

# Stuart R. Borrett

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## RESEARCH INTERESTS

- Systems ecology
- Ecological modeling, simulation, & analysis
- Network science
- Coastal and marine science
- Indirect effects
- Coupled human-natural systems
- Environmental impact assessment

## EDUCATION

2005 **Doctor of Philosophy**, University of Georgia, Athens, GA

Dissertation: *Ecosystem organization and transformation: The role of network architecture in the development of indirect effects*. Advisor: Dr. Bernard C. Patten

1997 **Bachelor of Arts**, Austin College, Sherman, TX

Biology Department, Center for Environmental Studies

## EXPERIENCE: ACADEMIC AND INDUSTRY

**Associate Professor (Quantitative Ecologist)** July 2013-present. Department of Biology and Marine Biology, University of North Carolina Wilmington.

**Visiting Research Fellow**. 2013-present. Duke Network Analysis Center, Social Science Research Institute, Duke University, Durham, NC.

**Honors College Faculty Fellow**. Jan. 2016-May 2016; May 2015 - Dec. 2015, University of North Carolina Wilmington. Developed and facilitated workshops to encourage honor student project success.

**Leadership Development Fellow**. 2015-2016. University of North Carolina Wilmington. NextUp program offered by the UNCW Center for Faculty Leadership.

**Assistant Professor (Quantitative Ecologist)**. 2007–2013. Department of Biology and Marine Biology, University of North Carolina Wilmington. Full time tenure-track position.

**Adjunct Assistant Professor**. 2008-2012. Biology Department, Western Kentucky University. Research mentor for graduate and undergraduate students in collaboration with Dr. Albert Meier.

**Postdoctoral Research Scientist**. 2005-2007. Computational Learning Laboratory, Center for the Study of Language and Information, Stanford University, Stanford, CA. *Computational Induction of Scientific Process Models*. Advisors: P. Langley and K.R. Arrigo.

**Research Assistant**. 2003–2005. Skidaway Institute of Oceanography. *Bio-feed back basis of self-organization in planktonic ecosystems using *Phaeocystis* as a model complex adaptive system*. PIs: P.G. Verity, M.E. Frischer, M.E. Hay, B.C. Patten. Skidaway, GA.

**Research Assistant**. 2002. Institute of Ecology, University of Georgia. *Effects of water withdrawal on inter-annual variability of stream low-flow characteristics*. PI: M. Freeman. Athens, GA.

**Research Assistant**. 1999–2002. Institute of Ecology, University of Georgia. *Community values and the long-term ecological integrity of rapidly urbanizing watersheds*. PIs: M.B. Beck, B.G. Norton, B.C. Patten, K.G. Porter, T.C. Rasmussen, A. Steinmann. Athens, GA.

**Assistant Staff Scientist.** 1997–1998. ENTRIX, Inc. Houston, TX. Environmental impact assessment and environmental management planning, primarily for oil and gas exploration and development in the US Gulf Coast and Latin America (Bolivia, Ecuador, Venezuela).

**Research Assistant.** 1995–1997. Austin College. *Dual interpretation of low intensity light by Japanese Quail* and *The effect of continuous release melatonin on reproduction in Japanese Quail*. PI: W. Meyer. Sherman, TX.

## HONORS & AWARDS

- 2009–present Recognized by one or more graduating senior at UNCW as a person whose impact on them was significant. 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016
- 2015 College of Arts and Science Research Reassignment (competitive ~1.5%), UNCW (1 semester without teaching to focus on research, Spring 2016)
- 2011 Dept. Research Reassignment (competitive), Dept. of Biology and Marine Biology, UNCW (1 semester without teaching to focus on research, completed Spring 2013)
- 2009 Chancellor’s *Discere Aude* Award for outstanding mentorship, UNCW.
- 1997 Austin College, *cum laude*
- 1997 βββ, Biology Honor Society
- 1997 Austin College, M.D. “Bud” Bryant Fellowship, Outstanding Biology Student
- 1993–1997 Austin College, Trustees Scholarship
- 1997 Austin College, Leadership Honor Society
- 1989 Eagle Scout, Troop 2, El Paso, TX

## RESEARCH

### **Publications**

\* postdoc, \*\* graduate student, \*\*\* Undergraduate student

Link to [my profile](#) on Google Scholar

### **Peer Reviewed**

#### **In Press**

38. Gomez, E. Borrett, S.R., LaPeyre, M.K., Peterson, B.J. *Estimating the impact of oyster restoration scenarios on transient fish production*. **Restoration Ecology**.

#### **In Print (#14+ since arriving at UNCW)**

37. Zhao, L., Zhang, H., O’Gorman, E.J., Wang, T., Ma, A., Moore, J.C., Borrett, S.R., Woodward, G. 2016. *The roles of weighting and indirect effects in identifying keystone species*. **Ecology Letters** 19(9): 1032–1040 [10.1111/ele.12638](https://doi.org/10.1111/ele.12638)
36. Lau, M.K., Keith, A., Borrett, S.R., Schuster, S., Whitham, T. 2016. *Genotypic variation in foundation species generates network structure that may drive community dynamics and evolution*. **Ecology** 97: 733–742. [dx.doi.org/10.1890/15-0600.1](https://doi.org/10.1890/15-0600.1)
35. Borrett, S.R., Hines \*\*, D.E., Carter \*\*\*, M. 2016. *Six general ecosystem properties are more intense in biogeochemical cycling networks than food webs*. **J. Complex Networks** 4:575-603 [doi: 10.1093/comnet/cnw001](https://doi.org/10.1093/comnet/cnw001).
34. Hines \*\*, D.E., Singh, P., Borrett, S.R. 2016. *Evaluating control of nutrient flow in an estuarine nitrogen cycle through comparative network analysis*. **Ecological Engineering** 89: 70–79. DOI: [10.1016/j.ecoleng.2016.01.009](https://doi.org/10.1016/j.ecoleng.2016.01.009).
33. Abbott, K.C., J. Karst, L. Biederman, S.R. Borrett, A. Hastings, J.D. Bever, V. Walsh, L. Miller. 2015. *Spatial heterogeneity in soil microbes alters establishment success of an introduced plant*.

