

## Nicholas S. Marzolf, Ph.D.

Postdoctoral Research Associate

Department of Biology

Duke University

[nicholas.marzolf@duke.edu](mailto:nicholas.marzolf@duke.edu)

[nmarzolf.weebly.com](http://nmarzolf.weebly.com) [ResearchGate](#) [@NickMarzolf](#) [Publons](#) [ORCID](#) [GitHub](#) [Google Scholar](#)

### Education

**Ph.D.**, Dept. of Forestry and Environmental Resources, North Carolina State University, 2021.

- Dissertation: *Drivers and consequences of CO<sub>2</sub> inputs to lowland Neotropical streams, Costa Rica.*
- Advisor: Dr. Marcelo Ardón

**M.S.**, Odum School of Ecology, University of Georgia, 2015.

- Thesis: *Environmental Limits on the Dispersal of *Pomacea maculata* in Lake Seminole.*
- Co-advisors: Dr. Alan Covich and Dr. Stephen Golladay

**B.S.**, Biology, College of Liberal Arts and Sciences, University of Florida, 2013.

- Study abroad: Universidad Autónoma de Yucatán, 2009

### Research Experience

**Postdoctoral Research Associate** (2022 – present)

Department of Biology, Duke University (PI: Dr. Emily Bernhardt)

- Model and create reproducible workflows to estimate productivity in rivers across the continental US using publicly available datasets
- Mentor and assist graduate student research projects
- Associated Projects: [StreamPULSE](#), [Macrosheds](#), MacroGas

**Postdoctoral Research Associate** (2021)

Dept. of Forestry and Environmental Resources, North Carolina St. University, Raleigh, NC. (PI: Dr. Marcelo Ardón)

- Compared spatial and temporal variability of water chemistry in Neotropical streams

**Graduate Student Fellow** (2017 – 2018) & **Graduate Research Assistant** (2020 – 2021)

Organization for Tropical Studies, San José, Costa Rica.

Dept. of Forestry and Environmental Resources, North Carolina St. University, Raleigh, NC

- Created [data visualization tool](#) for long-term water chemistry from Neotropical streams
- Measured carbon fluxes in headwater streams and evaluated fluxes as ecological disturbances
- Conducted *in situ* manipulative experiment to evaluate effects of disturbance in stream ecosystems

**Research Technician III** (2016 – 2017)

Joseph W. Jones Ecological Research Center, Newton, GA. (PI: Dr. Stephen Golladay)

- Conducted surveys of invasive and threatened fauna across aquatic ecosystems of SW Georgia
- Collected, processed, and analyzed water samples for analytical determination
- Perform manipulative experiments to determine interactions of aquatic fauna and flora.

**Graduate Research Assistant** (2013 – 2015)

University of Georgia, Athens, GA. (PIs: Dr. Stephen Golladay and Dr. Alan Covich)

- Conducted field surveys for native and invasive fauna and flora in Lake Seminole, Georgia
- Performed lab experiments to determine growth rates and temperature preferences of invasive *Pomacea maculata*

### Teaching Experience (\* denotes instructor of record)

- **\*Wetlands of Coastal North Carolina** (ENV 792), Duke University, Fall 2022
  - Graduate level field course to explore wetlands of North Carolina across a salinity gradient
- **\*Wetland Ecology and Management** (ENV 812), Duke University, Fall 2022
  - Instruct principles and management applications of wetlands to graduate students in the Nicholas School of the Environment.
- **\*Success in Environmental First Year** (ENV 100), North Carolina St., Spring 2021
  - Provide resources to first-semester students in the College of Natural Resources
- **Exploring the Environment** (ENV 101), North Carolina St. University, Fall 2022
  - Roles: Lead Teaching Assistant (2020) and Teaching Assistant (2019)
  - Introduce environmental science principles and current research in the College of Natural Resources.
- **Guest Lectures**
  - Geoscience Teaching Outdoors. October 2022
    - Field tour of ghost forests on the Albemarle-Pamlico Peninsula, North Carolina with 20 K-12 science teachers
  - Universidad de Costa Rica, Stream Ecology. June 2019.
    - Primer of Stream Ecology and Methods for Estimating Stream metabolism at La Selva Biological Station, Costa Rica. Delivered in Spanish.
  - Missouri Western State University. March 2019.
    - Long-term trends reveal effects of El Niño Cycles in lowland Neotropical streams, Costa Rica.
- **Instructed Workshops**
  - **Introduction to Stream Metabolism**
    - Reading group organized for Duke River Center (Spring 2022)
    - Investigate theoretical basis and models of stream metabolism
  - **Data Management for Undergraduates**
    - OTS LSAMP REU Program, La Selva Biological Station, Costa Rica (2018 – 2021)
    - Introductory workshop to data collection, management, and analysis
  - **An ethical discussion of water use, conservation, and climate change.**
    - OTS LSAMP REU Program, La Selva Biological Station, Costa Rica. (2018 – 2019)
    - Introduce topics related to global water use and effects of climate change

