

## James B. Heffernan

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### EDUCATION

Ph.D. Biology, 2007. School of Life Sciences, Arizona State University, Tempe, AZ.  
Dissertation Title: Wetlands as an alternative stable state in desert streams. Advisor: Dr. Stuart Fisher

B.A. Ecology and Evolutionary Biology, 2000. Cornell University, Ithaca, NY

### PROFESSIONAL APPOINTMENTS

2012-present	Assistant Professor of Ecosystem Ecology and Ecohydrology Duke University, Nicholas School of the Environment
2009-2011	Assistant Professor, Florida International University, Department of Biological Sciences and Southeast Environmental Research Center
2007- 2008	Post-Doctoral Associate, University of Florida Water Institute and School of Forest Resources and Conservation. Advisor: Dr. Matt Cohen.

### HONORS

ASU Division of Graduate Studies Dissertation Fellowship, 2006-2007  
NSF Graduate Research Fellowship, 2002-2005.  
University Graduate Scholarship, Arizona State University, 2001-2003

### PUBLICATIONS

17. Cohen, M. J., J. B. Heffernan, A. A. Albertin, and J. B. Martin. *In press*. Nitrate isotope dynamics in a spring-fed Florida river. *JGR-Biogeosciences*.  
<http://www.agu.org/journals/pip/jg/2011JG001715-pip.pdf>
16. Cavender-Bares, J., J. Heffernan, E. King, S. Polasky, P. Balvanera, W. C. Clark, K. N. Lee. *In press*. Sustainability and Biodiversity (Chapter 390), In S. Levin (Editor). Encyclopedia of Biodiversity, 2<sup>nd</sup> Edition. Elsevier.
15. Heffernan, J. B., and S. G. Fisher. 2012. Plant-microbe interactions and nitrogen dynamics during wetland establishment in a desert stream. *Biogeochemistry* 107:379-391. DOI 10.1007/s10533-010-9559-6
14. Cohen, M.J., D.L. Watts, J.B. Heffernan, and T. Osborne. 2011. Reciprocal biotic control of hydrology, nutrient gradients and landform in the Greater Everglades. *Critical Reviews in Environmental Science and Technology* 41: 395-429. doi:10.1080/10643389.2010.531224
13. Watts, D.L., M.J. Cohen, J.B. Heffernan, T. Osborne, and M.W. Clark. 2010. Hydrologic modification and the loss of self-organized patterning in the Everglades ridge-slough mosaic. *Ecosystems* 13(6):813-827.

12. Heffernan, J.B., D.M. Liebowitz, T.K. Frazer, J.M. Evans, and M.J. Cohen. 2010b. Algal blooms and the nitrogen-enrichment hypothesis in Florida springs: Evidence, alternatives, and adaptive management. *Ecological Applications* 20(3): 816-829.
11. Heffernan, J.B., and M.J. Cohen. 2010. Direct and indirect coupling of productivity and diel nitrate dynamics in a subtropical spring-fed river. *Limnology and Oceanography* 55(2):677-688. \*Faculty of 1000 Recommended Paper (<http://f1000biology.com/article/id/2669964>)
10. Heffernan, J.B., M.J. Cohen, T.K. Frazer, R.G. Thomas, T.J. Rayfield, J. Gulley, J.B. Martin, J.J. Delfino, and W.D. Graham. 2010a. Hydrologic and biotic influences on nitrate removal in a sub-tropical spring-fed river. *Limnology and Oceanography* 55(1): 249-263.
9. Roach, W.J., J.B. Heffernan, N.B. Grimm, R. Arrowsmith, C. Eisinger, and T. Rychener. 2008. Unintended consequences of urbanization for aquatic ecosystems: a case study from the Arizona desert. *BioScience* 58(8):715-727.
8. Heffernan, J.B., R.A. Sponseller, and S.G. Fisher. 2008. Consequences of a biogeomorphic regime shift for the hyporheic zone of a Sonoran Desert stream. *Freshwater Biology* 53(9):1954-1968.
7. Heffernan, J.B. 2008. Wetlands as an alternative stable state in desert streams. *Ecology* 89(5):1261-1271. \*Faculty of 1000 Exceptional Paper (<http://www.f1000biology.com/article/id/1124430/evaluation>)
6. Fisher, S.G., J.B. Heffernan, R.A. Sponseller, and J.R. Welter (2007). Functional Ecomorphology: Feedbacks between Form and Function in Fluvial Landscape Ecosystems. *Geomorphology* 89: 84-96.
5. Grimm, N.B., R.J. Arrowsmith, C. Eisinger, J. Heffernan, D.B. Lewis, A. MacLeod, L. Prasad, W.J. Roach, T. Rychener, and R.W. Sheibley (2005). Effects of urbanization on nutrient biogeochemistry of aridland streams. In R. DeFries, G. Asner, and R. Houghton (editors). Ecosystem interactions with land use change. American Geophysical Union Geophysical Monograph Series
4. Sabo, J.L., R. Sponseller, M. Dixon, K. Gade, T. Harms, J. Heffernan, A. Jani, G. Katz, C. Soykan, J. Watts, and J. Welter (2005). Riparian zones increase regional species diversity by harboring different, not more species. *Ecology* 86(1): 56-62.
3. Heffernan, J.B., and R. A. Sponseller (2004). Re-mobilization and processing of nutrients in Sonoran Desert riparian soils following artificial re-wetting. *Biogeochemistry* 70(1):117-134.
2. Fisher, S.G., R.A. Sponseller, and J.B. Heffernan (2004). Horizons in stream biogeochemistry: Flowpaths to progress. *Ecology* 85(9): 2369-2379.
1. Stelzer, R.S., J. Heffernan and G.E. Likens (2003). The influence of dissolved nutrients and particulate organic matter quality on microbial respiration and biomass in a forest stream. *Freshwater Biology* 48 (11): 1925-1937.