- PLoS ONE** 10(5): [e0125788](https://doi.org/10.1371/journal.pone.0125788). doi:10.1371/journal.pone.0125788.
32. Hines, D.E. \*\*, J.A. Lisa \*\*, B. Song, C.R. Tobias, S.R. Borrett. 2015. *Estimating the effects of seawater intrusion on an estuarine nitrogen cycle by comparative network analysis*. **Marine Ecology Progress Series** 524: 137–154 Preprint: [arXiv:1311.1171](https://arxiv.org/abs/1311.1171) [q-bio.QM] doi: 10.3354/meps11187
  31. Borrett, S.R., M.K. Lau \*\*. 2014. *enaR: An R package for Ecosystem Network Analysis*. **Methods in Ecology and Evolution** 5: 1206-1213. DOI: 10.1111/2041-210X.12282; Media Attention: UNCW, Harvard Forest
  30. Borrett, S.R., J. Moody, J. A. Edelmann\*. 2014. *The rise of network ecology: Maps of the topic diversity and scientific collaboration*. **Ecological Modelling** 293: 111-127 doi: [10.1016/j.ecolmodel.2014.02.019](https://doi.org/10.1016/j.ecolmodel.2014.02.019) Preprint: [arXiv:1311.1785](https://arxiv.org/abs/1311.1785) [q-bio.QM]
  29. Hines, D.E. \*\*, S.R. Borrett. 2014. *Comparison of network, neighborhood, and node levels of analysis in two models of nitrogen cycling in the Cape Fear River Estuary*. **Ecological Modelling**. 293: 210-220. doi: [10.1016/j.ecolmodel.2013.11.013](https://doi.org/10.1016/j.ecolmodel.2013.11.013)
  28. Whipple, S.J., B.C. Patten, S.R. Borrett. 2014. *Indirect effects and distributed control in ecosystems. Comparative network environ analysis of a seven-compartment model of nitrogen storage in the Neuse River Estuary, USA: Time Series Analysis*. **Ecological Modelling** 293:161-186. doi: [10.1016/j.ecolmodel.2014.08.025](https://doi.org/10.1016/j.ecolmodel.2014.08.025).
  27. Brasso \*\*, R., B. Drummond \*\*, S.R. Borrett, A. Chiaradia, M. Polito, A. Raya-Rey. 2013. *Unique pattern of molt leads to low intra-individual variation in feather mercury concentrations in penguins*. **Environmental Toxicology & Chemistry**. 32: 2331–2334. doi:10.1002/etc.2303
  26. Borrett, S.R. 2013. *Throughflow centrality is a global indicator of the functional importance of species in ecosystems*. **Ecological Indicators** 32:182–196. doi:10.1016/j.ecolind.2013.03.014 Preprint: [arXiv:1209.0725](https://arxiv.org/abs/1209.0725) [q-bio.QM] .
  25. Hines \*\*, D.E., J.A. Lisa \*\*, B. Song, C.R. Tobias, S.R. Borrett. 2012. *A network model shows the importance of coupled processes in the microbial N cycle in the Cape Fear River Estuary*. **Estuarine, Coastal and Shelf Science**. 20: 45–75. doi:10.1016/j.ecss.2012.04.018
  24. Fann \*\*, S.L. and S.R. Borrett. 2012. *Environ centrality reveals the tendency of indirect effects to homogenize the functional importance of species in ecosystems*. **Journal of Theoretical Biology** 294: 74–86. doi:10.1016/j.jtbi.2011.10.030 arXiv:1110.5385v1 [q-bio.PE]
  23. Borrett, S.R, M.A. Freeze, and A.K. Salas \*\*. 2011. *Equivalence of the ecological network analysis realized input and output oriented indirect effects metric*. **Ecological Modelling** 222:2142–2148. doi: [10.1016/j.ecolmodel.2011.04.003](https://doi.org/10.1016/j.ecolmodel.2011.04.003)
  22. Borrett, S.R. and M.A. Freeze. 2011. *Reconnecting environs to their environment*. **Ecological Modelling** 222: 2293–2403. doi: [10.1016/j.ecolmodel.2010.10.015](https://doi.org/10.1016/j.ecolmodel.2010.10.015)
  21. Salas \*\*, A.K. and S.R. Borrett. 2011. *Evidence for dominance of indirect effects in 50 trophic ecosystem networks*. **Ecological Modelling** 222: 1192-1204. arXiv:1009.1841v1 [q-bio.PE]; doi: [10.1016/j.ecolmodel.2010.12.002](https://doi.org/10.1016/j.ecolmodel.2010.12.002)
  20. Borrett, S.R., S.J. Whipple, & B.C. Patten. 2010. *Rapid development of indirect effects in ecosystem networks*. **Oikos** 119: 1136–1148. doi: [10.1111/j.1600-0706.2009.18104.x](https://doi.org/10.1111/j.1600-0706.2009.18104.x)
  19. Borrett, S.R., A.K. Salas \*\*. 2010. *Evidence for resource homogenization in 50 trophic ecosystem network*. **Ecological Modelling** 221: 1710–1716. doi:10.1016/j.ecolmodel.2010.04.004.
  18. Kaufman \*\*, A.G. & S.R. Borrett. 2010. *Ecosystem network analysis indicators are generally robust to parameter uncertainty in a phosphorus model of Lake Sidney Lanier, USA*. **Ecological Modelling** 221: 1230-1238 doi:10.1016/j.ecolmodel.2009.12.018

