the key factors that contribute to the PSTA cell's performance. Part of the investigation is the use of Remote Phosphorus Analyzers (RPA) at inflow and outflow sites, which allowed frequent measurements of TP, i.e. every three hours for 2.5 years. This analysis evaluates factors that may contribute to the PSTA Cell's ability to produce very low TP concentrations at the PSTA cell discharge. The factors evaluated include flow, two different water level operation periods, inflow concentration, season, and time-of-day. Frequent measurements using the RPAs should capture short time related events that may not be captured in daily or weekly sampling.

Water levels in the cell were maintained at 1.3 feet between March 2012 and April 2013 and 1.8 feet between April 2013 and September 2014. Outflow TP concentration was less during the 1.3-foot as compared to the 1.8-foot operation. However, the result was complicated by higher inflow TP concentrations during the 1.8-foot operation period, which occurred due to replanting activities in the upstream areas of STA 3/4. The RPA results indicate that the outflow concentration was not influenced by the time of day.

To compare inflow and outflow concentrations, weekly flow-weighted average concentrations were used. This time period was selected because the average hydraulic residence time in the PSTA cell is approximately one week.

Significant relationships were observed between the inflow and outflow TP concentrations. An analysis of covariance showed no significant difference between the two operation periods. The nearly identical relationships suggested that water level differences did not directly influence TP removal. Optimal flow conditions, where the maximum number of TP samples less than 13 µg/L occurred, was between 22 and 33 cfs for the two operational periods. This result suggested an additional project, which was recently completed, to determine if these flow regimes can maintain low TP concentrations for extended periods.

BIO: Dr. James is a Principal Scientist with over 30 years of experience with lake and wetland research. He has extensive experience with Lake Okeechobee. He recently joined the Water Quality Treatment Technologies Section as the coordinator for implementing the Restoration Strategies Science Plan for the Everglades Stormwater Treatment Areas.

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FROM CELLULAR TO GLOBAL: USING MERCURY STABLE ISOTOPES TO UNDERSTAND MERCURY CYCLING AND SOURCES

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Over the past decade, measuring the natural abundance of mercury (Hg) stable isotopes has become the forefront in methodology for source and process tracking of both bioavailable methylmercury (MeHg) and the precursor, inorganic divalent Hg. This approach has gained traction primarily due to the fractionation patterns Hg undergoes naturally in the environment and allows us to assign fractionation signatures to different chemical and micro-biotic transformations. Leveraging the composite signal of these transformations provides us with an isotopic "fingerprint". These "fingerprint" compositions allow for the environmental application of Hg stable isotopes for purposes such as the source tracking and even examining the impact of dietary shifts on Hg accumulation, such as those evident with invasive species. The information gained from mercury stable isotopes improves the understanding of Hg cycling and provides a diagnostic tool for resource managers interested in the mitigation of Hg contamination. This presentation will focus on the wide-ranging applications of stable Hg isotope research including mechanistic approaches as well as large-scale environmental surveys.

The strength of stable Hg isotope measurements comes from the understanding that different sources of mercury often exhibit unique signatures due to chemical, physical, and biological processes that impact them. One key process in the Hg cycle responsible for the manipulation of a source signature is microbial methylation. Results from lab scale studies show that different methylating microorganisms (e.g., sulfate- and iron- reducing bacteria) fractionate Hg to the same extent, but can selectively methylate different bioavailable pools of inorganic Hg. These micro-scale differences can lead to a wide range of isotope compositions observed in MeHg in sediments (e.g., δ202Hg = -0.4 to +0.4 ‰). Utilizing these "fingerprints" produced by both the methylation reaction and the original isotopic composition of inorganic Hg entering the system we can develop source profiles to track MeHg transport into the food web. In a regional study of the Florida Everglades, composite signatures of δ202Hg have established three isotopically distinct Hg sources in fish tissue: coastal, marsh, and terrestrially-derived Hg. Expanding the Everglades systems to a tertiary tracer approach, we can simultaneously trace the impact of photochemical processes on source MeHg (using Δ199Hg) as well as independently trace one component of the source portfolio, atmospherically derived Hg (using Δ200Hg). These differences in isotopic composition can also be used to further explore variation in Hg sources in different fish species, such as lower photochemical signals (Δ199Hg) in jewelfish compared to mosquitofish, which indicate different food sources. Lastly, the further establishment of isotopic signatures on a regional scale, such as the Everglades, can be used to expand upon national and global isotope studies that define the role of large-scale Hg sources (e.g., precipitation, dry deposition) on bioavailability and MeHg accumulation in aquatic systems.

BIO: Dr. Janssen is a post doc at the U.S. Geological Survey in Wisconsin. Her research focuses on microbial methylation of mercury and the application of Hg isotopes to understand Hg accumulation in the food web.

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PHOSPHORUS FLUX IN THE EVERGLADES STORMWATER TREATMENT AREAS

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Removal of phosphorus (P) from runoff by the Stormwater Treatment Areas (STAs) protects the historically oligotrophic Everglades from anthropogenic eutrophication. The outflow concentrations in the STAs continue to improve, with total phosphorus (TP) concentrations reaching below 20 µg/L in some of the STAs. More efforts are needed to achieve the stringent regulatory TP limits of 13 µg/L (long-term) and 19 µg/L (annual). The concerted Restoration Strategies Science Plan seeks to fill gaps in the understanding of STA internal processes, to facilitate the achievement of target discharge concentrations. One ongoing component of the science plan is the identification and quantification of sediment-to-water column P fluxes in the STAs, particularly in the back-end regions where fluxes could have the greatest influence on outflow concentrations.

STA-2 Cell 3 is a well-performing, well-studied STA flow-way dominated by submerged aquatic vegetation. Using in situ batch chambers and porewater equilibrators, we measured the net internal P load and the porewater diffusive flux, respectively, into the water column at inflow, mid, and outflow regions of Cell 3 on four occasions. The P internal loading rate displayed an internal gradient, from about 5 g $P/m^2/yr$ at inflow to about 1.2 g $P/m^2/yr$ at outflow, comparable to the magnitude of the P load advected by water flows. Diffusive fluxes were low at inflow (up to 0.2 g $P/m^2/yr$) decreasing to 0 at outflow, therefore diffusion was essentially negligible as a fraction of the total internal load. These "black-box" internal load estimates provide a useful context for evaluating potential flux mechanisms and already show promise for refining models of STA performance. Current and future research to identify and quantify the individual biogeochemical mechanisms that contribute to the internal load may illuminate management strategies to further reduce STA outflow concentrations.

BIO: Mr. Jerauld's research concerns the biogeochemical processes affecting water quality in treatment and natural wetlands. He has worked in wetlands around the state of Florida, and has been involved with Everglades stormwater treatment area research for nine years.

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EFFECTS OF FLOODPLAIN RESTORATION IN AGRICULTURAL WATERSHEDS ON PHOSPHORUS DYNAMICS

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Excess phosphorus (P) runoff from agricultural watersheds is a major water quality concern for many aquatic ecosystems in the Midwestern US. One management strategy that has been proposed to buffer high phosphorus loads in impacted watersheds is floodplain restoration in headwater streams, often referred to as a two-stage ditch. When inundated, floodplains can retain phosphorus through a variety of mechanisms, namely physical adsorption, biological uptake, and sediment deposition during flooding events. It is not known whether there is a fundament change in these mechanisms when a two-stage ditch is constructed and develops over time.

To assess changes in phosphorus retention upon creation of inset floodplains, we evaluated chemical and physical sediment properties in 10 two-stage ditches and 10 nearby unmodified streams in central and northern Indiana during the summer of 2017. Soil cores were collected to a depth of 5 cm in the floodplain benches and streambed sediments, and water chemistry was evaluated at both the upstream and downstream ends of each reach. Cores were homogenized and evaluated for water-extractable P, equilibrium phosphorus concentrations at zero net sorption, P sorption index (PSI), oxalate-extractable P, percent organic matter, and particle size distribution. In order to assess P removal potential during storm flow, a separate, paired experiment was carried out where intact soil cores were collected to a depth of 10 cm seasonally from three of these 10 streams during the same summer. These cores were incubated in a flow-through system using stream water, and P fluxes were calculated using the difference in inlet and outlet dissolved reactive phosphorus (DRP) concentrations.

Results of these experiments show no significant difference in any soil physical or chemical properties between the two-stage ditch and its control counterpart for either floodplain or stream sediments. Additionally, phosphorus fluxes from intact cores showed no significant differences between the two-stage and control reaches. However, phosphorus sorption index, an indication of phosphorus sorption capacity, was significantly correlated with organic matter, suggesting that sorption to organic matter directly and indirectly through humic-Fe(Al) complexes can significantly affect P sorption dynamics. Furthermore, organic matter content was largely driven by storm events, with antecedent dry days being the most significant predictor of organic matter on both floodplain and streambed sediments. This could indicate that sorption to biofilms or other more temporary pools of organic matter in the soil are being flushed periodically. These results challenge the assumption that soil phosphorus sorption parameters are static in time, and suggest that when floodplains are inundated, soil properties will strongly influence P dynamics. This is particularly important in agricultural landscapes where past management practices affect both quality and quantity of organic matter and P.

Bio: Alex Johnson is a second year master's student at Purdue University. His research focuses on coupled biotic and abiotic system in a variety of ecological engineering management strategies, with a particular focus on phosphorus cycling.

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ONE OF THESE THINGS IS NOT LIKE THE OTHER. EVALUATION OF WETLAND NUTRIENT STOICHIOMETRY AND HOMEOSTASIS IN A SUBTROPICAL TREATMENT WETLAND

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Ecological nutrient stoichiometry is the result of changes to elemental mass balances due to biological and ecological processes. Evaluating the relative changes in carbon (C), nitrogen (N) and phosphorus (P) ratios in aquatic and terrestrial ecosystems can advance our understanding of biological processes, nutrient cycling and decomposition of organic matter. Nutrient stoichiometric homeostasis relates ambient stoichiometric conditions to a species stoichiometric composition. Prior studies suggest that plant species degree of homeostasis ranges from weak to non-homeostatic. The degree of homeostasis of a plant species could indicates its sink strength. In wetland ecosystems, vegetation is a sizeable, highly variable and dynamic sink of nutrients.

This study investigated wetland nutrient stoichiometry across several ecosystem compartments (i.e. water, soil, vegetation) in two treatment cells of the Everglades Stormwater Treatment Area, south Florida (USA). These cells include an emergent aquatic vegetation system dominated by *Typha spp.*(cattail) and a submerged aquatic vegetation system composed of species such as *Chara* spp. (muskgrass) and *Potamgeton* spp. (pondweed). This study demonstrated that C, N, and P stoichiometry can be highly variable within and between wetland ecosystem compartments in a P-limited ecosystem. Generally, total P declined along the flow path in all ecosystem compartments, whereas trends in total N and C were not consistent. Meanwhile, TN:TP relationships increased as C:N and C:P varied in various compartments along the treatment flow paths. Nutrient homeostasis of dominant emergent and submerged aquatic vegetation (EAV and SAV, respectively) within two treatment cells was also investigated. This study confirmed the hypothesis that wetland vegetation is non-homeostatic along different vegetation communities with homeostasis coefficients of 0.67 ± 0.04 and 0.78 ± 0.03 for EAV and SAV respectively.

Assessment of wetland nutrient stoichiometry between and within ecosystem compartments suggest decoupling of organic matter decomposition from nutrient mineralization which may have significant influences on nutrient removal rates and contrasting dominant vegetation communities. Furthermore, vegetation within the STAs provides a large nutrient sink with relatively constant uptake pressure suggesting that vegetation, along with other factors, influence ambient nutrient conditions within a given treatment cell.

BIO: Mr Julian is a PhD student with the University of Florida Soil and Water Sciences Department, in the Wetland Biogeochemistry Laboratory studying wetland biogeochemical processes specific to the Everglades ecosystem and stormwater treatment areas, wetland nutrient spiraling, stoichiometry and aquatic productivity.

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RIVER RUNS THROUGH IT. EVALUATION OF GROUNDWATER AND SURFACE WATER CONNECTIVITY AND ITS IMPLICATION ON RIPARIAN BIOGEOCHEMISTRYAND ECOLOGY

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Alteration to the hydrologic balance of a river ecosystem can have profound effects on its biogeochemistry and subsequent ecology. Land use conversion, changes in water demand for agricultural and domestic uses and alteration of native vegetation are contributing factors to stream and river hydrology and can resulting in changes to regional groundwater elevations. This altered hydrology can result in surface water salinization through the transport of saline groundwater, accumulation of salts in soils, passive run-off and direct discharge of saline groundwater to surface waters. Stratified pools of saline water can occur due to reduced surface water flow in combination with groundwater discharge of saline water resulting in negative ecological impacts. Salinization of freshwater streams and rivers have been observed across the globe, however most notably salt-affect rivers and streams occur throughout large areas of south-eastern Australia especially in the lower plains in northern and western Victoria, Australia.

This study evaluated the change of water management and regional hydrology relative to surface water salinization and its effect on biota and biogeochemistry within the lower Wimmera River. The lower Wimmera River has a high environmental value with large stretches of intact riparian and in-stream vegetation and many threatened fauna species of concern. The rainfall-runoff relationship along different reaches of the lower Wimmera River have changed over time due to changes in climate and flow regulation by dams and weirs. Changes in water management through the provision of environmental flows has significantly reduced the extent and duration of high salinity events at key locations along the lower reaches of the river. Furthermore, concurrent with reduced salinity events, nutrient concentrations within the river have begun to decline. In addition to improve water quality fish and macroinvertebrate communities have rebounded.

Long term ecological monitoring has demonstrated that flow and water quality issues are critical factors that influence the overall ecological integrity of the Wimmera River. While some argue that environmental flows in lowland rivers are insufficient to adequately reduce harmful ecological impacts, environmental flow management is the central tenant to restoring water quality and ecological health in the River. Since the creation of water savings to be provided as environmental flows in the early 2000's environmental conditions have improved. Within a decade the River has improved from a highly impacted ecosystem to a highly valued ecosystem and environmental asset within a decade as a direct result of the implementation of environmental flow restoration.

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PH CONTROLS PHENOL OXIDASE AND DOC LEACHING FROM GLOBAL PEATLAND

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Increases in dissolved organic carbon (DOC) concentrations in streams have been recorded at locations all over the world including Europe, North America, and East Asia over the past few decades. A large proportion of DOC originates from watersheds with organic soils such as peatlands, which store over a third of global soil organic carbon. A recent report based on a field manipulation experiment suggested that changes in pH caused by a decline in acid deposition may be a key driver for the large release of DOC from peatland-dominated watersheds. However, the study failed to reveal a biological linkage between pH and DOC releases, even though microbial processes may be responsible for such changes in addition to chemical reactions and physical leaching from the peat matrix under elevated pH conditions. The present study aimed to investigate biogeochemical linkages between pH increase and DOC production in peatland by analyzing chemical properties, enzyme activities and microbial community structure in global peatland.

We collected soil and water samples from 7 peatland in Korea, UK, Japan and Indonesia. Phenol oxidase and hydrolases activities were measured by using artificial model substrates. Bacterial community structures were assessed by 454 sequencing and t-RFLP, and the abundances of microbes and functional genes were estimated by real time qPCR. In addition to the field survey, two pH manipulation experiments were conducted both in the field and lab conditions. Finally, we either knock-out phenol oxidase with an inhibitor or added phenol oxidase in peat slurry samples to reveal the role of phenol oxidase in DOC leaching from peat matrix.

The pH exhibited a positive correlation with phenol oxidase across the sites. When all data were plotted in a single graph, phenol oxidase activity appeared to be exponentially associated with pH. However, neither temperature nor water level exhibited significant correlations with phenol oxidase, indicating that pH is the main controlling variable for phenol oxidase. The manipulation experiment showed the same trend where phenol oxidase activity was significantly associated with pH changes. In addition, phenol oxidase activity was positively correlated with phenolics in pore-water in each site, indicating that phenol oxidase activity indeed is associated with the release of phenolic material from peat soils. Addition of phenol oxidase substantially increased phenolic concentration in peat slurry while the inhibition of the enzyme decreased phenolics in the sample. It was also found that pH effect on phenol oxidase is both direct and indirect through changes in microbial community as well as abundances. In summary, our results showed that pH increases in peatland by reduced atmospheric deposition activate phenol oxidase in peat, which then accelerates DOC leaching to adjacent aquatic ecosystems.

BIO: Dr. Kang is Professor at School of Civil and Environmental Engineering, Yonsei University in Korea. He has published over 100 international journal papers focusing on microbial ecology of wetland ecosystems. He is currently serving as an Associate Editor for 'Ecological Engineering' and editorial board members for 'Microbial Ecology', 'Pedosphere' and 'Ecosystem Services'.

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EFFECTS OF HURRICANE IRMA ON COASTAL EVERGLADES WATERS IN FLORIDA BAY

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Water quality along northern coastal Florida Bay is mediated by the everglades wetland processes and water volume and residence times in the watershed. Category 4 hurricane Irma in September 2017 produced a large flux of surface water and marsh nutrients affecting water conditions in coastal waters of South Florida. Monitoring efforts targeted the dissolved nutrients and phytoplankton response to the wind disturbance and increased flux from everglades marsh and mangrove coastline. Physical, chemical and biological parameters were tracked in Florida Bay waters in the aftermath of the hurricane; including dissolved oxygen, nitrogen, phosphorous, organic carbon, and chlorophyll-a. Results of the magnitude and dynamics of water conditions in the months following the storm event are described.

BIO: Mr. Christopher Kavanagh is a marine ecologist with more than 25 years of experience in coastal and estuarine research and management. He has experience with water quality and coastal processes, and is currently engaged in projects dedicated to restoration of the Everglades and Florida Bay.

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WHAT IS THE CARBON SEQUESTRATION POTENTIAL OF AUSTRALIA'S COASTAL FLOODPLAIN FORESTS?

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Coastal floodplain forests are ecological communities on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains, composed of *Casuarina* and *Melaleuca* species. In estuarine settings, they may be inundated during large spring tides, introducing sulphates and salinity to the soils. The contemporary biogeochemistry of coastal floodplain forests may also be influenced by sea-level history. For example, a sea level high-stand in the early to mid-Holocene along Australia's coastlines has resulted in elevated sulphate concentrations and potential acid sulphate soils in coastal floodplains. Together, these contemporary and historical factors may generate biogeochemical conditions similar to those of presently defined 'blue carbon' ecosystems (mangrove, tidal marsh, seagrass) – that is, waterlogged, sulphate-rich soils where decomposition of organic matter is slowed and methanogenesis is suppressed.

We present first data from multiple Australian coastlines on carbon stocks (above and belowground), soil carbon accumulation rates (based on radiometric ^{210}Pb dating) and decomposition rates (short-term litterbag experiment) in coastal floodplain forests. We compare our findings with data from more comprehensively studied mangrove, tidal marsh and seagrass ecosystems. Our quantifications of the carbon and surface accumulation dynamics of coastal floodplain forests have implications for carbon accounting and mitigation in Australia, future management of coastal floodplain forests, and global directions of blue carbon research and policy.

BIO: Dr. Kelleway is a Postdoctoral Research Fellow with over 10 years of experience conducting wetland research and management-oriented projects. His research focusses on the ecosystem processes associated with wetland change and the science and implementation needs of blue carbon projects.

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URBAN STORMWATER WETLANDS AS NOVEL BIOGEOCHEMICAL SYSTEMS: ELEVATED SALT AND SULFATE

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Evidence is emerging that freshwater ecosystems embedded in an urban landscape are distinct from those associated with rural land use and land covers. Specifically, urban aquatic systems bear a unique geochemistry characterized by high salt and high SO_4^{2-} concentrations. In snow-affected regions, rivers, streams, and wetlands are experiencing increasing ionic concentrations, as indicated by chloride (Cl^-) concentrations, due to effects of the use of salt de-icers on impervious surfaces. Chloride concentrations remain elevated year-round, indicating accumulation of salt in storage zones, and often exceed criteria for the protection of aquatic life. A trend of elevated SO_4^{2-} concentrations in urban aquatic ecosystems is a lesser-known pattern, but has been detected in urban streams in multiple regions. Compared to streams, less urban wetland water quality data is available.

We assessed the water quality functions of two urban stormwater wetlands in northeast Ohio by monitoring flows and solute concentrations at inflows, outflows, and wetland interiors, and pairing these data with indicators of sediment biogeochemistry. Surface waters in these and other urban wetlands routinely contained Cl^- and SO_4^{2-} concentrations greater than 100 mg/L, and sometimes Cl^- concentrations exceed toxicity criteria for aquatic life. Our data suggest that trends of elevated Cl^- and SO_4^{2-} concentrations in urban wetlands may be more pronounced than in urban streams. Through these two case studies, we demonstrate that, in addition to novel urban geochemical stressors, wetland design and construction, wetland management, and climate conditions all contribute to the water quality functions of urban wetlands.

BIO: Dr. Kinsman-Costello is an Assistant Professor in the Department of Biological Sciences at Kent State University. She is an aquatic ecosystem ecologist interested in the effects of hydrology on nutrient biogeochemistry. Her research aims to inform larger questions about the ability of humans to manage, restore, and create ecosystems.

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METAL MOBILITY AND RETENTION IN CONSTRUCTED WETLAND SEDIMENT

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The A-01 wetland treatment system (WTS) was designed to remove metals from the effluent at the A-01 NPDES outfall at the Savannah River Site, Aiken, SC. The A-01 effluent flows from a retention basin to a splitter box, where it is distributed to four pairs of cells in series before discharge to a stream. Each treatment cell is a one-acre wetland that contains *Schoenoplectus californicus* (giant bulrush) and has a nominal 24-hour retention time. The purpose of this research was to evaluate retention of the removed contaminants in wetland sediment, and the potential remobilization of these contaminants from the sediment into the water column.

Generally, the highest concentrations of Cu, Pb, and Zn were found in the sediment from the first cell in each pair of cells suggesting that most of the Cu, Pb, and Zn in the A-01 effluent was bound to the sediment quickly. Sequential extraction analysis was used to evaluate remobilization and retention of Cu, Pb, Zn, Mn, and Fe in the wetland sediment from the A-01 WTS. Remobilization of metals was determined by the Potentially Mobile Fraction (PMF) and metal retention by the Recalcitrant Factor (RF). The Potentially Mobile Fraction (PMF) is an indicator of the contaminant fraction that has the potential to enter the mobile aqueous phase due to changes in environmental factors such as pH, Eh, temperature and others. Metals associated with the PMF are metals found in water, exchangeable, acid soluble, organic, and amorphous Mn and Fe oxide fractions. Generally, the PMF values for Cu, Zn and Pb were about 20%. These low values indicate that most of the removed metals were in strongly bound phases and not easily extractable. The PMF values for Fe and Mn showed an opposite trend – the PMF values were very high; i.e., about 70% or more for Fe and 57-66 % for Mn. These high values indicate high desorption of Fe and Mn from the sediment and high solubility of their solid phases.

The RF is a ratio of strongly bound fractions to the total concentration of elements in sediment (or the sum of all fractions). The RF is opposite to the PMF; i.e., the RF indicates the virtually irreversible retention of metals by the solid phase. This construct provides an estimate of the percentage of a contaminant resistant to remobilization that is retained in the contaminated sediment. The RF values were about 80% for Cu, Zn and Pb, indicating high retention of these elements in the sediment. The RF values for Fe and Mn ranged from 30 to above 40, much lower than for Cu, Zn, and Pb.

BIO: Dr. Anna Sophia Knox is a Fellow Scientist at the Savannah River National Laboratory (SRNL). She has researched the biogeochemistry and geochemistry of metals and radionuclides in natural and contaminated soils/sediments for 25 years. She has published more than 95 scientific papers, book chapters, and one book.

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EMERGING BLUE CARBON: CARBON STORAGE OF ESTUARINE TIDAL FLAT AND SEDIMENTS IN WEST COAST OF KOREA

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Parallel to adaptation global policy for climate change, the Korean government also has highlighted the valuable role that of coastal and marine ecosystems playing as a sink for carbon dioxide (CO_2). Although mangroves and seagrasses were widely studied for carbon storage in those intertidal areas, the carbon storage and its controlling factors have poorly understood in the mudflat, especially in Korea. This study aimed to 1) investigate the trend of carbon storage research, 2) suggest investigation method for measuring the capacity of carbon storage in mudflats, and 3) assess the carbon storage capacity in mudflats, west coast of Korea by analyzing organic matter, bulk density, total organic carbon and carbon stable isotopic ratio ($\delta^{13}C$) in sediment. Coring sediments were collected from various types of tidal flats in west coast, Korea. Previous studies generally indicated that mangroves had the highest carbon storage capacity, followed by seagrasses and mudflats. For measuring carbon storage in sediment, the elemental analysis was the most reliable and recommended method for measuring carbon storage in mudflats. Vegetated areas with halophytes relatively higher organic carbon stocks in sediment (av. >40 Mg C ha^{-1}). While the sediment dried by reclamation showed very low organic carbon stocks (av. ~5 Mg C ha^{-1}). Carbon storage capacity in Korean mudflat generally showed smaller stocks compared with mangroves, however, it was also valuable habitat for carbons storage because the amount was estimated approximately over 30%. Of note, results indicated that the vegetated area was potentially supplied carbon sources by plant detritus, so that reason was a key role for more carbon storage. Overall, the mudflat plays as an organic carbon reservoir, and the carbon storage capacity could be affected by vegetation, human activities, and environmental changes. Thus, further studies and long-term monitoring would be necessary.

BIO: Dr. Kwon is a research assistant professor of Seoul national university, Korea. His major is marine biogeo-chemistry and he is a project manager for the first BLUE CARBON project focusing on organic carbon storage and sequestration of costal area, Korea. He has extensive experience with mudflat restoration and coastal ecology, and has led more than 10 projects dedicated to preserving and restoring mudflats.

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CARBON BUDGET OF AN EASTERN NORTH CAROLINA COASTAL FRESHWATER WETLAND FOLLOWING PHOSPHORUS ADDITION

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Wetlands store ~25-30% of the earth's soil pool of carbon. Fourteen percent of the world's wetlands are found in the United States with 17% of those found in North Carolina (NC). Seventy percent of North Carolina's freshwater wetlands are pocosin peatlands. Pocosins are known for their thick peat layers that store substantial amounts of carbon and other nutrients, particularly nitrogen. Since the 1920s, 50% of NC's pocosins have been degraded for agriculture. This research is carried out in a pocosin peatland located on East Carolina University's West Research Campus that drains into the Neuse and Tar Rivers, contributing to downstream river and estuary health by retaining large amounts of nutrients. The aim of this research is to determine how these freshwater ombrotrophic peatlands budget and store carbon when the availability of phosphorus, the limiting nutrient, increases following different fertilization treatments. CO_2 concentrations were collected from static greenhouse gas chambers at set time intervals to calculate CO_2 flux, an indicator or net ecosystem metabolism and overall carbon storage in plant tissue and soil. Above- and belowground biomass was also collected and burned to determine carbon lost on ignition and respective biomass allocation. Comparisons of biomass allocation and CO_2 flux between treatments were used to determine how increasing phosphorus availability in the soil changes the overall carbon budget of this wetland. Results show that increasing the limiting nutrient in pocosins initially decreases the flux of carbon as CO_2 out of the system under low PO_4 fertilization, but as PO_4 concentrations increase, so does the CO_2 flux. Demonstrating changes in carbon budgeting within a pocosin following nutrient application can provide insight into the fate of degraded peatlands and their potential influence on rivers downstream from them, such as the ones that occur along the southeastern Coastal Plain of the U.S.