### Manuscripts in Review

- J. B. Heffernan, A. Albertin, M. Fork, B. Katz, and M.J. Cohen. *In review*. Denitrification and nitrogen source inference in the karstic Floridan Aquifer. *Biogeosciences Discuss.*, 8, 10247-10294, doi:10.5194/bgd-8-10247-2011.

King, S., J. B. Heffernan, and M. J. Cohen. *In review*. Nutrient flux, autotrophic demand, and nutrient limitation in lotic systems. *Freshwater Sciences*.

### **Manuscripts in Preparation**

Heffernan, J. B., D.L. Watts, and M. J. Cohen. *In Prep*. Discharge competence as an ecohydrologic mechanism for pattern formation in peatlands: a meta-ecosystem model of the Everglades ridge-slough landscape.

Heffernan, J. B. and J. Munyon. *In Prep*. The South Florida Urban Lake District.

Sponseller, R. A., J. B. Heffernan, and S. G. Fisher. *In prep*. On the multiple roles of water in river networks.

### **AWARDS**

#### **Current**

Collaborative research: Ecological homogenization of urban America. National Science Foundation. Project #EF-1065760. \$226,679 (7/1/11-6/30/15). J. Heffernan (PI) and L. Ogden.

Mechanisms of Ridge-Slough Maintenance and Degradation Across the Greater Everglades. Army Corps of Engineers (via subcontract from University of Florida). \$164,089 (8/16/10-8/15/15). Sole PI.

Landscape Pattern- Ridge, Slough, and Tree Island Mosaics. Army Corps of Engineers. \$637,507 (8/1/10-7/31/13), JB Heffernan (PI), M Ross (FIU PI), J Sah, L Scinto.

ULTRA-ex: Double Exposures: Socio-ecological Vulnerabilities in the Miami-Dade Urban Region. National Science Foundation/Department of Agriculture (US Forest Service) BCS-0948988. \$299,180.00 (9/1/09-2/29/12). Gail Hollander (PI), JB Heffernan, M Ross, L Ogden, E. Gaiser.

Collaborative Research: Controls on Delivery and Fate of Water, Nitrogen and Calcium in a Spring-Fed Karst River. National Science Foundation EAR-0838390. \$81,783 (3/1/09-2/29/12). Sole FIU PI.

#### **Pending**

Preliminary Proposal: Controls and Dynamics of Nutrient Limitation Severity. J. Heffernan (PI), E. Bernhardt, and B. McGlynn.