17. Bata, S.A., S.R. Borrett, B.C. Patten, S.J. Whipple, J.R. Schramski, D.K. Gattie. 2007. *Equivalence of throughflow- and storage-based environs*. **Ecological Modelling**. 206: 400–406  
[doi:10.1016/j.ecolmodel.2007.04.005](https://doi.org/10.1016/j.ecolmodel.2007.04.005)
16. Bridewell, W., S.R. Borrett, & L. Todorovski. 2007. *Extracting constraints for process modeling*. Proceedings of the Fourth International **Conference on Knowledge Capture** (pp. 87-94). Whistler, BC.
15. Schramski, J.R., D.K. Gattie, B.C. Patten, S.R. Borrett, B.D. Fath, S.J. Whipple. 2007. *Indirect effects and distributed control in ecosystems: Distributed control in the environ networks of a seven-compartment model of nitrogen flow in the Neuse River Estuary, USA: Time series analysis*. **Ecological Modelling** 206: 18-30. [doi:10.1016/j.ecolmodel.2007.03.023](https://doi.org/10.1016/j.ecolmodel.2007.03.023)
14. Whipple, S.J., S.R. Borrett, B.C. Patten, D.K. Gattie, J.R. Schramski, S.A. Bata. 2007. *Indirect effects and distributed control in ecosystems: Comparative network environ analysis of a seven-compartment model of nitrogen flow in the Neuse River Estuary: Time series analysis*. **Ecological Modelling** 206: 1-17. [doi:10.1016/j.ecolmodel.2007.03.002](https://doi.org/10.1016/j.ecolmodel.2007.03.002)
13. Whipple, S.J., B.C. Patten, P.G. Verity, M.E. Frischer, J.D. Long, J.C. Nejstgaard, J.T. Anderson, A. Jacobsen, A. Larsen, J. Martinez-Martinez, and S.R. Borrett. 2007 *Gaining integrated understanding of *Phaeocystis spp.* through model-driven laboratory and mesocosm studies*. **Biogeochemistry** 83:293–309. [doi:10.1007/s10533-007-9089-z](https://doi.org/10.1007/s10533-007-9089-z)
12. Borrett, S.R., W. Bridewell, P. Langley, K.R. Arrigo. 2007. *A method for representing and developing process models*. **Ecological Complexity** 4: 1–12. [doi:10.1016/j.ecocom.2007.02.017](https://doi.org/10.1016/j.ecocom.2007.02.017)
11. Borrett, S.R., B.D. Fath, B.C. Patten. 2007. *Functional integration of ecological networks through pathway proliferation*. **Journal of Theoretical Biology** 245: 98–111. [doi:10.1016/j.jtbi.2006.09.024](https://doi.org/10.1016/j.jtbi.2006.09.024)
10. Borrett, S.R. and O.O. Osidele. 2007. *Environ indicator sensitivity to flux uncertainty in a phosphorus model of Lake Sidney Lanier, USA*. **Ecological Modelling** 200: 371–383.  
[doi:10.1016/j.ecolmodel.2006.08.011](https://doi.org/10.1016/j.ecolmodel.2006.08.011)
9. Bridewell, W., P. Langley, S. Racunas, and S.R. Borrett. 2006. *Learning process models with missing data*. Proceedings of the Seventeenth European **Conference on Machine Learning** (pp. 557-565). Berlin: Springer.
8. Nejstgaard, J.C., M.E. Frischer, P.G. Verity, J.T. Anderson, A. Jacobsen, M.J. Zirbel, A. Larson, J. Martínez-Martínez, A.F. Sazhin, T. Walters, D.A. Bronk, S.J. Whipple, S.R. Borrett, B.C. Patten, and J.D. Long. 2006. *Plankton development and trophic transfer in sea water enclosures with added nutrients and *Phaeocystis pouchetii**. **Marine Ecology Progress Series** 321: 99–121
7. Gattie, D.K., J.R. Schramski, S.R. Borrett, B.C. Patten, S.A. Bata, S.J. Whipple. 2006. *Indirect effects and distributed control in ecosystems: Network environ analysis of a seven-compartment model of nitrogen flow in the Neuse River Estuary, USA—Steady-state analysis*. **Ecological Modelling** 194: 162–177. [doi:10.1016/j.ecolmodel.2005.10.017](https://doi.org/10.1016/j.ecolmodel.2005.10.017)
6. Borrett, S.R., S.J. Whipple, B.C. Patten, R.R. Christian. 2006. *Indirect effects and distributed control in ecosystems: Temporal variation of indirect effects in a seven-compartment model of nitrogen flow in the Neuse River Estuary, USA—Time series analysis*. **Ecological Modelling** 194: 178–188.  
[doi:10.1016/j.ecolmodel.2005.10.011](https://doi.org/10.1016/j.ecolmodel.2005.10.011)
5. Schramski, J.R., D.K. Gattie, B.C. Patten, S.R. Borrett, B.D. Fath, C.R. Thomas, S.J. Whipple, 2006. *Indirect effects and distributed control in ecosystems: Distributed control in the environ networks of a seven-compartment model of nitrogen flow in the Neuse River Estuary, USA—Steady-state analysis*. **Ecological Modelling** 194: 189–201. [doi:10.1016/j.ecolmodel.2005.10.012](https://doi.org/10.1016/j.ecolmodel.2005.10.012)

4. Fath, B.D. and S.R. Borrett. 2006. *A MATLAB® function for network environ analysis. Environmental Modelling & Software* 21: 375–405. doi:10.1016/j.envsoft.2004.11.007
3. Cowie, G.M. and S.R. Borrett. 2005. *Institutional perspectives on participation and information in water management. Environmental Modeling & Software* 20: 469–483. doi:10.1016/j.envsoft.2004.02.006
2. Borrett, S.R. and B.C. Patten. 2003. *Structure of pathways in ecological networks: Relationship between length and number. Ecological Modelling* 170: 173–184. doi:10.1016/S0304-3800(03)00224-2
1. Beck, M.B., B.D. Fath, A. K. Parker, O.O. Osidele, G.M. Cowie, T.C. Rasmussen, B.C. Patten, B.G. Norton, A. Steinmann, S.R. Borrett, D. Cox, M.C. Mayhew, X.-Q. Zeng, and W. Zeng. 2002. *Developing a concept of adaptive community learning: Case study of a rapidly urbanizing watershed. Integrated Assessment* 3:299–307.