### Mentoring Experience

- **Students mentored**
  - **Ashton Espino (2021)**. Organization for Tropical Studies, Research Experience for Undergraduate Program, La Selva Biological Station, Costa Rica
    - Project title: *Determining the frequency, magnitude, and duration of acidification events in tropical streams across a groundwater gradient, Costa Rica.*
    - Co-mentored with Ana Meza-Salazar.
  - **Yessica Jimenez (2019)**. Organization for Tropical Studies, Research Experience for Undergraduate Program, La Selva Biological Station, Costa Rica.
    - Project title: *The effect of variable stream pH on the activity of stream insects*
    - Co-mentored with Alonso Ramírez.
  - **Terrius Bruce (2018)**. Organization for Tropical Studies, Research Experience for Undergraduate Program, La Selva Biological Station, Costa Rica.
    - Project title: *Stream macroinvertebrates as indicators in response to changes in pH in tropical streams.*
    - Co-mentored with Alonso Ramírez.
    - Currently: Ph.D. Student, University of Arkansas

- **Dominic Baca (2018)**. Organization for Tropical Studies, Research Experience for Undergraduate Program, La Selva Biological Station, Costa Rica.
  - Project title: *Microbial respiration on woody debris across a natural phosphorus gradient & an experimental pH gradient in Neotropical freshwater streams in Costa Rica*.
  - Co-mentored with Alonso Ramírez.
- **Mariely Vega-Gomez (2018)**. National Science Foundation Supplement for Research Experience for Undergraduates. La Selva Biological Station, Costa Rica.
  - Project title: *Effect of stream pH on leaf litter decomposition in tropical lowland streams*.
  - Co-mentored with Marcelo Ardón.
  - Currently: Ph.D. Student, North Carolina State University.
- **Society for Freshwater Science Instar Program**
  - 2021 Annual Meeting Mentor

### Grants, Awards, and Funding

● Dept. of Forestry and Environmental Resources Graduate Student Association Conference Award.	\$30	2021
● NSF Postdoctoral Scholarship, STREAMS Project	\$37500	2021
● Laarman Gift Fund for International Research, Department of Forestry and Environmental Resources Award, NCSU	\$3,220	2019
● Organization for Tropical Studies Graduate Student Fellowship	\$5,200	2017 - 2018
● University Graduate Fellowship, NCSU	\$24,000	2017 - 2018
● Provost Fellowship, NCSU	\$4,000	2017 - 2018
● US Army Corp of Engineers Research Grant. Invasive Apple Snail eDNA in Lake Seminole	\$2,500	2014
● Research Assistantship, University of Georgia and Joseph W. Jones Ecological Research Center Graduate Cooperative	\$42,000	2013 - 2015
● Athletic Band Scholarship (Trombone), School of Music, University of Florida	\$2,500	2009 - 2013
● Florida Bright Futures Scholarship	\$100,000	2009 – 2013