Preliminary Proposal: The Ecological Drill Hypothesis: Biotic Control on Carbonate Dissolution in a Low-Relief Patterned Landscape. M Cohen (PI), J. Martin, J. Heffernan, D. McLaughlin, T. Osborne

#### **Completed**

Hyporheic Nitrogen Metabolism of Spring Run and Blackwater Rivers. St. John's River Water Management District. \$240,000 (1/1/09-9/31/10). PI: MJ Cohen (University of Florida). Subcontract (\$84,200/2yrs) to JBH at FIU.

Landscape Pattern- Ridge, Slough, and Tree Island Mosaics. South Florida Water Management District. \$191,354 (4/1/09-9/30/09). JB Heffernan (PI), M Ross, J Sah, L Scinto, MJ Cohen (UF), TZ Osborne (UF).

NSF Doctoral Dissertation Improvement Grant: “Temporal Dynamics of Alternative Stable States in a Desert Stream.” \$11,300. June 2005-May 2007

ASU Graduate and Professional Students Association Research Grant: “Reciprocal Interactions Between Plant Establishment and Nitrogen Availability in a Sonoran Desert Stream.” \$1661. Oct 2004-June 2005

## TEACHING

### *Florida International University*

QBIC Journal Club	Cell Biology (2 sections)	Fall 2009, 2010
	Evolution (2 sections)	Spring 2010
PCB 3043: Ecology		Spring 2010, 2011
BSC 4934/5935: Analysis of Urban Systems		Fall 2010, Fall 2011

### *Arizona State University (as Teaching Assistant)*

Bio 100: The Living World	Fall 2001, Spring 2002
Bio 187: Introduction to the Life Sciences	Fall 2005, Spring 2006

## MENTORING

### *Graduate Student Committees (as chair):*

Megan L. Fork (M.S.; FIU Biological Sciences)  
 Jay Munyon (Ph.D.; FIU Biological Sciences)  
 Ewan Isherwood (M.S.; FIU Biological Sciences)

### *(as member)*

Jeff Muehlbauer (Ph.D.; University of North Carolina Department of Geography)  
 Elizabeth Lacey (Ph.D.; FIU Biological Sciences)  
 Sylvia Lee (MS; FIU Biological Sciences)  
 Dina Liebowitz (PhD; University of Florida School of Natural Resources and Environment)  
 Emily Nodine (Ph.D.; FIU Biological Sciences)  
 Sean Giery (Ph.D.; FIU Biological Sciences)

### *Undergraduate student researchers*

Virginia Fernandez (FIU Biology)  
 Sean Koester (FIU Earth and Environment)  
 Mario Cisneros (FIU Biology)  
 Manuela Aguilar (FIU Biology)  
 Gabriel Sone (FIU Biology)

## SERVICE AND SYNERGISTIC ACTIVITIES

Peer Review Committee for Florida Department of Environmental Protection, ‘Derivation of Dissolved Oxygen Criteria to Protect Aquatic Life in Florida’s Fresh and Marine Waters’. August 2011-present

Organizing Committee and Faculty Instructor, NCEAS Sustainability Science Distributed Graduate Seminar. Fall 2010. J. Cavender-Bares and W. Clark (PIs).

Special Session Co-Organizer, 'Spring-fed ecosystems as models for testing ecological theory and global change predictions,' American Society of Limnology and Oceanography/North American Benthological Society Joint Meeting, June 6-11, 2010, Santa Fe, NM

Special Session Organizer, 'Nutrients and Hyporheic Processes,' Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI), Biennial Science Meeting, July 14<sup>th</sup>-16<sup>th</sup>, 2008, Boulder, CO

Collaborator, Florida Coastal Everglades Long-Term Ecological Research site (FCE-LTER).  
Working groups: Human Dimensions, Biogeochemistry, Primary Production  
Cross-site working group: Integrated socio-ecology of lawns and residential landscapes  
Participant, LTER Science Council meeting May 2009 (Scenarios working group)

Proposal review: National Science Foundation (Doctoral Dissertation Improvement Grants [DDIG] – *Panelist*; Integrative Graduate Education and Research Training [IGERT] – *Panelist*; Ecosystem Science – *ad hoc reviewer*)