### **Book Chapters, Reports, and Other Publications**

5. Borrett, S.R., Fath, B.D., Whipple, S.J. 2014. *Introduction to the special issue Systems Ecology: A Network Perspective and Retrospective. Ecological Modelling* 293:1–3. doi: 10.1016/j.ecolmodel.2014.10.005.
4. Borrett, S.R., R.R. Christian, R., R.E. Ulanowicz. 2012. *Network Ecology (Revised)*. In: A.H. El-Shaarawi and W.H. Piegorsch (Eds.). *Encyclopedia of Environmetrics* (2<sup>nd</sup> edition). John Wiley and Sons: Chichester, pp. 1767-1772. doi:10.1002/9780470057339.van011.pub2
3. Bridewell, W., S.R. Borrett, P. Langley. 2009. *Innovative construction of explanatory scientific models*. In: A.B. Markman and K.L. Wood (Eds.) *Tools for Innovation*. Oxford University Press, NY.
2. Patten, B.C., B.D. Fath, J.S. Choi, S. Bastianoni, S.R. Borrett, S. Brandt-Williams, M. Debeljak, J. Fonseca, W.E. Grant, D. Karnawati, J.C. Marques, A. Moser, F. Müller, C. Pahl-Wostl, R. Seppelt, W.H. Seibold, Y.M. Svirezhev. 2002. *Complex adaptive hierarchical systems*. In: R. Costanza and S.E. Jørgensen (Eds.). *Understanding and Solving Environmental Problems in the 21st Century: Toward a New, Integrated Hard Problem Science*. Elsevier Science, Ltd, Oxford, pp. 41–87.
1. Cowie, G.M., S.R. Borrett, and others. 2001. *Foresight for Lanier: A Workshop. Summary of Results*. University of Georgia. January 25, 2001. Athens, GA.

### **Software**

2. Lau, M. Borrett, S.R., and Hines, D.E. 2012. *enaR: Tools for Ecological Network Analysis*. R package version 1.01. <http://CRAN.R-project.org/package=enaR>. Version 2.9 Released 2015. Development hosted on GitHub at <https://github.com/SEELab/enaR>.
1. Fath, B.D. and Borrett, S.R. 2004. *NEA.m*. Matlab Central File Exchange. <http://www.mathworks.com/matlabcentral/fileexchange/5261-nea-m>.

### **Selected Recent Presentations & Posters**

\* postdoc, \*\* graduate student, \*\*\* Undergraduate student

102. Borrett, S.R. 2016. Network Insights into Ecosystem Function: Food Web Organization and Estuarine Nitrogen Cycling. Institute of Biology, Free University of Berlin, Berlin, Germany. Invited Presentation.
101. Borrett, S.R. 2016. Network Insights into Ecosystem Function: Food Web Organization and Estuarine Nitrogen Cycling. Leibniz- Institute of Freshwater Ecology and Inland Fisheries (IGB). Berlin & Neuglobsow, Germany. Invited Presentation.
100. Borrett, S.R. 2016. Applying Ecological Network Analysis to Understand Changing Coastal Ecosystems. ECSA 56 2016, Bremen, Germany. Invited Keynote Presentation.

99. Borrett, S.R. 2016. Review and synthesis of five flow decompositions techniques in Ecosystem Network Analysis. The International Society for Ecological Modelling Global Conference 2016, Towson, MD.
98. Borrett, S.R., Fath, B.D., Kazanci, C. 2016. Proposed changes in the mathematical notation used for Ecosystem Network Analysis for clearer communication. The International Society for Ecological Modelling Global Conference 2016, Towson, MD. (poster)
97. Hines<sup>\*\*</sup>, D.E., Borrett, S.R. 2016. Sensitivity and uncertainty analysis for network flow models: a comparative ecosystem application. The International Society for Ecological Modelling Global Conference 2016, Towson, MD. (poster)
96. Hines<sup>\*\*</sup>, D.E., Borrett, S.R. 2015. How what you don't know affects what you do know: Exploring an application of a linear inverse modeling uncertainty analysis on network models. 100<sup>th</sup> Annual Meeting, Ecological Society of America, Baltimore, MD.
95. Borrett, S.R., Hines<sup>\*\*</sup>, D.E. 2015. Six general ecosystem properties tend to be more intense in biogeochemical cycling network than in trophic webs. 100<sup>th</sup> Annual Meeting, Ecological Society of America, Baltimore, MD.
94. Carrera<sup>\*\*\*</sup>, L. Hines<sup>\*\*</sup>, D.E., Borrett, S.R. 2015. Preliminary Food web of the Cape Fear River Estuary. Undergraduate Research Showcase, Center for Undergraduate Research and Fellowships. April.
93. Sosnowski<sup>\*\*</sup>, A. C., Ghoneim, E., Burke, J. J., Borrett, S.R., Hines, E., Maddalena, D. 2015. Spatio-temporal analysis of flooding extent employing a MODIS vegetation proxy in the Sudd wetland of South Sudan. Association of American Geographers Annual Meeting, Chicago, IL.
92. Gomez<sup>\*\*</sup>, E., Peterson, B., Borrett, S.R., La Peyre, M. 2015. A dynamic ecological and economic model linking oyster reef bioenergetics to final ecosystem services. 44<sup>th</sup> Benthic Ecology Meeting, Quebec City, Quebec, Canada.
91. Borrett, S.R. 2015. Tracing the connections in ecosystems with network analysis: theory and application. Invited presentation. Department of Biology and Physics, Kennesaw State University, GA. (Jan. 28)
90. Gomez<sup>\*\*</sup>, E., Peterson, B., Borrett, S.R., Dvarskas, A., Posey, M., Alphin, T., Wilgins, E. 2014. A dynamic ecological and economic model linking oyster reef bioenergetics to final ecosystem services. A Community on Ecosystem Services, Dec. 8-12. Washington, DC.
89. Sterling<sup>\*\*\*</sup>, A., Echevarria<sup>\*\*</sup>, M., Borrett, S.R., Taylor, A. 2014. *Swimming under the influence: Effect of algal toxins on the behavior of the marine ciliate *Favella* sp.* 36th Southeastern Phycological Colloquy, Wilmington, NC.
88. Borrett, S. R. Hines<sup>\*\*</sup>, D.E., Singh<sup>\*\*</sup>, P., Lau<sup>\*</sup>, M.K. 2014. *enaR: a tool for ecosystem network analysis*. Statistical and Applied Mathematical Sciences Institute workshop on Mathematical and Statistical Ecology. Research Triangle, NC. (Poster)
87. Borrett, S. R., Lau<sup>\*\*</sup>, M.K., Hines<sup>\*\*</sup>, D.E. 2014. *enaR: An R package that facilitates comparison of ecosystem structure and function with network analysis*. 43<sup>rd</sup> Benthic Ecology Meeting, Jacksonville, FL.
86. Hines<sup>\*\*</sup>, D.E., Lisa<sup>\*\*</sup>, J.A., Song, B., Tobias, C.R., Borrett. 2014. *A network model comparison predicts how seawater intrusion will alter coupling among estuarine nitrogen cycling processes*. 43<sup>rd</sup> Benthic Ecology Meeting, Jacksonville, FL.