BIO*:* Sydni is currently finishing her Master's of Biology research thesis at East Carolina University working with Dr. Enrique Reyes where she focused on ecology and biogeochemistry of wetlands.

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ASSESSING SIGNIFICANCE OF DIFFERENT ENVIRONMENTAL DRIVERS IMPACT COASTAL ELEVATION CHANGE IN LOUISIANA

Jing Liu
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In coastal Louisiana, it is certain that tidal wetlands already experiencing submergence by sea level rise and associated high rate of land subsidence. With 12 ± 8 mm per year Relative Sea Level Rise (RSLR), 5,000 km^2 of wetlands has lost over the past century. When coastal marshes maintain their elevation relative to RSLR, they could survive. On the other hand, if marshes vertical develop rate slower than RSLR, they will gradually become submerged and convert to intertidal mudflat or to open water. It is necessary to assess current and predict future rates of vertical buildup of coastal surfaces and wetland sustainability during the next century.

The processes of the capacity of coastal wetlands maintain a stable relationship with sea level is complex, many factors must be considered in such an assessment. This study using empirical coastal surface elevation change data derived from a network in Louisiana, from 2007 to 2017 to model and assess the significance of different environmental driver impact on surface elevation change. Factorial analysis of variance was undertaken to develop a model that provided the best fit to the empirical data using surface elevation change and vertical accretion change as dependent variables. Water temperature, water level distance from channel, percentage of vegetation and salinity were tested as independent variables. The Akaike Information Criterion Corrected (AICc) score was used to select for the most parsimonious model of independent variable interactions. Using time series analysis to describe the important features of time series pattern and explain how the past affects the future to forecast the future values of the series. Applying the wetlands accretion model to RSLR to develop a landscape elevation model that increase the integrity of sea level rise vulnerability assessment for coastal wetlands.

BIO: Jing Liu is a second year Ph.D. student in Department of Geosciences, FAU. Her multidisciplinary research integrates environmental science, GIS, remote sensing, statistical modeling, and machine learning techniques to better understand impacts of accelerated sea-level rise on coastal systems.

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DYNAMICS OF SOIL NITROGEN ACCUMULATION FOLLOWING VEGETATION RESTORATION IN A TYPICAL KARST CATCHMENT

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The extremely fragile karst ecosystem in southwest China is one of the largest exposed carbonated rock areas (more than 0.54 million km^2) in the world. Since the "Grain for Green" and other ecological restoration projects have been implemented in the late 20th century, much tillage and pasture lands have been abandoned or changed from crop to forest or other secondary vegetation states, which are accompanied by changes in ecosystem structure, processes and functions. However, the dynamics of soil nitrogen (N) after vegetation restoration have not been thoroughly evaluated on the long-term fixed-point research in a karst catchment in southwest China.

In order to expand the scientific understanding of soil N accumulation after vegetation restoration, we analyzed the data, which was recorded 10 years from fixed-point field experiment, to evaluate the dynamic of soil N sequestration after vegetation restoration in a typical karst catchment. We used 528 soil samples to measure the dynamics of soil nitrogen content (NC) and soil nitrogen density (ND) on different vegetation restoration types (tillage converted to pasture, planted forest and mixed plantation of pasture and forest, abandoned tillage, pasture converted to mixed plantation of pasture and forest, abandoned pasture land, and unchanged tillage and pasture).

We observed that the overall soil N content across the catchment was increased significantly, but the overall soil N density had no obvious change in the topsoil after vegetation restoration. The overall soil N density only increased 0.38% with a lower rate of soil N sequestration after short term vegetation restoration. Meanwhile, the ratio of soil carbon to nitrogen (C: N ratio) in the overall catchment was increased significantly. Our study indicated that the recovery of soil N was slow, thus it requires long term vegetation restoration to recover the soil N in karst area.

BIO: Dr. Zhang is an Associate Professor of soil ecology. His research focuses on understanding the effects of human disturbance and land use change on carbon and nitrogen sequestration and cycling of nutrients in terrestrial ecosystems.

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EARLY IMPACTS OF RESTORATION ON BIOGEOCHEMISTRY OF INTERTIDAL OYSTER REEFS IN THE INDIAN RIVER LAGOON, FLORIDA

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Globally, oyster reefs have declined in numbers due to factors such as habitat loss, overharvesting, and disease. Within the northern Indian River Lagoon, FL there are ongoing efforts to restore degraded reefs by providing substrate for oyster spat. Although prior studies on restoration have focused on the effects of oysters on water clarity and nitrogen pollution in coastal water bodies, few have assessed the impact of restoration on improving biogeochemical cycling. This study aims to analyze the effects of restoring an oyster reef on sediment and surface water nutrient cycling within the first year of recruitment and growth. Using a before-after-control-impact design, four sediment cores and one surface water sample were taken on each of four dead, restored, and natural/reference reefs to observe changes in physiochemical (bioavailable nutrients NO_3^-, NH_4^+, PO_4^{3-}, and DOC; total carbon, nitrogen and phosphorous pools; bulk density; and sediment pH) and microbial (extracellular enzymes) properties at time points before restoration, and one week-, one month-, six months- and nine months-post restoration. Preliminary results indicate that before restoration, natural/reference reefs display the highest amount of both bioavailable and long-term nutrient pools as well as the lowest sediment pH. Dead reef sediments, with the lowest organic matter content, consistently had the highest bulk density. Before restoration, the restored reef sediments show measurements similar to the levels of dead reefs because they are both functionally dead – a pile of loose, disarticulated shells. Continuous monitoring over the next several months will improve the understanding of nutrient storage and cycling on oyster reefs and the time after restoration required to restore biogeochemical function.

BIO: Bryan Locher is a Master of Science student at the University of Central Florida in Dr. Lisa Chambers' Aquatic Biogeochemistry Lab. His research interests include the biogeochemistry of coastal ecosystems and how to create cleaner, healthier coastal waters.

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CONSTRUCTED WETLANDS FOR SALTWATER AQUACULTURE WASTEWATER TREATMENT USING A FLOATING TREATMENT WETLAND BIOREACTOR SYSTEM AND WETLANDS MODIFIED WITH BIODEGRADABLE PLASTICS

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Constructed wetlands are known to be effective for effluent treatment of freshwater runoff from urban and agricultural areas, however, little is known about the efficiency of nutrient-rich saltwater treatment. To compare the nutrient removal efficiency of constructed wetlands, two types of mesocosms were designed: a floating treatment wetland (FTW) with the halophytes embedded in a floating mat and an typical constructed wetland (CW) with sand and gravel substrate. We set the goal of this study to examine the effectiveness of these constructed wetlands for effluent treatment of saltwater aquaculture wastewater. We planted saltwater cordgrass (*Spartina alterniflora*) in the wetlands and reared pinfish (*Logodon rhomboides*) in a recirculated aquaculture system. As a novel approach, biodegradable plastics were introduced in these wetlands as a carbon source to enhance a microbial nutrient removal process. Polycaprolactone (PCL) was incorporated in the design of the CW through burial within the upper 8 cm of sand while PCL was used as the reactor medium in a closed recirculating bioreactor system within the FTW. A total of eight mesocosms (100-gallon polyethylene stock tank: 1.33 m x 0.47 m x 0.61 m) were prepared, four mesocosms FTW and four CW with two of each having biodegradable plastics and two controls without. The experiments were conducted in early summer in 2017, having two feeding events for the FTW and four feeding events for the CW. A YSI sonde was used for monitoring of pH, oxygen, and salinity within the FTW. Aboveground plant biomass was measured prior to experimentation and once again after the completion of experiment. Root, soil, and plastic samples were collected upon completion of the experimental period for high-throughput sequencing analysis of microbial communities. Inorganic nutrient concentrations were determined through standard calorimetric methods for ammonia, nitrite, nitrate, and phosphate. Our results showed that the CW had an average nitrate removal rate of 12.15 ± 0.31 mg-N L^{-1} day^{-1} for control and 12.37 ± 0.36 mg-N L^{-1} day^{-1} for replicates with an embedded PCL layer over the experimental period, determined from the difference between inflow and outflow concentrations. FTW showed that nitrate removal did not occur for control mesocosms with an average removal rate of 0.58 ± 0.51 mg-N L^{-1} day^{-1} for replicates with the PCL-bioreactor equipped FTW. Our nitrate measurements showed that CW had a larger removal rate than FTW.

BIO: Cristina Lopardo is an Environmental Science M.S. student at Florida Gulf Coast University conducting research in the field of developing nutrient removal technologies through microbial remediation and constructed wetlands as part of her thesis work. She received the Dorothy M. Rygh Fellowship and Blair Foundation Scholarship for her work.

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FLUCTUATING SEA LEVEL AND HABITAT CHANGE IN WESTERN AUSTRALIA

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Recent evidence indicates climate change and intensification of the El Niño Southern Oscillation (ENSO) has increased variation in sea level. Although wide-spread impacts are anticipated to arise from the sea level seesaw associated with climate change, none have yet been demonstrated. Intertidal ecosystems of the arid zone, including mangroves and associated ecosystems of the high intertidal salt flats are among those ecosystems that are highly influenced by sea level, and thus they may be vulnerable to sea level variability and extreme low sea level events. During 16 years of monitoring of a mangrove forest in north Western Australia, we documented two mangrove dieback events, the most recent one being coincident with the large-scale dieback of mangroves in northern Australia (2015-2016). Diebacks in Western Australia were coincident with periods of very low sea level, which were associated with increased soil salinization of 20-30% above pre-event levels, leading to canopy loss, reduced mangrove recruitment and development of conditions favorable for cyanobacterial mats. Our study indicates that intensification of ENSO and fluctuating sea levels, along with other factors, may influence the balance between mangrove and high intertidal salt flats within intertidal landscapes of the arid zone.

BIO: Cath Lovelock's research focuses on climate change and coastal plant communities. She is a member of the International Blue Carbon Scientific Working Group and is lead author of the Wetlands chapter for the upcoming 2019 revision of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

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NITROUS OXIDE EMISSION FROM WORLD PEATLANDS

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Nitrous oxide (N_2O) is a powerful greenhouse gas and the main driver of stratospheric ozone depletion. We conducted a global soil and gas sampling campaign between August 2011 and December 2017, following a standard protocol. We sampled 66 organic soil sites in 29 regions across the tropical, temperate and boreal climates. Within each region, at least one site was established in a natural peatland and another one in an adjacent drained area. The hydrology and trophic status of the natural peatlands ranged from groundwater-fed swamps and fens to ombrotrophic peat bogs. Land use varied between natural (fen, bog, swamp or bog forest) and agricultural (pasture, hay field or arable). Within the sites, locations followed a groundwater-depth gradient. Gas fluxes were determined using the static chamber method at least three times within three days per location. Soil pH, NO_3-N, NH_4-N, P, K, Ca and Mg, TN and organic matter content were determined from the collected samples. In French Guiana fen samples the bacterial and archaeal 16S rRNA genes and functional genes involved in nitrogen cycling (*nirS*, *nirK*, *nosZI*, *nosZII*, bacterial and archaeal *amoA*, *nifH*, *nrfA*, ANAMMOX bacteria genes) in soil were quantified by using quantitative PCR method.

In all areas N_2O emissions were significantly higher in the affected sites than in the natural sites. Statistical analyses showed a strong positive correlation between the N_2O emissions and soil NO_3-N content ($p<0.05$), while soil moisture and water table level showed a negative correlation with N_2O emission ($p<0.05$) in all sites.
We found that the emissions can be predicted by models incorporating soil nitrate concentration (NO_3^-), water content (WC) and temperature. N_2O emission increases asymptotically with NO_3^-, and follows a bell-shaped distribution with WC. Combining the two functions explains 70% of log N_2O emission from all organic soils. Accordingly excess soil NO_3^- provided, either through draining wet soils or irrigating well-drained soils can increase N_2O emission by orders of magnitude. Combining soil NO_3^- with temperature explains 69% of log N_2O emission. Across the global sites, tropical organic soils exhibited the highest N_2O emission and thus should be a research and conservation priority for reducing N_2O emissions.

Drainage had a clear impact on the communities of *nirS*, *nirK*, *nosZ*, archaeal *amoA* and *nifH* gene possessing microorganisms. The structure of the communities was mainly related to different N forms. The bacterial community was more abundant ($p<0.001$) in the natural site while the N_2O production potential (abundance of the *nir* genes) was not different between the drained and non-drained sites. N_2O reduction potential (abundance of *nosZ* genes) was higher ($p<0.01$) in the natural area where significantly lower mineral N content and high groundwater level were detected.

BIO: Dr. Mander is Professor of Physical Geography and Landscape Ecology and Head of the Department of Geography, Institute of Ecology and Earth Sciences at the University of Tartu, Estonia. His research and teaching are focused on landscape ecology (carbon and nutrient cycling in wetlands and catchment levels) and ecological engineering (constructed wetlands: design and performance).

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GREENHOUSE GAS EMISSIONS AND CARBON SEQUESTRATION IN MEDITERRANEAN RICE FIELDS AND WETLANDS: THE EBRO DELTA CASE

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Wetland ecosystems sequester 20-30% of earth's carbon but may emit 20-25% of total global methane emissions. Rice fields, considered semi-natural wetlands, are the leading source of anthropogenic methane emissions. The Ebro Delta is one of the most important wetland complexes in the Mediterranean with 65% of its area covered by rice fields. The aim of this study was to investigate 1) total annual cumulative CH_4 emissions in rice fields and wetlands 2) main soil, habitat and crop traits modulating such emissions, 3) soil and carbon accretion rates and 4) global warming potential and possible management measures to reduce it.

Methane samples to estimate emissions were collected using the non-steady state gas-sampling chamber method and analyzed through gas chromatography. Soil core samples were taken to estimate accretion and carbon sequestration rates using radioisotope ^{137}Cs and ^{210}Pb dating methods.

Estimated cumulative emissions were 98.4 kg CH_4 ha^{-1} and 215.7 kg CH_4 ha^{-1} during the growing season (May to September) and fallow season (October to December), respectively, the later accounting for 68.7 % of the total emitted CH_4. Total annual cumulative CH_4 emissions were 314.1 kg CH_4 ha^{-1}, and amounted a total of 6595,7 Tm yr^{-1} CH_4 in the whole rice growing area (*ca*. 21.125 ha). A GLM analysis showed that the main drivers of CH_4 emissions in the growing and post-harvest seasons differed: in the growing season, sulphate content in the soil and bulk density were the most explanatory variables whereas in the post-harvest, grain yield of the past year and bulk density were the most important ones. Total cumulates CH_4 rice field emissions across the whole year were mostly explained by bulk density, which is in turn related to the soil organic matter content. Natural wetlands emitted one order of magnitude less methane than did rice fields, and salinity significantly decreased both methane emissions and carbon accretion rates in wetlands.

Accretion rates from the Ebro Delta sites were similar although more variable, with rates based on ^{137}Cs ranging from 0.1 to 0.9 cm yr^{-1} and reflecting the wide range of conditions and management history across sites within the Delta. Carbon sequestration rates from the Ebro Delta were quite variable, with ^{137}Cs-based rates ranging from 20 to 500 g C m^{-2}yr^{-1}. Low salinity sites had slightly higher rates of sequestration than salt marsh locations; however, even some salt marsh locations within the Delta had high rates of sequestration (> 200 g m^{-2}yr^{-1}). As expected high rates of sequestration were associated with locations that had high rates of sediment accretion. Soil accretion rates in rice fields based on ^{210}Pb ranged from 0.14 ± 0.06 cm·yr^{-1} to 0.19 ± 0.12 cm·yr^{-1}, and the corresponding C accumulation rates are quite similar with values close to 30 g C m^{-2}yr^{-1}. Thus, accretion and C sequestration rates in the rice fields are in the lower range of those estimated in natural wetlands in the Ebro Delta.

Results show that natural wetlands (salt and brackish marshes) have global cooling potential. However more research is need to have accurate carbon budgets in order to determine the likely global warming potential of rice fields.

BIO: Dr. Martínez-Eixarch is an agroecologist at IRTA, a public research institute in Catalonia (Spain). Her research is centred on rice agroecosystems as semi-natural wetlands and the interaction between rice cultivation and climate change, with special focus on the carbon cycle, greenhouse gases emissions and mitigation measures.

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EFFECTS OF FLOODPLAIN RESTORATION ON NITROGEN AND PHOSPHORUS DYNAMICS IN AGRICULTURAL WATERSHEDS

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Excess nitrogen and phosphorus in receiving waters is associated with high nutrient inputs (e.g., fertilizer, food and animal waste, sewage) in watersheds that are unsustainably and intensively managed for agriculture uses. The majority of export occurs during high flows that mobilize dissolved nitrogen and phosphorus as well as sediment and associated pollutants. In undeveloped watersheds, floodplains intercept this flood pulse creating optimal conditions for physical and biological retention to occur. Anoxic conditions in saturated soils or soil aggregates promote nitrogen removal via denitrification but can also cause release of phosphorus from sorption sites that are maintained under oxic conditions. Restoration or creation of riverine floodplains has the potential to improve water quality, however understanding the cumulative effects on nitrogen and phosphorus dynamics is critically needed. Our goal is to determine the functional relationships that exist between sources and sinks of nutrients (e.g., denitrification, phosphorus release) and hydrodynamic and environmental drivers. We are using the Wabash-Tippecanoe River (WTR) confluence as a model ecosystem to quantify floodplain hydrodynamics, sedimentation, and carbon and nutrient fluxes. Hydrodynamic modeling of the WTR and analysis of daily flow frequency shows that during the median flow at least part of the floodplain is inundated for 10% of the year (36 days) and the entire floodplain is inundated 2% (7 days) of the year. This spatial distribution of flooding is also reflected in structural (e.g. soil nutrient content, bulk density) and functional (e.g. denitrification) patterns. The covariance between inundation, soil properties and denitrification suggests that structural connectivity plays a strong role in controlling the distribution of floodplain function. This detailed understanding of the controls on biogeochemistry is critically needed to guide management decisions regarding placement and impact of restoration projects.

BIO: Dr. McMillan is an Assistant Professor with over 10 years experience in research, design, and assessment of stream and wetland restoration projects. She integrates field experiments and numerical methods to identify controls on biogeochemical processes and optimize placement of ecologically based management practices in agricultural and urban watersheds.

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METHANE EMISSIONS FROM BOTH WETLAND AND UPLAND TREES ACROSS A FLOODING GRADIENT

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Studies of CH_4 fluxes in forests have traditionally focused on soil surfaces, with wetland forests acting as net CH_4 sources and upland (freely drained) forests as net CH_4 sinks. It is increasingly clear that CH_4 is also exchanged across leaves, branches, trunks, and woody debris, but it is not clear whether these surfaces are quantitatively important to forest CH_4 budgets because of a lack of empirical data. We investigated the relative importance of CH_4 exchange across soils and tree stems as a function of species, time, and water table depth. Measurements of CH_4 and CO_2 flux were made from trees (0.5 m above ground) and soils over two growing season on 32 individuals and 9 species, arranged across a 150 m upland-to-wetland forest transect at the Smithsonian Environmental Research Center, Maryland, USA. As expected, upland soils were net CH_4 methane sinks, while transitional and wetland soils were net sources (mean±se = -65±6, 7±25, and 190±123 µg m^{-2} soil h^{-1}, respectively). By comparison, tree stems were nearly always net CH_4 sources, with emissions of 69 ±13, 181 ± 55 and 568 ± 175 µg m^{-2} stem h^{-1} in upland, transitional and wetland habitats, respectively. Methane fluxes were not consistently observed from 20 of the tree stems, but every individual released CH_4 flux at some point during the study. We conclude that tree stems have a meaningful effect on the CH_4 budgets of forests – both wetland and upland – that has been largely overlooked.

BIO: Pat Megonigal is Senior Scientist at the Smithsonian Environmental Research Center, and an ecosystem ecologist with expertise in carbon cycling and greenhouse gas fluxes in wetlands and forests as they relate to global change. He is a Fellow of the Ecological Society of America and the Soil Science Society of America.

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SUSTAINABLY SOLVING LEGACY PHOSPHORUS AND NITROGEN IN LANDSCAPES WITH WETLANDS AND WETLACULTURE

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The world is faced with unprecedented threats to our aquatic ecosystems from excessive nutrients caused especially by agricultural and urban runoff. More than 750 aquatic ecosystems suffer from degraded ecosystem services with impairments described as hypoxia, dead zones, and harmful algal blooms, most due to pollution caused by excessive nitrogen and phosphorus. At the same time, it has also been estimated that, on a global scale, we have lost half of our original wetlands to our current extent of 8 to 12 million km^2, with most of that loss in the 20^{th} century. We are proposing here a sizeable increase in the wetland resources around the world to solve the diminishing wetland problem but with the strategic purpose of mitigating the excess phosphorus and nitrogen in a sustainable fashion. Examples include minimizing phosphorus inflows to the Florida Everglades and Lake Erie in the Laurentian Great Lakes and reducing nitrogen fluxes by wetlands and riparian forests in Midwestern USA to reduce seasonal hypoxia in northern Gulf of Mexico. The status of our physical models (mesocosms) in Ohio and Florida for investigating nutrient saturation of our landscapes and aquatic ecosystems and recycling (flipping) those nutrients back to agriculture—defined as wetlaculture—will be described as a procedure of decreasing nutrient fluxes to downstream ecosystems and returning those nutrients to agricultural production.

BIO: Dr. Mitsch is Eminent Scholar and Director, Everglades Wetland Research Park and Sproul Chair for Southwest Florida Habitat Restoration, Florida Gulf Coast University, Naples Florida, Professor Emeritus and Founding Director ORWRP, The Ohio State University, and Courtesy Professor at USF, Florida, and Notre Dame. He is Editor-in-Chief, *Ecological Engineerin*g.

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THE ROLE OF PRIMING EFFECTS ON THE CONVERSION OF BLUE CARBON TO CO_2 IN THE COASTAL ZONE

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Coastal ecosystems are recognized as valuable but vulnerable carbon (C) sinks, and the C stored in these systems is often referred to as blue C. These systems face many threats, particularly along low-relief coastlines such as Florida, which are susceptible to erosion and C loss as sea levels rise. Degradation of peat-derived organic matter (OM) may be enhanced in the presence of labile algal-derived OM via microbial priming effects. To investigate the role of microbial priming effects on the degradation of peat-derived blue C, incubations were established and a suite of analyses were conducted to evaluate changes in peat-derived OM, CO_2 production, metabolites, and microbial community structure (via metagenomic sequencing) over the course of the experiment. Four treatments were established: seawater with peat and algal leachate (SWPA), seawater and peat leachate (SWP), seawater and algal leachate (SWA), and seawater alone (SW). Treatments containing peat leachate (SWPA and SWP) harbored greater total DOC concentrations compared to SWA and SW treatments. Over the course of the incubation, CO_2 concentrations increased in all treatments, with the highest CO_2 levels in treatments with algal-derived DOM (SWA and SWPA). Both treatments with algal-derived DOM (SWA and SWPA) showed an increase in ^{13}C-labeled CO_2 over the course of the incubation, and stable isotope mass balance indicated that the conversion of peat-derived OC to CO_2 occurred approximately 30% faster with the presence of algal-derived DOC. Aromaticity indices from absorption spectra were significantly lower in the SWP treatment when compared to the SWPA treatment. Dissolved organic matter molecular formulae detected by Fourier-transformed ion cyclotron resonance spectrometry indicated an increase in the degradation of peat-derived compounds when algal material was present, and metagenomic analyses indicated that there were 1021 functional genes that were unique to the SWPA treatment. Overall, these findings suggest that there is an increase in microbial degradation of peat when in the presence of algal-derived DOM, which may drive the conversion of blue carbon stocks to CO_2 when exported to estuarine systems.

BIO: Dr. Morrison is a post-doctoral research associate studying microbial community dynamics and biogeochemical cycling within wetland and coastal systems. She received her PhD from the University of Florida’s Soil and Water Sciences Department in soil microbial ecology.

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NUTRIENT ENRICHMENT ALTERS BLUE CARBON POOLS AND PROCESSES

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Global change factors are known to induce feedbacks on primary production that drive ecosystem processes including carbon sequestration in tidal salt marshes. Although there has been an emphasis on the inventory of blue carbon pools and processes, little attention has been given to the potential role of changing foundation species genetic diversity and genetic identity on carbon cycle processes. In a long-term nitrogen enrichment experiment in Massachusetts (TIDE), we have found that nutrient pollution acted as an environmental filter that reduced intraspecific genetic diversity, altered genetic identity, and altered plant traits (e.g. flowering phenology, root:shoot ratio) of the foundation species, *Spartina alterniflora*.

To evaluate how these changes in foundation species alter blue carbon pools and processes, we measured carbon pools, biomass allocation, and carbon cycle processes for two years in paired nitrogen-enriched and reference salt marshes. We found that genetic changes in nutrient enriched ecosystems were associated with reductions in belowground biomass, altered phenology, and increased ecosystem respiration in comparison to paired reference ecosystem. Reduced belowground biomass allocation and enhanced ecosystem respiration have resulted in reduced soil carbon pools at depth. Our data suggest that genetic changes in foundation species from global change factors, such as nutrient enrichment, may create cascades that accelerate changes in ecosystem processes to alter the blue carbon function of wetlands.

BIO: Dr. Mozdzer is an assistant professor in Bryn Mawr's Biology Department. He has nearly 20 years' experience researching coastal wetlands. His research has been focused on the effects of global change on greenhouse gas fluxes, carbon storage, plant ecophysiology, genetic diversity of foundation species, and invasive species.

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MICROSCALE HYDROGEN PEROXIDE MEASUREMENTS OF CYANOBACTERIAL BLOOMS IN SOUTHWEST FLORIDA LAKES

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Cyanobacterial blooms are a global problem because of the increased flux of nitrogen and phosphorus and other limiting nutrients into lakes and coastal waters. Cyanobacterial blooms are of special concern to human health as studies have shown that they can produce toxins or other substances that lead to illness. Along with nutrient management, chemical treatments to control harmful algal blooms have been used, including copper sulfate, biological treatment by use of catalysis, and recently, the use of hydrogen peroxide. The utilization of hydrogen peroxide to control cyanobacterial blooms is promising because hydrogen peroxide does not last long and is degraded into water and oxygen. In high concentrations, however, hydrogen peroxide is toxic to aquatic organisms, and an understanding of natural hydrogen peroxide concentrations is necessary for future water management. The aim of this project was to collect baseline data of hydrogen peroxide in southwest Florida lakes. We also examined biological responses of cyanobacteria to hydrogen peroxide exposure.

