

TODD Z. OSBORNE, Ph.D.

Assistant Professor of Coastal Biogeochemistry



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 new faculty member at Whitney Laboratory, 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. In my first year, I have been actively seeking sources of funding and cultivating new collaborative relationships with agencies such as the US Department of Energy, US Geological Survey and US Environmental Protection Agency and nurtured several new working relationships with collaborators from the Smithsonian Institute, University of Sydney and many researchers here in the United States. Carbon sequestration, mangrove migration and coastal eutrophication are issues of great importance locally and globally and will thus be the priority areas of my research program for the short term. I have recruited three doctoral and two masters students and have initiated several experiments on carbon transformations in our own Matanzas basin. I continue to pursue funding from NSF's Environmental Biology (Ecosystem Science) and Geosciences (Marine Geochemistry) programs to investigate carbon and nitrogen sequestration processes in coastal wetlands from the mangrove systems of the Everglades to the cordgrass marshes of the Georgia coast.

Education:

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| 2005 | Doctor of Philosophy, Biogeochemistry, Soil and Water Science Department, University of Florida, Gainesville, FL |
| 2000 | Master of Science, Environmental Engineering Sciences, University of Florida, Gainesville, FL |
| 1997 | Bachelor of Science, Applied Biology and Biotechnology, School of Biology, Georgia Institute of Technology, Atlanta, GA |

Professional Experience:

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| 2014-Present | Assistant Professor, Estuarine Biogeochemistry, Whitney Laboratory for Marine Bioscience, University of Florida, St. Augustine, FL |
| 2013 | Senior Environmental Scientist (ES VI) Physicochemistry- Aquatic Sciences, Bureau of Environmental Sciences, St. Johns River Water Management District, Palatka, FL |
| 2007-2013 | Research Assistant Professor, Aquatic Biogeochemistry, Wetland Biogeochemistry Laboratory, Soil and Water Science Department, University of Florida, Gainesville, FL |
| 2005 | Post-Doctoral Associate, Soil and Water Science Department, University of Florida, Gainesville, FL |
| 2003-2005 | Project Coordinator, Soil and Water Science Department, University of Florida, Gainesville, FL Everglades Soil Mapping Project, soil, water, vegetation sampling and ecological site description 2000+ sites in Everglades basin |
| 1999-2005 | Environmental Scientist (On Demand Consultant), Jones Edmunds and Associates (JEA) Gainesville, FL |

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| 1998-2005 | Graduate Teaching Assistant, Soil and Water Science Department, University of Florida, Gainesville, FL |
| 1998-2000 | Graduate Research Assistant, Environmental Engineering Sciences Department, University of Florida, Gainesville, FL |
| 1998 | Research Intern, Makerere University Biological Field Station, Kanuwara, Uganda |

Research Interests:

- Soil biogeochemical processes associated with sea level rise, coastal forest retreat and development of salt marsh ecosystems
- Coastal ecosystem processes with respect to sea grasses, salt marshes, and mangrove productivity and organic matter cycling, sub-aqueous soil pedogenesis
- Biogeochemical cycling of carbon, nitrogen, phosphorus and other nutrients in wetland soils and aquatic ecosystems
- Role of organic matter as driver and modulator of aquatic ecosystem functions
- Role of aquatic vegetation in DOM/POM/nutrient dynamics, soil accretion
- Fire ecology of wetlands and impacts to biogeochemical cycles and ecosystem responses, soil subsidence
- Wetland soils as natural water quality treatment systems
- Aquatic ecosystem services evaluation

Membership in Professional Societies:

American Society of Limnology and Oceanography
 Society of Wetland Scientist
 American Society of Agronomy – Soil Science Society of America
 Ecological Society of America
 Sigma Xi Scientific Honor Society
 National Science Teachers Association (NSTA)
 Society Internationale de Limnologie
 Southeastern Estuarine Research Society
 Florida Association of Environmental Soil Scientists (lifetime)

Honors:

Professional Wetland Scientist (PWS)
 Sigma Xi Inductee (2002)
 USDA National Needs Fellow (2000-2003)
 Co-designer of Waldo Treatment Wetland (recipient of EPA National Award 2001)

National /International Professional Service:

- Host and Organizer, 12th International Wetland Biogeochemistry Symposium, Coral Springs FL, April 2018.
- Co-Host and Organizer, 4th International Mangrove and Macrobenthos Meeting, St. Augustine FL, August 2016.
- Guest Associate Editor and Organizer: *Fire Ecology Vol 9 Issue 1- Special Issue -Fire in Wetlands*
- Editorial Board: *Trends in Soil Science and Plant Nutrition*
- Editorial Board: *Journal of Geology and Geosciences*
- Session Chair: Fire as an Ecological Driver in Wetland Ecosystems- International Association of Ecology 2012 Orland FL; Management Challenges in Wetland Restoration- Society of Freshwater Scientists, Jacksonville, FL 2013

- Volunteer manuscript reviewer for: *Limnology and Oceanography*, *Aquatic Botany*, *Ecological Engineering*, *Fundamental and Applied Limnology*, *Environmental Engineering*, *Catena*, *Soil Science Society of America Journal*, *Estuaries and Coasts*, *Soil and Sediment Contamination*, *Soil, Water, and Air Pollution*, *Wetlands Ecology and Management*, *Wetlands*, *Biology of Invasive Species*, *Fire Ecology*, *Florida Scientist*, *European Journal of Soil Science*, *African Journal of Ecology*, *Biogeochemistry*; *Hydrobiologia*, *Oecologia*, *Water Research*, *Journal of the North American Benthological Society*
- US Environmental Protection Agency (technical reviews)
- Estonia Science Foundation (proposal review committee)
- Louisiana Sea Grant (proposal review committee)
- USACE DECOMP (professional review committee)
- Monitoring and Assessment Program (MAP) SFWMD Landscape and Nutrients committees
- Restoration, Co-ordination, and Verification (RECOVER) USACE interagency Everglades Restoration Program committee & project reviewer
- Oklahoma Water Resources Research Institute (review committee)

Recent Publications (2010-Present):

Julian, P., **Osborne, T.Z.** (2018). From lake to estuary, the tale of two waters: a study of aquatic continuum biogeochemistry. *Environmental monitoring and assessment*, 190: 96

Dhaliwal, S.S., Toor, G.S., Rodriguez-Jorquera, I.A., **Osborne, T.Z.**, Newman, S. (2018). Trace metals in the soils of Water Conservation Area of Florida Everglades: Considerations for ecosystem restoration. *Journal of Soils and Sediments*, 18: 342

Simpson, L.T., **Osborne, T.Z.**, Feller, I.C. Wetland Soil Co₂ Efflux Along a Latitudinal Gradient of Spatial and Temporal Complexity. (2018). *Estuaries and Coasts*, 1-10

Smith, R.S., Blaze, J.A., **Osborne, T.Z.**, Byers, J.E. (2018). Facilitating your replacement? Ecosystem engineer legacy affects establishment success of an expanding competitor. *Oecologia*, 188: 251

Julian, P., Gerber, S., Bhomia, R., King, J., **Osborne, T.Z.**, Wright, A.L., Power, M. (2018). Evaluation of nutrient stoichiometric relationships amongst ecosystem compartments of a subtropical treatment wetland. Fine-scale analysis of wetland nutrient stoichiometry. *bioRxiv*, 220186

Julian, P.J.(g), S. Gerber, A.L. Wright, B. Gu, **T.Z. Osborne**. (2017). Carbon pool trends and dynamics within a subtropical peatland during long-term restoration. *Ecological Processes* 6:43 DOI 10.1186/s13717-017-0110-8

Newman, S. **T.Z. Osborne**, S.E. Hagarthy, C. Saunders, K. Rutchey, K. Shall, K.R.Reddy. (2017). Drivers of landscape evolution: multiple regimes and their influence on carbon sequestration in a subtropical peatland. *Ecological Monographs* 87(4): 578-599

