

# Riley Leff

PhD Candidate, Biological Sciences

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## Education & Research Roles

### PhD, Biological Sciences

George Washington University, Washington, DC

2021 – Present

- Research Interests: Plant Ecophysiology, Climate Change, Open Source Software, Acausal Models
- Research Advisor: Dr. Keryn Gedan

### Research Associate

2019 - 2021

Pacific Northwest National Laboratory, Chicago, IL

- Studied Tree Mortality In Response To Drought And Sea Level Rise
- Research Advisor: Dr. Nate McDowell

### BSc, Biological Sciences

2015 – 2019

University of Chicago, Chicago, IL

- Honors B.S. Thesis: Microbial Diversity and Function in the Phyllosphere
- Research Advisor: Dr. Joy Bergelson

## Software Development

### Primary Languages

#### Rust

My preference for any projects that benefit from static typing, robust error handling, and memory safety.

- Floco: a library to enforce user-defined constraints on arbitrarily-sized floats directly within Rust's type system. [\[Link\]](#)
- Dirgrab: CLI utility for injecting entire local projects into LLM context windows. [\[Link\]](#)
- SDI-12: Implementation of a legacy serial standard for communication with embedded environmental sensors for embedded environmental sensors. [\[Link\]](#)
- High-performance backends for scientific models.

#### Python

Go-to for prototypes, quick scripts, data analysis, and AI/ML ecosystem.

- Retrieval-Augmented Generation (RAG) utility script for linking your local Zotero library to LLMs. [\[Link\]](#)
- Zotero Expander Script: Add all citations from a paper to your library. [\[Link\]](#)

### Other Languages

#### R

Used mainly for domain-specific packages, ggplot2, and collaboration within the biological sciences.

- ezSperry: Wrapper package to call a stomatal optimization model from R. [\[Link\]](#)

#### JavaScript / TypeScript

Primarily used for frontend web development (e.g. Svelte) but occasionally useful in research/academic contexts.

- Forest Royale: a educational 3D multiplayer game to communicate plant physiology concepts to students. [\[Link\]](#)
- RiLeaf.ijm: ImageJ macro automating leaf area quantification. [\[Link\]](#)

#### Typst

To generate pretty and reproducible documents.

- This CV! Follow the link for an example of how to generate a CV from structured data and formatter components. [\[Link\]](#)

## Awards

NSF Graduate Research Fellowship <i>National Science Foundation</i>	April 2023
Harlan Graduate Research Fellowship <i>GWU Biology</i>	April 2021, 2022, 2024
Irish Endowment Fund <i>GWU Biology</i>	April 2023, 2024
Laboratory Mission Award Finalist <i>Pacific Northwest National Laboratory</i>	September 2020
Research Honors <i>UChicago Biological Sciences</i>	June 2019
Academic Honors <i>The University of Chicago</i>	June 2019
Excellence in Teaching Award <i>UChicago Biological Sciences</i>	June 2018
Ecology & Evolution Research Fellowship <i>UChicago Biological Sciences</i>	May 2018
Dean's List <i>The University of Chicago</i>	2016, 2017, 2018
The University Scholarship <i>The University of Chicago</i>	March 2015

## Publications & Datasets

Citations: 202 h-index: 8 [Link to Google Scholar](#)

### Journal Articles

#### 1. Biogeochemistry of upland to wetland soils, sediments, and surface waters across Mid-Atlantic and Great Lakes coastal interfaces

Allison N. Myers-Pigg, Stephanie C. Pennington, Khadijah K. Homolka, Allison M. Lewis, Opal Otenburg, Kaizad F. Patel, Peter Regier, Madison Bowe, Maxim I. Boyanov, Nathan A. Conroy, Donnie J. Day, Cooper G. Norris, Edward J. O'Loughlin, Jesse Alan Roebuck, Lucie Stetten, Vanessa L. Bailey, Kenneth M. Kemner, Nicholas D. Ward, EXCHANGE Consortium, Silver Alford, Michael P. Back, Andy Baldwin, Jade Bolinger, Jacob A. Cianci-Gaskill, Matthew J. Cooper, Alex Demeo, Kyle Derby, Derek Detweiler, Suzanne Devres-Zimmerman, Erin Eberhard, Keryn Gedan, LeeAnn Haaf, Erin Johnson, Aliya Khan, Matthew L. Kirwan, Payton Kittaka, Erika Koontz, Adam Langley, Riley Leff, Scott Lerberg, Sairah Y. Malkin, Amy M. Marcarelli, Steven E. McMurray, Tyler Messerschmidt, Taylor C. Michael, Holly A. Michael, Elizabeth C. Minor, Brian Moye, Thomas J. Mozdzer, Scott Neubauer, Andrea Pain, Michael Philben, Evan Phillips, Dannielle Pratt, Lauren Sage, Daniel Sandborn, Stacy Smith, Alexander Smith, Samina Soin-Voshell, Bongkeun Song, Amanda Sprague-Getsy, Kari St. Laurent, Lorie Staver, Alice Stearns, Rebecca Swerida, Ethan J. Theuerkauf, Katherine Tully, Rodrigo Vargas, Elizabeth Watson, and Coreen Weilminster  
*Scientific Data*, 2023 [\[DOI\]](#) [\[Link\]](#)