Hydrogen peroxide was quantified by ferrous ion oxidation in the presence of xylenol orange and by using hydrogen peroxide microsensors. We compared these two methods in terms of detection limits and linearity, and found that both methods correlated with each other and are interchangeable. Our initial sensor work showed that the concentration of hydrogen peroxide changes quickly in cyanobacterial cultures; it was produced under the light condition while it declined under the no light condition. Based on this observation, we hypothesized that previous measurements of hydrogen peroxide in literature constantly underestimated the concentration of hydrogen peroxide because it would be degraded during the transportation of water from the field to the laboratory. To confirm this hypothesis, we compared two surface water samples, one was collected from the field and transferred to the laboratory with blue ice, and the other was treated with 0.2-µm pore-size filters at the field and transported in the same manner. The results supported our hypothesis and showed that the concentration of hydrogen peroxide was consistently higher in the filtered water samples than the normal (non-filtered) condition water samples. Literature data suggested that the concentration of hydrogen peroxide is higher in surface water than the deeper water in lakes. However, no such measurements have been taken in southwest Florida. In addition, nothing is known about microscale distributions of hydrogen peroxide in surface lake water. Thus, we used the hydrogen peroxide microsensor to examine the millimeter scale distribution of hydrogen peroxide in thin surface lake water. These measurements were applied under cyanobacteria bloom conditions and compared with normal conditions. The lake surface microlayer water was collected and used for standard nutrient and chlorophyll analyses along with iron measurements. We visited two cyanobacterial blooming sites (Devitt Pond in Sanibel Island and Lake San Carlos in Fort Myers) and determined vertical hydrogen peroxide profiles in these lakes (approximately 2 m deep). In Devitt Pond, the hydrogen peroxide concentration ranged between 0.3 to 1.7 µM and the maximum concentration was observed at the surface. Similar profiles were obtained from Lake San Carlos, but the concentration was higher and ranged from 2.7 to 8.1 µM. The microprofiles (0-60 mm) showed steeper hydrogen peroxide gradients and ranged from 1.2 to 2.4 µM in Devitt Pond and 3.3 to 20.9 µM in Lake San Carlos. The concentration of hydrogen peroxide was higher at the bloom sites than at the control sites and higher at the location in the sun than the location in the shade. All together, we found a high natural background level of hydrogen peroxide in southwest Florida lakes and a significant contribution by cyanobacteria in hydrogen peroxide dynamics.

BIO: Luka Ndungu, is pursuing master's degree in Environmental Science at Florida Gulf Coast University. He is studying the interaction between cyanobacteria and hydrogen peroxide in aquatic ecosystem.

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SEASONAL AND HURRICANE IRMA EFFECTS ON THE HYDROLOGIC REGIME OF A CONSTRUCTED URBAN STORMWATER TREATMENT WETLAND COMPLEX IN SOUTHWESTERN FLORIDA

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Freedom Park, a 20-ha park constructed in Naples, Florida in 2009, includes a 4.6-ha stormwater wetland treatment system for improving the water quality of the downstream impaired Gordon River and estuaries that flow into the Gulf of Mexico. The watershed includes 1,766 ha of a highly urbanized Naples metro area. The goals of the stormwater wetlands are to improve the water quality, reduce peak flows discharging into Gordon River and further to Naples Bay, and provide an aesthetic water park for the public. Understanding the hydrology of the system is a critical component in understanding the overall functioning of its design, and in determining if the original goals of the system are being met. A hydrologic budget was summarized into monthly budgets between August 1, 2016 and October 31, 2017, which included both wet and dry seasons. For the 15-month study period, average surface water pumped into the system was 59 cm week^{-1}; the average surface outflow was 45 cm week^{-1}. During this period, average precipitation inflow was 4.4 cm week^{-1}, while the average evapotranspiration rate was 6.7 cm week^{-1}. The average water level at the outflow basin decreased gradually throughout the dry season from November 1, 2016 to May 31, 2017, then rapidly spiked 1.4 m during the week of June 6, 2017 when the wet season began. The system also received an additional pulse of 34 cm during Hurricane Irma on September 10, 2017. Previous studies have found that the wetland system acted as a net sink of nutrients, as was intended by its original design. Our stormwater pulsing study during Hurricane Irma showed that after an initial inflow flush due primarily to rainfall, total phosphorus and total nitrogen concentrations were higher at the outflow than at the inflow for several days before returning to normal conditions. Similarly, the mass of nutrients leaving the system was 57 and 27% higher for TN and TP, respectively, than the mass entering the system during this 6-day period during and following the hurricane. The design of the inflow with pumps rather than natural ditch overflow also meant that the rainfall-dominated inflow was much less than it would have been during such a dramatic hydrologic pulse. We also found that the dissolved oxygen in these wetlands, which was normally hypoxic (below 2 mg/L), briefly increased for 2-days to 5 mg/L before returning to the typically low oxygen conditions. Samples taken at the inflow and outflow of the system for several other storm events throughout the 2017 wet season were also analyzed for their effects on water quality.

BIO: Taylor Nesbit is a second-year graduate student in the Masters of Environmental Science program at Florida Gulf Coast University. She works as a Graduate Research Assistant at the Everglades Wetland Research Park in Naples, Florida. Most of her research is focused on the ecosystem-functioning of created stormwater treatment wetlands at Freedom Park.

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PERSISTENT SALTWATER INTRUSION ALTERS ECOSYSTEM CARBON CYCLING IN TIDAL FRESHWATER MARSHES: COMPARISON OF RESULTS FROM *IN SITU* MANIPULATIONS IN VIRGINIA AND SOUTH CAROLINA

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Saltwater intrusion, which is driven by a variety of mechanisms including sea level rise, changes in precipitation, and anthropogenic hydrological modifications, can cause salinization of tidal freshwater wetlands. This salinization alters one of the defining properties of tidal freshwater wetlands, namely their low salinity, and leads to changes in the soil physicochemical environment, microbial communities, and plant processes. Collectively, these changes to the ecosystem may cause alterations to important ecosystem services including primary production and carbon sequestration.

We have conducted long-term (multi-year) *in situ* salinity manipulation experiments in tidal freshwater marshes in Virginia and South Carolina. These sites have similar background salinity levels, typically < 0.3, but differ in their soil characteristics, hydrology, and plant communities. At each site, additions of brackish water to the surface of the marsh have increased porewater salinities from freshwater to oligohaline levels. We have made a suite of measurements at each site, including porewater chemistry, marsh-atmosphere fluxes of CO_2 and CH_4, and soil CO_2 and CH_4 production potentials. During the first year of manipulation at the Virginia site, we found that saltwater intrusion decreased gross primary production and ecosystem respiration by 40-50% within 1.5–2.5 months of beginning the experiment. In contrast, at the South Carolina site there was only a transient decrease in CH_4 emissions and no change in CO_2 fluxes between the marsh and atmosphere during the entire first growing season of manipulation. During the second and third years of manipulation, both sites exhibited sustained and substantial reductions in rates of gross primary production, respiratory CO_2 emissions, and CH_4 fluxes to the atmosphere. Despite the between-site consistency in how these CO_2 and CH_4 exchanges respond to saltwater intrusion, there was substantial interannual and site-to-site variability in how net ecosystem production (a proxy for the rate of ecosystem carbon storage) responded to saltwater intrusion. Sometimes, saltwater intrusion did not affect rates of net ecosystem production but other times net ecosystem production was reduced by ~50% due to salinization.

Although each of our *in situ* experiments has lasted for multiple years, the responses we have captured still represent the initial disturbance stages of salinization. It remains to be seen how these ecosystems will respond over even longer time scales as salt-tolerant plants move into today's tidal freshwater wetlands and microbial communities shift in response to salinization. Because carbon accumulation is a key contributor to soil accretion in tidal freshwater wetlands, these salinization-driven alterations to the wetland carbon cycle have implications for future wetland sustainability in the face of rising sea levels and increasing salinity at the head of estuaries.

BIO: Dr. Neubauer is an associate professor in the Department of Biology at Virginia Commonwealth University. His research focuses on wetland biogeochemistry and microbial ecology, with an emphasis on ecosystem responses to environmental change. He has extensive experience in tidal freshwater marshes, having worked in these fascinating ecosystems for >20 years.

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RESTORATION OF BIOGEOCHEMICAL CHARACTERISTICS THROUGH ACTIVE MANAGEMENT OF THE NUTRIENT-ENRICHED EVERGLADES

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Four decades of elevated phosphorus (P) loads to the historically oligotrophic Everglades caused a regime shift from the ridge (*Cladium jamaicense* Crantz)-and-slough landscape to large areal expanses of cattail (*Typha domingensis* Pers.). To accelerate the recovery of these P-impacted areas, we conducted a large-scale *in situ* study, comprised of fifteen 6.25 ha plots, to test our ability to rehabilitate cattail areas by creating an alternative submerged aquatic vegetation (open; SAV) regime. We hypothesized the open/SAV environment would be more oxygenated with higher wildlife value, but there was a concern that a large-scale vegetation management action would exacerbate P conditions in this already enriched landscape. During the first four years, floc P levels were significantly elevated in the created open versus cattail dominated plots. However, more recently, 10 years post-creation, floc P concentrations have decreased in the western-most plots, while remained somewhat elevated in the eastern-most plots. There is also a dramatic increase in ash content (from 10 to > 50% in open compared to cattail plots), indicative of higher mineral enrichment/precipitation in the western-most plots. There are several mechanisms that likely explain this differential response including; location of the plots relative to a north-south airboat trail, thus influencing how surface water flows from inflow culverts affect landscape biogeochemistry, the generally greater flows from the western-most inflow structure contributing to higher mineral loads in the western plots, and the subtly different hydroperiods and water depths. Existing hydroperiods and depths contributed to more rapid regrowth of emergent plants such as cattail, and more organic conditions in the plots east of the north-south airboat trail. In contrast, the combination of higher minerals and shallower depths/shorter hydroperiods at the western sites supported greater SAV metabolism, which in turn results in greater calcium carbonate precipitation and potentially, capping of the legacy P. This study highlights the importance of linking chemistry, hydrology and biology, and understanding their feedbacks when designing restoration projects. In addition, the importance of examining long-term, as well as short-term, responses when considering whether an active management treatment is successful and sustainable.

BIO: Dr. Newman is a Senior Scientist and Section Leader of the Marsh Ecology Research Group, with over 25 years of experience conducting research and restoration projects in the Everglades.

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MICROBIAL COMPOSITION OF EVERGLADES STORMWATER TREATMENT AREAS IS LINKED TO SULFUR CYCLE

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The Everglades stormwater treatment area (STA) flow-ways (FWs) were designed to remove nutrients, especially phosphorus, from agricultural runoff before it enters the Everglades Protected Area. In the 23 years since the construction of the STAs, many studies have focused on ways to optimize the efficiency of this system. However, little work has focused on the microbial composition of the STAs and the role of microbes in nutrient cycling. 16S amplicon survey was used to study the sulfur cycle in the STA. We are able to detect 40 genera of sulfate-reducing bacteria (make up to 12% of total relatively abundance) belong to 5 families (Desulfarculaceae and Desulfohalobiaceae, Desulfovibrionaceae, Desulfobacteraceae, Syntrophaceae and Syntrophobacteraceae) all belong to Deltaproteobacteria. Desulfarculaceae and Desulfococcus are the most abundant families made up about 60% of all sulfate-reducing bacteria. Sulfate-reducing bacteria are highly abundant in floc, ras and pre-STA. Sulfur-oxidizing bacteria are most abundant in water and floc sample (make up to 8% of the relative abundance). Gammaproteobacteria is the most abundant class (make up to 70% of all sulfur-oxidizing) and is quite diverse with 28 genera with Theotrichaceae and Halothiobacillaceae are the most abundant families. The second most abundant group is Epsilonproteobacteria, and the third one is Betaproteobacteria. Sulfate-reducing and Sulfur-oxidizing bacteria make up a substantial portion of the microbial community in both SAV and EAV FWs. As such, these two groups may exert control over phosphate availability in aquatic systems and deserve in-depth investigation.

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NUTRIENT AND SEDIMENT INPUTS CHANGE SOIL STRUCTURE AND BIOGEOCHEMISTRY IN FLOODPLAIN ECOSYSTEMS: A CROSS-STUDY SYNTHESIS

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We synthesized measurements of inputs and internal cycling of sediment and nutrients made across multiple studies of floodplains in the eastern, southeastern, and south central United States. We specifically tested if floodplain inputs of sediment and nutrients and soil biogeochemical process rates differ among landscape settings and among natural, restored, and created floodplains. We also tested if inputs change floodplain soil structure and nutrient mineralization rates.

Rates of sedimentation and associated particulate N, P, and C inputs varied among physiographic provinces, with generally increasing rates from higher to lower gradient landscapes, from mountains to the sea. Soil N and P net mineralization rates and turnover rates also varied across landscape settings. Nutrient mineralization rates were explained by a combination of material input rates and soil characteristics, with nutrient inputs having the most influence on soil P and N mineralization and N turnover, whereas soil characteristics were more important for P turnover, nitrification, and ammonification. The nutrient concentrations in deposited sediment and underlying soil widely diverged at locations with little sedimentation, and converged where there was greater sedimentation. Finally, spatial covariation in organic and mineral sedimentation among measurement locations identified average allochthonous and autochthonous C sedimentation rates of 150 and 70 g-C m^{-2} yr^{-1}, respectively. In summary, this multi-study synthesis of floodplain ecosystem ecology found that greater inputs of sediment and particulate and dissolved N and P, associated with increasing hydrologic connectivity, changed soil characteristics, enhanced C trapping, and stimulated biogeochemical cycling in floodplains.

BIO: Dr. Greg Noe has been a Research Ecologist with the U.S. Geological Survey's Water Mission Area in Reston, Virginia, since 2002, where he leads the Wetland Ecosystem Ecology & Biogeochemistry Laboratory (WEEBL). Dr. Noe's research centers on wetland ecosystem ecology, focusing on the interactive influences of geomorphology, hydrology, climate, and biology on nitrogen, phosphorus, and carbon biogeochemistry in fluvial ecosystems, as well as plant community ecology and restoration ecology.

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EMERGING BLUE CARBON: PILOT STUDY OF ORGANIC CARBON AND NITROGEN STORAGE IN ESTUARINE TIDAL FLAT SEDIMENT, KOREA

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Recently, Korean government has highlighted the valuable role that coastal and marine ecosystems play in sequestering organic carbon and nitrogen. However, the variation in rates of carbon and nitrogen storage and the factors controlling storage have poorly understood in Korean tidal flat. This study aimed to 1) evaluate the carbon and nitrogen storage in worldwide scope of coastal and marine ecosystems, 2) assess the carbon and nitrogen storage capacity in the Korean mudflat by analyzing organic matter, bulk density, total nitrogen (TN), sediment organic carbon (SOC), and carbon stable isotopic ratio ($\delta^{13}C$) in the sediment. Sediments were cored from various types of tidal flat such as Ganghwa, Boryeong, Saemangeum coast, Geum-river Estuary, and Nakdong delta. Results showed that previous global studies generally reported that mangroves had the highest carbon and nitrogen storage capacity followed by salt marshes and mudflats. In field study of Korea, more vegetated sediments in Ganghwa have higher SOC and TN densities (47.4 Mg C ha^{-1} and 6.5 Mg N ha^{-1}), while recent reclaimed sediments in Saemangeum have the lowest SOC and TN densities (3.6 Mg C ha^{-1} and 2.3 Mg N ha^{-1}). The SOC and TN stocks tended to decrease from the vegetation mudflat to the bared mudflat in the order: more vegetated mudflat > fewer vegetated mudflat > bared mudflat. Carbon storage capacity in mudflats generally showed smaller stocks compared with mangroves, however, it was also a valuable sink for carbon storage because the amount was estimated approximately as 30%. Of note, results indicated that the area where plant detritus was supplied as carbon and nitrogen source showed more SOC and TN stocks compared to dried area by reclamation. Overall, the mudflats played an important role as an organic carbon and nitrogen reservoir.

BIO: Mr. Noh is a Ph.D student of Seoul national university, Korea. His major is marine benthic ecology and he is a project researcher for the first BLUE CARBON project focusing on organic carbon storage and sequestration of costal area, Korea. He is also studying mudflat restoration and coastal ecology, and has participated in more than 5 projects dedicated to preserving and restoring mudflats.

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BIOGEO2018 MANGROVE FOREST BIOMASS ESTIMATES, COMMUNITY STRUCTURE AND CLASSIFICATION IN THE NIGERIAN NIGER DELTA

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Mangrove forests are important coastal ecosystems because they provide cultural, provisional and regulatory services but they are threatened by exploitation, urbanization and sea level rise. Nigerian mangroves are hotspots of oil pollution, development, deforestation and invasive species, especially in the Niger Delta. Hence, mangroves in Nigeria should be studied to understand the effects of these land use changes on the biomass, despite research challenges.

I assessed Niger Delta mangrove forests in terms of aboveground biomass, community structure and how various economic activities in these regions affect them. Classification of my study region was also done to differentiate mangroves from the invasive species, Nipa palm; and the relationship between biomass and radar backscatter was established. 25 square plots in 3 sites were sampled in 2 states of the Niger Delta; ground control points were also collected across the Niger Delta for classification using optical and radar data products from ALOS PALSAR and Sentinel.

Initial results show that a total of 6.3 ha of mangrove area was sampled with mean AGB of 83.73 ± 61.4 t ha^{-1}. An overall accuracy of 99% and kappa coefficient of 0.99 was derived from the classification of the study area using maximum likelihood method. However, the commission of Nipa palm was about 30%andcanbeimproved. The relationship between radar backscatter and plot estimates of AGB showed the highest R square value of 57% and p-value < 0.001 from a combination of the VV: VH Sentinel 1 radar and HV: HH ALOS PALSAR data. The site with the highest biomass was found in the protected site plots and the lowest was found on the site were urbanization was actively taking place. DBH size distribution and biomass contribution also gave evidence to this also.
The results show that the effects of exploitation in the Niger Delta mangrove forests are underestimated and underreported, hence, the need for an updated mangrove biomass monitoring the Niger Delta. A new mangrove biomass map is possible in the Niger Delta based on these results which will be important to stakeholders in planning mangrove conservation.

BIO: Chukwuebuka Nwobi is a young scientist specializing in mangrove carbon stock, ecosystem function and restoration of mangrove forests in Nigeria.

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HOW NUTRIENTS INTERACT WITH STRESSES, SUCH AS FLOODING AND SALINITY, TO AFFECT WETLAND PLANT GROWTH AND LEAF TISSUE STOICHIOMETRY

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Nutrients often limit plant development and productivity, influence the outcome of competition among plant species, and influence herbivore behavior through their effects on plant tissue chemistry. Likewise, stresses such as flooding and salinity often limit plant productivity and influence the outcome of competition among plant species. The relationship among plant growth, nutrients and a stress can be classified according to whether growth is dominated by the stress or by the nutrient, and whether the stress and the nutrient act independently or interact. There are four possible outcomes: *(a)* the nutrient and stress act independently with the stress dominating growth, *(b)* the nutrient and stress act independently with the nutrient dominating growth, *(c)* the nutrient and the stress interact with the interaction dominated by the stress, and *(d)* the nutrient and the stress interact with the interaction dominated by the nutrient. Experiments using nutrient availability, flooding stress or salinity stress, and a wetland grass (*Spartina patens* (Aiton) Muhl.) or a wetland tree (*Taxodium distichum* (L.) Rich.) indicated that a limiting nutrient did not increase growth when the stress was high. This outcome reflected the third possible outcome above: nutrients and stresses interacted with the interaction dominated by the stress. This outcome also reflected principles of ecology and toxicology; *(i)* increasing availability of a limiting nutrient increases growth and *(ii)* everything, including nutrients, is a toxin; the dose determines whether or not something is toxic. When plant growth is limited by stress, the only responses to nutrients are no-response or a toxic response, which can appear to be a tipping point if one is looking for a tipping point.

Stress alone altered the C:N ratio of leaves. In *S. patens*, the effect of salinity stress on leaf tissue C:N was small enough that it could be accounted for when interpreting C:N ratios. In *T. distichum* however, leaf tissue C:N ratio could not be used to compare nutrient availability among trees because flooding caused a bigger difference in C:N ratios than nutrient availability. In *T. distichum*, Hg in first-year leaves was increased by flooding stress and decreased by nutrient availability, presumably when roots were smaller and limited to the surface of pots. However, Hg in second-year leaves increased with nutrient availability when nutrient availability also increased root biomass and presumably allowed roots of even drained treatments to penetrate deeper to reduced soil where methylation of Hg is more likely. Such complexity might complicate predicting landscape hotspots of mercury methylation.

BIO: Andy Nyman is a Professor of wetland wildlife with more than 70 peer-reviewed publications and 25 years of experience working with wildlife managers and wetland restoration agencies.

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AN OVERVIEW OF GLOBAL AND REGIONAL SEA LEVEL RISE PROJECTIONS: MEANS AND EXTREMES

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Understanding the impacts of future sea level rise on coastal wetlands and infrastructure is important for planning of restoration and resiliency efforts. While data from tide gauges and satellite altimetry provide valuable information on historical rates of sea level rise, recent work clearly indicates that these rates are dynamic and likely to change in the future due to a variety of factors. Coupled with expectations of an accelerated increase of global temperature suggested by climate models, a significant acceleration of global sea level rise cannot be excluded from consideration in the future planning of coastal infrastructure. Future sea levels in coastal regions will be further modified by regional and local factors such as vertical land movement, dynamic effects of ocean circulation and wind patterns, and the changes in gravitational effects of melting ice from Greenland and Antarctica. Numerous entities have attempted to project sea levels both globally and regionally. Future increase in mean sea levels along coastlines will also result in significant changes to the frequency and magnitude of sea level extremes. This presentation will provide an overview of numerous global and regional sea level rise projections, modeling the magnitude and frequency of sea level extremes and the potential implications of increasing sea levels on coastal projects located in both natural and built environments.

BIO: Dr. Obeysekera is the technical lead for climate change and sea level rise at SFWMD. He is a co-author of three national reports on global and regional sea level projections and is a recipient of the 2015 Norman Medal from the American Society of Civil Engineers.

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VARIATION IN CARBON STORAGE AND NUTRIENTS IN MANGROVE PEATS ACROSS PUERTO RICO

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Mangrove ecosystems play a vital biogeochemical role at the continental – estuarine boundary, storing carbon and nutrients and sequestering contaminants. Yet the ability of mangroves to maintain ecosystem functions is uncertain given accelerated sea-level rise and land-use changes that alter productivity and storage. Additionally, we lack an understanding of how hydrogeomorphic conditions and physiographic context influence biogeochemical cycling and carbon storage. Across the island of Puerto Rico, mangrove forests are found across a wide range of climate (moist-tropical to arid) and geomorphic (igneous to sedimentary) settings. These variables influence forest productivity, amount of terrigenous sediment influx, and pore-water salinity.

In 2017, we embarked on a pilot project to document differences and similarities in carbon storage and nutrient accumulation in three coastal locations in Puerto Rico: Pinones on the north coast, Jobos Bay on the southeast coast, and Punta Pitahaya on the southwest coast. Two 40-cm deep cores were collected in each location. Total nitrogen (TN), phosphorus (TP), organic (OC) and inorganic carbon (IC), and percent organic matter (OM) were determined down core at 2 cm intervals in the top 10 cm and 1 cm thereafter. Radiometric dating using ^{210}Pb isotopes is being conducted to generate sediment accumulation rates.

Estimates of percent organic matter from loss on ignition were much lower on average in the cores from the north side of the island compared to those of the south side (12 to 28 % vs. 65 to 69%). Similar trends were observed for TC and TN. Trends in TP were observed for all cores with TP increasing over time from 100 to 300 ug/g to more than 600 ug/g at the surface. However, the timing and abruptness of increases in TP vary by location and are likely attributable to multiple phenomena, including changes in upstream agricultural intensity and climatic conditions that would bring increasing amounts of terrigenous materials into the estuarine environment. Additionally, periodic disturbance from hurricanes likely plays a role in observed variation down-core. Finally, we compare our initial results to those of the wider Caribbean region including south Florida.

BIO: Dr. Ogurcak is a postdoctoral associate with a degree in Earth Systems Science from Florida International University. She has over 10 years of experience in ecological research in the Everglades and the Florida Keys.

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THE ROOTS OF BLUE CARBON IN MANGROVE FORESTS: THE EFFECT OF PHYSICAL SOIL PROPERTIES ON STILT ROOT DEVELOPMENT IN *RHIZOPHORA STYLOSA*

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Recent global analyses suggest mangroves store large carbon (C) reservoirs in their soils that can reach 885 Mg C ha^{-1}. The below-ground biomass of mangroves is a major contributor to these C sinks. In plants, root system development tends to be highly plastic in response to environmental conditions such as nutrient and water availability, as well as soil physical characteristics such as bulk density (BD). Most of the research on mangrove root growth, however, has focused on the below-ground roots. Here we present an assessment of the development of stilt roots of *Rhizophora stylosa* upon encountering soils with varying soil BD. We used containers which were filled with soils of different BD and which were placed underneath the root tips of stilt roots. Root image analysis indicated that BD had a significant effect on root growth, with longer roots at low BD (ca. 0.1 cm increase for each 0.2 g cm^{-3} decrease in BD). Furthermore, analysis of the tissue suggests soil BD influences root anatomy. Thus, the effect of soil characteristics on mangrove root growth influences the length and quality of root tissues with flow on effects on C cycles in mangrove ecosystems.

BIO: Anne Ola is a PhD candidate at the University of Queensland. Her research focuses on processes at the soil-root interface and its wider implications for environmental issues such as carbon sinks in mangrove forests and, previously, soil erosion on agricultural land.

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IMPACTS OF SEDIMENT DREDGING ON PHOSPHORUS DYNAMICS OF A RESTORED RIPARIAN WETLAND

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Muskegon Lake is a drowned river mouth-lake that connects directly to Lake Michigan. It was designated as a Great Lakes Area of Concern (AOC) in 1985 with one of the major impairments being the loss of fish and wildlife habitat due to industrialization along the shoreline in the 1900s. In an effort to increase fish and wildlife habitat within the AOC, a restoration project was initiated in 2012 that would restore floodplain habitat. In the early 1900s an earthen berm had been constructed that hydrologically separated former wetlands from their adjacent stream to be used for celery production. After farming ended in the 1990s, the pumps were turned off and this area refilled to form two ponds, one never dredged and the other partially dredged. Initial studies indicated that the undredged pond had very high phosphorus (P) concentrations both in the water column (TP: 850 µg/L) and the sediment (SRP: 3-8 mg/L), so reconnection risked the net movement of P from the restored wetland to downstream Bear Lake, which already was under a TMDL for excess P. Sediment dredging was selected as the most effective approach to prevent P loading following hydrologic reconnection. To evaluate the success of the dredging at reducing P release from the reconnected wetland, we are now repeating experiments to measure P release rates from incubated sediment cores. Sediment cores were collected in both the summer and fall of 2017 and incubated under two water temperatures (ambient; +2°C) and two oxygen levels (oxic; hypoxic), resulting in 4 different treatments. Additionally, P isotherm experiments were conducted to provide more information on how sediment dredging effected P dynamics in this wetland. We will compare results from post-dredging with those from pre-dredging to evaluate the efficacy of sediment removal as a restoration approach. Understanding the success of the dredging at reducing the P release from this wetland will help determine if additional management techniques are needed to avoid further impairment of downstream water quality.