Simpson, L.T. (g), **T.Z. Osborne**, L.J. Duckett, I.C. Feller. (2017). Carbon storages along a climate induced coastal wetland gradient. *Wetlands* 37(6): 1023-1035

Osborne, T.Z., M.F. Coveney, R.A. Mattson. (2017). Potential for direct nitrate-nitrite inhibition of submerged aquatic vegetation (SAV) in Florida Springs: A review and synthesis of current literature. *Water* 8: 30-46

Osborne, T.Z., Fitz H.C., Davis S. (2017). Restoring the foundation of the Everglades: assessment of edaphic responses to hydrologic restoration scenarios. *Restoration Ecology* 25(S1): S59-S70

Simpson, L.T.(g), **Osborne, T.Z.**, Feller, I.C. (2017). Establishment and biomass allocation of black and red mangroves: Response to propagule flotation duration and seedling light availability. *Journal of Coastal Research* 33(5): 1126-1134

Vogel, W.J., **Osborne, T.Z.**, James, R.T. Cohen M.J. (2016). Spectral prediction of sediment chemistry in Lake Okeechobee Florida. *Environmental Monitoring Assessment* 188: 594-607

Julian, P., A.L. Wright, **T.Z. Osborne**. (2016). Iron and sulfur Porewater and surface water biogeochemical interactions in a subtropical peatland. *Soil Science Society of America* 80:794-802

Dhaliwal,S., G.S. Toor, I. Rodriguez-Jorquera, **T.Z. Osborne**, S. Newman. (2016). Trace metals in soils of Water Conservation Area of Florida Everglades: considerations for ecosystem restoration. *Journal of Soils and Sediments* 10.1007/s11368-016-1459-5.

Osborne, T.Z., S. Newman, K. R. Reddy, L. R. Ellis, and M. S. Ross. (2015). Spatial Distribution of Soil Nutrients in the Everglades Protection Area. In: *Microbiology of the Everglades Ecosystem*. J. entry, A. Ogram (Eds.) CRC Press- Taylor Francis Group. Boca Raton FL USA. 38-67.

Bukata, B.J. **T.Z. Osborne**, and M.L. Szafraniec. (2015). Soil nutrient assessment and characterization in a degraded central Florida Swamp. *Water, Air and Soil Pollution* 226(9) 1-11

Orem, W., S. Newman, **T.Z. Osborne**, K.R. Reddy. (2015). Projecting changes in Everglades soil biogeochemistry for carbon and other key elements to possible 2060 climate and hydrologic scenarios. *Environmental Management* 55: 776-798

Gabriel, MC, D. Axelrad, W. Orem, N. Howard, **T.Z. Osborne**. (2015). Response to “Comment on and Reinterpretation of Gabriel et al., (2014) “Fish Mercury and Surface Water Sulfate Relationships in the Everglades Protection Area” *Environmental Management* 55:1227-1231

Osborne, T.Z. (2015). Potential for Nitrate-Nitrite Inhibition of Submerged Aquatic Vegetation (SAV) in Florida Springs. *St. Johns River Water Management District Special Publication Series* SP2015-2

Osborne T.Z., R. Mattson, and M. Coveney. (2015). Macroinvertebrate Grazers, Dissolved Oxygen Stress, and the Loss of Top-Down Control of Algae in Florida Spring Ecosystems. *St. Johns River Water Management District Special Publication Series* SP2015-1

Watts, A. C., D. L. Watts, M. J. Cohen, J. B. Heffernan, D. L. McLaughlin, J. B. Martin, D. A. Kaplan, A. B. Murray, **T.Z. Osborne**, and L. N. Kobziar. (2014). Evidence of biogeomorphic patterning in a low-relief karst landscape. *Earth Surface Process and Landforms* 39 (15): 2027-2037

Gabriel, M.C., N. Howard, **T.Z. Osborne**. (2014). Fish mercury and surface water sulfate relationships in the Everglades Protection Area. *Environmental Management* 53: 583-593