85. Oxe<sup>\*\*</sup>, E.A., Borrett, S.R., Hines<sup>\*\*</sup>, D.E., Lisa<sup>\*\*</sup>, J.A., Song, B., Tobias, C.R. 2014. *Comparison of process coupling in the nitrogen cycle between the New River and Cape Fear River estuaries*. 43<sup>rd</sup> Benthic Ecology Meeting, Jacksonville, FL.
84. Borrett, S. R., 2014. *Connecting the dots: Developments in ecosystem network theory and the impact of climate change on estuarine N cycling*. Invited presentation. Department of Zoology, University of Calcutta, Calcutta, India. (Mar. 1)
83. Borrett, S. R., Carter<sup>\*\*\*</sup>, M., Hines, D.E<sup>\*\*</sup>. 2014. *Environ properties tend to be more intense in biogeochemical cycling models than in trophic networks*. Invited presentation. International Conference on Environmental Biology and Ecological Modelling, Visva-Bharati University, Santiniketan, India (Feb. 26).

## FUNDING

### In Review

US Army Research Office, Biomathematics Program. Hypergraph topological predictors of the dynamics of complex ecological systems. PIs Golubski, A, Westland, E., Borrett, S.R. **\$352,801**. UNCW Subaward: \$104,759. (Preproposal sub. Sept 2015; Full proposal sub. Sept. 2016)

### Funded

NSF: Robert Noyce Teacher Scholarship Program--Capacity Building. *University of North Carolina Wilmington (UNCW) project INCISE (Integrated Certificate in STEM Education)*. Moallem, M. (PI) with others. Borrett as supporting collaborator. **\$299,929**. 1/1/2015-1/1/2017.

UNCW Office for International Programs travel grant (**\$1000**) to attend the 2016 ECSA 56 Conference. Bremen, India.

UNCW Office for International Programs travel grant (**\$1000**) to attend the 2014 International Conference on Environmental Biology and Ecological Modelling, Visva-Bharati University, Santiniketan, India.

UNCW Cahill Award: *Creating interdisciplinary capacity and collaborations for ecological network analysis through an immersion at the Duke Network Analysis Center*. Borrett, S.R. **\$2,331** for 1/2013-12/2013.

Center for Teaching Excellence Summer Pedagogy Development Initiatives. *Development of a Systems Thinking Learning Module for UNCW*. UNCW. **\$3500**. Borrett, S.R (PI). 2013.

Friends of UNCW. *Funds to purchase the ELMO TT-12 Interactive Document Camera*. PIs Pabst, A. Borrett, S.R. **\$885**. 2013.

Duke-UNC Oceanography Consortium. *Proposal for 1-week of ship time in aid of research in Onslow Bay, NC*. Finelli, C. Freshwater, W., Long, Z., Borrett, S.R. Estimated **~\$50,000** value. 2013.

UNCW Quality Enhancement Plan Pilot Grant. *UNCW: Enhancing applied learning through explorations of the natural world*, PIs: Frampton, A., Emslie, S, Finelli, C, Van Tuinen, M., Long, Z, Pyott, S., Pabst, A. and Borrett, S.R. **\$13,390**. 2011.

UNCW Quality Enhancement Plan Pilot Grant. *Experience Research: Enhancing the CSURF program to promote engagement in research as applied learning*. PIs: Bruce, K. E., Atwill, W. D., Kelley, P.H., Borrett, S.R. **\$31,500**. 2011.

NSF: Collaborative Research: *Impact of sea level rise on sedimentary nitrogen removal processes in tidal freshwater ecosystem*. B.K. Song (Lead PI), S.R. Borrett (Co-PI Responsible for Modelling). **\$500,411** for 2010-2013.

NECSent Catalysis Meeting. *Ecological Models and Social Networks: How evolutionary forces shape networks and communities*. Duke Network Analysis Center (Moody, J lead PI with 11 collaborators including S.R. Borrett). Workshop Funded for 2012-2013.

UNCW Office for International Programs travel grant (**\$1500**) to attend the 2011 International Society for Ecological Modelling meeting in Beijing, China. I escorted one graduate and one undergraduate student to the meeting.

UNCW College of Arts and Sciences, *Summer Curriculum Development Initiative*. Proposal to revise the Ecology Laboratory (BIOL366) to (1) Better align the course activities and assessment with the departmental and university learning outcomes; (2) Formalize the laboratory report format so that it is consistent across labs in BIOL 366 and makes use of a biological writing text recently adopted by the department; and (3) Integrate the use of spreadsheets (e.g. Microsoft Excel) to teach the students to organize, manage, and analyze biological data, **\$3,500**.