BIO: Kim is currently a graduate student at Grand Valley State University and based at the Annis Water Resources Institute in Muskegon, MI. She is advised by Dr. Alan Steinman and is pursuing a degree in aquatic biology with research interests in wetland restoration and nutrient cycling.

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METHODS OF SULFUR ANALYSIS IN WETLANDS STUDIES AND APPLICATIONS TO MERCURY BIOGEOCHEMISTRY

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Sulfur plays a major role in the biogeochemistry of wetland ecosystems as an essential nutrient, and a driver of biogeochemical processes in wetlands such as microbial sulfate reduction and sulfur oxidation. Microbially-mediated redox reactions produce the large variety of chemical forms of sulfur present in wetlands. Microbial sulfate reduction is an important driver of carbon cycling and methylmercury production in wetlands. This presentation will focus on methods of sulfur analysis for identifying forms, sources, and biogeochemical processes in wetlands involving sulfur.

The variety of forms and reactivity of sulfur requires many different approaches for analysis. Sulfate is usually determined by traditional ion chromatography, but care must be taken in sulfidic water to avoid oxidation of sulfide to sulfate. Similarly, dissolved sulfide must be stabilized and analyzed quickly by colorimetric or ion selective electrode methods to avoid loss of sulfide through oxidation. More complex analytical approaches are required for analysis of other sulfur compounds. For example, thiosulfate and sulfite are isolated on C_{18} resins, followed by high performance liquid chromatography. Organic sulfur analysis may involve extraction and gas/liquid chromatography - mass spectrometry for individual compounds, or K- and L-edge X-ray absorption spectroscopy for more general organic sulfur characterization. Sulfur species in wetland sediments are often determined by sequential extraction and categorized either as elemental sulfur, monosulfides, disulfides, sulfates, or organic sulfur.

Sulfur isotopes have been used to examine sources as well as redox cycling. For example, $\delta^{34}S$ of sulfate has been used to identify sources of sulfate from aerosols of coal, fly ash piles, and agricultural sources to wetlands. Studies in the Everglades using sulfur isotopes have demonstrated the importance of agricultural sources of sulfate in driving sulfate reduction and methylmercury production in wetland soils. An approach using both $\delta^{34}S$ and $\delta^{18}O$ of sulfate may provide additional refinement for distinguishing potential sources of sulfate. Sulfur isotopes have also been used to examine redox processes such as microbial sulfate reduction where fractionation leaves the residual sulfate isotopically heavier. Sulfur isotopes have also been utilized to examine organic sulfur formation from reaction of isotopically light sulfide with organic matter. The use of isotopically labelled sulfur species in lab and field experiments (microcosms and mesocosms) has provided important information on the rates of redox reactions and the fate of sulfur species during cycling. Information from these analytical and experimental approaches is used to construct conceptual and mathematical models of sulfur biogeochemistry in wetlands.

BIO: Dr. Orem is a Supervisory Research Geochemist with the U.S. Geological Survey. His current research focuses on biogeochemistry and organic geochemistry, Including: environmental health impacts of energy resources, mercury methylation and sulfur cycling in wetlands, and microbial methanogenesis in coal, shale, and petroleum d.

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TRANSATING THE EFFECTS OF SEA-LEVEL RISE IN URBAN SYSTEMS TO THE COASTAL ECOSYSTEM INTERFACE

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Impacts of sea level rise on urban landscapes is being realized globally with saltwater transgression (SWT) events along our coastlines becoming more commonplace. Nowhere is this more noticeable than in large urban areas such as Miami where meteoric high tides (king tides) flood urban landscapes and infrastructure. Impacts of these events on the adjacent aquatic environment have yet to be considered by the scientific community. Potential contaminants mobilized from the urban environment during inundation with saltwater include petroleum products, pesticides and herbicides, fertilizers, and heavy metals. *The objectives of this study were to characterize ecologically relevant types of saltwater extractable contaminants that are normally found in urban soils and impervious surfaces and determine the magnitude of mobilization that can be expected under short term inundation by full strength seawater.* This study investigated regional king tide flooding of urban landscapes and opportunistically monitored storm surges that impacted the state of Florida during the 2016 hurricane season. Pre and post flood water samples were analyzed for heavy metals, selected persistent organic pollutants of anthropogenic origin, organic carbon and nutrients (nitrogen, and phosphorus) to determine the extraction potential of seawater in urbanized terrestrial environments. Supplemental intact core studies were also conducted to determine flux rates for certain parameters. Terrestrial soils and surfaces were found to be significant sources of C,N,P) heavy metals (Cd, Cu, Pb, Zn), and anthropogenic organics (PAHs; petroleum hydrocarbons). Saline waters were observed to aid in mobilization of these materials to a greater extent than freshwater alone. In all observations, mobilization of pollutants was increased significantly by saltwater, however, use of flood events to investigate SLR pollutant mobilization incorporates uncertainty due to volumes of water and spatial extent of flooding involved. All analytes measured in pre-storm surge waters from all sites increased dramatically post-surge above what was expected based upon soils experiments alone suggesting significant loading from the built environment (roads, buildings, other infrastructure).

BIO: Dr. Osborne in an Assistant Professor of Coastal Biogeochemistry at the Whitney Laboratory for Marine Bioscience in St. Augustine, Fl. His research interests include climate change effects on biogeochemical cycling, carbon transformations in aquatic and marine ecosystems, peatland and mangrove ecology.

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USING DGT TO MEASURE BIOAVAILABLE METALS IN A CONSTRUCTED WETLAND TREATMENT SYSTEM

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Passive samplers rely on the unassisted molecular diffusion of analytes through a diffusive surface onto an adsorbent because of differences in concentration between the two media. Diffusive Gradients in Thin Films (DGT) is a type of passive sampler that consists of an absorbent gel that selectively binds to specific contaminants and a diffusion gel that selectively admits analyte molecules. DGT probes are exposed in surface waters, submerged sediments, and saturated soils for hours to days to measure metals and other contaminants. Following exposure, the absorbent gel is removed from the DGT probe and analyzed to determine the concentration of the analytes of interest.

We used DGT probes to measure a contamination gradient and bioavailable metal fractions in the A-01 wetland treatment system (WTS), which was designed to remove copper and other metals from the A-01 NPDES outfall at the Savannah River Site near Aiken, SC. The A-01 effluent is distributed to four pairs of cells in series. Effluent passes from the A cell to the B cell in each pair resulting in a gradient of decreasing metal contamination along the effluent flow path. DGT water and sediment probes were placed at intervals along the gradient and compared with water, sediment, and fish samples collected at the same locations. The DGT results were analyzed to see if they conformed to the expected contamination gradient, were comparable to samples collected by other methods, and appeared to measure bioavailable metals fractions within the WTS.

Copper (Cu), lead (Pb), and zinc (Zn) concentrations measured by DGT water probes generally declined as influent traveled from the beginning of the effluent flow path to the end of the effluent flow path. In contrast, metal concentrations measured by conventional water samples exhibited this pattern only for Cu. These results suggest that metal concentration measurements derived from DGT water probes were better than metal concentration measurements derived from conventional water samples at reflecting contamination gradients previously shown to be present in the WTS. Metal concentrations measured by DGT probes were lower than metal concentrations measured in water for Cu and Zn, likely reflecting reduced bioavailability of these metals in the wetland and pointing out the potential ability of DGT to measure potentially toxic metal species while excluding metal species unlikely to have biological effects. Results from the DGT sediment probes are currently under analysis to assess the presence of horizontal and vertical contamination gradients in the WTS sediments. DGT results will also be compared with metal concentrations measured in *Gambusia holbrooki* collected from the wetlands to assess the relationship between DGT measurements and metal bioaccumulation by this species.

BIO: Dr. Michael H. Paller is a Senior Fellow Scientist at the Savannah River National Laboratory. Research interest include fish and macroinvertebrate ecology, impact assessment, ecological risk assessment, remediation of contaminated sediments, transfer of radionuclides and metals through aquatic ecosystems, and factors affecting the bioavailability of metals. He is the author of over 140 refereed publications and technical reports and one book.

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"ACCIDENTAL" URBAN WETLANDS: BIOGEOCHEMICAL PROCESSES IN UNEXPECTED PLACES

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"Accidental" urban wetlands are environments formed not through deliberate restoration or management activity, but as a result of land use and water infrastructure decisions by municipalities. These wetlands are often formed in abandoned industrial, residential, or commercial areas that are low-lying in the landscape, where overland flows from storms and municipal water use can accumulate and support wetland soils and plant communities. Their positioning within the urban matrix means that accidental wetlands have the potential to both receive and modify materials from surrounding urban areas. Abandoned industrial sites have been estimated to occupy 20,200 km^2 in U.S. cities, but the function and capacity of pollutant removal in unrestored urban wetlands has been little studied. Research we have conducted in both the northeastern U.S. (New Jersey Meadowlands) and the southwestern U.S. (Salt River in Phoenix, Arizona) demonstrates that accidental wetlands tend to receive high volumes of nutrient-enriched municipal, storm, and rainwater, and demonstrate the capacity for high levels of nutrient removal.

Little is known about how management and design intention or interventions influence most wetland functions, as compared to no interventions or design. Ecosystems such as created wetlands, which are deliberately constructed to support specific biogeochemical processes, typically include structural characteristics that mimic those of natural systems, where contaminant processing is high. Design and management of vegetation community, soils, and hydrology is meant to facilitate particular wetland functions (e.g., nutrient removal, microbial habitat). We argue, however, that accidental wetlands may in some cases provide a greater variety of functions than designed urban environments, because the latter can be overdesigned for a limited set of specific functions. Although their soils and hydrology differ greatly from native and constructed wetland systems in the same region, accidental urban wetlands studied in New Jersey (NJ) and Arizona (AZ), appear to support redox conditions that facilitate high rates of microbial denitrification within a few decades following formation. Accidental wetlands in NJ demonstrated comparable or higher rates of denitrification than remnant wetlands surrounded by urban development or native wetland systems, and these rates often matched or exceeded nitrate (NO_3^-) loading from stormwater and the atmosphere. Denitrification rates in these wetlands were mediated by soil pore structure and water dynamics, and limited by NO_3^- availability. In AZ, percent removal of NO_3^- by accidental wetlands was generally high, and matched or exceeded removal in native or constructed wetlands in the same region. The wetlands were often a net source of dissolved PO_4^{3-}, but on average removed 21–28% of P entering the wetlands. These high levels of function suggest that structural elements (soil structure, hydroperiod) mediating beneficial microbial processes in urban wetlands may in some cases develop relatively quickly in the absence of design and management.

BIO: Dr. Palta is an Assistant Professor of Environmental Science and a denitrification enthusiast. She has spent the last 20 years of her life mostly in waders, exploring and studying wetlands in the Southeastern, Northeastern, and Southwestern U.S. She is currently involved in projects examining urban wetlands in New York City.

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LARGE METHANE EMISSIONS FROM AMAZON FLOODPLAIN TREES

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Wetlands release methane (CH_4) - a powerful greenhouse gas - to the atmosphere via three main pathways: diffusion, bubbling and plant-mediated transport. However, there is growing evidence that CH_4 emissions may also occur via stem and leaf surfaces of wetland trees. Our earlier work in temperate, tropical and boreal forested wetlands revealed that trees emit ≤90% of CH_4 in forested wetlands. These findings together with many other recent studies have highlighted the gross underestimation of CH_4 emissions from wetlands by excluding measurements from trees.

Here we present, our recent stem CH_4 emission measurements from over 2300 trees across 13 locations in the central Brazilian Amazon basin. We found tree stems to emit 0.33–337 mg m^{-2} h^{-1}, which are about 200 times larger than emissions reported for temperate wet forests and tropical peatswamp forests, making them the largest non-ebullitive wetland fluxes recorded. Stem CH_4 emissions exceeded emissions from leaf, soil, aquatic and macrophyte surfaces. Less than 4% of wood cores extracted from tree stems at 20 and 130 cm above the soil or water surface displayed capacity for CH_4 production, which is indicative that the CH_4 emissions measured at the stem surfaces are principally of soil-microbial origin. The $\delta^{13}C$ values of stem CH_4 emissions ranged from -76.3 to -59.1‰, averaging -66.2 ± 6.4‰, these values are typical for wetland soil CH_4.

Using measured CH_4 fluxes and their corresponding surface area, we estimated the contribution of each CH_4 transport pathway to total ecosystem CH_4 flux. Emissions from tree leaves and stems collectively were the dominant source of CH_4 evasion from Amazon floodplain soil. Conservative scaling the stem and leave emission data to the entire Amazon lowland basin yields an annual source strength of up to 21.2 ± 2.5 Tg CH_4 yr^{-1} for tree-mediated emissions. Our findings from the Amazon basin highlight that tree-mediated CH_4 emissions represent a sizeable source of CH_4 to the regional CH_4 budget and illustrates the importance of considering tree-mediated CH_4 emissions in large scale assessments and process-based wetland models.

BIO: Dr Pangala is a Research fellow and lecturer at Lancaster University, with research interests in plant-soil interactions and greenhouse gas exchanges from carbon-dense forests. Bornean peatswamp forests and Brazilian Amazon feature heavily in her work and in these ecosystems, she has been studying the role of trees in transporting methane to the atmosphere.

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HAVE WE REACHED A NEW NORMAL?: NUTRIENT CYCLING AND BLOOM DYNAMICS IN THE INDIAN RIVER LAGOON

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Ecosystem-disruptive harmful algal blooms (HABs) are becoming increasingly more common in many estuaries. Multiple physical and chemical factors are known to contribute to HABs by increasing phytoplankton growth from the base of the ecosystem and much attention has been paid to external supply of nutrients (i.e. nitrogen-N and phosphorus-P) as the driver of blooms in coastal systems. We investigated potential 'bottom-up' factors—including temperature, salinity, and available N and P—in light of recent algal bloom events since 2011 in the northern Indian River Lagoon (IRL) basins. While temperature and salinity have been implicated for similar blooms in other estuaries, these factors do not show a direct, conclusive correlation with recent HABs in the IRL. In contrast, long-term water quality monitoring data (>15 years) shows a disproportionate increase in total and dissolved P in the water-column prior to a significant shift in the composition and magnitude of bloom events in 2010-11. We also hypothesized that increased P levels, and in turn lower N:P ratios, may explain elevated abundance of picocyanobacteria in the IRL. As such, we found that dissolved P was also an important predictor of the N_2 fixation activity in the IRL, and significant rates were measured (0.28-0.35 g N m^{-2} over one week) leading up to a "brown tide" event in 2015-16.

Secondary effects and feedbacks from these major HABs include declines in seagrass abundance and health, leading to higher internal nutrient loads from senescent biomass, and reduced nutrient uptake and storage by the seagrasses and other benthic producers. Algal culture uptake experiments suggest that this internal supply of reduced forms of N (i.e. ammonium and dissolved organic N) may help select for the certain species of nano- and pico-planktonic algae that have recently dominated IRL blooms. Additionally, these experiments demonstrate that IRL HAB-groups are likely well-adapted to using organic P. In turn, a shift in nutrient pools from N and P storage in benthic communities to recycling and flux to the water-column is likely enhanced by the turnover of organic nutrients via the microbial loop.

Together, these internal nutrient cycling processes may help lead to a 'new' ecosystem state favoring widespread and sustained blooms of nano- and picoplanktonic algae that can take advantage of the predominant nutrients available in the IRL. These results also highlight the complex and often overlooked internal biogeochemical feedbacks from nutrient enrichment in estuaries, and they demonstrate the need for dual nutrient (i.e. N and P) management strategies in aquatic ecosystems.

BIO: Joshua Papacek is a PhD candidate in the Soil and Water Sciences Department at the University of Florida. He received his B.S. degree in Biological Sciences at Michigan Technological University before joining the Wetland Biogeochemistry Laboratory at UF as a Graduate Student Fellow in 2013.

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NUTRIENT DYNAMICS AND THEIR INTERACTION WITH PHYTOPLANKTON GROWTH IN THE AQUATIC AREAS OF COASTAL WETLAND IN LIAOHE DELTA, CHINA

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Fluvial inputs of nutrients and efficient nutrient recycling mechanisms make estuarine and coastal waters of wetlands highly productive. For the same reasons, they are susceptible to eutrophication problems. In China, eutrophication problems along coastal wetlands are becoming serious because of discharges of domestic sewage and industrial wastewater and runoff of agricultural fertilizer. Addressing these problems requires an informed assessment of the factors that controlling wetland algal production. Our study aims at determining whether nutrients were limiting to phytoplankton growth, their interactions, the possible factors controlling phytoplankton biomass, and the effect of nutrient variations on the trophic status in the aquatic areas of coastal wetland in Liaohe Delta, China. Based on an investigation during the autumn of 2013, we found no evidence of nutrient limitation for phytoplankton growth in our study. Ammonium concentrations were high enough to suppress nitrate uptake, and therefore ammonium was the principal source of nitrogen for phytoplankton in the surface waters. Nitrate and silicate followed a conservative mixing pattern versus salinity. The major factors limiting phytoplankton growth in this study were light availability and low temperature. The degree of light limitation was most extreme in the Liaohe River mouth but weaker in offshore areas. This fact, combined with nutrient over-enrichment stress, has caused serious eutrophication problems and frequent occurrences of dinoflagellate blooms in the aquatic area of coastal wetlands of Liaohe Delta.

BIO: Dr. Pei is an associate research scientist from the Key Laboratory of Coastal Wetlands, China Geological Survey, with extensive interests in biogeochemistry, nutrient pollution and eutrophication problems of coastal wetlands. He is awarded the Distinguished Young Scientists Training Program in Ministry of Land and Resources and has led 5 projects.

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HOW DO WE MANAGE MICROBIOMES TO PROMOTE URBAN WETLAND FUNCTIONS?

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Nutrient runoff from urban development has led to elevated contaminant inputs into aquatic ecosystems. To mitigate nutrient runoff, best management practices, such as stormwater wetlands are incorporated into urban landscapes to enhance flood control and improve water quality. However, increased environmental stressors, such as drought and salinity can affect microbial communities, thus threatening wetland nitrogen removal functions. In most engineered and restored ecosystems, the contribution of microbial communities is often ignored even those these organisms determine the types and rates of ecosystem functions. To examine how environmental features of urban wetlands influence microbial community structure and function, we ran potential denitrification assays (acetylene block method) to quantify nitrogen removal rates and characterized bacterial community composition (amplicon sequencing method) along riparian areas of an urbanized stream and constructed stormwater wetland. Distinct bacterial communities were associated with the highest sediment denitrification rates in shady, vegetated, and wetter areas, compared to denitrification rates in unvegetated wetland sediment and base and stormflow water samples. To quantify the impacts of environmental stressors on nitrogen removal potential, we ran a laboratory-based manipulation of moisture and salinity on constructed stormwater wetland sediments. Results revealed that salinity significantly reduced denitrification rates under the most saturated moisture conditions. Differences in potential denitrification rates are due in part to changes in bacterial community responses to environmental stressors such as moisture and salinity manipulation and organic carbon inputs. To promote the design and management of resilient constructed stormwater wetlands, we need to know how environmental change interacts with the built environment if we are to support urban wetland functions.

BIO: Dr. Peralta is an Assistant Professor of Microbial Ecology. Her research examines how human changes to the landscape impacts microbial community structure and ecosystem functions. Recent projects leverage social-ecological-technological approaches for targeting restoration of microbial functions in managed ecosystems.

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REBUILDING MISSISSIPPI RIVER DELTA: OPERATING A SEDIMENT DIVERSION TO BALANCE ECOSYSTEM AND SOCIAL NEEDS

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Louisiana's coastal future relies on reconnecting the Mississippi River to the delta and allowing the water, sediment and nutrients from the river to nourish and sustain existing marshes and rebuild lost wetlands. Through a series of gates, a restoration infrastructure project called a sediment diversion can allow discharge of up to 75,000 cfs from the river to the adjacent marshes at various times and flows. The very nature of the size of the flow, similar at times to the average flow of the Missouri River, can fundamentally alter the ecological and social landscape. The inherent flexibility of the structure and its operations require a dynamic balancing of multiple objectives and constraints of the ecosystem and the communities that rely on those resources.

To access these interconnected relationships, we formed an interdisciplinary working group of experts to explore, discuss, debate and document the state of the knowledge, data gaps, trigger points, monitoring and operational strategies. Over an eight-month period, the working group, along with 42 other invited guest experts, evaluated how the operation of a sediment diversion could affect every major aspect of the coast. This was accomplished by maximizing operations for each single objective, void of other constraints, and then evaluating the commonalities and dissimilarities in each strategy.

For instance, biogeochemistry plays an important role in the health of coastal wetlands, including nutrient loading, sulfates and sulfides, soil conditions, toxins and carbon. The working group evaluated questions such as "how could operations maximize denitrification?" to develop operation strategies, including flow capacities, length of operations and seasonality. The working group also evaluated key thresholds that could lead to induced harm and monitoring needs to adaptively manage the diversion. This activity was repeated for each key aspect of the landscape, including river and basin hydrodynamics, geomorphology and sediments, water quality, wetland health, fish and wildlife species, and communities and socio-economics. The working group also evaluated governance and stakeholder issues.

The recently published results included a set of recommendations for operational strategies, both initially and over long-term operation of the diversion. The working group is currently testing the recommendations through hydrodynamic, morphology and vegetation models to determine how the expert predictions of outcomes compare to the predictions of 3D, process-based models. This presentation will summarize the interdisciplinary approach to an environmentally and socially complex problem, overview the recommendations of the working group and provide some preliminary modeling results from the on-going effort.

BIO: Natalie is the Director of Science Policy at EDF. Previously, she served as the technical and outreach lead for the 2012 Coastal Master Plan. She has a B.S. in Wildlife and Fisheries, a M.S. in Oceanography and Coastal Sciences and is a PhD candidate in Marine-Estuarine Environmental Science.

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REEVALUATING THE CONSEQUENCES OF LAND USE: ACCELERATED DISSOLUTION OF GEOLOGIC PHOSPHATE DEPOSITION IN HUMIC LAKES

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Since the establishment of the Clean Water Act, managers have sought to reduce pollutant loads to impaired lakes to reach total maximum daily loads. However, non-point source (NPS) pollution continues to challenge pollutant management. One potential source of NPS pollution is erosion and sediment transport from urban areas with large amounts of concentrated runoff. While erosion and sediment transport is not typically a major NPS pollutant for nutrients, Florida's geology indicates a closer look. The U.S. Geological Survey suggests that geological units with notable amounts of phosphate can be found at or near land surface across 19% of Florida. This estimate does not take into account further exposure by erosion, channelization, and earth moving activities. Therefore, erosion and sediment transport in this geologic setting may be a significant source of phosphorus loading to drainage lakes. Furthermore, changes in the intensity of storm events are likely to further exacerbate this issue. In this study, we examined the factors that dictate geologic phosphate dissolution in eutrophic humic lakes.

Geologic phosphate is often considered stable and relatively innocuous despite high total phosphorus concentrations. However, in humic drainage lakes, biogeochemical conditions may create an environment conducive to accelerated geologic phosphate dissolution, thereby increasing concentrations of biologically available phosphorus. Our findings from dissolution experiments in several humic lakes underlain by the phosphate-rich Hawthorn Group help to understand whether erosion and sediment transport of geologic phosphorus is meaningful to phosphorus loads in such lakes. These findings may indicate a new approach to phosphorus management, load estimates, and prioritization for humic drainage lakes found in this geologic setting. Furthermore, we suggest risk-assessment techniques for certain land uses and associated activities to prevent new geologic phosphate exposure and transport in vulnerable watersheds.

BIO: Sara Phelps is a research fellow in the UF Soil and Water Sciences Department Wetland Biogeochemistry Lab at the Whitney Laboratory for Marine Biosciences. She has over 6 years of experience in environmental consulting. Her research focuses on land use impacts on soil weathering processes, aquatic biogeochemistry, and water quality.

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NOVEL INTERACTIONS MAY AFFECT RANGE EXPANSIONS: IS HEAVY UNGULATE BROWSING RESTRAINING MANGROVE ADVANCE ON THE SOUTH TEXAS COAST?

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As global temperatures continue to increase, various tropical and subtropical species are predicted to expand their range. One well know case involves the mangroves movement poleward, replacing saltmarsh ecosystems. Mangroves are important for coastal systems because they provide habitat for many organisms, mitigate erosion, and sequester carbon and nutrients. As the mangroves invade saltmarsh systems, shifts in the overall ecosystem structure and function occur and novel biotic interactions are observed.

Along the Gulf of Mexico, at the southern tip of Texas, recent observations have shown that expanding black mangrove (*Avicennia germinans*) stands are being browsed intensively on by invasive nilgai antelope (*Boselaphus tragocamelus*) and less frequently by native white tail deer (*Odocoileus virginianus*). The antelope were introduce to the south Texas region via the King Ranch in the 1930's and have since significantly increased in population and distribution. Generally thought to be grazers, *B. tragocamelus* have been recurrently recorded on camera browsing on *A. germinans*. Preliminary carbon and nitrogen stable isotope analysis suggest that *B. tragocamelus* prefer mangroves and other C3 woody species over the abundant, higher protein content C4 grasses. This interaction has not been documented and appears to markedly alter mangrove plant architecture, metabolism and reproductive output.

In order to assess the effects of heavy browsing by *B. tragocamelus*, selected structural and functional characteristics of *A. germinans* were compared between browsed and non-browsed trees. As expected, browsed trees have a smaller canopy and reduced Leaf Area Index, but also exhibit a change in resource allocation and have lower resorption ratios of nitrogen and phosphorus. Browsed trees tend to have leaves with higher N content making them a higher quality forage, and perhaps promoting recurrent browsing on affected trees. Leaf chlorophyll content in browsed trees was lower, possibly pointing at more stressed or less healthy plants. Browsing negatively affected the amount of inflorescences and produced smaller propagules. Vertebrate herbivory on *A. germinans* in south Texas is considered a novel interaction, and may well constitute a negative feedback to the range expansion of this estuarine foundation species.

BIO: Tianna Picquet is a graduate student at the University of Texas Rio Grande Valley, pursuing her MS in biology. Her current research focuses on plant-animal interactions within coastal wetlands. She also has a BS in biology from Cleveland State University where she focused on biodiversity surveys within forests and wetlands.

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MICROBIAL ENZYME ACTIVITY IN A STORMWATER TREATMENT AREA IN RESPONSE TO INFLOW FLOW CONDITIONS

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The Everglades Stormwater Treatment Areas (STAs) have been constructed to reduce phosphorus (P) from the water column as a major component of the Everglades Restoration efforts. The STAs are required to produce ultra-low P concentrations at the outflows to protect the receiving water bodies. As part of a large-scale scientific research to understand the internal processes within the STA that produce these desired outflow concentrations, the role of the microbial communities in nutrient cycling within the STA is being examined. Since P in the outflow water in well-performing STAs are primarily in particulate and dissolved organic forms, nutrient cycling by the microbial community provides critical pathways to breakdown of these forms of P. The level of enzyme activity is often used as an indicator of nutrient limitation of the system or to evaluate shifts in the nutrient limitation (i.e., from P-limited to nitrogen (N) limited). The magnitude and distribution of enzymes associated with the release of P and N and the breakdown of carbon compounds may differ along the nutrient gradient and in response to flow conditions.