### Publications (\* denotes undergraduate co-author)

#### **Peer Reviewed Journal Articles**

- **Marzolf, N. S.**, D. M. Baca\*, T. K. Bruce\*, M. Vega-Gómez\*, C. D. Watson\*, C. N. Ganong, A. Ramírez, C. M. Pringle, and M. Ardón. Do experimental pH increases alter the structure and function of a lowland tropical stream? *Ecosphere*. DOI: 10.1002/ecs2.4097
- **Marzolf, N.**, Small, G., Oviedo-Vargas, D., Ganong, C., Pringle, C., Ramirez, A., Duff, J., Genereux, D. P., Ardón, M. 2022. Partitioning ecological and groundwater inorganic carbon sources in a lowland tropical stream, Costa Rica. *Biogeochemistry*. DOI: 10.1007/s10533-022-00954-4.
- Gómez-Gener, L., G. Rocher-Ros, T. Battin, M. J. Cohen, H. Dalamgro, K. J. Dinsmore, T. Drake, C. Duvert, A. E. Prast, Å. Horgby, M. Johnson, L. Kirk, F. Machado-Silva, **N. S. Marzolf**, M. J. McDowell, W. H. McDowell, H. Miettinen, A. K. Ojala, H. Peter, J. Pumpanen, D. Riveros-Iregui, I. Santos, J. Six, E. H. Stanley, M. B. Wallin, S. White, and R. A. Sponseller. 2021. Global carbon dioxide efflux from rivers enhanced by high nocturnal emissions. *Nature Geoscience*:1–6. DOI: 10.1038/s41561-021-00722-3
- In the news: <https://phys.org/news/2021-04-streams-rivers-emit-carbon-dioxide.html>
- **Marzolf, N. S.**, and M. Ardón. 2021. Ecosystem metabolism in tropical streams and rivers: a review and synthesis. *Limnology and Oceanography* 66:1627–1638. DOI: 10.1002/lno.11707

- Rüegg, J., C. C. Conn, E. P. Anderson, T. J. Battin, E. S. Bernhardt, M. B. Canadell, S. M. Bonjour, J. D. Hosen, **N. S. Marzolf**, and C. B. Yackulic. 2020. Thinking like a consumer: linking aquatic basal metabolism and consumer dynamics. *Limnology and Oceanography Letters* 6:1–17.
- **Marzolf, N. S.**, C. Smith, and S. Golladay. 2019. Limpkin (*Aramus guarauna*) establishment following recent increase in nonnative prey availability in Lake Seminole, Georgia. *The Wilson Journal of Ornithology* 131:179.
- **Marzolf, N. S.**, S. Golladay, P. McCormick, A. Covich, and S. Wilde. 2018. Inter- and intra-annual apple snail egg mass dynamics in a large southeastern US reservoir. *Hydrobiologia* 811:155–171.
- **Marzolf, N. S.**, S. W. Golladay, and A. P. Covich. 2015. Is environmental calcium availability limiting dispersal of an invasive snail in Lake Seminole and associated smaller lakes? Pages 1–5 in R. J. McDowell, C. Pruitt, and R. A. Bahn, editors. *Proceedings of the 2015 Georgia Water Resources Conference*. Athens, GA.

### ***In review***

- Ardón, M., Clark, D., **Marzolf, N.**, Ramírez, A., Pringle, C. Can we see nitrate from the trees? Examining the nitrogen paradox in a Neotropical watershed. For *Biogeochemistry*.
- Shivers, S. D., Golladay, S. W., Waters, M. N., Wilde, S. B., **Marzolf, N.S.**, Covich, A. P. Invasive species interactions affect nutrient cycling in a shallow reservoir: A mesocosm experiment. For *Freshwater Biology*.
- Duvert, C., **N. S. Marzolf**, A. V. Borges, L. Deirmendjian, A. M. Herreid, L. C. Jeffrey, A. Linkhorst, C. Lopez-Lloreda, M. N. Macedo, D. Oviedo-Vargas, D. A. Riveros-Iregui, V. Solano-Rivera, and K. M. Whitmore. Greenhouse gas emissions from tropical inland waters: drivers, sources and future research. For *Limnology and Oceanography Letters*