UNCW Biology and Marine Biology Equipment Committee. We requested funds for a departmental video camera to record departmental seminars so that students can practice critiquing science presentations and witness and critique their own presentations. This purchase was targeted to help students in senior seminars, BIO495, **\$600**. 2008

UNCW Special Tenure-Track Faculty Travel Fund (**\$1000**) and Office for International Programs (**\$600**) for travel to 2009 International Society for Ecological Modelling Meeting, UNCW. I Escorted one graduate and one undergraduate student to the meeting.

University of Georgia. University-wide Dissertation Completion Award, Ten months of funding (**\$15,000**) to complete dissertation. University of Georgia, Athens, GA.

University of Georgia OVPR International travel funds. (a) 2004. Fourth European Conference for Ecological Modelling. Bled, Slovenia. (b) 2001. International Society for Ecological Modelling, European Chapter meeting. Dubrovnik, Croatia. (c) 2000. Ecosummit2000. Halifax, Canada.

## TEACHING

### ***Classroom, Laboratory, & Field***

**Systems Ecology.** 1-week intensive graduate course. Beijing Normal University, Summer 2013. Invited by Professor Bin Chen. Co-taught with J.R. Schramski.

**Systems Ecology and Ecosystem Network Analysis.** Short course for graduate and undergraduate students. UNCW: SU2011

**Fundamentals of Ecological Modeling.** Graduate lecture and laboratory. UNCW: 2007, 2008, 2010, 2011, 2012, 2013, 2014, 2015, 2016. Co-taught with K.R. Arrigo at Stanford University in 2006.

**Ecological Thought: Past to Present.** Graduate seminar course. UNCW: F 2008, F 2010, F 2011. Co-developed and co-taught the course at the University of Georgia with B.C. Patten and S.J. Whipple where it is now a required course for UGA ecology graduate students.

**Readings in Ecology.** Graduate seminar course. UNCW Sp 2017. Co-taught with Dr. Zach Long.

**Introduction to Ecology.** Undergraduate course. Large lecture format with 36-190 students. UNCW: SP 2008, SP 2009, SP 2010, SP & SU 2014, SP & SU 2015, SU 2016, Sp 2017

**Ecology Laboratory.** Undergraduate course. Faculty coordinator responsible for curriculum, lab preparation, and managing and preparing 3-5 TAs. I also occasionally teach sections. UNCW: SP



2008, F 2009, SP & SU 2010, SP & SU 2011, SP & SU 2012, SU 2013, SP & SU 2014, SP & SU 2015

**Survey of Biological Research.** Undergraduate Honors Seminar. UNCW: F 2013

**Living in a Connected World: The Power, Beauty, Science, and Mathematics of Networks.** Undergraduate Honors Seminar. UNCW: F 2015.

**Senior Seminar: Bringing the Biosphere Home.** Undergraduate seminar. UNCW: 2008

**Ecosystem Complexity in the Marine Environment – Seeking an Answer to the Question: What is Biocomplexity?** Skidaway Institute of Oceanography: 2003. Three week short course for undergraduate and graduate students. Co-instructors: P.G. Verity, M.E. Frischer, B.C. Patten, S.J. Whipple. Skidaway, GA.

### **Workshops & Tutorials**

**Ecological Network Analysis.** 2016. ECSA 56 Meeting. Bremen, Germany. 2-hr workshop on constructing and analyzing network models for ecology (~60 participants).

**Network Analysis.** 2016. International Society for Ecological Modelling. Towson, MD. Two day workshop on constructing and analyzing network models for ecology (24 participants enrolled).

**Ecological Network Analysis.** 2015. Ecological Society of America, Baltimore, MD. With M.K. Lau and C. Kazanci. ¾ day introduction to network ecology concepts, use, and tools (EcoNet and enaR).

**Ecological Network Analysis.** 2011. Northern Arizona University. 1-Day workshop.

**Network Environ Analysis: Windows into Eco-System Environments** 2007. Western Kentucky University. 1-Day workshop.

### **Mentoring**

#### **Primary Mentor**

##### **Faculty**

1. Todd LaMaskin. Assistant Professor, Department of Geology and Geography, University of North Carolina Wilmington. (2012–2016)

##### **Ph.D.**

1. David E. Hines. Ph.D. Marine Biology (2011 – 2015). Next Step: EPA Postdoctoral Fellow.

##### **M.S.**

4. Evan Anway. M.S. Biology (2016-present). *TBD*
4. Emily Oxe. M.S. Biology 2014. *A Comparison of Recycling and Process Coupling in the Nitrogen Cycle of Two North Carolina Estuaries*. Next Step: Lab Coordinator for Community College.
3. John Mejaski. M.S. Marine Biology. 2013. *Ecological Network Analysis, A tool for Urban Water Metabolism: Case Study of Wilmington, North Carolina*. Next Step: unknown.
2. Youri N. Nelson. M.S. Applied Mathematics 2011. (Co-Advisor with Dr. Feng) *Hierarchical inductive process modeling and analysis*. Next Step: Mormon Mission.
1. Andria K. Salas. M.S. Marine Science. 2010. *Indirect effects in trophic and evolutionary networks*. Next Step: Ph.D. program in Biology at the University of Texas at Austin.

##### **Graduate Directed Independent Study Students**

Lisa Hollensead, 2014

Lindsey Deignan, 2013

**Graduate Research Internships or Short Term Visitors to Laboratory**

Oksana Buzhdygan, Winter 2016 (Institute of Biology, Freie Universität, Berlin, Germany)

Elizabeth Gomez, Summer 2014 (Stony Brook University)

Pawandeep Singh, Summer 2014 (Visva-Baharati University, India)

Matt Lau, Summer 2011 (Northern Arizona University)

**Undergraduate Honors Theses**

2. Sarah L. Fann. Honors Thesis (B.S. Marine Biology and Statistics, 2010). *Environ centrality quantifies the relative roles of species in generating ecosystem activity*. Next Step: Fullbright Scholarship in Australia.

1. Anthony G. Kaufman. Honors Thesis (B.S. Marine Biology, 2009) *Ecological network analysis indicators are robust to flux uncertainty in Lake Sidney Lanier, USA*. Next Step: Completed MS degree at the University of Maryland.