Manuscript Review: American Naturalist, BioScience, Eco-DAS, Ecological Applications, Ecological Indicators, Ecological Monographs, Ecology, Ecosystems, Environmental Management, Environmental Modelling and Software, Environmental Science and Technology, Freshwater Biology, Geoderma, Hydrology and Earth System Science, Journal of Arid Environments, JGR-Biogeosciences, Journal of the North American Benthological Society, Journal of the American Water Resources Association, Journal of Hydrology, Limnology and Oceanography

Member: American Geophysical Union, American Society of Limnology and Oceanography, Ecological Society of America, European Geophysical Union, Society for Freshwater Science (formerly North American Benthological Society)

Active Faculty and Organizing Committee, Quantifying Biology in the Classroom (QBIC) mathematics-biology curriculum development program. (2009-2011)

Departmental Service: *FIU Biological Sciences*: Seminar Committee (2009-10); Graduate Committee (2010-11); Urban Ecologist Search Committee (chair; 2010-2011). *FIU SERC*: Seminar Series Organizer (2010-11).

### **PUBLIC OUTREACH**

Research in the Santa Fe River Hydrologic Observatory: Where does all the nitrate go? October 5<sup>th</sup>, 2007. Ichetucknee Springs Basin Working Group meeting, Lake City, FL.

Public Comment on proposed EPA numeric nutrient criteria for Florida Inland Waters – Document ID: EPA-HQ-OW-2009-0596-1839.1. 6 May, 2010.

### **INVITED SEMINARS**

Formation and loss of self-organized pattern in the Florida Everglades. Nicholas School of the Environment, Duke University. March 15<sup>th</sup>, 2010.

Formation and loss of self-organized pattern in the Florida Everglades. Princeton University

Department of Civil and Environmental Engineering. Nov 19<sup>th</sup>, 2010.

Estimation of biogeochemical processes in flowing waters from diel variation. Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI). April 24<sup>th</sup>, 2010. Distributed Seminar.

Coupling carbon and nitrogen cycles in spring-fed rivers. Southeast Environmental Research Center, Florida International University. March 24<sup>th</sup>, 2010.

Self-organization in biogeomorphic systems. Department of Oceanography and Coastal Sciences, Louisiana State University. October 9<sup>th</sup>, 2009.

Theory and application in the biogeosciences and socio-ecology. Department of Earth and Environment, Florida International University. September 30<sup>th</sup>, 2009.

Nitrogen dynamics in Florida springs from hours to decades. Marine Biology Program, Florida International University. February 27<sup>th</sup>, 2009.

Wetlands as an alternative stable state in desert streams. Department of Biological Sciences, Florida International University. February 19<sup>th</sup>, 2008.

Wetlands as an alternative stable state in desert streams. Department of Fisheries and Wildlife, Michigan State University. January 17<sup>th</sup>, 2008.

Effects and fates of rising nitrogen loads to Florida springs. Department of Fisheries and Aquatic Sciences, University of Florida. November 9<sup>th</sup>, 2007.

Wetlands as an alternative stable state in desert streams. Center for Wetlands, University of Florida. October 3<sup>rd</sup>, 2007.

Wetlands as an alternative stable state in desert streams. Geomorphology Seminar (ASU GPH 591; Instructor: Dr, Mark Schmeekle). April 15<sup>th</sup>, 2007.

#### **INVITED PRESENTATIONS**

J. B. Heffernan and M.J. Cohen. Estimation of N transformations from high frequency NO<sub>3</sub> time series. American Geophysical Union, Dec 12-17<sup>th</sup>, 2010. San Francisco, CA.

Heffernan, J. B. The importance of temporal variability in spring ecosystems. University of Florida Water Institute Symposium – Session on science and policy in Florida Springs. February 25<sup>th</sup>, 2010.

Heffernan, J. B. Patterning of vegetation communities and soil microtopography in the Everglades Ridge and Slough mosaic. Florida International University GIS Symposium. February 23<sup>th</sup>, 2010.

#### **CONTRIBUTED ORAL PRESENTATIONS (LAST FIVE YEARS)**

Katz, B.G., J.B. Heffernan, and R.J. Verdi. 2011. Nitrogen sources and fate in a large karstic springs basin. Geological Society of America, Minneapolis, MN.

Liebowitz, D.M., M. Cohen, T. Frazer, J. Heffernan, L. Korhnak. 2010. Exploring Alternative Controls of Algal Proliferation in Florida's Springs. North American Benthological Society. Santa Fe, NM.