### ***In prep***

- **Marzolf N.**, Espino, A. R.\*, A. M. Meza-Salazar, A. P. Jackman, C. N. Ganong, A. Ramírez, and M. Ardón. How does rainfall affect acidification events in Neotropical streams, Costa Rica? For *Freshwater Biology*.
- **Marzolf, N.**, Ramírez, A., Pringle, C.M., Ardón, M. Spatial and temporal variability in 25 years of stream chemistry across a groundwater gradient, Costa Rica. For *Ecology*.
- **Marzolf, N.**, Hidalgo, M., Ardón, M. Coarse woody debris decomposition across a groundwater gradient, Costa Rica. For *Freshwater Biology*.
- **Marzolf, N.S.**, Rhea, S., Slaughter, W., Vlah, M.J., DeVecchia, A.G., Bernhardt, E.S. Evaluation of whole-stream metabolism estimates from National Ecological Observatory Network stream and river sites. For *Scientific Data*.

### **Invited Talks**

- International Society of Tropical Foresters, NCSU Chapter. January 2020 *Partitioning inorganic carbon fluxes in headwater streams, Costa Rica*.
- North Carolina State University Department of Forestry and Environmental Resources Seminar Series, Raleigh, NC. December 2018. *Alternative states and regime shifts across a Neotropical stream elevation gradient*.
- Southern Division of the American Fisheries Society Spring Meeting, Savannah, GA. January 2015. *Development and Use of eDNA Methods to Monitor Dispersal of Invasive Apple Snail, Pomacea maculata, in a SE Reservoir*.
- National Shellfisheries Association Annual Meeting, Knoxville, TN. March 2017. *An Overview of Apple Snail Research in Lake Seminole, GA*. Organized by Shirley Baker.

### **Contributed Presentations**

- **Marzolf, N.**, DelVecchia, A., Vlah, M., Rhea, S., Gubbins, N., Bernhardt, E. Continental-scale estimates of lotic ecosystem metabolism from NEON aquatic sites. *Oral presentation*. Joint Aquatic Science Meeting. May 18, 2022. Grand Rapids, Michigan.
- Behrens, J., Bernhardt, E., **Marzolf, N.**, Anderson, S., Hassett, B., Ramirez, X., Edwards, T., Hu, L., Gu, H. Smaller bugs and heavier metals in the aquatic to terrestrial subsidies of urban streams? *Oral presentation*. Joint Aquatic Science Meeting. May 18, 2022. Grand Rapids, Michigan.
- Duvert, C., **Marzolf, N.**, Linkhorst, A., Deirmendjian, L., Herreid, A., Jeffrey, L., Lopez-Lloreda, C., Macedo, M., Oviedo-Vargas, D., Riveros-Iregui, D., Solano-Rivera, V., Whitmore, K., Borges, A. Greenhouse gas emissions from inland waters: A perspective and research agenda for the tropics and subtropics. *Virtual presentation*. Joint Aquatic Science Meeting. May 18, 2022. Grand Rapids, Michigan.
- Ardón, M., **Marzolf, N.**, Ramírez, A., Pringle, C. Are N-fixing trees responsible for high nitrate in tropical streams? *Virtual presentation*. Joint Aquatic Science Meeting. May 18, 2022. Grand Rapids, Michigan.
- Ardón, M., **Marzolf, N.**, Ramírez, A., Pringle, C. Can we see the nitrate from the trees? Examining the nitrogen paradox in Neotropical streams. *Oral presentation*. Society for Freshwater Science Annual Meeting. May 23, 2021. Presented virtually due to COVID-19.
- **Marzolf, N.**, Small, G., Ganong, C., Pringle, C., Ramirez, A., Duff, J., Ardón, M. Partitioning ecological and groundwater inorganic carbon sources in a lowland tropical stream, Costa Rica. *Oral presentation*. Society for Freshwater Science Annual Meeting. May 23, 2021. Presented virtually due to COVID-19.
- **Marzolf, N.**, Ardón, M., Ramírez, A., Pringle, C. Long-term trends reveal effects of El Niño Cycles in lowland Neotropical streams, Costa Rica. *Oral presentation*. Association for the Sciences of Limnology and Oceanography Annual Meeting. February 2019. San Juan, Puerto Rico.
- **Marzolf, N.**, Ardón, M., Ramírez, A., Pringle, C. M. Long-term trends in water chemistry in geothermally-modified groundwater influenced lowland tropical streams. *Poster presentation*. Society for Freshwater Science Annual Meeting. May 2018. Detroit, MI.
- Golladay, S. W., **Marzolf, N. S.**, Smith, C. R., Shivers, S. D., Covich, A. P. Of Limpkins and Apple Snails: Invasive Species, Novel Ecosystems, and an Uncertain Future. *Oral Presentation*. Georgia Chapter of the Wildlife Society Annual Meeting. September 2017. Covington, GA.
- Smith, C. R., Golladay, S. W., **Marzolf, N. S.** Invertebrate Resistance/Resilience Mechanisms in an Intermittent Stream Among Years with Varying Hydroperiods. *Oral Presentation*. Society for Freshwater Science Annual Meeting. June 2017. Raleigh, NC.
- Golladay, S. W., **Marzolf, N. S.**, Smith, C. R. Applying the Sustainable Boundary Approach to Develop Flow Guidelines in the Unregulated Flint River, Georgia. *Oral Presentation*. Society for Freshwater Science Annual Meeting. June 2017. Raleigh, NC.
- **Marzolf, N. S.**, Golladay, S. W.; Smith, C. R. Intra- and inter annual apple snail population dynamics in Lake Seminole. *Poster Presentation*. Presented at Society for Freshwater Science Annual Meeting. June 2017, Raleigh, NC and Georgia Water Resources Conference, April 2017, Athens, GA.
- **Marzolf, N. S.**, Shivers, S. D., Smith, C. S., Golladay, S. W., Covich, A. C. An Overview of Apple Snail Research in Lake Seminole, GA. *Oral Presentation*. National Shellfisheries Association Annual Meeting. March 2017. Knoxville, TN.
- **Marzolf, N. S.**, Shivers, S. D., Golladay, S. W., and Covich, A. P. Potential Physiochemical Limitation on the Dispersal of the Invasive Apple Snail: Applying the Novel Ecosystem Concept in a Large Reservoir. *Oral Presentation*. Ecological Society of America Annual Meeting. August 2016. Ft Lauderdale, FL.
- Shivers, S. D., **Marzolf, N. S.**, Covich, A. P., Golladay, S. W. Hydrologic drivers of submerged aquatic vegetation coverage alter nutrient retention: Applying the novel ecosystem concept to a