**Undergraduate Directed Independent Study Students**

Jaimee Pyron, F 2016

Courtney Hand, 2014

Rachel Feller, 2008

Sarah Johnson, 2016

Monty Carter, 2009-2011

Nathan Marceil, 2008

Matthew Reeps, 2015-2016

Peter Thompson, 2009-2011

Youri Nelson, 2010

Tanner Schwartz, 2015-2016

Jasmyn Ferbish, 2011

Louis Shakleton, 2012

Lilianna Carrera, 2014-2015

Jeremy Miller, 2011

Julienne Beblo, 2011-2012

Nathalie Reilly, 2014

John Webber, 2011

Kasey Palmquest, 2013

Drew Braden, 2010

Amanda Laraia, 2011

**Undergraduate Internship Supervised**

Eleanor Fallaize, 2014

Abigail Milkus, 2014

Lauren Smith, 2014

Stephanie Gray, 2014

Alexa Chrisos, 2014

**Advisory Committee Member****Ph.D.**

Astrid Layton, Engineering, GA Tech, 2014

Lindsey Deignan, UNCW  
Rebecka Brasso, UNCW, 2014

Nikolai Klibansky, UNCW, 2013

Lisa Hollensead

Leigh Ann Harden, UNCW, 2013

Mike Polito, UNCW, 2012

Matt Lau, NAU, 2014

Jess Lisa, VIMS, 2015

Christi Visaggi, UNCW, 2012

**M.S.**

Amanda Cole

Elizabeth Gomez (Stony Brook University), 2015

Lou Muzuczek

Sean Hardison

Tiffany Lewis

Lisa OGawa

Molly Johnson (Kennesaw State University)

Andrew Long

Brad Parnell

Amelia Sosnowski, 2015

Wai Long

Jessica Mallindine

Amber Morris

Jennifer Idol

Neil Creales

**Honors Advisory Committees**

David Billips, Honors (Biology, 2016). Primary mentor: Dr. Long

James Andrew, Honors (Marine Biology, 2015). Primary mentor: Dr. White

Peter Lawson, Honors (Biology, 2013). Primary mentor: Dr. Stapleton

Corey Rand, Honors (Mathematics, 2013). Primary mentor: Dr. Freeze

Drew Howard, Honors (Marine Biology, 2012). *Effects of beach re-nourishment on ocean surf-zone turbidity: Assessment using a predictive model*. Primary mentor: Dr. Lankford

Ahmed Metwally, Honors (Marine Biology, 2011). *Do algal toxins affect the swimming behavior of microzooplankton?* Primary mentor: Dr. Taylor

Anna Robuck, Honors (Marine Biology, 2010). *Testing natural products from the sponge Aplysilla longispina and tunicate Eudistoma hepaticum for the development of nontoxic antifouling paints*. Primary mentor: Dr. Pawlik

## SERVICE & LEADERSHIP

### Professional

#### Editor

2015. Guest Editor for article, PLoS Computational Biology.

2013-2014. Guest Editor for Special Issue, Ecological Modelling, Volume 293. 17 papers.

#### Reviewer

Manuscripts: *Ecological Modelling; Environmental Modelling & Software; Oikos; Ecology Monographs; Ecology Letters; Ecological Indicators; Acta Ecologica Sinica; Environmental Management; Landscape and Urban Planning; Environmetrics; Frontiers of Earth Science; Resources, Conservation & Recycling.*

Proposals: *NSF-GEO/OCE (F & Sp 2015, F 2016), MD SeaGrant, NSF-BIO (F 2016, Panel 2016).*

#### Organizing Committees

2016. *Scientific Advisory Board, International Society for Ecological Modelling Global Conference 2016*. Towson University, Baltimore, MD.

2016. *Network Modeling Symposium*. International Society for Ecological Modelling Global Conference 2016, Towson University, Baltimore, MD.

2013. *Systems Ecology: A Network Perspective and Retrospective*. A workshop in honor of the 45<sup>th</sup> anniversary of Professor Bernard C. Patten at the University of Georgia (April 12-14, 2013). One of 3 co-organizers (Stuart J. Whipple, Brian D. Fath).

2008. *University of Georgia Ecological Network Analysis Conference (2008)*. Athens, GA. One of multiple co-organizers.

#### Judge

2014. *Best Student Presentation/Poster*. 43<sup>rd</sup> Benthic Ecology Meeting, Jacksonville, FL

2013. *Science Fair*, Wrightsville Elementary (Dec.).

2010. *Theory Section Award for best presentation*. 95<sup>th</sup> Annual Meeting, Ecological Society of America. Pittsburgh, PA.

2006. *Buell Student Award for best presentation*. 91<sup>st</sup> Annual Meeting, Ecological Society of America. Memphis, TN.

#### Consulting

2016-present. *Consultant*, College of Health and Human Services, Dean C. Hardy. Assessed the college leadership structure and made recommendations for improvements to enhance the college effectiveness and sustainability.

## **Community**

### Advisory Boards and Board of Directors

2010-2016. *Cape Fear Museum of Science and History*, New Hanover County, NC. Chair (2015-2016), Assistant Chair (2014-2015).

2013-2014. *Cape Fear Economic Development Council*, Wilmington, NC.

### Invited Lectures

2015. *Ecosystem applications of network models*. Osher Lifelong Learning Institute at UNCW. (Sept 24).

2015. *The rise, utility, and beauty of network ecology*. Osher Lifelong Learning Institute at UNCW. (Feb 5).

2013. *Ecological address and neighbors of the Lower Cape Fear Region*. Osher Lifelong Learning Institute at UNCW. (Sept. 30).

2012. *Ecological address and neighbors of the Lower Cape Fear Region*. Cape Fear River Watch, First Saturday public lecture series. (June 2).

### Committee Member

2011-2012. *STEM Regional Roundtable*. Committee of formal and informal educators, businesses, and NPOs and NGOs.