#### 2. Coastal inundation regime moderates the short-term effects of sediment and soil additions on seawater oxygen and greenhouse gas dynamics: a microcosm experiment

Peter Regier, Nicholas D. Ward, Alex Izquierdo, Andrew H. Baldwin, Donnie Day, Julia McElhinny, Kaizad Patel, Rodrigo Vargas, Jianqiu Zheng, Exchange Consortium, and Allison Myers-Pigg  
*Frontiers in Marine Science*, 2023 [\[DOI\]](#) [\[Link\]](#)

#### 3. Draft Genome Sequences of Three Bacterial Species from Aquatic Habitats near Washington, DC

Riley T. Leff, Jonathan MacDougall, Christina Pavloudi, Lausanne Oliver, Kaitlynn Slattery, Guinevere Lissner, and Jimmy H. Saw  
*Microbiology Resource Announcements*, 2023 [\[DOI\]](#) [\[Link\]](#)

#### 4. Severe declines in hydraulic capacity and associated carbon starvation drive mortality in seawater exposed Sitka-spruce (*Picea sitchensis*) trees

Wenzhi Wang, Peipei Zhang, Hongxia Zhang, Charlotte Grossiord, Stephanie C Pennington, Matthew J Norwood, Weibin Li, Alexandria L Pivovaroff, Laura Fernández-de-Uña, Riley Leff, Steven B Yabusaki, Scott Waichler, Vanessa L Bailey, Nicholas D Ward, and Nate G McDowell  
*Environmental Research Communications*, 2022 [\[DOI\]](#) [\[Link\]](#)

#### 5. Plant genetic effects on microbial hubs impact host fitness in repeated field trials

Benjamin Brachi, Daniele Filiault, Hannah Whitehurst, Paul Darme, Pierre Le Gars, Marine Le Mentec, Timothy C. Morton, Envel Kerdaffrec, Fernando Rabanal, Alison Anastasio, Mathew S. Box, Susan Duncan, Feng Huang, Riley Leff, Polina Novikova, Matthew Perisin, Takashi Tsuchimatsu, Roderick Woolley, Caroline Dean, Magnus Nordborg, Svante Holm, and Joy Bergelson

*Proceedings of the National Academy of Sciences*, 2022 [DOI] [Link]

## **6. The influence of increasing atmospheric CO<sub>2</sub>, temperature, and vapor pressure deficit on seawater-induced tree mortality**

Weibin Li, Nate G. McDowell, Hongxia Zhang, Wenzhi Wang, D. Scott Mackay, Riley Leff, Peipei Zhang, Nicholas D. Ward, Matt Norwood, Steve Yabusaki, Allison N. Myers-Pigg, Stephanie C. Pennington, Alexandria L. Pivovaroff, Scott Waichler, Chonggang Xu, Ben Bond-Lamberty, and Vanessa L. Bailey

*New Phytologist*, 2022 [DOI] [Link]

## **7. Declining carbohydrate content of Sitka-spruce trees dying from seawater exposure**

Peipei Zhang, Nate G McDowell, Xuhui Zhou, Wenzhi Wang, Riley T Leff, Alexandria L Pivovaroff, Hongxia Zhang, Pak S Chow, Nicholas D Ward, Julia Indivero, Steven B Yabusaki, Scott Waichler, and Vanessa L Bailey

*Plant Physiology*, 2021 [DOI] [Link]

## **8. Hydraulic architecture explains species moisture dependency but not mortality rates across a tropical rainfall gradient**

Alexandria L. Pivovaroff, Brett T. Wolfe, Nate McDowell, Bradley Christoffersen, Stuart Davies, L. Turin Dickman, Charlotte Grossiord, Riley T. Leff, Alistair Rogers, Shawn P. Serbin, S. Joseph Wright, Jin Wu, Chonggang Xu, and Jeffrey Q. Chambers

*Biotropica*, 2021 [DOI] [Link]

## **9. Seawater exposure causes hydraulic damage in dying Sitka-spruce trees**

Hongxia Zhang, Xinrong Li, Wenzhi Wang, Alexandria L. Pivovaroff, Weibin Li, Peipei Zhang, Nicholas D. Ward, Allison Myers-Pigg, Henry D. Adams, Riley Leff, Anzhi Wang, Fenghui Yuan, Jiabing Wu, Steve Yabusaki, Scott Waichler, Vanessa L. Bailey, Dexin Guan, and Nate G. McDowell