large reservoir. *Oral Presentation*. Ecological Society of America Annual Meeting. August 2016. Ft. Lauderdale, FL.

- Smith, C. S., **Marzolf, N. S.**, Golladay, S. W. Changing Ecosystems. *Oral Presentation*. ACF Freshwater Mussel Workshop. August 2-4, 2016. Newton, GA
- **Marzolf, N. S.**, Golladay, S. W., Covich, A. P., Wilde, S. B., McCormick, P. V. Rapid Expansion of an Invasive Snail and Implication for Water Quality in a Novel Ecosystem. *Poster Presentation*. University of Georgia Celebration of Graduate Education in Support of the Land-Grant Mission. March 2016. Tifton, GA.
- **Marzolf, N. S.**, Shivers, S. D., Golladay, S. W., and Covich, A. P. Abiotic Effects on Spatial Distribution and Abundance of Two Highly Invasive Species in a Novel Lake Ecosystem. *Oral Presentation*. Society of Freshwater Science Annual Meeting. May 2015. Milwaukee, WI.
- **Marzolf, N. S.**, Shivers, S. D., Golladay, S. W., and Covich, A. P. Is Environmental Calcium Availability Limiting the Dispersal of an Invasive Snail in Lake Seminole and Associated Smaller Lakes? *Poster Presentation*. 2015 Georgia Water Resources Conference. April 2015. Athens, GA.
- **Marzolf, N. S.**, Covich, A. P., Golladay, S. W., McCormick, P.V., and Wilde, S. B. Quantifying Effects of Invasive Apple Snails (*Pomacea maculata*) in a Large Reservoir: an Outline for Research. *Poster Presentation*. Florida Lake Management Society Annual Meeting. June 2014. Stuart, FL.
- **Marzolf, N. S.** Faster than a Swimming Snail: Understanding Ecological Impacts of Apple Snails in Lake Seminole. *Oral Presentation*. Odum School of Ecology Graduate Student Symposium. January 2014. Athens, GA.