Chambers, L.G, **T.Z. Osborne**, and K.R. Reddy. (2013). Effect of salinity pulsing events on soil organic carbon loss along an intertidal wetland gradient: A laboratory experiment. *Biogeochemistry* 115:363-383

***Osborne, T.Z.**, K.R. Reddy, L.R. Ellis, N.G. Aumen, D.D. Surratt, M.S. Zimmerman, and J. Sadle. (2013). Evidence of recent phosphorus enrichment in surface soils of Taylor Slough and northeast Everglades National Park. *Wetlands* 34(1) 37-45

Osborne, T.Z., L.N. Kobziar, & P.W. Inglett. (2013). Investigating the role of fire in shaping and maintaining wetland ecosystems. *Fire Ecology* 9(1): 1-5

Inglett, K.S., P.W. Inglett, K.R. Reddy, and **T.Z. Osborne**. (2012). Temperature sensitivity of greenhouse gas production in wetland soils of different vegetation. *Biogeochemistry* 108: 77-90

White, W.R., L.R. Ellis, L.N. Sturmer, **T.Z. Osborne**, S. Baker. (2012). Applying a soils-based approach to clam aquaculture in Florida. *J. Shellfish Res.* 31(1): 360-360

Chambers, L.G., **T.Z. Osborne**, and K.R. Reddy. (2011). Short-term response of carbon cycling to salinity pulses in a freshwater wetland. *Soil Sci. Soc. Am. J.* 75(5) 1-8

Marchant, B.P., S. Newman, **T.Z. Osborne**, K. Rutchey, K.R. Reddy, and R.M. Lark. (2011). Spatio-Temporal Monitoring of Soil Phosphorus in the Everglades Water Conservation Area 2A: 1998—2008. *European J. Soil Sci.*

Osborne, T.Z., G.L. Bruland, S. Newman, K.R. Reddy, & S. Grunwald. (2011). Spatial distributions and eco-partitioning of soil biogeochemical properties in Everglades National Park. *Env. Monit. Assess.* 183: 395-408

Han, Lu, S. Huang, C.D. Stanley, and **T.Z. Osborne**. (2011). Phosphorus fractionation in core sediments from the Haihe River, China. *Soil Sed. Cont. Int. J.* 20(1): 30-53

***Osborne, T.Z.**, S. Newman, P. Kalla, D.J. Scheidt, G.L. Bruland, M.J. Cohen, L.J. Scinto, & L.R. Ellis. Landscape patterns of significant soil nutrients and contaminants in the Greater Everglades Ecosystem: Past, Present, and Future. (2011). *Crit. Rev. Environ. Sci. Technol.* 41:6 121-148

*Reddy, K.R., S. Newman, **T.Z. Osborne**, J.R. White, and C. Fitz. Legacy phosphorus in the Everglades ecosystem: implications for management and restoration. (2011). *Crit Rev Env. Sci Technol.* 41:6 149-186

*Cohen, M.J., J. Heffernan, D. Watts, and **T.Z. Osborne**. Reciprocal biotic control on hydrology, nutrient gradients, and landform in the Greater Everglades. (2011). *Crit. Rev. Environ. Sci. Technol.* 41:6 395-429

Watts, D., M.J. Cohen, J. Heffernan, **T.Z. Osborne**, & M.W. Clark. (2010). Hydrologic modification and the loss of self-organized patterning in the ridge slough mosaic of the Everglades. *Ecosystems* 13: 813-827

Research Support:

PI Translating the effects of sea level rise in urban systems on the coastal ecosystem interface. Climate Change Initiative- UF-IFAS (\$102,400 1 yr)

PI Mangroves on the march- a trophodynamic investigation of coastal wetland response to climate change. Early Career Seed Grant- UF-IFAS (\$46,540 1 yr)

PI Bridging the America's- comparative mangrove studies from Panama to Florida. 1923 Fund (\$500,000 5 yrs)