Heffernan, J., D.L. Watts, and M.J. Cohen. 2010. Ecohydrologic feedbacks and topographic pattern in Everglades peatlands: a model of the self-organizing canal hypothesis. Ecological Society of America, Pittsburgh, PA.

Liebowitz, D.M., Cohen, M.J., Heffernan, J.B., Frazer, T.K. 2010. Exploring Alternative Controls of Algal Proliferation in Florida's Spring Systems. UF Water Institute Symposium. Feb 23-24, 2010. Gainesville, FL.

Ogden, L., J. Heffernan, V. Smith, and H. Gladwin. "The Politics of Emplacement: A Case Study of Hurricane Andrew," 108th Annual Meeting, American Anthropological Association, Philadelphia, Dec. 4, 2009.

Heffernan, J.B., M.J. Cohen, and D. L. Watts. 2009. Variance and skewness as leading indicators of pattern loss in the Everglades ridge and slough mosaic. Ecological Society of America, Special session on leading indicators of regime shifts in ecosystems. August 2-7, Albuquerque, NM.

Liebowitz, D.M., M. Cohen, T. Frazer, J. Heffernan, L. Korhnak. 2009. Top-Down versus Bottom-Up Control of Algal Proliferation in Florida's Springs. American Water Resources Association Conference. Snowbird, Utah.

Cohen, M.J., J.B. Martin, K.A. McKee, J.B. Heffernan, and D.M. Liebowitz. 2009. Flow variability effects on water chemistry in Florida's Artesian Springs. North American Benthological Society, May 17-22, Grand Rapids, MI.

Heffernan, J.B., M.J. Cohen. 2009. Inferring autotrophic assimilation and denitrification from diel nitrogen variability. North American Benthological Society, May 17-22, Grand Rapids, MI.

Heffernan, J.B., M.J. Cohen, T.K. Frazer, R.G. Thomas, T.J. Rayfield, J. Gulley, J.B. Martin, J.J. Delfino, and W.D. Graham. 2009. Nitrogen dynamics in a spring-fed river. American Society of Limnology and Oceanography, Nice, France.

Heffernan, J.B., M.J. Cohen, and T.K. Frazer. 2008. Nitrogen dynamics in Florida springs. North American Benthological Society, Salt Lake City, UT.

Heffernan, J.B., M.J. Cohen, T.K. Frazer, J.M. Evans, and D.M. Liebowitz. 2008. Re-evaluating the role of nitrate enrichment in Florida Springs. University of Florida Water Institute Symposium, Gainesville, FL.

Heffernan, J.B. and S.G. Fisher, 2007. Wetlands as an alternate state in desert streams. American Society of Limnology and Oceanography, Santa Fe, NM.

#### **CONTRIBUTED POSTERS (LAST FIVE YEARS)**

Heffernan, J. B., M.J. Cohen, C. R. Foster, R.G. Thomas. 2010. Estimation of autotrophic assimilation from diel nitrate variation. American Society of Limnology and Oceanography/ North American Benthological Society. Santa Fe, NM.

Liebowitz, D.M., Cohen, M.J., Heffernan, J.B., Frazer, T.K. 2009. Exploring Alternative Controls of Algal Proliferation in Florida's Spring Systems. North American Benthological Society. May 16-23, 2009. Grand Rapids, MI.

Heffernan, J.B., M.J. Cohen, J. Martin, T. Rayfield, R. Thomas, J. Delfino, and W. Graham. 2008. Solute delivery and processing in a spring-fed river. Consortium of Universities for the Advancement of Hydrologic Science, Biennial Meeting, July 14-16<sup>th</sup>, Boulder, CO.

Watts, D.L., M.J. Cohen, J.B. Heffernan, T.Z. Osborne, and M.W. Clark. 2008. Soil elevation as an indicator of Everglades ridge and slough alternative stable states. University of Florida Water Institute Symposium, Gainesville, FL.

Liebowitz, D.M., M.J. Cohen, J.B. Heffernan, and T.K. Frazer. 2008. Exploring Alternative Controls of Algal Proliferation in Florida's Springs. Southeastern Environmental Flows Conference, October 27-29<sup>th</sup>, Athens, GA.