### **Datasets and R Packages**

- Long-term stream chemistry from La Selva Biological Station, Costa Rica.: [https://nmarzolf.shinyapps.io/LTREB\\_Data/](https://nmarzolf.shinyapps.io/LTREB_Data/)

### **In prep**

- neonMetab: R Package to estimate stream metabolism from National Ecological Observatory Network stream and river sites
- Estimates of stream metabolism from National Ecological Observatory Network stream and river sites
- Long-term estimates of river metabolism from US Geological Survey sites
- GHG in TIW: Compilation of greenhouse gas concentration and flux measures from Tropical Inland Waters

### **Service Activities**

- **Volunteer**
  - Ellerbe Creek Watershed Association: Participate in local clean-ups and invasive species removal (2022)
  - Dougherty County Public Schools Science Fair Judge (2016)
  - City of Gainesville Air Potato round-up invasive species removal (1998-2009)
- **Organized Special Sessions**
  - Society for Freshwater Science 2023 Annual Meeting: Responses of inland water greenhouse gas emissions to management and global change
  - Society for Freshwater Science 2021 Annual Meeting: Greenhouse gases in tropical streams, rivers, lakes, and wetlands: current work and future research needs
- **Graduate Student Representative**: Search Committee for College of Natural Resources Dean of Diversity, Equity, and Inclusion, North Carolina State University, 2018
- **Reviewer**
  - *Freshwater Biology* (2022 – pres., n = 2)
  - *Biogeosciences* (2021 – pres., n = 2)

- *Biotropica* (2021 – pres., n = 1)
- *Aquatic Ecology* (2020 – pres., n = 2)
- *Journal of Geophysical Research: Biogeosciences* (2020 – pres., n = 1)
- *Hydrobiologia* (2019 – pres., n = 2)
- *Freshwater Science* (2019 – pres., n = 2)
- *Communications Earth and Environment* (2022 – pres., n = 1)

### **Proficiencies and Training**

- **Proficiencies**
  - Software: ArcMap, QGIS, R, Microsoft Office, LoggerNet
  - Languages: English, Spanish (conversational)
  - SCUBA (PADI) and Nitrox Certified
- **Training**
  - **Diversity: Inclusion in the Modern Workplace.** Raleigh, NC. February 2021.
  - **Managing Bias.** Raleigh, NC. February 2021.
  - **Data Security Training Workshop.** Raleigh, NC. October 2020.
  - **NSF Workshop Heterotrophic Regimes: A cross-biome perspective.** Ovronnaz, Switzerland. September 2018.
  - **Fundamentals of Ecosystem Ecology Graduate Course.** Cary Institute of Ecosystem Studies. Millbrook, NY. January 2018.
  - **Prescribed Fire Course.** Joseph Jones Ecological Research Center. Newton, GA. 2014 – 2015.
  - **Freshwater Mussel Workshop.** Joseph Jones Ecological Research Center. Newton, GA. 2014, 2016.

### **Professional Membership**

- Organization for Tropical Studies (2022 – pres.)
- Association for the Sciences of Limnology and Oceanography (2018 – pres.)
- North American Lake Management Society (2018 – pres.)
- Ecological Society of America (2016 – pres.)
- Florida Lake Management Society (2014 – pres.)
- Society for Freshwater Science (2014 – pres.)

### **References**

- **Stephen Golladay** (sgollada@jonesctr.org)
  - *Associate Scientist, Joseph W. Jones Ecological Research Center*
- **Marcelo Ardón** (mlardons@ncsu.edu)
  - *Associate Professor, Dept. of Forestry and Environmental Resources, North Carolina State University*
- **Emily Bernhardt** (emily.bernhardt@duke.edu)
  - *James B. Duke Distinguished Professor and Chair, Department of Biology, Duke University*