Currently, there is limited data available regarding the influence of flows on the rates of exoenzyme activity in the STAs and the magnitude of microbial influence on P cycling in the STAs. This presentation is focused on enzyme activity measurements in STA-2 Flow-way 3, a 2,324-acre freshwater wetland located in southern Florida that is dominated by submerged aquatic vegetation and has been operational since 1999. The enzyme activity measurements in the surface water and periphyton communities as the flow-way is subjected to variable flow conditions is discussed. The enzymes assayed are those associated with P acquisition (alkaline phosphatase, phosphodiesterase), carbon acquisition (B-glucosidase), and N acquisition enzyme (leucine aminopeptidase). Sampling was conducted prior to and during the flow events, and during stagnant conditions.

For periphyton, higher activity was observed during stagnant conditions than under flow conditions for all the enzymes. Conversely, there was greater enzyme activity measured in the surface water during flow conditions. In the periphyton, the activity of phosphatase, phosphodiesterase, and B-glucosidase increased along the nutrient gradient from inflow to outflow while the activity of leucine aminopeptidase was comparable among all locations. No consistent gradient in enzyme activities was observed in the surface water. For both the surface water and periphyton, enzymatic activity was lowest in the Summer compared to the Spring and Fall sampling events.

BIO: Kathleen Pietro is a senior environmental scientist with over 30 years of experience working with southern Florida freshwater wetlands. Her expertise is in evaluating the nutrient removal performance of the Everglades Stormwater Treatment Areas and her current research is focused on the influence of the microbial communities within the wetlands.

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PLANT-MEDIATED METHANE AND CANOPY EXCHANGE IN A BOREAL UPLAND FOREST

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Forest soils are generally considered as a sink of atmospheric methane (CH_4), while trees and vegetation are not accounted in the CH_4 balance of forests. Recent studies show that trees may both emit and consume CH_4 from the stem and from the canopy, and by doing so, significantly influence the CH_4 balance of forest ecosystems. Our aim is to partition CH_4 fluxes in boreal forests to different components: forest floor, ground vegetation and trees, and to evaluate the role of trees in the CH_4 balance of boreal forests.

We have measured CH_4 fluxes at forest floor, tree stem and tree canopy levels by enclosure methods during 2012-2017 in a boreal forest at Hyytiälä, southern Finland (SMEAR II station). We have also measured CH_4 fluxes above the forest canopy using flux gradient and eddy covariance methods, conducted laboratory experiments to partition CH_4 fluxes between below and aboveground parts of forest vegetation, and studied the capacity of tree stems to transport CH_4 in controlled laboratory conditions. Additionally, we have assessed the role of methane oxidizing and methane producing microbes in different components of the forest. Combining these measurements allow us to evaluate the roles of soil and trees as sources and sinks of CH_4 in the forest, and assess the contribution of trees to the CH_4 balance of boreal forests.

We found that trees emit CH_4 from their stem and from the canopy. Tree-stem emissions have strong seasonality and the fluxes differ markedly between tree species and between growing habitats. The leaf-level canopy CH_4 exchange involves both emission and consumption processes, while the drivers of the CH_4 exchange are still poorly understood. Based on our multi-year measurements, it is clear that boreal trees are a significant source of CH_4, and we propose that trees should be accounted when assessing the CH_4 budgets of forests. We also recognize that our understanding of the exchange processes is still incomplete, and to solve that we need more process studies combined with state-of-the-art field measurements.

BIO: Associate Professor Mari Pihlatie is a group leader and a PI of soil research at SMEAR INAR ecosystem stations in Finland. She is an expert in plant-soil interactions, and methane and nitrous oxide exchange processes in forest ecosystems. She was recently awarded a prestigious European Research Council (ERC) starting grant.

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MOLECULAR- AND ATOMIC-LEVEL APPROACHES TO CHARACTERIZE DISSOLVED ORGANIC MATTER: INSIGHTS FOR MERCURY BIOAVAILABILITY IN THE FLORIDA EVERGLADES

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Dissolved organic matter (DOM) in the Florida Everglades controls a number of environmental processes important for ecosystem function including light absorption, mineral dissolution and precipitation, and the transport and reactivity of metals. Mercury (Hg) speciation and bioavailability in the Florida Everglades, in particular, are intimately linked to sulfur cycling and interactions with DOM.
Under sulfate reducing conditions, which develop in response to agricultural sulfate inputs to Everglades wetlands, sulfide reacts with DOM to form highly reduced sulfur species (i.e., thiols) in the DOM; these highly reduced sulfur groups strongly complex divalent mercury and increase the bioavailability of mercury in the form of nanocolloidal mercuric sulfide. Recent advancements in the understanding of DOM chemistry on mercury cycling in the Everglades has relied on the application of new tools that provide atomic- and molecular-level information.

This presentation will highlight the application of emerging tools in the characterization of DOM including: (1) atomic-level characterization of organic sulfur by X-ray absorption spectroscopy and stable isotope measurements, and (2) molecular-level characterization of DOM by ultrahigh resolution mass spectrometry. The above mentioned approaches were used to characterize DOM isolated from surface and pore waters at a variety of locations in the Florida Everglades over several field campaigns from 2014-2017. X-ray absorption spectroscopy, which quantifies the relative abundance of different organic sulfur functionalities, was used to demonstrate a spatial dependence in DOM sulfur content and speciation in Everglades wetlands that results from sulfurization of DOM in sulfidic sediment pore waters. Ultrahigh resolution mass spectrometry, which quantifies molecular signatures of unique S-containing molecules, provided evidence that DOM enriched in reduced sulfur in sediment pore waters exchanges with DOM in overlying surface waters. The stability of reduced sulfur in Everglades DOM to oxidation was elucidated using both X-ray absorption spectroscopy and ultrahigh resolution mass spectrometry on (i) field samples collected from surface waters exposed to natural oxidation and (ii) laboratory samples subject to controlled light and dark oxidation. Lastly, we present results on the use of stable sulfur isotopes to differentiate between different sources of sulfur in Everglades DOM (e.g., sulfate from atmospheric sources versus agricultural inputs). Information gained here on DOM-sulfur chemistry provides a framework to evaluate DOM-sulfur dynamics in response to temporal fluctuations in sulfate loading, and build on previous works that define the factors influencing mercury methylation in the Everglades ecosystem.

BIO: Dr. Poulin is a chemist at the U.S. Geological Survey in Boulder, Colorado. His research focuses on understanding how the chemical nature of dissolved organic matter influences the environmental cycling of major elements (e.g., carbon, sulfur) and trace metal contaminants (e.g. mercury).

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CHALLENGES OF CONNECTIVITY WITHIN URBAN LANDSCAPES: EXAMPLES FROM THE BALTIMORE ECOSYSTEM STUDY

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Connectivity of urban water bodies has been substantially changed due to hydrological, physicochemical, and biological alterations throughout upland, riparian, and aquatic environments. For example, drainage networks of impervious surface areas often use storm drains to allow runoff to bypass infiltration or riparian zones, causing flashier hydrographs and increases in contaminant loading. In addition to direct effects on water bodies, urbanization can also alter reciprocal connections from aquatic to terrestrial environments. For example, direct connections between wastewater and urban water bodies causes increased pharmaceutical loading in urban streams. While pharmaceuticals have myriad direct effects on ecosystem structure and function within stream ecosystems, they also impact the emergence of aquatic macroinvertebrates, reducing the connection between aquatic and terrestrial ecosystems. In addition, various strategies for rehabilitating urban ecosystem functioning (e.g., retention ponds, floodplain restorations) are often aimed at enhancing connectivity, either explicitly or implicitly. Using results from the Baltimore Ecosystem Study and other work focused on common urban contaminants, we will summarize the impacts of connectivity impairments in urban aquatic ecosystems. In particular, we will focus on how numerous problems associated with urbanization are driven primarily by altered connectivity, and how these problems may be addressed by directly improving connectivity issues across the urban landscape.

BIO: Dr. Reisinger is an assistant professor of urban soil and water quality, focusing on nutrient and energy dynamics of urban ecosystems. He recently moved to Florida, but previous work has focused on urban stream restorations in Baltimore as well as nutrient cycling in large rivers throughout the US.

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ECOLOGICAL CONSEQUENCES OF INVASIVE PLANT SPECIES INTRODUCTION TO VOLCANIC LAKES IN CENTRAL AMERICA: AN EXAMPLE OF LAKE ATITLAN, GUATEMALA

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Different functional groups of macrophytes vary in their impact on aquatic ecosystem structure and processes. Replacement of one functional group by another, often resulting from an introduction of an invasive species, can have serious and often irreversible consequences.

We will document and explain physico-chemical and metabolic changes in littoral zones of Lake Atitlán, Guatemala, following invasion by floating-leaved and submersed macrophytes, *Eichhornia crassipes* and *Hydrilla verticillata*, and the replacement of native emergent species, *Schoenoplectus californicus.* We utilized observational data from before and after invasion of *Hydrilla*, plant biomass and water characteristics data sampled along transects through littoral zones, and gas emission measurements in controlled mesocosms and in the lake.

While the three species don't differ significantly in their standing crop biomass, there is a major difference in the depth distribution of *Hydrilla* and *Schoenoplectus*, with *Hydrilla* having maximum biomass in water depths of 2-6 m, while *Schoenoplectus* reaches maximum biomass in waters 0.5-2 m deep. The two invaders have higher turnover rates than *Schoenoplectus*. Significant differences in nutrient composition of the three species, with *Eichhornia* and *Hydrilla* containing less carbon and thus exhibiting lower C:N and C:P ratios than *Schoenoplectus*, lead to their faster decomposition rates and potential shift in nutrient cycling within the ecosystem.

Water oxygen profiles differ among the three species. *Schoenoplectus* stands maintain a well oxygenated water column. Dissolved oxygen within *Hydrilla* stands is supersaturated in the upper 100 cm (roughly coinciding with the densest part of upper canopy), decreases with depth, but does not drop below 50%. Dissolved oxygen in *Eichhornia* dominated areas is characterized by 50-60% saturation and it drops to about 30% near the bottom. Both *Schoenoplectus* and *Eichhornia* patches exhibit comparable CO_2 fluxes, sequestering 230 and 300 mg CO_2 $m^{-2}h^{-1}$ respectively during the day and emitting 250 and 200 mg CO_2 $m^{-2}h^{-1}$ respectively during the night. Contrary to these two species, *Hydrilla* is sequestering CO_2 during the day (34 mg CO_2 $m^{-2}h^{-1}$) as well as at night (44 mg CO_2 $m^{-2}h^{-1}$).

Our description of changes to the littoral ecosystem in Lake Atitlán is representative of other Central American volcanic lakes exposed to rapid eutrophication and spread of invasive species.

BIO: Dr. Rejmánková is a professor of aquatic and wetland ecology in the Department of Environmental Science and Policy at UC Davis with research focus on structure and functions of wetland ecosystems in Central America.

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CHEMICAL CONTROLS ON CARBON SEQUESTRATION AND GHG FLUX ALONG A BOREAL TO TROPICAL GRADIENT

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Biogeochemical controls regulating C carbon storage and GHG gas flux in peatlands are underestimated compared to hydrologic and anaerobic regulators. To examine the role of carbon quality in C accretion in northern compared to tropical peatlands we completed field and lab studies on bog peats collected in Minnesota, North Carolina, Florida and Peru to answer three fundamental questions; 1) is tropical peat more recalcitrant than northern peat 2) does the addition of aromatic and phenolic C compounds increase towards the tropics 3) do differences in the chemical structure of organic matter explain variances in carbon storage and GHG flux in tropical versus northern peatlands? Our main hypothesize is that high concentrations of phenolics and aromatic C compounds produced in shrub and tree plant communities in peatlands coupled with the fire production of biochar aromatics in peatlands may provide a dual biogeochemical latch mechanism controlling microbial decomposition of peat even under higher temperatures and seasonal drought. By comparing the peat bog soil cores collected from the MN peat bogs, NC Pocosins, FL Everglades and Peru palm swamps we find that the soils in the shrub-dominant Pocosin contain the highest phenolics, which microbial studies indicate have the strongest resistance to microbial decomposition and a distinctive dominant fungal community. A chemical comparison of plant driven peat carbon quality along a north to south latitudinal gradient indicates that tropical bog peatlands often have higher aromatic compounds, and enhanced phenolics, especially after light fires, which enhances C storage and affect GHG flux.

BIO: Professor Curtis J. Richardson is a Wetland Ecologist and Director of the Duke Wetland Center. He has worked on biogeochemical cycles of C, and P in freshwater wetlands for more than 30 years. He has published more than 200 peer-reviewed papers in top journals, including, Science and Nature as well as books on the Everglades and the Pocosins.

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CHANGES IN CARBON AND NITROGEN IN A DRAINED SUBTROPICAL WETLAND. THE CASE OF THE EVERGLADES AGRICULTURAL AREA

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Drainage of the Everglades Agricultural Area (EAA) soils has resulted in soil subsidence. Subsidence rates have been reduced compared to previously reported rates. Increases in mineral content, recalcitrant carbon, and higher water tables attributed to best management practices, are considered possible causes for this reduction. The objectives of this research are to determine how soil C lability and water management affect subsidence rates, and how C and N pools and fluxes have changed as a result of the subsidence process. To establish this, oxidation rates (CO_2 efflux) of shallow and deep EAA soils exposed to four water management treatments were evaluated along with measurements of NO_3-N, NH_4-N, soluble organic nitrogen (SON), and dissolved organic carbon (DOC) performed on leachate. Additionally, a C fractionation procedure is being implemented to determine the size of the labile and recalcitrant C pools in these soils. Preliminary results indicate that soils exposed to 2 days flooding – 12 days draining cycles during the summer season have the highest CO_2 efflux rates (52 - 157 mg of CO_2 C m^{-2} h^{-1}). The NH_4-N in leachates is highest in flooded soils (0.46 to 0.86 mg L^{-1}) compared to drained soils, whereas NO_3-N is highest in drained soils with concentrations as high as 395 mg L^{-1}. Similarly, the SON and DOC have higher concentrations in drained soils, in the case of DOC, deep soils have higher concentrations (56 mg L^{-1}) compared to shallow soils (37 mg L^{-1}). Organic matter and the hot water extracted C (the most labile C pool) are higher in deep soils compared to shallow soils. All C pools decrease at deeper increments in the soil profile. The C:N ratio in deep soils is higher (14.3) compared to shallow soils (13.7). Preliminary results indicate that water management is of great importance controlling C and N cycling in subsiding histosols. Results also show that the distribution of soil C pools varies with depth in these soils, however these differences in C fractions do not cause differences in oxidation rates.

BIO: Andres Rodriguez is a PhD candidate in the Soil and Water Sciences Department at the University of Florida. He has a MSc degree in environmental studies from Florida International University and a BSc in Biology from the Universidad Nacional de Colombia.

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THE ROLE OF CYANOBACTERIA IN NUCLEATING THE PRECIPITATION OF CALCIUM CARBONATE IN THE EVERGLADES: VATERITE AND ARAGONITE

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In the Everglades, the formation of marl by periphyton occurs when dissolved calcium crystallizes in the presence of cyanobacteria. The site of nucleation for crystallization is the milieu external to the cyanobacteria cell wall, consisting mainly of extracellular polymeric substances and heterotrophic bacteria. The environment surrounding the cyanobacteria, especially the filamentous forms, creates the nucleation sites and formation of calcium carbonate crystals. Factors important for the successful crystallization include the appropriate alkalinity, pH, bicarbonate ion concentrations, dissolved calcium and low concentrations of phosphorus. In the oligotrophic regions of the Everglades, such as the marl prairies, sediments characteristically have layers of calcium carbonate that originate from cyanobacteria-dominated periphyton microbial communities. Several species of cyanobacteria thrive in these habitats; however, only a few of these species are directly involved in calcium carbonate mineralization.

Cyanobacteria from the central part of the Everglades were examined using compound light and epifluorescent microscopy to identify species that mediate calcium carbonate mineralization. As reported in the literature, the two cyanobacteria species are responsible for the majority of the biologically mediated calcium carbonate crystallization in the Everglades: *Scytonema* and *Schizothrix calcicola*. Microscopic examination of these filaments indicated that these organisms formed distinct types of calcium carbonate. *Scytonema* filaments were robust, up to 20 µm in diameter, and calcium carbonate as orthorhombic blocks. The active sites of filament growth lacked crystals; older portions of the filament generally were completely encrusted by calcium carbonate crystals. *Schizothrix* filaments are slight, ranging up to 2 µm in diameter and the calcium carbonate crystals were needle-like and new needles branched at right angles from the parent crystal.

Using energy-dispersive X-ray spectroscopy on the two dominant genera resulted in *Scytonema*-associated crystals having the chemical composition consistent with aragonite. In contrast, the crystals on *Schizothrix* were found to be consistent with vaterite, a rare form of calcium carbonate from biological systems. Phosphorus was below detection in either type of crystal. In addition to natural observations, *Scytonema* and *Schizothrix* were isolated and cultured in the laboratory for experimental manipulation of the nucleation process. Sterile-filtered water from WCA 3B, with active natural crystal formation, was manipulated by adding phosphorus. As the concentration of phosphorus increased, the formation of crystals ceased. This may help explain the loss of periphyton mats dosed with phosphorus reported in the literature. The external armoring of cyanobacteria filaments with crystals may protect filaments from grazing and may enhance photosynthetic light capture when ultraviolet light is converted to usable wavelengths. The formation of vaterite by *Schizothrix* reveals unreported complexity of calcitic soils that may lead to a better understanding of this phenomenon in the Everglades.
BIO: Dr. Rosen is an algal physiologist ecologist with over 30 years of experience growing algae and cyanobacteria for experimental manipulation of biochemical processes and taxonomic determinations. He works extensively on harmful algal blooms and has examined the periphyton communities in the Everglades over the past 7 years.

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GLOBAL CONTROLS OF CARBON STORAGE IN MANGROVE SOILS

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Nearly fifty years ago, Bruce Thom proposed a conceptual framework based on ecogeomorphology to explain global-scale variation in mangrove ecosystem properties by linking coastal geomorphological processes to distinct coastal environmental settings (CES). However, these assumptions have not been empirically tested under a macroecological perspective. Here we show that CES account for the global variability in mangrove soil C:N:P stoichiometry and organic carbon (SOC) stocks, in contrast to more widely used latitudinal (or climatic) gradients of ecosystem properties. Using this ecogeomorphology framework we developed a global model that captures variation in mangrove SOC stocks compatible with distinct types of CES. We show that relative to contemporary global estimates, mangrove SOC stocks have been underestimated by up to 50% (a difference of roughly 200 Mg ha^{-1}) in carbonate settings, and overestimated by up to 86% (ca. 400 Mg ha^{-1}) deltaic coastlines. Considering that 54% of the world's carbonate settings occur in the neotropics, our findings underscore the role of this region as a global blue carbon hotspot. Moreover, we provide new information for 57 nations that currently lack SOC data, enabling these and other countries to develop or evaluate their blue carbon inventories.

<u>BIO</u>: Dr. Rovai is an ecologist with more than 15 years of experience planning, designing, and implementing environmental impact assessments and restoration projects in tropical rainforests and mangroves. He has extensive experience with mangrove restoration, and has consistently contributed to the field with several specialized and high impact publications.

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LESSONS FROM LANDSCAPE BUDGETS IN THE DECOMP PHYSICAL MODEL AND SHARK SLOUGH, EVERGLADES NATIONAL PARK (ENP)

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A critical component of future Everglades restoration projects includes the restoration of sheetflow. The Decomp Physical Model (DPM), a landscape-scale (2-km x 5-km) field test, recently demonstrated restored flows enhance sediment transport; a key mechanism to restore ridge-and-slough topography, confirming large-scale model predictions. In addition, the DPM, revealed biological responses that feedback on flow, not anticipated by models. In three flow events, floating periphyton was cleared from sloughs experiencing high velocities (2-5 cm/s), an important mechanism in which reduced vegetative resistance led to increased velocities with flow duration. Longer flow durations also corresponded with changes in floc source (greater green-algal derived) and increased floc erodibility. We hypothesize these biological responses to flow may be as or more important than physical mechanisms regulating sediments in sloughs and ridges. We address this hypothesis by using an ecosystem mass-balance model to identify the primary mechanisms controlling stocks and fluxes of sediment and Phosphorus (P) under high and low flows. The model; originally developed for Shark Slough, Everglades National Park, was calibrated for the DPM study area and simulated for multiple scenarios, under different combinations of biological and physical responses to flow. By comparing model scenarios against DPM observations, our preliminary findings indicate that incorporating physical and biologically-mediated flow effects enabled the model to fit observed changes in water column P and suspended sediments, sediment transport, and floc standing stocks of P; however, additional flow-mediated mechanisms were required. The most surprising observation was that while floc volume, mass and carbon decreased under high flow, floc-P increased by ~40% over baseline. Flow-mediated mechanisms required to fit these observations include: (1) increasing aquatic P-assimilation rate by slough vegetation (likely driven by increased biomass total P (TP)) and (2) adding sediment capture (and release post-flow) in submerged aquatic vegetation. While reduced floc carbon and mass stocks support the mechanism of sediment redistribution in restoring ridge-slough topography, concomitant increases in floc P stocks, TP and organic matter quality (e.g., as food for consumers) may impact longer-term changes in primary and secondary production in sloughs, all of which may require several more years to fully develop (Davis, 1994; Newman et al., 1998). Although these changes were clearly evident in areas receiving high-flows, challenges remain in restoring large areas, as high flows and increased sediment mobilization were limited in scope to ~500-m radius from the control structure.

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BIO: Dr. Saunders is a Lead Scientist in the Everglades Systems Assessment section of the SFWMD and currently serves as team lead of the interagency science team for the Decomp Physical Model, a field test evaluating sheetflow benefits in Water Conservation Area 3B.

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METHANOGENIC ARCHAEA DOMINATE MATURE *POPULUS DELTOIDES* HEARTWOOD HABITATS

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Methane is a potent and impactful greenhouse gas which has accumulated in the lower atmosphere and accounts for 20% of radiative forcing. Recently there have been widespread reports from diverse forest types demonstrating that the direct emission of methane from the trunks of living trees may be a significant source of terrestrial emissions. Contrastingly, reports of methanogens from wood of *Populus* tree species were prominent in the literature 40 years ago, but have not been revisited with modern molecular microbial ecology approaches. We examined the microbial communities associated with the heartwood and sapwood of Eastern Cottonwood (*Populus deltoides)* trees in Tennessee using Illumina rRNA gene amplicon approaches. At sampling trees often emitted flammable gasses, and DNA analysis results showed both environments were primarily composed of microbial taxa associated with anaerobic environments. For example, Methanogens were prominent (23.9% overall) in heartwood environments, making up on average 34% relative abundance, versus 13% in sapwood environments and primarily classified as acetoclastic *Methanobacterium* spp. Members of the Firmicutes phylum overall were 39% of sequences and in 42% greater abundance in heartwood over sapwood environments. Measures of wood moisture content, pH of the wood, and tree DBH were also significant predictors of taxon abundance and overall composition patterns. Our results show that unlike more well studied plant associated communities in the soil, roots, rhizosphere and phylosphere, wood associated communities are shape by the unique environmental conditions of the habitat and may be prominent and overlooked sources of methane emissions in temperate forest systems.

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EFFECTS OF HURRICANE IRMA ON DISSOLVED ORGANIC CARBON FLUXES ALONG A SALINITY GRADIENT

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Disturbance events, such as hurricanes, create copious amounts of runoff from terrestrial uplands that flow into streams and rivers and eventually out into the ocean. Along with the runoff, dissolved organic matter (DOM) also runoff the landscape and into these waterways where they may react and undergo further transformation. Dissolved organic carbon (DOC) is one of the most prolific and important components of DOM as a whole. To determine how concentrations of DOC were affected by Hurricane Irma in St. Augustine, Florida, water samples were collected at four sites along the gradient from upstream Pellicer Creek (off of CR 204) to the dock behind the Whitney Laboratory for Marine Bioscience (near the ocean inlet) over a period of 3 months. Dissolved organic carbon concentrations ranged from almost 0 mg L^{-1} to 25 mg L^{-1} at Whitney Dock and 45 mg L^{-1} to 65 mg L^{-1} at CR 204. DOC concentrations increased at Whitney Dock during Hurricane Irma and continued to increase for approximately a week after the storm hit. However, sampling at 204 showed where DOC concentrations increased before and as the hurricane hit and then decreased as it was flushed out of the area and towards the coast. DOC concentrations took months to finally stabilize back to pre-hurricane conditions.

BIO: Ms. Schafer is a PhD student in the soil and water sciences department at the University of Florida advised by Dr. K.R. Reddy and Dr. Todd Osborne. She has been studying estuarine science for the past four years with a current focus in estuarine water quality and carbon cycling.

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SETTLING AND ENTRAINMENT PROPERTIES OF PARTICULATES IN THE STAS

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Everglades Stormwater Treatment Areas (STAs) are flow-through constructed wetlands operated to reduce phosphorus (P) from canal water draining the Everglades Agricultural Area (EAA). Phosphorus is removed in the STAs via multiple mechanisms including: i) plant and microbial uptake, ii) biologically mediated chemical changes enhancing P sequestration (e.g. co-precipitation with calcite), iii) particulate settling and entrapment, and iv) by chemical mechanisms (e.g. P sorption), all resulting in P-storage via accretion. Despite P removal successes (> 85% reduction in P loads) additional efforts are necessary to achieve regulatory limits, including ways to reduce particulate P discharge which is generally 50% of outflow total P. The focus of this study was to investigate the dynamics of particulate resuspension in STAs 2 and 3/4. Particle dynamics were studied: relative to applied shear stresses in core experiments, under stagnant, low, and high flow conditions, and as affected by differential flow paths and hydrologic and meteorological conditions.

Multiple replicate soil cores were collected at the inflow, midflow, and outflow areas along north-to-south flowpaths in STA cells dominated by submerged aquatic vegetation (SAV). One set of cores were sectioned into 1 cm increments and analyzed for selected physicochemical properties. Cores generally showed recently accreted soil (RAS i.e. soil accreted since STA operations began) depths of approximately 15 cm, mineral contents of 70-80% (ash by LOI), and TP contents that generally decreased down core and downstream. Other sets of replicate cores were subjected to erodibility treatments to determine the near bed critical shear stresses that would cause erosion and entrainment using two methods: SedFlume and GUST chambers). Median critical shear stress of surficial sediments generally varied between 0.06 and 0.20 Pa by both methods, were generally lower in the SedFlume compared to the GUST, and were estimated to be approximately 2 orders of magnitude greater than the shear stresses exerted by the water column suggesting little erosion and/or resuspension of previously deposited sediment under most flow conditions. However, flow velocities and direction and the amount of particulates moving through the water column were shown to be influenced by cell topography, location, and wind speed and direction. High velocity (>2 cm s^{-1}) were periodically observed in remnant agricultural ditches especially in proximity to cell outflows. Localized flows and water column particulates were shown to be effected by wind speed and direction. There was generally greater water borne particulates in the afternoon corresponding to daily highs in wind speed. As the critical shear stress of the water column were shown to be much less than required to resuspend sediments we suggest that water movement is suspending floc/periphyton from the surfaces of the SAV. This conclusion is also supported by increasing particle size from inflow to outflow along the cells.