2009-2010. *Environmental Sustainability Committee*. Church of the Servant Episcopal Church, Wilmington, NC. This committee is planned and executed a community meeting to learn about environmental stewardship from a faith perspective held Feb. 2010. I participated in regular meetings and co-led the search for the keynote speaker. Wilmington, NC.

### Organizer/Leader

2009. Tour of the Wilmington Northside Waste Water Treatment Plant. (2009). Environmental Sustainability group from the Church of the Servant Episcopal Church. Wilmington, NC.

## **College and University**

### UNC Faculty Assembly

2014–present. Elected delegate from UNCW.

2015. Faculty Assembly Leadership Nomination Committee.

### UNCW Faculty Senate

2014–present. Faculty Welfare Committee

2013–present. University Curriculum Committee

2013–2015. Faculty Senator for Dept. Biology and Marine Biology

### UNCW Strategic Planning Committee (2015)

- Subcommittee for attracting and retaining students, staff, and faculty.

Information Technology Advisory Committee, College of Arts and Sciences, UNCW (2015-present)

Panel Discussant. *Out of Print: Film Screening & Discussion*. Writers Week 2013 (Nov. 8, 2013)

Tour of Outdoor Classrooms and Laboratories, Osher Life Long Learning Program (Sept. 2016). With 3 other faculty.

Organizing Committee. *Walking Tour of UNCW's Natural Areas*, an Osher Life Long Learning Institute event held for UNCW Chancellor Miller's Installation. One of 6 committee members and tour leaders.

Orientation Leader. (2010). Spoke with beginning freshman about college life.

University Institutional Effectiveness Committee (2009). Advisory Role. Advised with modeling the university planning process for SACHS review. Facilitated two participatory modeling meetings with university administrators.

### Administrative Search Committees

Director, Experiencing Transformative Education through Applied Learning (University's Quality Enhancement Plan). UNCW 2014. Successfully recruited J. Boersma.

Provost and Vice Chancellor for Academic Affairs, UNCW 2012. Successfully recruited Dr. D. Battles

### Staff Search Committees

*ITSD Search Committee for Academic Research Systems Analyst.* (2011). Reviewed 13 full applications, interviewed 3 candidates.

### UNCW Center for Teaching Excellence and Faculty Leadership

2010–2016. Advisory Board, *Center for Teaching Excellence*

2015. Panel Discussant. *Visualizing Data* (Nov. 17)

2013. Panel Discussant. *College: What It Was, Is, and Should Be* (Nov. 19)

2013. Co-Led (with Roger Shew and Amanda Willard) CTE Workshop. *A Tour of UNCW's Outdoor Classrooms.* (March 12)

2011. Panel Discussant. *Round-table discussion on Teaching Innovation.* (Oct. 6)

2011. Hosted and assisted Matt Lau for a campus wide *R Tutorial.*

### UNCW Honors College

2010. *Honor Scholars Program Cultural Dinner.* Hosted dinner and cultural experience for 7 UNCW freshman.

2009–2013. Advisory Board, *Center for the Support of Undergraduate Research and Fellowships.*

2015. Faculty Fellow. Developed program to increase Honor Student success and retention.

## Department

### *Department of Biology and Marine Biology, UNCW*

Ad-Hoc Broader Impacts Committee (2015–2016).

Liaison. Department Liaison to campus Information and Technology Services (2010–present).

Undergraduate Curriculum Committee. (2014–2015).

Chair. Ad-Hoc Laboratory Report Committee. (2013–2014).

Liaison. Department Liaison to Center for Teaching Excellence (2010–2013).

Long Range Planning Committee. (2013–2014)

Advancement and Student Relations Committee.

2012–2013. This committee evaluated the merits of starting a Departmental Facebook page and helped hire Jen Cole to initiate the page.

2016–2017. *Chair.*

Undergraduate Assessment Committee Member (2009–2013). *Coordinator* (Fall 2011– Spring 2013).

Organizing Committee. *Gulf of Mexico Symposium.* Public symposium was held at UNCW Spring 2012. Mike Tidwell was the keynote speaker. A discussion followed with an expert panel.

Chair's Advisory Committee. (2010-2012). Assisted the Department Chair as needed on departmental policies and procedures. Reviewed all faculty annual reports each year.

Ad hoc B.S. Marine Biology Curriculum Review Committee. (2009). This committee met ~5 times during Fall 2009. Proposed curriculum changes adopted by the Biology faculty Spring 2010.

### Faculty Search Committees

*Vertebrate Biologist* (2014-2015). UNCW Dept. of Biology and Marine Biology. Reviewed 75 applications. Successfully recruited Ray Danner.

*Plant Biologist* (2013-2014; 2 Faculty Positions). UNCW Dept. of Biology and Marine Biology. Reviewed ~200 applications. Successfully recruited D. Penneys.

*Coastal and Marine Biologist* (2012-2013; 4 Faculty Positions). UNCW Dept. of Biology and Marine Biology. Reviewed ~300 applications. Successfully recruited S. Brander, S. Lopez-Legentil, R. Condon, and S. Kamel.

*Coastal Plant Ecologist* (2008–2009). UNCW Dept. of Biology and Marine Biology. Reviewed ~60 applications and interviewed 4 candidates for the position. I hosted one candidate reception at my home. Successfully recruited Dr. Z. Long.

### ***Institute of Ecology, University of Georgia***

Chairperson. *Faculty Symposium Committee* (2003).

Graduate Student Representative. *Curriculum Committee* (2002-2004).

Graduate Student Representative. *Faculty* (2002-2003). Institute of Ecology.

Organizing Committee Member. *Graduate Student Symposium* (2000-2002), *Chairperson* 2002.

Graduate Student Representative. *Computer Oversight Committee* (1999-2001).

Faculty Search Committees

*Quantitative Ecologist* (2000-2001). Institute of Ecology, University of Georgia, Athens, GA. Successfully recruited P. Rohani.

### ***Society Memberships***

International Society for Ecological Modelling

Ecological Society of America