*Plant Physiology*, 2021 [DOI] [Link]

## **10. Changes in carbon and nitrogen metabolism during seawater-induced mortality of *Picea sitchensis* trees**

Weibin Li, Hongxia Zhang, Wenzhi Wang, Peipei Zhang, Nicholas D Ward, Matt Norwood, Allison Myers-Pigg, Chuanyan Zhao, Riley Leff, Steve Yabusaki, Scott Waichler, Vanessa L Bailey, and Nate G McDowell

*Tree Physiology*, 2021 [DOI] [Link]

## **11. Stability of tropical forest tree carbon-water relations in a rainfall exclusion treatment through shifts in effective water uptake depth**

Alexandria L. Pivovaroff, Nate G. McDowell, Tayana Barrozo Rodrigues, Tim Brodribb, Lucas A. Cernusak, Brendan Choat, Charlotte Grossiord, Yoko Ishida, Kolby J. Jardine, Susan Laurance, Riley Leff, Weibin Li, Michael Liddell, D. Scott Mackay, Heather Pacheco, Jennifer Peters, Israel J. Sampaio Filho, Daisy C. Souza, Wenzhi Wang, Peipei Zhang, and Jeff Chambers

*Global Change Biology*, 2021 [DOI] [Link]

## **12. Tree growth, transpiration, and water-use efficiency between shoreline and upland red maple (*Acer rubrum*) trees in a coastal forest**

Wenzhi Wang, Nate G. McDowell, Stephanie Pennington, Charlotte Grossiord, Riley T Leff, Aditi Sengupta, Nicholas D. Ward, Uğur Uzay Sezen, Roy Rich, J. Patrick Megonigal, James C. Stegen, Ben Bond-Lamberty, and Vanessa Bailey

*Agricultural and Forest Meteorology*, 2020 [DOI] [Link]

## **Published Datasets**

### **EXCHANGE Campaign 1: A Community-Driven Baseline Characterization of Soils, Sediments, and Water Across Coastal Gradients**

Stephanie C. Pennington, Silver Alford, Michael P. Back, Vanessa Bailey, Andy Baldwin, Jade Bolinger, Madison Bowe, Maxim I. Boyanov, Jacob A. Cianci-Gaskill, Nathan A. Conroy, Matthew J. Cooper, Donnie Day, Alex Demeo, Kyle Derby, Derek Detweiler, Suzanne Devres-Zimmerman, Erin Eberhard, Keryn Gedan, LeeAnn Haaf, Khadijah K. Homolka, Erin Johnson, Kenneth M. Kemner, Aliya Khan, Matthew Kirwan, Payton Kittaka, Erika Koontz, Adam Langley, Riley Leff, Scott Lerberg, Allison M. Lewis, Sairah Malkin, Amy M. Marcarelli, Steven E. McMurray, Tyler Messerschmidt, Taylor C. Michael, Holly A. Michael, Elizabeth C. Minor, Brian Moye, Thomas J. Mozdzer, Scott Neubauer, Cooper G. Norris, Edward J. O'Loughlin, Opal Otenburg, Andrea Pain, Kaizad F. Patel, Michael Philben, Evan Phillips, Dannielle Pratt, Peter Regier, Jesse Alan Roebuck Jr., Lauren Sage, Daniel Sandborn, Stacy Smith, Alex Smith, Samina Soin-Voshell, Bongkeun Song, Amanda Sprague-Getsy, Kari St. Laurent, Lorie Staver, Alice Stearns, Lucie Stetten, Rebecca Swerida, Ethan J. Theuerkauf, Katherine Tully, Rodrigo Vargas, Nicholas D. Ward, Elizabeth Watson, Coreen Weilminster, and Allison N. Myers-Pigg

*Environmental System Science Data Infrastructure for a Virtual Ecosystem*, 2023 [DOI] [Link]

### **Leaf gas exchange (BNL-PNNL collaboration), San Lorenzo, Panama, 2020**

Julien Lamour, Kenneth Davidson, Kim Ely, Alexandria Pivovaroff, Nate McDowell, Riley Leff, Alistair Rogers, and Shawn Serbin

*Next-Generation Ecosystem Experiments Tropics; Brookhaven National Laboratory; Pacific Northwest National Laboratory*, 2022 [DOI] [Link]

### **Functional trait data for 11 canopy tree species in the control and drought treatments at AU-DRO (2018-2019)**

Alexandria Pivovaroff, Nate McDowell, Tayana Barrozo, Timothy Brodribb, Lucas Cernusak, Charlotte Grossiord, Yoko Ishida, Kolby Jardine, Susan Laurance, Riley Leff, Weibin Li, Heather Pacheco, Israel Sampaio, Daisy Souza, Wenzhi Wang, and Peipei Zhang