BIO: Dr. Len Scinto is an associate professor in the Department of Earth and Environment and Southeast Environmental Research Center at FIU. Working in the Everglades system for >25y his research focuses largely on the effects of hydrologic and nutrient variation on biogeochemical processes.

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THE ORLANDO EASTERLY WETLANDS – 30 YEARS OF CONSTRUCTED SUCCESS

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The Orlando Easterly Wetlands (OEW), completed in 1987, is a 486 hectare free surface flow constructed wetland. The system is comprised of 3 different flow pathways, 18 treatment cells and 67 water control structures. The wetlands are permitted to receive up to 132 million L/d annual average daily flow. The OEW polishes excess nutrients from reclaimed water received from the Iron Bridge Regional Water Reclamation Facility. From 1991 through 2016, the system has removed 525,955 kg of nitrogen (N) and 37,307 kg of phosphorus (P). The average N and P concentration discharged from the system are 0.87 mg/L and 0.06 mg/L, respectively.

To maintain the P uptake capability, the system is managed to promote diverse aquatic habitats. Herbicide applications, water level manipulations and prescribed burns are routinely employed to help promote beneficial native vegetation such as cattails (*Typha spp*.) When detritus significantly accumulates, full scale muck removal projects are initiated. Between 2001 and 2016, nearly 316 hectares have been renovated with approximately 1.5 million cubic meters of muck removed. These projects reduce short circuiting within the wetlands and create conditions for improved wildlife habitat and nutrient uptake.

The OEW continues to provide a site for various undergraduate and graduate research. Currently, the Florida Fish and Wildlife Conservation Commission along with the University of Florida are studying the conditions that affect giant bulrush (*Schoenoplectus californicus*) survivorship in restoration areas. University of Central Florida faculty and students are researching various topics such as uric acid concentrations and its possible correlation with wildlife; how constructed wetlands and nutrient gradients affect greenhouse gas production; and bacterial species identification and its influence on N and P removal.

The system was also designed to provide wildlife habitat. To help achieve this, over 2.2 million native aquatic plants were installed. Biodiversity within the OEW is high with more than 240 species of birds being recorded within the constructed wetlands. Several years after construction, the OEW was opened to the general public as the Orlando Wetlands Park. Annually, tens of thousands of visitors frequent the Park. Bird watching, photography, hiking, jogging and horseback riding are popular activities. A volunteer group has been formed to help with wetlands education and assist with Park operations. From nutrient removal to public awareness, the OEW continues to serve as a model for constructed wetlands.

BIO: Mark D. Sees is Wetlands Manager for the City of Orlando's Water Reclamation Division. Mr. Sees has more than 20 years of experience managing and maintaining the Orlando Easterly Wetlands.

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EFFECTS OF INCREASED SALINITY ON MICROBIAL PROCESSING OF CARBON AND NUTRIENTS IN BRACKISH AND FRESHWATER WETLAND SOILS

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Everglades coastal wetlands are exposed to saltwater intrusion from storms and sea-level rise (SLR), leading to uncertainties for the fate of belowground carbon (C). Soil microbial extracellular enzyme activities (EEAs) drive organic matter breakdown. Our objectives were to determine how microbial EEAs and root breakdown in freshwater and brackish water peat soils are affected by saltwater intrusion. We simulated episodic saltwater intrusion by monthly *in situ* dosing of wetland chambers (*n* = 6, 1.2 m diameter) with Instant Ocean®. Control wetland chambers (*n* = 6) were dosed with ambient site water. We deployed 5 root litterbags in brackish and freshwater chambers for approximately 2 years (retrieved after 1, 3, 6 9, 12 and 24 months). After each collection, we analyzed the remaining root litter for microbial EEAs, elemental stoichiometry (C:nitrogen, N, C:phosphorus,P) and breakdown rate.

At the freshwater site, root degradation was 30% within the first 30 days for both control and treatment chambers. After 30 days, the degradation rates slowed down within both the controls and treatments ended at around 50% remaining after 740 days. At the brackish site, root degradation was also 30% within the first 30 days for both control and treatment chambers. After 30 days, the percent dry matter remaining slightly decreased at both the controls and treatment chamber with dry matter ended at around 60% remaining after 740 days. The majority of mass loss occurred within the first 30 days. Interestingly, the majority of mass loss occurred within the initial 30 days.

We implemented a path analysis approach to quantify the relative importance of hypothesized factors contributing to root breakdown rate after short (30 days) and long-term (740 days) durations at both the freshwater and brackish site. We constructed four path models with eleven predictor variables for root breakdown: average phosphorous (P), sulfur (S), and C-acquiring enzymes, salinity, litter C:N, litter C:P,porewater dissolved organic C (DOC), porewater total dissolved N (TDN), porewater soluble reactive P (SRP) and SO_4^{-1}. Preliminary results from the path model indicate predictors ($P < 0.05$) of breakdown rates vary between short-term and long-term exposure and between sites. Freshwater short-term breakdown rates were best predicted (standardized coefficient) directly by labile C acquiring enzyme activity (0.51), salinity (-7.39), DOC (-0.50), SRP (0.35), and SO_4^- (7.045). Freshwater long-term breakdown rates were best predicted by salinity (-1.72), DOC (0.41), TDN (-0.79), SRP (-0.44), and SO_4^- (2.21). Brackish short-term breakdown rates were best predicted by P (0.17) and S (-0.14) acquiring enzymes, C:P content (-0.31), DOC (0.99), TDN (-0.66), and SO_4^- (0.50). Brackish long-term breakdown rates were best predicted by salinity (1.79), TDN (1.27), SRP (-0.79), and SO_4^- (-1.12). Overall, enzyme activities were not predicted to have direct effects on breakdown rates long-term. Porewater chemistry, particularly SO_4^{-1}, appears to be a good predictor of breakdown rates during short-term and long-term incubations and across sites. Site chemistry dominates breakdown rate likely because it both directly influences leaching and also may indirectly affect enzyme activities. Average enzyme activities across root liter collections may not be effective predictors of breakdown as they represent instantaneous microbial demand. Dosing experiments provide insights into critical peat formation and degradation mechanisms and will allow for better planning and water management decisions.

BIO: Shelby Servais is a Ph.D. candidate at Florida International University. Shelby will defend her dissertation in Summer 2018 and is interested to hear about any job or postdoc opportunities!

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CARBON CYCLING AND POTENTIAL SOIL ACCUMULATION WITHIN COASTAL FORESTED WETLANDS

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In forested wetlands, carbon (C) cycling governs peat soil accumulation, driven primarily by the difference between ecosystem photosynthesis and respiration as well as lateral advection of water-borne carbon and methanogenesis. For coastal wetlands facing sea-level rise, a framework was created for estimating potential elevation changes based on four years of continuous C-cycling data within Cypress Swamp, Dwarf Cypress and Pine Upland ecosystems in the Greater Everglades. Soil accumulation was estimated using a two-dimensional mass-balance model of vertical net ecosystem carbon exchange (NEE), vertical flux of methane (FCH_4), and lateral flows of dissolved organic (DOC) and inorganic carbon (DIC) in surface water that drained a study area.

The NEE sequestered roughly 81,120 metric tons of C from the atmosphere over the four year study. This value was computed as a summation of daily Cypress Swamp, Dwarf Cypress, and Pine Upland NEE rates, weighted by the spatial extent of each within the study. Approximately 4,240 metric tons of C was emitted from these ecosystems as methane during decomposition. Net lateral water-borne advection of DOC and DIC contributed about 226 metric tons of C into the study area as organic and inorganic material. An accumulation of about 3 mm of soil was estimated by the mass-balance model over the four year study, assuming an average soil bulk-density value of 0.28 g C cm^{-3}. Accumulation rates were very sensitive to changes soil bulk density values. Potential annual elevation gains from the carbon cycle were 0.8 mm per year, or about 1.6 mm per year less than the mean twenty year rate for sea-level rise (2.4 mm per year), measured by the USGS at Taylor River in the Everglades.

<u>BIO:</u> Barclay Shoemaker is a research hydrologist for the USGS. His interests include computational hydrology, sustainable water use, climate change and hydrology, and hydrologic characterization for local and regional conflicts over water. He has authored numerous USGS technical reports and journal articles, and has served as reviewer for several scientific journals.

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EFFECTS OF NUTRIENT ENRICHEMENT ON THE CARBON DYNAMICS IN THE SALT MARSH – MANGROVE ECOTONE

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Globally, coastal wetland vegetation distributions are changing in response to climate change. In the southeastern United States, increased winter temperatures over the past 4 decades have resulted in poleward expansion of mangroves at the expense of saltmarsh, altering mangrove productivity, carbon (C) fluxes and ecosystem C storage. The magnitude and direction of change will be dependent on environmental variables, and nutrient enrichment is among one of the key drivers of productivity in mangroves. Alteration of carbon dioxide (CO_2) efflux and decomposition due to eutrophication has the potential to alter C dynamics of marine ecosystems currently undergoing change. We measured CO_2 efflux, belowground decomposition, and soil C in the mangrove – salt marsh ecotone in St. Augustine, Florida to, (1) estimate CO_2 flux rates and belowground decomposition in a nitrogen limited ecotonal ecosystem and (2) elucidate the effects of nutrient enrichment on ecosystem C storage. Nutrient enrichment resulted in an increase in mangrove biomass and soil CO_2 efflux, and a decrease in belowground decomposition of cotton strips. Soil C was significantly different across treatments. Consequently, we assert that the net change on ecosystem C stock and flux is dependent on nutrient status of the system.

BIO: Dr. Simpson is an ecologist whose research occurs at the intersection of ecosystem processes and the biotic and abiotic factors which influence them. She is currently focused on C storage and flux in the mangrove – salt marsh ecotone and how natural perturbations alter the dynamics of the system.

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HOW CAN THE INVASIVE SUBMERSED MACROPHYTES STAY SO HIGHLY PRODUCTIVE IN A NITROGEN LIMITED LAKE? MOLECULAR ANALYSIS OF ASSOCIATED DIAZOTROPHS MAY PROVIDE THE ANSWER

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Lake Atitlán, as many other volcanic lakes around the globe, is nitrogen (N) limited. The lake is located in the highlands of Guatemala and has recently transitioned from oligotrophic to mesotrophic status. During the last decade, the composition of the littoral macrophyte flora has changed quite dramatically due to the introduction of hydrilla (*Hydrilla verticillata*). A massive development of green algae (mostly *Cladophora*) and a dense periphyton of dominant cyanobacteria and diatoms on leaves and stems of littoral vegetation commonly occur. Nitrogen limitation of the lake is accompanied by sufficient available phosphorus, providing favorable conditions for organisms capable of fixing atmospheric N. Nitrogen-fixation by planktonic cyanobacteria has been explored in previous studies, but how do the littoral macrophytes cope with N limitation? Their tissue composition indicates N concentrations in the range typical of the respective species growing in N-unlimited conditions. A local emergent bulrush, *Schoenoplectus californicus*, apparently utilizes N produced by the heterotrophic fixation in its rhizosphere, with estimated contribution of this N up to 19% of the plant N budget. Here we explore N-fixation by both auto- and heterotrophic fixers that live in epiphytic biofilms on leaves and stems or in the rhizosphere of two invasive macrophytes: *Hydrilla verticillata* and *Eichhornia crassipes*. We obtained results from traditional microscopy-based taxonomical evaluation of cynobacterial epibionts and complemented it by next generation sequencing of plant-associated bacterial assemblages. We gained information about the presence of specific N-fixing genera and of their relative importance within the microbial assemblages. These data on community composition were then correlated with diazotroph activity (as measured by the acetylene reduction method). We improved our knowledge of the ecophysiology of these invasive macrophyte species and on the potential role of these complex plant-microbe consortia in progressing habitat disruption at Atitlán´s littoral zones.

BIO: Dr. Sirová is a post-doctoral researcher in aquatic microbial ecology. She is interested in complex microbial communities such as biofilms and microbial mats. She is currently exploring the interactions between aquatic macrophytes and associated microbes, and how these relationships affect plant ecophysiology under various environmental conditions.

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COUPLED SOIL CARBON MEASUREMENTS AND REMOTE SENSING TO QUANTIFY ABOVE AND BELOWGROUND CARBON STOCKS IN MANGROVE FOREST OF THE TEN THOUSAND ISLANDS REGION OF SOUTHWEST FLORIDA, USA

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As blue carbon initiatives seek broader policy and market recognition for the potential of coastal wetlands to sequester atmospheric carbon, there must be reliable methods to quantify and predict carbon storage responses to climate change. Wide spatial and temporal variability in coastal vegetative communities and soil biogeochemistry necessitate location-specific quantification of carbon stocks to improve current wetland carbon inventories as well as projections of future change to these inventories. To further this aim, we combine field-based soil carbon measurements with remote sensing measurements to quantify total above- and below-ground carbon stocks in the mangrove forest of the Ten Thousand Islands region of Southwest Florida, USA. We use NASA Goddard's LiDAR Hyperspectral and Thermal (G-LiHT) airborne imager with regional VHR imagery to upscale small spatial scale above-ground carbon stocks to the regional scale. Below-ground carbon burial and accretion rates were determined via ^{210}Pb radiometric dating. Future viability for carbon storage is assessed by comparing accretion rates with sea-level rise projections since mangrove ecosystems only sequester carbon as long as they can maintain elevation with respect to sea-level rise.

BIO: Joseph M. Smoak is a professor of biogeochemistry at the University of South Florida in St. Petersburg.

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TIME SERIES SOIL OXYGEN DATA HELP IDENTIFY HOT SPOTS AND HOT MOMMENTS OF GREENHOUSE GAS EMISSIONS FROM WETLANDS

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Greenhouse gas (GHG) emissions from wetlands are affected by soil oxygen (O_2), temperature and moisture or water filled pore-space (WFPS). Current sampling methods fail to capture how short-term fluctuations in these drivers affect GHG emissions, leading to inadequate estimates of annual emissions from wetlands. Although methane (CH_4) and nitrous oxide (N_2O) fluxes have been measured or simulated at different spatial and temporal scales, long term GHG measurements and accompanying environmental data are needed to reduce uncertainty and identify key drivers of gas emissions. We coupled weekly methane (CH_4) and nitrous oxide (N_2O) flux measurements with 30-minute interval soil sensor data for O_2, water-filled pore space (WFPS) calculated from soil moisture, and temperature to investigate: 1) which sensor best explained GHG emissions; 2) whether continuous sensor data explained emissions beyond measurements synchronized with weekly fluxes; and 3) what variables best explained and predicted GHG fluxes? Data from 23 sites collected between 2012-2014 from constructed wetland in Dayton, OH were used to develop time-lag models, based on pre-defined time intervals prior to the flux measurement, and instantaneous models, based on sensor readings concurrent with GHG flux measurements.

The most important predictor for CH_4 flux was the variance in soil O_2 24-hours prior to the flux measurement. High CH_4 fluxes occurred when variance was large due to a transition from low to high soil O_2. This indicates that short-term fluctuations in soil O_2 related to reconnection of the soils to the atmosphere, typical of soil drainage, result in CH_4 emissions. N_2O fluxes were best modelled with WFPS data from the soil moisture sensor and the most important predictor was the WFPS 14 days prior to the flux measurement. Dry conditions lead to N_2O emissions, as peak N_2O fluxes occurred 14 days after the lowest WFPS. Combining data from multiple sensors explained more variance in fluxes than top single sensor model for each gas (30% for CH_4 and 15% for N_2O), underscoring the relative importance of interactions among drivers. However, the most important variable (based on ΔAIC) did not change between the individual and multiple sensor models. Fluxes predicted using linear interpolation were significantly different from model predictions. The largest difference between the two predictive methods occurred after periods of rapid change, indicating linear interpolation may underestimate fluxes. Our study demonstrates that long-term continuous data, which accounts for short-term variation in soil properties, can improve our understanding of wetland ecosystem function.

BIO: Dr. Smyth is an Assistant Professor of Biogeochemistry at the University of Florida. She has a Ph.D. in Marine Science from UNC-Chapel Hill and was a postdoc at the University of Kansas and a David H. Smith Conservation Fellow at the Virginia Institute of Marine Science.

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EFFECT OF HYDROLOGIC RESTORATION ON COASTAL WETLAND SOIL PROPERTIES

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Marsh loss is a major concern in the Mississippi River Delta and is a result of many factors including sediment or nutrient deprivation and salt intrusion. Freshwater diversions are designed to reintroduce freshwater from the Mississippi River in order to maintain freshwater marsh vegetation and nutrient cycling functions. One aspect of preventing marsh loss is accretion, which can be driven by mineral sedimentation or the buildup of organic matter. Organic matter accretion is driven by plant productivity whereas excess decomposition can negate gains in marsh elevation; both processes are limited by available nutrients. This study characterized soil properties at a freshwater diversion site before full freshwater flow to the site began with the intention of resampling after a decade of diversion operation. We present a baseline of nutrient status and accretion processes of this marsh before freshwater, sediment and nutrient input occurred. There were 142 stations (0-10 and 10-20 cm depth) to determine a baseline of soil moisture, bulk density (BD), pH, organic matter content (OM), total phosphorus (TP), nitrogen (TN), and carbon (TC). Maps of soil properties in the recently accreted 0- to 10-cm depth interval were produced using kriging. From the spatial correlation analysis, we observed that TN, TC and OM, in the 0- to 10-cm depth interval, had similar properties and were closely inversely related to BD. These results allowed us to infer the mechanism of accretion across the wetland, which varied with distance from the river. Continuing study of Davis Pond freshwater diversion area is ongoing, and a sampling team will return in April and May 2018 to observe the changes in biogeochemical processes, accretion, plant nutrient uptake and community structure. Long-term effects of freshwater restoration projects have yet to be quantified, and this research can reveal the potential impacts of freshwater diversions on freshwater marsh soil properties related to resilience in coastal Louisiana.

BIO: Alina Spera is a master's candidate in the Wetland and Aquatic Biogeochemistry Laboratory at Louisiana State University. Alina's research focuses on the impacts of large scale restoration projects on freshwater wetland biogeochemical processes.

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FATE OF SOIL CARBON FOLLOWING SEA LEVEL RISE-INDUCED COASTAL WETLAND SUBMERGENCE: A MICROCOSM EXPERIMENT

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Coastal wetland submergence can occur when rates of relative sea level rise exceed that of vertical accretion or landward transgression. Once collapsed and disarticulated by wetland submergence, these highly organic soils are exposed to oxygen-rich seawater, which may accelerate mineralization rates. To determine how inputs of oxygenated seawater alter degradability of organic matter with depth, nine soil cores were collected to a depth of 1 m from three brackish marshes within Barataria Bay, LA, USA, which is experiencing high rates of wetland loss from submergence. Field enzyme activity (β-glucosidase (BG), N-acetyl-beta-D-glucosaminidase (NAG), alkaline phosphatase (AP), β-xylosidase (XY), and β-cellobiosidase (CB)) and microbial biomass carbon (MBC) did not change significantly with depth until 50 cm, where activity increased dramatically and then slowly declined. Total carbon, total nitrogen, and percent organic matter were highest between 50 and 100 cm, contradicting the generally accepted paradigm of decreasing litter quality with depth. Following initial characterization, soil microcosms were created for 11 depth segments under anaerobic conditions (mimicking an intact wetland) and aerobic conditions (mimicking a submerging wetland mixing with oxygenated bay water); carbon dioxide (CO_2) production was measured within the bottles over 14 days. Carbon dioxide production was greatest within the aerobic treatments. At 90 -100 cm, the difference in CO_2 production between aerobic and anaerobic treatments was 4x greater than CO_2 production at the soil surface. Though CO_2 production increased with depth within both treatments, potentially mineralizable ammonium rates decreased with increasing depth. Results from this study challenge the assumption that both organic matter quality and degradability of organic matter decrease with depth, suggesting coastal wetland submergence could significantly enhance CO_2 emissions.

BIO: Havalend Steinmuller is a PhD Candidate at the University of Central Florida in Dr. Lisa Chambers' Aquatic Biogeochemistry Lab. Her research focuses on biogeochemical responses of coastal wetlands to sea level rise.

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ROLE OF HYDROPERIOD AND FIRE ON CARBON DYNAMICS OF A SUBTROPICAL PEAT MARSH

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Preservation of peatland carbon stocks has global and local implications. Globally, loss of peatlands is coincident with the release of greenhouse gases. Locally, peatland loss can result in marsh subsidence and associated hydro-ecological impacts, as well as the release of sequestered nutrients to downstream water bodies. Atmospheric-landscape carbon exchange was monitored at a subtropical peat marsh in Florida, USA from 2009-2014 using eddy covariance methods. During the study period, hydroperiod ranged from nine to twelve months. Net ecosystem productivity (NEP) was strongly affected by hydroperiod, varying from relatively low (-65-97 g CO_2-C m^{-2} y^{-1}) in years with periodic drying events to much higher values (-284-597 g CO_2-C m^{-2}) during years with constant marsh inundation. Lower NEP rates were primarily the result of increased peat oxidation during periods when marsh water level was below land surface. Methane emissions varied seasonally with temperature and water level and averaged 44 g CH_4-C m^{-2} y^{-1}. Tradeoffs exist between topographic preservation of wetlands and reduction in the potency of greenhouse gas emissions. Inundation simultaneously reduces carbon mass loss through suppression of peat oxidation but increases the release of methane, a highly potent greenhouse gas. A prescribed fire in 2014 consumed approximately 85 percent of the aboveground biomass (963 g C m^{-2}), rapidly releasing carbon sequestered over a period of years.

BIO: David Sumner is the Associate Director for Studies of the USGS Caribbean-Florida Water Science Center; he has 32 years of hydrologic experience with the USGS in Florida, North Dakota, and Mississippi.

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BIOACCUMULATION AND EFFECTS OF CADMIUM IN THREE PHYTOPLANKTON SPECIES: *AKASHIWO SANGUINEA*, *HETEROSIGMA AKASHIWO*, AND *COSCINODISCUS* SP.

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Cadmium is a non-essential metal that can have harmful effects on primary producers in aquatic ecosystems. These effects can include a shift in community structure favoring harmful algal blooms (HABs), which is likely to have a variety of ecological consequences in higher trophic levels. In order to assess whether Cd pollution is likely to result in a shift in species composition favoring HABs, we are investigating Cd bioaccumulation and toxicological effects of Cd in two HAB-forming phytoplankton species, *Heterosigma akashiwo* and *Akashiwo sanguinea*, and the diatom *Coscinodiscus sp*. In addition, the research is investigating whether community-level effects can be predicted from effects in individual species, by comparing results obtained in single-species Cd exposures to those obtained when the three species are exposed together.

Non-axenic laboratory cultures are maintained in f/2 media without chelators, at 20 ppt salinity, 18-19º C, and a 12-12 h light-dark cycle. Experiments are conducted using a broad range of cadmium exposures, and the following end-points are quantified: Cd accumulation, algal growth rates, chlorophyll-a concentrations, photosynthetic efficiencies of photosystem II, and phytoplankton carbohydrate concentrations. The data from the single-species exposures will be compared to data from the assemblage exposures. The findings will provide insight into the effects of Cd on primary production and into the potential for broader ecosystem impacts in estuaries. This research is ongoing; results will be presented at the meeting.

BIO: Sabrina Tabassum-Tackett is a Masters student working in Environmental Toxicology under the guidance of Dr. Paul Klerks. Originally from Bangladesh, she graduated with B.S. in Microbiology from Marshall University, WV. She is interested in the effects on heavy metals on estuarine and marine phytoplankton.

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BIOGEOCHEMICAL DRIVERS OF AQUATIC ECOSYSTEM METABOLISM UNDER AN ALTERED FLOW REGIME IN AN EVERGLADES MARSH

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The objective of this study is to determine the effects of restored sheet-flow on Everglades aquatic ecosystem metabolism within the Decompartmentalization Physical Model (DPM) project. The DPM is a landscape-scale field test evaluating hydrologic and biological responses to flow treatments, including low flow (baseline) and high flow (impact) conditions. Starting in 2012, dissolved oxygen (DO) and other water quality parameters were measured at 10 sites, within the DPM study area using water quality sondes. The sondes were deployed continuously for 5 days per month and gross and net primary productivity, as well as aquatic respiration, were calculated from diurnal changes in DO. Water quality parameters that included Total Phosphate was also sampled during the sonde deployment. We hypothesized that sites with the high flow conditions would have increased productivity and respiration as a result of increased phosphorus loading compared to lower flow sites. Previous studies have shown that increased water velocity decreases the diffusive boundary layer of submerged aquatic vegetation (SAV), thus increasing the diffusive rates of nutrients and carbon dioxide into the plant. This in turn may increase phosphorus uptake and oxygen production during photosynthesis. Counter to what was expected, the data suggests that while phosphorus loading and DO is increased in sloughs during periods of increased flow, but aquatic ecosystem metabolism is decreased; however, once flow velocities are reduced, GPP and ER become higher compared to flow period values. This may be caused by several factors: 1. increased flow physically pushes the detached SAV and periphyton to the slough edges and into the ridge thus decreasing the active photosynthesis in the slough; 2. other studies show that mechanical bending stress applied to some species of SAV decreases the photosynthetic rates in the plant; 3. the increased water velocity breaks apart and damages SAV and periphyton decreasing photosynthesis within the slough; and 4. Increased phosphorus loading rates during flow may have increased labile P such that production is higher once the stress caused by flow is decreased. The change in production of organic matter and phosphorus uptake in sloughs likely has impact on sediment phosphorus and organic matter budgets which may have implications for restoration at the landscape level.

BIO: Erik Tate-Boldt is a wetland ecologist with the Marsh Ecology Research Group of the South Florida Water Management District and currently works on the implementation of scientific research on wetland biogeochemistry and ecology to support the Everglades restoration process and water management operational decisions.

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VERTICAL PATTERNS OF CH4 EMISSION ALONG TREE STEMS OF *ALNUS JAPONICA* AND *FRAXINUS MANDSHURICA*

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The emissions of methane (CH_4) from tree stems were measured at several heights up to approximately 5m along the stems of two tall tree species, *Alnus japonica* and *Fraxinus mandshurica*, both of which are adapted to saturated soil conditions in temperate wetlands of northern Japan.

We established two experimental sites. Site A was located at the bottom of an alluvial valley in an agricultural area of eastern Hokkaido, northern Japan, and was dominated by naturally-regenerated *A. japonica* trees. The mean height, mean diameter at breast height (DBH), and tree density of *A. japonica* trees within the experimental plot (15m x 30m) were 21 m, 23 cm, and 733 trees ha^{-1}, respectively. The soil was composed of peat and alluvial fine sediments. Site T was located on a floodplain along a small mountain stream in central Hokkaido. The canopy was dominated by planted *F. mandshurica* trees. The mean height, mean DBH, and tree density of *F. mandshurica* within the experimental plot (20m x 60m) were 28 m, 31 cm, and 183 trees ha^{-1}, respectively. The soil was composed of alluvial deposits, mostly loam and clay-loam.