Co-PI Science for Management of Everglades Stormwater Treatment Areas. South Florida Water Management District (\$1,100,000 3 yrs)

Co-PI Kings Bay sediment and dredge spoil assessment. Southwest Florida Water Management District (\$78,000 1 yr)

CO-PI SJRWMD. Springs Protection Science Initiative (\$3,000,000 3 yrs)

PI Spatial extent of soil phosphorus enrichment in the Taylor Slough landscape, Everglades National Park. USDOJ/NPS (\$72,000 2 yrs)

Co-PI Everglades Foundation & USDOJ/NPS Synthesis of freshwater Everglades research and restoration results: bringing ecosystem management forward. (\$883,892 2 yrs)

PI SJRWMD Environmental consequences of organic soil subsidence in the Upper St. Johns River Basin (\$150,000 3 yrs)

PI SFWMD Kissimmee River Floodplain Restoration: Soil and Sediment Assessment (\$215,000 1.5 yrs)

Co-PI Malcolm Pirnie Inc. Coquina Desalinization Plant Phase 2 Environmental Study (\$194,000 2 yrs)

Co-PI USACE Mechanisms of Ridge Slough Maintenance In the Florida Everglades (\$813,344 5 yrs)

PI SWFWMD Flatford Swamp Restoration Assessment. (\$54,000 1 yr)

Co-PI Florida Department of Transportation (FDOT) Monitoring and assessment of seagrass habitat impacts of hydrologic restoration of Lake Surprise, Key Largo, and habitat restoration of SL15, Indian River Lagoon, Fort Pierce (\$688,000 3 yrs)

PI SFWMD Spatial Changes in Total Phosphorus and Sulfur in WCA-2A (Combined 2X) (\$32,200)

PI SFWMD Kissimmee River Restoration: Vegetation Flow Resistance Study (\$15,700 1 yr)

Co-PI SFWMD Evaluation of landscape pattern drivers by priority sampling units in Florida Everglades (\$981,422 4 yrs)

Co-PI USACE Determination of landscape evolution by hydrologic gradient manipulation: implications for Everglades landscape restoration (\$890,077 4 yrs)

Co-PI Florida Sea Grant Environmental and market condition requirements for successful aquaculture of the Sunray Venus clam (\$100,000 2 yrs)

Co-PI St. Johns River Water Management District (\$65,000 1 yr) Soil Subsidence in Blue Cypress Marsh. Developing Hydrologic Regime to Sustain Peat Soils.

Co-PI St. Johns River Water Management District (\$224,000 3 yrs) Organic matter dynamics in the Lower St. Johns River Basin.

Co-PI South Florida Water Management District (SFWMD) Spatial distribution of sediment biogeochemistry of Lake Okeechobee (\$159,000 2 yrs)

Co-PI US Army Corps of Engineers (USACE) Differential growth and decomposition in the Everglades as drivers of ridge and slough ecosystem formation and maintenance (\$466,850 3 yrs)

PI US Army Corps of Engineers (USACE) Regional distribution of soil nutrients- hierarchical soil nutrient mapping for improved ecosystem change detection (\$228,000 2 yrs)

Co-PI USDA Soil biogeochemical indicators of degradation of hard clam farming leases over various farming intensities (\$20,000 1 yr)

PI SFWMD Process level effects of increased specific conductance of surface waters on cycling of carbon and phosphorus in the Northern Everglades (\$31,520 1 yr)

PI SFWMD Spatial Distribution of Sulfur in Northern Everglades Soils (\$32,500 1 yr)

PI SFWMD Spatial Distribution of Sulfur in Southern Everglades Soils (\$34,475 1 yr)

PI Critical Ecosystems Science Initiative (CESI)(USDOI) Effects of managed fire on water quality and invasive species recruitment in the A.R.M. Loxahatchee National Wildlife Refuge (\$288,000 3 yrs)

Co-PI National Park Service (USDOI) (CESI) Long-term Changes in Phosphorus Storage in Selected Hydrologic Units of the Everglades (\$41,460 1 yr)