At each site, three sample trees were selected for stem CH_4 flux measurements. A scaffold was erected beside each sample tree. For *A. japonica* trees, CH_4 fluxes were measured at six heights (0.15 – 5.15m above ground level) on a stem in both August and September 2014. For *F. mandshurica* trees, fluxes were measured at five heights (0.1m – 4.5m) in July 2016, in addition to preliminary experiments in which fluxes were measured at five heights (0.15 – 2.35m) in both July and October 2012. In all cases, CH_4 fluxes were measured using the static closed-chamber method. Gas concentration analyses were done using a gas chromatograph equipped with a flame ionization detector.

Significant CH_4 emissions were detected even at the highest measurement positions in both tree species, with the maximum fluxes of 24 and 62 μg CH_4 m^{-2} h^{-1} at 5.15m in *A. japonica* and 4.5m in *F. mandshurica*, respectively. However, the flux patterns along the stem differed between the two species. In *A. japonica*, CH_4 emission rates were highest at the lowest measurement position on the stem, and decreased with stem height for all measurements. The relationship between stem height and CH_4 emissions fit a power function or logarithmic function. By contrast, in *F. mandshurica*, the CH_4 flux patterns were irregular and differed among the sampled trees. The lowest measurement position did not always have the highest emissions; rates were higher at the upper measurement positions in some cases.

BIO: Dr. Terazawa is a professor of forest ecology and management, and heads the Laboratory of Ecosystem Conservation. One of his current interests is that of the mechanisms of methane emissions from forested wetlands, particularly the role of trees in methane release from soil to the atmosphere.

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EVALUATING DIFFERENT SALTS AS PROXIES FOR BRACKISH WATER IN SEA LEVEL RISE AND CLIMATE CHANGE RESEARCH

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Climate change and sea level rise have the potential to alter the vegetation composition of our aquatic ecosystems. In order to achieve resilience and stability in our ecosystems, we need a better understanding of future changes based on sound scientific projections. Using actual sea water for implementing sea level salinities in laboratory and greenhouse experiments is not always feasible, hence commercial aquarium mixes might be a good substitute to mimic natural saltwater-freshwater systems. In this study, we compared the growth of *Vallisneria americana* (Eel-grass) and *Hydrilla verticillata* (Hydrilla) under 4 salinity levels (0.5, 1.0, 2.5 and 5.0 ppt) induced by 4 different salt types (Sea Water, Instant Ocean Aquarium Mix, NaCl and Morton Sea Salt). Aquatic plants were grown in separate fertilized pots filled with Sand or Peat and were submersed in 60 L mesocosms. Salinity levels were increased gradually and water level, salinity and pH were monitored every week. After 10 weeks exposure to increased salinity levels, plants were visually evaluated on a 0-10 scale and destructively harvested to record wet and dry weights. Results showed that Peat and Sand did not substantially impact plant's biomass and hence substrate type may not be a significant factor when sufficient fertilizer is applied. Mesocosms which were treated with Instant Ocean Aquarium Mix or Sea Water had reduced Hydrilla growth at 2.5 and 5 ppt salinity levels. While Morton or NaCl treated mesocosms had severe Hydrilla damage at 2.5 ppt level and at 5 ppt all Hydrilla were eradicated. Based on elemental composition of these salts, pure NaCl has 14% more Na^+ and Cl^- at 5 ppt salinity level than other salt types. This might have caused more severe osmo-regulatory disruption and reduced the biomass production. Vallisneria's growth was not affected by different salt types in various salinity levels except at 0.5 ppt level where NaCl had smaller biomass than all other salt types. Overall, our results suggest that Instant Ocean Aquarium Mix is a strong candidate for increasing salinity levels in sea level rise experiments, as it showed a similar effect on plant's biomass as Sea Water.

BIO: Mohsen Tootoonchi has a Master's degree in Soil and Water Science from the University of Florida. He is working on a PhD in Dr. Lyn Gettys' Aquatic Plant Science Lab at the same institution. His dissertation research examines the effect of saltwater encroachment into freshwater systems.

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COASTAL ENVIRONMENTAL SETTINGS AS A MODEL TO EXPLAIN GLOBAL CONTROLS OF CARBON STORAGE IN MANGROVES

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Mangroves store larger amounts of carbon per area of coastal zone than areal estimates in many terrestrial ecosystems, and are suggested as a meaningful strategy to mitigate the effects of greenhouse gases. However, analyses of how ecosystems may mitigate the global carbon cycle also require mapping ecosystem area with respective storages and fluxes across the earth surface to compare annual global carbon flux among ecosystem types. We provide a new framework based on diverse coastal environmental settings (ie diverse estuarine morphology) to explain global variation in mangrove carbon storages using soil organic carbon as a model to more accurately determine mangrove contribution to global carbon dynamics. We deliver the first global mangrove area estimate occupying distinct coastal environmental settings, highlighting the role of carbonate settings as global blue carbon hotspots, where SOC stocks have been underestimated by up to 50%. Carbon budgets suggest that a large fraction of mangrove organic matter is buried or consumed locally, and the importance of mangrove detritus is related to the ratio of wetland area to open water. Export of mangrove C (with an approximate C:N of 117) is less than previously thought, and much of the C exchange via tides may actually be equally distributed among dissolved organic (DOC) and inorganic (DIC) carbon. Wood production is about 240 g C/m^2/year, and the average C sequestration in mangroves soils is about 163 g C/m^2/year. The sum of these two measures (NPP_W + ΔS_{org}) is then a mean approximation of mangrove NEP. Geographic location and regional climate of major mangrove forests may explain carbon exchange with nearshore coastal waters (e.g., the wet tropics compared to drier low latitude regions).

Coastal environmental setting also affects the form (e.g., DIC, DOC) and magnitude of carbon exchange between mangrove forests and nearshore coastal waters. TOC in the net tidal exchange from mangroves to the estuary becomes a carbon sink depending on how much of this organic carbon is respired back to the atmosphere. Most estuaries are considered heterotrophic, and thus much of this mangrove carbon is not buried in the coastal zone. This is still a major question in the carbon budget of coastal ecosystems, but there have been some very interesting discoveries in the last decade. Closing the gaps in these nutrient budgets is very important, and need to be linked with estimates on how such exchanges vary with disturbances on ecosystems associated with land use and pulses such as floods, fires and cyclones when estimating how the biogeochemistry of mangroves may mitigate global nutrient cycles.

BIO: Dr. Twilley is Executive Director of the Louisiana Sea Grant College Program and professor in the Department of Oceanography and Coastal Science at LSU. Most of Dr. Twilley's research has focused on coastal systems ecology and ecosystems, and more recently has been involved in developing ecosystem models coupled with engineering and landscape designs to formulate adaptation strategies for coastal communities. He received his BS and MS from East Carolina University, PhD from University of Florida and post-doctoral studies were at University of Maryland Center for Environmental Studies.

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COMPLETE GENOME SEQUENCING REVEALED THE EVOLUTION, ADAPTATION AND COSMOPOLITAN DISTRIBUTION OF *NITROSOSPIRA LACUS*

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Nitrosospira lacus is a recently proposed new species of cluster 0 *Nitrosospira* isolated from freshwater sediment. *N. lacus* and other *Nitrosospira* play a key role in the global nitrogen cycling in the first process of nitrification, conversion of ammonia to nitrite. *Nitrosospira* and its sister genus *Nitrosomonas* belong to the family Nitrosomonadaceae within the class Betaproteobacteria. The functional redundancy and niche separation created by *Nitrosospira* and *Nitrosomonas* species, and later with ammonia-oxidizing archaea, has become a globally popular subject in environmental microbiology. Although they have been concurrently found in various natural and man-made environments, the dominance of either group in specific habitats may be used as a biological indicator of environmental health. Ecologically *Nitrosospira* dominate in various soil environments, but minor in wastewater treatment plants. Currently recognized *Nitrosospira* species do not contain high ammonia adapted species and this oligotrophic nature may lead to an ecological advantage of this group of nitrifying bacteria in nature.

The objective of this study is to understand what is the inventory of genes necessary and unique for the habitat differentiation and sharing of *N. lacus* and other betaproteobacterial ammonia oxidizers through complete genome sequencing. The genomic data were exploited in examining the global distribution and habitat range of *N. lacus*.

The complete 3.26 Mb circular genome comprised 3,007 protein-coding DNA sequences, 44 tRNA genes, and a single 16S-23S-5S rRNA operon. The gene inventory supported chemolithotrophic metabolisms for function in wetland and soil environments. The APG3 genome encoded a large number of chemotaxis- and flagellum-associated proteins, suggesting the importance of chemotaxis for *N. lacus*. Many but not all ammonia-oxidizing bacteria use urea for chemolithotrophic growth. The ability to use urea as an energy source conveys an advantage to ammonia oxidizers, including pH manipulation, and as an alternate energy source. The presence of urea may also allow these microorganisms to survive at low pH conditions because the majority of ammonia is in the form of ammonium ion, which is not directly used by ammonia oxidizers. A urease operon was present in the genome of *N. lacus*. Additionally, a gene coding urea ABC transporter substrate-binding protein was located in the genome. It is known that the disruption of this coding gene leads to the loss of high-affinity urea transport activity in cyanobacteria. This protein was found in all *Nitrosospira* genomes but not in the genomes of *Nitrosomonas*. The prominence of *Nitrosospira* in acidic soil can be partially explained by the presence and absence of this protein, which assist in urea uptake and metabolism. Furthermore, the gene for polyphosphate kinase 2 (*ppk2*) were present in the *N. lacus* genome. This enzyme has been shown to be involved in stress tolerance, biofilm formation, and virulence through the utilization of poly P to generate guanosine-5'-triphosphate (GTP). We found that *ppk2* is widely present in other *Nitrosospira* genomes, but not in the genomes of *Nitrosomonas*. Thus, this is another example of genes that can potentially assist the environmental adaptations of *Nitrosospira*. Despite a limited phenotypic diversity, *Nitrosospira* has a wider variety of morphology. All *Nitrosospira* species are motile, this is in contrast with *Nitrosomonas* species in which nearly half of species have no motility. Unique morphology along with chemotaxis and biofilm formation capability supported by PPK2 may increase the ecological fitness of *Nitrosospira* in microenvironments. Our global search of *N. lacus*-like gene sequences in environmental clone and metagenomic libraries revealed the habitat range and global distribution patterns of this species, indicating that *N. lacus* is a cosmopolitan species and widely distributed in temperate freshwater environments (e.g. lake sediment, rice fields, wetlands). *N. lacus* represented the greatest numbers of environmental ammonia monooxygenase gene (*amoA*) sequences among currently recognized *Nitrosospira* species and is regarded as the most cosmopolitan species.

BIO: Dr. Urakawa is an aquatic ecologist of FGCU with more than 10 years of experience culturing and studying nitrifying microorganisms. He is interested in environmental restoration and has engaged in various research projects including natural and constructed wetlands.

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THE IMPACTS OF COREXIT EC9500A ON WETLAND MICROBIAL ACTIVITY AND COMMUNITY STRUCTURE IN BARATARIA BAY, LOUISIANA, USA

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On April 20, 2010, the BP Deepwater Horizon oil platform in the Gulf of Mexico experienced an explosion that resulted in the largest marine oil spill in U.S. history. As a remediation tactic, 7.9 million liters of dispersant, Corexit EC9500A, was sprayed into Gulf of Mexico waters. It has been shown in previous studies that exposure of coastal wetland soil to Corexit can lead to the reduction in several important microbial-mediated ecosystem services related to water quality (denitrification) and ecosystem primary productivity (nitrogen mineralization). To get a more complete picture of how Corexit impacts coastal marshes, it is vital to look at how the microbial communities in the soil react to different levels of Corexit exposure. It is possible to find a link between shifts in the microbial community and changes in ecosystem services by analyzing changes in microbial activity and community structure over time with Corexit exposure. Heterotrophic microbial respiration was measured for both wetland soil and estuarine sediment in Barataria Bay, LA., USA. Triplicate cores for wetland soil and estuarine sediment were collected and analyzed for microbial biomass carbon and nitrogen, %LOI, moisture content, TP, and TC/TN. There were four treatment levels (control, 1:10, 1:100, 1:1,000) of Corexit:wet soil ratios under anaerobic conditions. Gas samples were analyzed on a Gas Chromatograph (FID) to monitor microbial respiration over time. The samples were then analyzed for microbial community structure using a metagenomics approach. These results will indicate how microbial activity and community structure in coastal wetland soils shift in response to Corexit exposure. This research may provide more insight on how coastal wetlands will respond/recover over time after exposure to dispersant.

BIO: Jessica Vaccare is a graduate student in the Wetland and Aquatic Biogeochemistry Laboratory at Louisiana State University. Jessica's research focuses on ecosystem services and nutrient cycling in coastal wetlands.

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LARGE METHANE EMISSIONS FROM PALM STEMS IN AMAZONIAN PEAT AND FLOOD LANDS

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Plants in wetlands have long been known to emit methane (CH_4). However, most measurements have focused on stem tops and leaves. Recently, measurements at the lower parts of tree stems have shown that stem emissions can exceed soil CH_4 emissions in Asian peatlands (Pangala et al. 2012). Stem CH_4 fluxes inversely correlated with stem wood density. The Pastaza-Maranon basin in the western Amazon basin of Peru contains ~35,000 km^2 of forested peatlands. About 75% of those are dominated by low wood density *Mauritia flexuosa* palms, which are also one of the hyperdominant species within the Amazon basin. Palm emissions from the Amazon basin could therefore represent a significant CH_4 flux to the atmosphere.

Palm and soil surface fluxes were measured at four sites south of Iquitos Peru and in flooded swamp, igarape, and varzea sites around Santarem and Ariquemes, in Brazil. We used flexible stem chambers to adapt to stems of any size above 7.5cm in diameter. All chambers were sampled in closed loop with a Gasmet DX4015 for flux measurements, which lasted ~5 minutes after flushing with ambient air. Breath air was used to check chambers for leaks.

We found that *M. flexuosa* stem fluxes decreased with height along the stem and were positively correlated with soil fluxes. Profile measurements from 14 palms showed that the stem flux decrease could be modeled according to a cylindrical diffusion model. Soil fluxes within the peat, swamp and varzea areas varied strongly, and palm stem fluxes varied accordingly.

Our measurements in peatlands of Peru show that palms and especially *M. flexuosa* can emit very large quantities of CH_4. With anywhere between 1 and 5 billion *M. flexuosa* stems across Amazon basin wetlands, stem fluxes from this palm species could represent a major addition to the overall Amazon basin CH_4 flux.

BIO: Dr. van Haren is an assistant research professor with Biosphere 2 at the University of Arizona and has researched biogeochemical plant-soil interactions in tropical environments, especially the Amazon basin, for the past 15 years.

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SPECIES INFLUENCE ON METHANE EMISSIONS FROM TREE STEMS FROM AMAZONIAN PEAT AND FLOOD LANDS

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Through both active and passive gas transport, trees could represent a significant portion of ecosystem CH_4 emissions, especially from peatlands and flooded forests. In wetlands, to enable passive oxygen transport to the roots for respiration, some tree species generate arenchyma tissue, which can also allow methane (CH_4) to diffuse from the soil to the atmosphere. Likewise through sapflow transport, trees can also move substantial amounts of dissolved CH_4 from soil solutions to the atmosphere. The Amazon basin contains about 16,000 tree species of which ~230 species represent half of all trees. To scale the tree fluxes across the Amazon basin we need to understand what species emit CH_4 and what factors drive those emissions.

Palm, tree and soil surface fluxes were measured at four sites south of Iquitos Peru and in flooded swamp, igarape, and varzea sites around Santarem and Ariquemes, in Brazil. In the peatlands, we identified all tree species with stems greater than 10cm in 0.5 ha plots. From those species, we selected those that were most abundant to measure stem fluxes. We measured stem fluxes of 25 tree and palm species. We used flexible stem chambers to adapt to stems of any size above 5cm in diameter. All chambers were sampled in closed loop with a Gasmet DX4015 for flux measurements, which lasted ~5 minutes after flushing with ambient air. Breath air was used to check chambers for leaks. Stem fluxes within the first 50cm above the soil surface were greatest in several palm species (*Mauritia flexuosa* and *Astrocaryum jauari*), but nearly zero in another (*Euterpe oleracea*). Likewise, multiple species in the Euphorbiaceae and Sapotaceae consistently across sites yielded some of the highest CH_4 flux measurements, whereas other species within those families did not emit substantial amount of CH_4.

The presence of arenchyma tissue generally was a strong indicator of emissions and the species with arenchyma had the greatest CH_4 fluxes. However, the generation of arenchyma is not a trait that appears to be conserved at the family level.

BIO: Dr. van Haren is an assistant research Professor with Biosphere 2 at the University of Arizona and has researched biogeochemical plant-soil interactions in tropical environments, especially the Amazon basin, for the past 15 years.

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BIOGEOCHEMICAL RESPONSE OF COASTAL WETLAND SOIL TO THIN LAYER SEDIMENT APPLICATION

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Recent interest has focused on wetland restoration projects that introduce a thin layer of sediment onto degrading and fragmenting marsh surfaces to combat land loss associated with rising sea level, address functional losses, and improve coastal resiliency. A restoration project in Avalon, New Jersey received 5-19 cm of sediment onto vegetated marsh areas and 32-82 cm of sediment into degraded open water features interspersed within the coastal marsh. Prior to restoration, degraded open water features contained higher extractable ammonium and lower dissolved organic carbon than vegetated marsh soil, suggesting a potential shift in nutrient export as marshes fragment and converted to open water. Six months after sediment placement, surface bulk densities increased and buried marsh soils remained microbially active demonstrating the capacity for buried soils to provide labile nutrient sources, such as ammonium, during vegetation recruitment. The rapid biogeochemical response to restoration suggests that thin layer sediment placement techniques may jump-start marsh recovery by maintaining native vegetation seed sources, rhizomes, and microbial communities in near-surface soils compared to other restoration strategies. Soil biogeochemical properties were again evaluated 18 months following sediment placement to assess the recovery of marsh functions in response to thin layer sediment applications. The short-term biogeochemical response to soil burial will be presented, along with changes in introduced sediments overlying the native marsh. Although frequently overlooked during wetland restoration/creation activities, soil biogeochemical processes provide insight into restoration effectiveness for a host of microbial-driven ecosystem services, especially during short-term (<2 year) monitoring periods.

BIO: Dr. VanZomeren is a research ecologist with five years of experience in wetland restoration and creation. She has extensive experience with wetland research and has led more than five wetland restoration projects focused on wetland biogeochemistry.

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AUTOMATED MEASUREMENTS OF CO_2, CH_4, AND N_2O FLUXES FROM TREE STEMS AND ADJACENT SOILS

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The emissions of the main greenhouse gases (GHG; CO_2, CH_4 and N_2O) through tree stems are still an uncertain component of the total GHG balance of forested lands. Stem CO_2 emissions have been studied for several decades, but the drivers and spatiotemporal patterns of possible CH_4 and N_2O emissions from tree stems are unclear. Additionally, it is unknown how stem GHG emissions could be related to soil physiological processes or environmental conditions. We designed an automated system to continuously measure CO_2, CH_4 and N_2O fluxes from tree stems and adjacent soils. We measured these fluxes at hourly resolution from April to July 2017 at two different heights (75 [LStem] and 150cm [HStem]) of bitternut hickory (*Carya cordiformis*) trees and adjacent soil locations in a forested area in the Mid Atlantic of the USA. Stem and soil CO_2 emissions showed similar seasonal patterns with an average of 6.56±0.09 (soil), 3.72±0.05 (LStem) and 2.47±0.04 µmols m^{-2} s^{-1} (HStem) (mean±95% CI). Soil temperature controlled CO_2 fluxes at both daily and seasonal scales (R^2>0.5 for all cases), but there was no clear effect of soil moisture. The stems were a clear CH_4 source with emissions decreasing with height (0.35±0.02 and 0.25±0.01 nmols m^{-2} s^{-1} for LStem and HStem, respectively) with no apparent seasonal pattern, and no clear relationship with environmental drivers (e.g., temperature, moisture). In contrast, soil was a CH_4 sink throughout the experiment (-0.55±0.02 nmols m^{-2} s^{-1}) and its seasonal pattern responded to moisture changes. Despite soil and stem N_2O emissions did not show a seasonal pattern or apparent dependency on temperature or moisture, they showed net N_2O emissions with a decrease in emissions with stem height (0.29±0.05 for soil, 0.38±0.06 for LStem and 0.28±0.05 nmols m^{-2} s^{-1} for HStem). The three GHG emissions decreased with stem height at similar rates (33%, 28% and 27% for CO_2, CH_4 and N_2O, respectively). At the forest stand level, the CH_4 sink capacity of soils could be partially counteracted by the stem emissions. These results indicate the need to measure CO_2, CH_4 and N_2O emissions not only in soil but also at different heights in stems to account for the total GHG balance in forested ecosystems.

BIO: Dr. Vargas is an Associate Professor with research experience on how biophysical factors regulate soil-plant-atmosphere interactions across different vegetation types. He has co/authored 90 peer-reviewed publications in a wide variety of journals, and serves in committees for several national and international scientific networks and scientific organizations.

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BLUE CARBON SEQUESTRATION WITHIN A NORTHEASTERN FLORIDA INTERTIDAL WETLAND – RESPONSE TO CLIMATE CHANGE AND HOLOCENE CLIMATE VARIABILITY

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Intertidal forests and salt marshes represent a major component of Florida's coasts and are essential to the health and integrity of coastal Florida's ecological and economic systems. In addition, coastal wetlands have been recognized as highly efficient carbon sinks with their ability to store carbon on time scales from centuries to millennia. Although losses of salt marshes, mangroves, and seagrass beds through both natural and anthropogenic forces are threatening their ability to act as carbon sinks globally, the poleward encroachment of mangroves into salt marshes may lead to regional increases in carbon sequestration as mangroves store more carbon than salt marshes.

For Florida, this encroachment of mangroves into salt marshes is prominent along the northern coasts where fewer freeze events have coincided with an increase in mangrove extent over the past several decades. Soil cores collected from a northeastern Florida wetland will allow us to determine whether the recent poleward encroachment of mangroves into northern Florida salt marshes has led to an increase in belowground carbon storage. The soil cores, which are approximately two to three meters in length, will also provide the first known record of carbon storage in a northern Florida wetland during the Holocene. Ages of the cores will be determined from $^{210}Pb/^{137}Cs$ and ^{14}C dating. Initial results from the top 20 cm, which represents ~100 years based on$^{210}Pb/^{137}Cs$ dating, suggest more carbon is currently being stored within the transition between marsh and mangrove than in areas currently covered by salt marsh vegetation or mangroves. The transitional zone also has a much larger loss of carbon within the top 40 cm compared to the mangrove and marsh cores. Lignin-based degradation indices along with other biomarker data and ^{14}C ages will allow us to determine how much of this loss of carbon may be related to degradation and how much may be related to changes in carbon sources.

BIO: Derrick Vaughn is a Ph.D. student within Thomas Bianchi's lab at the University of Florida. His dissertation looks at differences in carbon storage along Florida's northern coast in response to recent climate change and Holocene climate variability.

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BIOGEO2018 USE OF BACTERIAL TRANSFORMATION IN PROCESSING NON-BIODEGRADABLE PLASTICS

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In today's society, we are dependent on plastics. In 2015, we globally produced about 322 metric tons of plastic, and it is presumed that we could not cope with the removal of plastics from our society. However, common plastics are non-biodegradable, and our use of plastics is polluting the world we live in. Polyethylene Terephthalate, or PET, is used in water and other drinking bottles, synthetic clothing, microwaveable trays, insulation, and more. While PET is recyclable, it is reduced to pollutants if littered. This is common considering PET is the most commonly used plastic. Many believe that this "plastic problem" cannot be helped.

Ideonella sakaiensis is a bacterium discovered outside a plastic recycling facility, and it is capable of breaking down PET. It uses enzymes called PETases to hydrolyze PET into two monomers: ethylene glycol and terephthalic acid. At room temperature, it can process a thin film of PET over the course of about 42 days. This is a somewhat slow reaction time. However, if the plastic is processed by means of essential cooking it, it is more easily broken down. *I. sakaiensis* is easily grown, and once it adheres itself to the surface of PET, it can begin producing PETase and needs very little of other resources.

A bacterial transformation was demonstrated as a fairly easy process in a lab using *E. coli* to produce ampicillin-resistance, and many students were able induce insulin production in the culture with a second transformation. By isolation the PETase production gene, *E. coli* can be used to produce PETase and break down PET into environmentally friendly monomers more quickly and efficiently. A large portion of our plastics can successfully be biodegraded and returned to the earth.

BIO: Nic Vermeulen is a junior who currently volunteers at WJH bird Resources. He studies bird behaviors as well as the microbial environment waterfowl ponds. His interest in this project was sparked by his aspirations in microbiology. Nic has also been involved in several teaching groups giving presentations on microbial life.

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BIOGEOCHEMICAL RESPONSE OF SELECTED STA FLOW-WAYS TO DIFFERENT FLOW SCENARIOS

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The Everglades Stormwater Treatment Areas (STAs) are an important component of the Everglades restoration efforts. The five STAs combined, have effectively reduced total phosphorus (TP) concentrations in the surface water, to as low as 20 µg L^{-1} and reduced TP loads, by as much as 86 percent in the recent years. However, the mandates to achieve lower TP concentrations at the outflow structures emphasize the need for a better understanding of the factors and mechanisms that might limit the STAs to achieve and sustain the current long-term Water Quality Based Effluent Limit of 13 µg L^{-1}.

This field investigation is a component of a comprehensive study to evaluate the sources, forms, flux, and transformation of phosphorus in the Everglades STAs. Specifically, the investigation is being conducted along a transect in three different flow-ways with different vegetation types under stagnant, low flow, and high flow conditions. Phosphorus cycling and movement within an STA is a function of various chemical, physical, and biological processes operating at different regions of the flow-way. The concentration of P observed at the outflow structure is a net result of all these processes.

Preliminary results from flow events in STA-2 Flow-ways (FWs) 1 and 3 show distinct TP concentration gradient from inflow to outflow at all phases of the flow event. Average TP reduction however, was higher for emergent aquatic vegetation-dominated STA-2 FW 1 than for submerged aquatic vegetation-based STA-2 FW 3. In STA-2 FW 3, TP concentrations were elevated under stagnant condition following a period of high P loading but not after low P loading with increases resulting from a large increase in particulate P (PP). Reduction in PP accounted for most of the reduction in TP concentration along the treatment FW at all periods of the flow events. Compared to dissolved organic P (DOP), soluble reactive P (SRP) was reduced much earlier in the FW, indicating that this P fraction was consumed much more readily through biological and physico-chemical processes operating along the front half of the treatment FW. Residual P pool at the back end of the FW was comprised mainly of PP and DOP at all periods of the flow events. TP showed strong positive correlations with metal cations calcium, aluminum and iron along with total nitrogen, chlorophyll, total suspended solids, surface water pH, and dissolved oxygen during the low flow, high flow, and stagnant periods. The implications of initial results for STA operation and performance along with current efforts to identify the sources and composition of DOP and PP especially at the lower reaches of the flow-way will be discussed.

BIO: Dr. Villapando is currently a Lead Environmental Scientist for the South Florida Water Management District with almost 20 years of experience managing water quality improvement projects in support of the Lake Okeechobee and Everglades Restoration efforts.

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MERCURY DEPOSITION IN RIVERS OF SURINAME

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The study focusses on the occurrence of methyl mercury in sediments of Rivers in the lowlands of Central and Western Suriname. The use of mercury in the growing artisanal gold mining industry has caused an increase of mercury in the environment. This study tries to assess the accumulation of the mercury in Rivers downstream and downwind of the gold mining areas. Previous studies have shown that mercury accumulates in areas downwind of artisanal gold mining areas, but the process is not yet fully understood. This research has been ongoing for over six months, and up until now, assessed methyl mercury levels in sediments upstream, at and downstream of five villages. The study, which is part of a larger three-year program, provides insight into the presence and possible accumulation of methyl mercury and its possible relations with seasonal variations (temperature and water flow).

BIO: I have a background in biological anthropology and ecology, with more than ten years of experience in primate behavior and feeding ecology field studies. My current focus is on studying the impact of climate change on the distribution, availability, and methylation of mercury in the environment.

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EFFECTS OF TEMPERATURE INCREASING ON THE NITROUS OXIDE EMISSION FROM INTERTIDAL AREA ALONG THE EAST CHINA COAST

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Estuarine and coastal area is significantly a contributor to the inventory of nitrous oxide (N_2O), but we know little about the effect of temperature increasing among different coasts. This study presents the results of incubation experiments of the N_2O fluxes along the East China Estuarine and Coastal line (from south tropical site, 20º N, to north temperate site, 40º35´ N), in which the temperature was controlled on three gradients (15ºC,25 ºC,35 ºC) and the semi-diurnal tide was simulated by episode flooding. During the aeration, N_2O fluxes from north sites showed an exponential positive correlation with temperature, with the mean N_2O fluxes increased from 49.0±40.6 nmol×m^{-2}×h^{-1} at 15 ºC to 3157.3±3955.4 nmol×m^{-2}×h^{-1} at 35 ºC. However, the Southern N_2O fluxes decreased with temperature rising gradient, from the from the 233.2±291.6 nmol×m^{-2}×h^{-1} at 15 ºC to the 182.7±142.3 nmol×m^{-2}×h^{-1} at 35 ºC. In the period of inundation, northern N_2O fluxes increased from 741.4±518.5 nmol×m^{-2}×h^{-1} at 15 ºC to 1023.8±1400.1 nmol×m^{-2}×h^{-1} at 35 ºC with temperature gradient, and the Southern N_2O fluxes decreased from the highest fluxes 977.0±305.5 nmol×m^{-2}×h^{-1} at 15 ºC to 68.0±47.5 nmol×m^{-2}×h^{-1} at 35 ºC. Coastal sediments from different climatic zones varied in responses to increasing temperature. Under global ongoing warming condition, high latitude coasts would act as important potential N_2O sources. Adversely, the flux of N_2O from low latitude coastal sediments may decrease with the increasing temperature. In addition, the influence of the flooding exhibited negative correlation with increasing temperature among the mostly studying sites. Temperature and tidal fluctuation have a combined impact on N_2O budget at coastal wetland. And, the balance of N_2O production and consumption determine the varied N_2O emission from different soils responding with increasing temperature.

BIO: Dr. Wang is a professor with 18 years of experience on carbon and nitrogen biogeochemical cycling at Yangtze delta. He has extensive experience with greenhouse gases production and emission from river and wetland and the nitrogen removal by wetland, and has led 8 projects.

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DOES AN 'IRON-GATE' REGULATE DROUGHT EFFECTS ON PEAT DECOMPOSITION?

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Iron is the fourth-most abundant element in the Earth's crust. It plays fundamental roles in regulating biological and physical processes in many ecosystems. Studies have showed that iron (Fe) can substantially stabilize organic carbon in mineral-rich soils. Recently a study suggests that Fe even could protect carbon via an ‘iron gate’ mechanism during drought in organic-rich wetland soil. Coupled with a “soil-moisture gate” theory that low soil moisture limits phenolic oxidase activity and decomposition in unsaturated peatlands, it appears that 1) double gates against short-term drought might exist in some organic-rich soils, particularly peatlands and 2) minerotrophic fens with substantial Fe inputs likely present higher resilience to drought than oligotrophic bogs.

To test whether the ‘iron gate’ mechanism can protect carbon in organic-rich wetlands, we (1) set up a manipulation experiment by adding ferrous iron to a high-lignin and low-Fe peatland soil, and (2) measured dissolved Fe in pore water from additional peatlands in North and South America. Our results indicate that Fe actually stimulates carbon decomposition in peatlands during either flooding or drought, which is in line with other findings in humid tropical forest soil, but contrary to the ‘iron gate’ mechanism. In organic-rich soils, phenolics principally control carbon decay. Although drought-induced Fe oxidation reduces phenol oxidase activity, thus decreasing the oxidation of phenolics, simultaneously Fe oxidation precipitates phenolics, which disables the carbon protection mechanism. The conflicting processes affecting the availability of phenolics in peatlands indicates that the ‘iron gate’ mechanism is probably not applicable in peatlands.

BIO: Dr. Hongjun Wang is a biogeochemist. He has been working on biogeochemical cycles of C, N and P in freshwater wetlands, especially in peatlands and riparian/littoral terrestrial-aquatic ecotone for more than 10 years. He has published more than 10 peer-reviewed papers as first author in top journals, including Nature Climate Change, Atmospheric Chemistry and Physics, Atmospheric Environment and Journal of Geophysical Research etc.

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METHANE EMISSIONS FROM THE STEMS OF LIVING TREES IN UPLAND FORESTS

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Most forests worldwide are located in upland landscapes. Upland forests are traditionally thought to be net sinks for atmospheric methane (CH_4). Previous studies have mainly focused on ground CH_4 flux in upland forests, and living tree stem-based CH_4 processes and fluxes are thus relatively poorly understood. Recently, we measured *in situ* CH_4 fluxes from the stems of living trees in upland forests using a static closed-chamber method, and investigated the relationship between CH_4 concentration and water content in the heartwood of living trees. We found that approximately 4–13% of tree stems or approximately 8–31% of tree species had a substantial CH_4 concentration of ≥10000 μL L^{-1} in their heartwood across the mid-temperate, warm temperate, and sub-tropical upland forests. The stems of *Populus davidiana* emitted the large quantities of CH_4, amounting to mean annual emissions of 85–103 μg $m^{-2}h^{-1}$ during July 2014–July 2015 on a stem surface area basis. The emission rates were similar in magnitude to those from tree stems in wetlands. The emitted CH_4 was derived from the heartwood of stems. On a *P. davidiana* dominated ecosystem scale, annual stem CH_4 emissions were equivalent to 63% of the amount of CH_4 consumed by soils. The heartwood CH_4 concentration was related to water content by a power function. A threshold of water content occurred beyond which CH_4 was produced at high levels in the heartwood. Temperature was not a limiting factor for CH_4 production during the summer and autumn seasons, and thus most of the CH_4 production may be explained by water content in the heartwood of living trees in upland forests.

Detailed results related to this abstract can be found in Wang et al., New Phytologist (2016) 211: 429–439, doi: 10.1111/nph.13909; Journal Geophysical Research - Biogeosciences (2017) 122: 2479–2489, doi: 10.1002/2017JG003991).

BIO: Dr. Wang is a professor with extensive experience in studying methane in terrestrial ecosystems, and has led more than 10 projects dedicated to measuring and investigating the processes and fluxes of methane.

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DEVELOPING A NUTRIENT MANAGEMENT STRATEGY FOR SOUTHWEST FLORIDA TIDAL CREEKS BY LINKING SOURCE WATER CONCENTRATIONS, INSTREAM PROCESSES, AND ESTUARINE DYNAMICS

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Southwest Florida tidal creeks are integral to the ecological function of their larger coastal estuaries, serving as a site of nutrient cycling and a critical nursery area for many juvenile fish species of recreational and commercial importance. However, the estuarine portion of these creeks is currently under-represented in routine environmental monitoring efforts and regulated by narrative criteria that were developed for other systems. This study focused on developing quantitative, defensible, and protective numeric targets and thresholds for nutrients in southwest Florida tidal creeks as part of a larger effort to identify site-specific indicators of tidal creek biological integrity. The study involved a one year bimonthly sampling effort of 16 of the more than 300 tidal creeks identified during the study. Biological response endpoints including water column chlorophyll, sediment chlorophyll, and fisheries data were collected and combined with existing in situ and remote sensing data describing landscape level effects at varying spatial scales. Water quality conditions were found to be characteristic of wetland environments with the potential for low dissolved oxygen concentrations and periodic high chlorophyll concentrations. However, despite water quality conditions that might typically be considered poor in larger estuaries, many of these creeks supported high fish species diversity and an abundance of important estuarine dependent fish species including the important sportfish Common Snook (*Centropomus undecimalis*). In addition, nutrient concentrations did not follow a linear decay curve along the salinity gradient indicating the potential for nutrient addition in the estuarine portion of these creeks, possibly by the presence of natural emergent wetland vegetation. This presentation will discuss how outcomes from this study have led to an efficient and effective management strategy for identifying creeks with a high likelihood of impairment, and review current effort efforts to increase the reliability of site-specific water quality targets for these systems by investigating aspects of biogeochemical nutrient dynamics in these creeks as part of a current follow up study.

BIO: Mr. Wessel is a fisheries biologist and environmental consultant with 25 years of experience in developing monitoring designs, and analyzing data on various aspects of estuarine ecology to inform natural resource management decision in Florida.

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EVALUATING NITRATE REDUCTION IN A HYDROLOGICALLY RESTORED BOTTOMLAND HARDWOOD FOREST: IS RECONNECTION IMPROVING WATER QUALITY FUNCTION?

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Due to increased N fertilization of agricultural land, the Mississippi River has seen a dramatic increase in the nitrate load over time, triggering a hypoxic zone in the Northern Gulf of Mexico every summer. Bottomland hardwood forests located along the Mississippi River and its tributaries can play a crucial role in reducing nitrate loads prior to waters reaching the Gulf of Mexico. However, almost 80% of the bottomland hardwood forests in the Lower Mississippi Alluvial Valley have been modified and the construction of 2,700 km of levees along both sides of the lower Mississippi River has limited the area of floodplain interacting with river floodwaters by 90%. Restoring floodplain wetlands and increasing their connection along rivers can reduce water nitrate by increasing opportunities for nitrate reduction. Mollicy Farms, a 6,475 hectare bottomland hardwood forests site in northern Louisiana, is the largest floodplain reconnection and bottomland hardwood reforestation project in the Mississippi River watershed and borders the Ouachita River, a tributary of the Mississippi River. The farming operation has been abandoned and the riparian tract has been reconnected to the river through several breaches in the perimeter levee.

To evaluate the role of Mollicy Farms in reducing river nitrate, nitrate reduction rates and soils characteristics of the site were compared to those of a natural bottomland hardwood forest site directly across the river. Measures of soil characteristics were significantly different including total C, bulk density and microbial biomass. Nitrate reduction rates in Mollicy Farms (11.8 ± 3.4 mg N m^{-2} d^{-1}) were, on average, lower than the natural bottomland hardwood forest rates (16.4 ± 8.1 mg N m^{-2} d^{-1}). Despite having lower rates, nitrate reduction in Mollicy Farms was approximately 72% of the reduction found in the natural site soil. These results suggest that the microbial process of denitrification has the potential to become more quickly restored compared to other biogeochemical parameters and that restoring floodplain wetlands may be a useful tool for enhancing nitrate reduction in the Lower Mississippi Alluvial Valley and, consequently, reducing the areal extent of the annual hypoxia zone forming in the Northern Gulf of Mexico.

BIO: Dr. John R. White is a professor in the Department of Oceanography & Coastal Sciences at Louisiana State University focused on researching the biogeochemical function of wetlands and aquatic systems. Dr. White has been conducting research for over 25 years with significant research experience both in the Florida Everglades and the Mississippi River Delta.

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DRIVERS AND MECHANISMS OF PEAT COLLAPSE IN COASTAL WETLANDS

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Coastal wetlands store immense amounts of carbon (C) in vegetation and sediments given their relatively low global area coverage, but this store of C is under threat from climate change. Accelerated sea level rise (SLR), greater inundation, and more frequent periods of droughts will impact biogeochemical cycling in wetlands. Coastal peat marshes are especially susceptible to saltwater intrusion and changes in water depth, but little is known about how exposure to salinity affects organic matter accumulation and peat stability. Within the brackish water portions of the Everglades, open water ponds forming in the middle of marshes has been documented and referred to as “peat collapse” and hypothesized to be the result of a rapid shift in soil C balance, leading to a net loss of organic C and loss of soil elevation. However, the drivers and mechanisms of peat collapse are still not fully understood.

Using coupled field and mesocosm manipulation experiments, we measured fresh- and brackish-water marsh responses to elevated salinity, greater inundation, drought, and increased nutrient loading. In the field, we found that elevated salinity only affected net ecosystem production (NEP) when water fell below the soil surface, but did increase root turnover. In the mesocosm experiments we exposed a freshwater marsh to brackish conditions (0 → 8 ppt) and elevated P. NEP was unaffected by elevated salinity but significantly increased with P enrichment. Elevated salinity did not impact root growth, but led to a higher turnover of live to dead roots. This led to a ~2-cm loss in soil elevation within 1 year of being exposed to elevated salinity conditions. When exposing a brackish marsh to more saline conditions (10 → 20 ppt), we found that NEP, plant productivity, and root growth were all significantly decreased with elevated salinity, leading to a shift in the marsh from a net C sink to a net C source to the atmosphere. Elevated salinity did not increase elevation loss, but when coupled with a drought event, elevation loss doubled.

Based on the findings from our many experiments, we can begin to piece together the drivers and mechanisms of peat collapse. When freshwater marshes are first exposed to elevated salinity, even though aboveground productivity and NEP may be unaffected, soil structure and integrity appear to be negatively affected by salt through a loss of live roots within the soil profile, leaving the peat vulnerable to collapse. This would explain the presence of live sawgrass “pedestals” in the brackish portions of the Everglades where it appears that the surrounding soil has collapsed. Exposing these brackish marshes to even greater increases in salinity further led to a net decline in soil C storage, but did not negatively affect elevation. Although saltwater intrusion into freshwater wetlands may initially stimulate primary productivity through a P subsidy, the impact of elevated salinity on root and soil structure may ultimately be what matters to the survival or collapse of these marshes.

BIO: Benjamin Wilson is an outgoing Ph.D. candidate with extensive knowledge of biogeochemical cycling in coastal wetlands. By the time of the conference, he will have already defended his dissertation. If you know of any employment opportunities, Wilson will be happy to hear about them.

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DO CONSTRUCTED WETLANDS REMOVE METALS OR INCREASE METAL BIOAVAILABILITY?

Xiaoyu Xu
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The H-02 wetland system was constructed to treat building process water and storm runoff water from the Tritium Processing Facility on the Savannah River Site (Aiken, SC). Monthly monitoring of Cu and Zn concentrations, and water quality parameters (temperature, pH, ORP, alkalinity, DOC, sulfate, chloride) in surface waters continued from 2014 to 2016. Water samples were collected at the source pipes, retention basin, influent and effluent connected to wetland cells, and the discharge stream. Metal speciation was modeled by WHAM 7. Overall, the wetland system functioned well. Total Cu and Zn concentrations released to the effluent stream were below the NPDES limit, and the average removal efficiency was 65.9% for Cu and 71.1% for Zn. Sulfate compounds were consumed by the wetland during the “warm” season (Feb. to Aug.) since sulfate concentrations in the effluent were lower than the influent. High temperature, adequate labile organic matters, and anaerobic conditions favored sulfate reduction that produced sulfide minerals to completely remove metals from the water column. However, sulfate compounds were produced during the “cold” season (Sept. to next Mar.) when the dominant reaction in sulfur cycling shifted to sulfide oxidation. Relatively high concentrations of metal-organic complexes, especially metal and fulvic acid (FA) complexes were also explored during this time, demonstrating increasing reactions between metals and organic matters. Thus, adsorption to organic matter became the primary process for removal. In summary, the metal-removal process in H-02 wetland was seasonal and regulated by sulfur cycling. Although the wetland continued to successfully remove metals during the sampling occasions, long-term sustainability still needs to be closely monitored. In addition, the metal-FA accumulation in the wetland system may cause negative effects to the surrounding environment as they are biologically reactive, highly bioavailable, and can be easily transferred to terrestrial ecosystems by trophic exchange.

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CARBON SEQUESTRATION AND ITS CONTROLLING FACTORS IN THE TEMPERATE WETLAND COMMUNITIES ALONG THE BOHAI SEA, CHINA

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The carbon sequestration rate (CSR) in deltaic wetalands is associated with the nutrient balance, sediment (soil) accretion rate (SAR), and geological and climatic conditions. To explore these relationships, micronutrients; C, N, and P concentrations; and ages determined by either dating mark-paleosol or radiometric dating with ^{137}Cs and ^{210}Pb from 14 cores of both the Yellow River Delta (YRD) and the Liaohe Delta (LHD) wetlands in 2007 and 2012, repectively, were analyzed. With the exeption of Ca, the concentrations of N, Corg, Cu, Zn, Fe, Mn, Mg, K, Al, and hydrogen ions (H^+) were significantly higher in the wetland soils of the LHD than the YRD, but the organic CSRs were virtually identical at the two sets of sites, about 140 g C m^{-2} y^{-1} at sites above mean sea level (MSL). SAR and organic CSR at LHD sites below MSL were about 2.8 times the corresponding rates at sites above MSL. SAR and total CSR were much higher in the YRD than the LHD because of the much greater accumulation rate of $CaCO_3$ in the YRD. The organic CSRs were primary controlled by SAR in both detaic wetand systems. However, organic CSRs in the LHD wetlands were much more sensitive to the changes of SARs than in the YRD.

Bio: Dr. Siyuan Ye Senior Scientist and the Director of Key Laboratory of Coastal Wetland Biogeosciences, China Geological Survey (CGS). She has been worked as a coastal wetland scientist with the Institute of Marine Geology, CGS for 28 years. Biogeochemistry and carbon cycle are her specialities certified by her more than 100 journal articles both in Chinese and English.

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POLYPHENOLS AS INHIBITORS IN DIFFERENT DEGRADED PEAT SOILS: IMPLICATIONS FOR MICROBIAL METABOLISM IN REWETTED RIPARIAN PEATLANDS

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Last 30 years, more than 30,000 ha of drained minerotrophic peatlands (= fens) in NE Germany have been rewetted to restore their ecological functions. Due to an extended drainage history, a re-establishment of their original state is not expected in a human life time perspective. Elevated concentrations of dissolved organic carbon, ammonium and phosphate have been measured in the soil porewater of the upper degraded peat layers of rewetted fens at levels of one to three orders higher than the values in pristine systems; an indicator of increased microbial activity in the degraded topsoil. However, there is evidence that the substrate availability within the degraded peat layer is lowered since the organic matter has undergone mineralization over the decades of drainage and intense agricultural use of the areas. Therefore, the pool of soil organic matter (SOM) is expected to become enriched in polyphenolic molecules, e.g. lignin or tannins, compounds that are usually associated with increased SOM recalcitrance. On the other hand, it has been shown before that the polyphenol-induced inhibition of hydrolytic enzymes that are integral to anaerobic OM decomposition is suspended during aeration of peat soils, mainly due to enzymatic oxidation of the polyphenols themselves, e.g. by phenol oxidase. Accordingly, we hypothesized that degraded peat substrate of rewetted fens contain less enzyme-inhibiting polyphenols, compared to less degraded peat substrate of more pristine fens.

We collected substrate samples from the upper 20cm peat layer and fresh roots of dominating vascular plants and mosses (i.e., the peat parent material) from five formerly drained and rewetted sites, and from five more pristine sites of NE Germany and NW Poland. We determined total phenolic contents in these samples, and quantified hydrolysable and condensed tannic substances. Polyphenolics from less decomposed peat and living roots were served as an internal standard for polyphenol analysis and to run enzyme inhibition tests.

As hypothesized, we found that highly degraded peat contained eight times lower levels of total polyphenolics and 50 times lower levels of condensed tannins than less decomposed peat. In addition, we found that polyphenol contents of plant tissue were strongly different between plant species, with highest contents in roots of *Carex appropinquata* that were more than 10-fold higher than Sphagnum spp. (450 vs. 39 mg/g dry mass). Despite these differences, enzyme activities and peat degradation were not significantly correlated, indicating no simple linear relationship between polyphenolic contents and microbial activity.

BIO: Dr. Zak has over 15 years' experience in freshwater and wetland-related environmental research, land use change, conservation, restoration and worked on several freshwater-related projects. His work is dedicated to interdisciplinary research integrating biology, ecology, microbiology and biogeochemistry across aquatic and terrestrial systems.

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HYDROLOGICAL REGIME IMPACTS ON MACROPHYTE COMMUNITIES OF URBAN STORMWATER TREATMENT WETLANDS IN SOUTHWEST FLORIDA

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Macrophytes communities play significant roles in the carbon and nutrient dynamics of treatment wetlands and their development is largely influenced by the hydrological regime. This study investigated seasonal variations of the macrophyte communities of 4.6-ha of urban runoff treatment wetlands at 20-ha Freedom Park, Naples, Florida, by integrating real-time hydrological data on the site with high-resolution aerial photography and ground-truth field surveys. A geographic information system (GIS) is used to create macrophytes community polygons and to extract the polygons into vectors for the spatial analysis during dry and wet seasons. Spatial analysis showed that the shallow areas were dominated by nine macrophyte communities dominated by *Thalia geniculate, Eleocharis cellulose, Pontederia cordata,* and *Cladium jamaicense* which were planted in 2009; and *Panicum repens*, *Mikania scandens* and *Typha* spp. which have since colonized the wetlands. The deepwater areas were dominated by *Nymphaea odorata*, *Nuphar lutea* and *Panicum repens* in the dry season. Macrophyte community structure in the shallow areas changed significantly in the dry season of March 2017 compared to the wet season in October 2016, especially to more colonizing by *Panicum repens*, *Mikania scandens* and *Typha* spp. This study contributes directly to understanding vegetation community dynamics during dry and wet season shifts, which will lead to ecologically rigorous management of the treatment wetland vegetation to optimize its goals of water quality improvement, hydrologic management, and protection of aesthetics for the park.

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BIO: Dr. Zhang is Assistant Director of Everglades Wetland Research Park at Florida Gulf Coast University with more than 17 years of experience planning and implementing wetlands construction projects. She has extensive experience with wetland and river restoration, and has experience with watershed hydrology and GIS modelling.

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EXTREME EVENTS ALTER C DYNAMICS ACROSS THE FLORIDA EVERGLADES

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We examined the relationship between extreme events and carbon dioxide (CO_2) exchange rates across major ecosystems in Everglades National Park, FL, USA. These pulse events are particularly important for understanding how freshwater marsh and mangrove dominated ecosystems will adapt to sea-level-rise (SLR) and climate change in this low elevation, subtropical wetland complex. Productivity across the Everglades peaks near the coast (mangroves) where the supply of P from seawater is balanced by freshwater supplies. Productivity is greatest in mangrove forests (1200 g C m^{-2} yr^{-1}), compared to long- and short-hydroperiod freshwater marsh ecosystems that range from being a small sink to a small source of CO_2 (-11– -110 g CO_2 m^{-2} yr^{-1}) annually. Although climate and hydrology are major drivers of ecosystem structure and function, disturbance regimes (i.e., drought, extreme flooding, hurricanes, low temperature events, and fire) interact with hydrology to modify populations, communities, and ecosystems across the coastal gradient. Recent El Niño Southern Oscillation cycles (ENSO; 2009-2013) and low temperature events (2009-2012) have provided important opportunities to explore variation in ecosystem sensitivity to disturbances and recovery trajectories in freshwater marsh and mangrove forests.

In Florida, fluctuations in precipitation patterns occur with changes in the El Niño southern oscillation (ENSO) phases. While El Niño events co-occur with wetter than average conditions, La Niña phases are associated with drier than average conditions. Under normal conditions, short-hydroperiod freshwater marshes have higher productivity rates during the dry season while long-hydroperiod freshwater marshes exhibit greater productivity rates during the wet season. This site-specific seasonality in productivity is driven by changes in hydrology and as a result, ENSO phases either magnify or mute seasonal productivity rates. La Niña phases were concurrent with increased productivity in short-hydroperiod freshwater marshes compared to El Niño and neutral years. The exceptionally wet year associated with an El Niño phase led to greater productivity in the long-hydroperiod freshwater marsh. When it comes to low-temperature events (<5°C), both water levels and distance from the coast influenced ecosystem sensitivity. While the long-hydroperiod freshwater marsh gained 0.26 g CO_2 m^{-2} more carbon during low-temperature events due to the higher light levels, mangrove forest had the greatest carbon lost (7.11 g CO_2 m^{-2} low-temperature $event^{-1}$). Across disturbance types, hydrology played a major role in determining the degree of exposure and therefore the sensitivity to disturbance.

BIO: Dr. Junbin Zhao is a postdoctoral associate working on a project regarding greenhouse gas emission in the Everglades wetlands. He has years of experiences in studying wetland CO_2 and CH_4 exchange at ecosystem and plant scale.

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ACTIVE MANAGEMENT INFLUENCES ON BIOGEOCHEMISTRY IN A NUTRIENT POOR WETLAND

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We are implementing active management strategies to physically alter the environment, with the goal of changing biogeochemical feedbacks, such that restoration is sustainable. In the Everglades, large sections of the open water slough landscape have been overdrained and overgrown with *Cladium jamaicense* (sawgrass). To restore these areas, a combination of herbicide and physical compaction was used to remove sawgrass above the water line to redirect flow and open up historical slough flow paths. Preliminary evidence from an experimental flow in July 2017 indicated substantial increases in flow, farther from the culvert structure, and a change in the overall direction, fitting the remnant north-south flow pattern. This management resulted in a large carbon load to the water column, and across the sediment/water interface, which will directly influence nutrient cycling as the managed area transitions from a sawgrass ridge to a slough. We hypothesize that increased light penetration leads to increased algal growth and oxygen production, but higher decomposition rates may negatively affect oxygen levels in the water column. In addition, flow will increase as frontal area decreases and plant species in the managed area transition to more slough-like species, affecting floc production, transport, and chemistry. In this talk we will present the short term results of the restoration of this overdrained landscape and discuss the longer term consequences of this active management approach.

BIO: Dr. Zweig is a Senior Scientist with the South Florida Water Management District and has 17 years of experience in the Everglades wetland system. Her experience is with wetland plant communities and the environmental gradients that affect them.

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