*Next-Generation Ecosystem Experiments Tropics; Pacific Northwest National Laboratory*, 2021 [DOI] [Link]

## **Presentations**

### **Talks**

#### **Tree Mortality In Response To Seawater Inundation**

George Washington University Seminar Series, 2023

#### **Predicting Tree Function and Mortality in a Changing Tropical Environment**

American Geophysical Union Fall Meeting, 2020

#### **Microbial Diversity and Function in the Phyllosphere**

University of Chicago Honors Research Symposium, 2019

## **Posters**

#### **Foliar Water Uptake Keeps Dying Trees Alive In A Coastal Forest**

VCR LTER All-Hands Meeting, 2024

#### **Reverse sap flow in coastal forest in response to saltwater flooding**

New Phytologist Next-Gen Scientists, 2024

#### **Sap Flux: Updates From 3 Years Of Monitoring Across The Delmarva**

Critical Zone Network Meeting, 2024

#### **Hydraulic Stress Limits Pinus taeda Range In A Mid-Atlantic Coastal Forest**

SALT Conference, 2024

#### **Sap Flux: Updates After 3 Years Of Monitoring Across The Delmarva**

Critical Zone Network All-Hands Meeting, 2024

#### **Seawater Inundation Impacts On Pine Hydraulic Regime**

Delaware Wetlands Conference, 2024

#### **A Novel Quantitative Method To Improve Sap Flux Measurements**

George Washington University Harlan Symposium, 2023

## **Wireless Sensor Networks For Automated Field Data Collection**

VCR LTER All-Hands Meeting & Critical Zone Network Meeting, 2023

## **Seawater Intrusion Disrupts Sap Flux Dynamics In A Coastal Forest**

George Washington University Harlan Symposium, 2022

## **Seawater Inundation Induces Reverse Sap Flux In Coastal Forest**

Virginia Coastal Reserve LTER NSF Mid-Term Review, 2022

## **Predicting Tree Function and Mortality in a Changing Tropical Environment**

American Geophysical Union Fall Meeting, 2020

## **Microbial Diversity and Function in the Phyllosphere**

University of Chicago Honors Research Symposium, 2019

## **Teaching**

**Instructor:** Intro To Python (Summer Seminar Series) 2023

*George Washington University*

**Instructor:** Intro To R (Summer Seminar Series) 2023

*George Washington University*

**Instructor:** Intro To Ecology (Summer Seminar Series) 2022

*George Washington University*

**Teaching Assistant:** Conservation Biology 2022

*George Washington University*

**Lab Instructor:** Introductory Microbiology 2021

*George Washington University*

**Interim Instructor (7th Grade)** 2020

*Twin Rivers Charter Academy, Yuba City, CA*

**Lab Instructor:** Core Biology 2017 - 2019

*University of Chicago*

**Instructor / Mentor:** Neighborhood Schools Program (5th Grade) 2016 - 2017

*University of Chicago Outreach, Chicago, IL*

**Corps Member / Tutor:** Jumpstart (Pre-K Literacy) 2015 - 2016

*University of Chicago Community Service Center, Chicago, IL*

## **Outreach & Engagement**

**Reverse sap flow in coastal forest in response to saltwater flooding** 2024

Presentation at GWU Earth Day Symposium

**What Do The Trees Know?** 2024

Activity at Virginia Coastal Reserve LTER 'Day In The Lab'

**Trees As Strategists** 2025

Presentation at GWU Earth Day Symposium

**Trees As Strategists** 2025

Activity at GWU Biology Graduate Student Council Science Fair

**Forest Royale** 2025

Online Educational Game

A 3D multiplayer plant physiology strategy game designed to teach students about complex tradeoffs in plant-environment interactions.

[*Link*]

## Mentorship

### **Sehrin Hossain**

Undergraduate, George Washington University

2025 – Present

- Project: Automated image segmentation pipeline to analyze wood traits
- Outcome: Won Luther Rice Fellowship.

### **Ellyn Kinkel**

Undergraduate, George Washington University

2024 – Present

- Project: Analyzing non-structural carbohydrate storage in salt-stressed coastal forests.
- Outcome: Won Harlan Undergraduate Fellowship.

### **Kaeden Rippon**

Undergraduate, University Of Virginia

2024

- Project: Detected foliar water uptake in pine saplings.
- Outcome: Won VCR LTER REU Funding.

### **Noa Shapiro-Tamir**

REU Student, Oberlin College

2023

- Project: Measured leaf decomposition rates across a salinity gradient.
- Outcome: Won VCR LTER REU Funding.

### **Maggie Connolly**

Undergraduate, George Washington University

2022

- Project: Studying plant hydraulic responses to elevated salinity.
- Outcome: Won Harlan Undergraduate Fellowship.

### **Aaron Mendez**

High School Student, GWU School Without Walls

2022

- Project: Analyzing non-structural carbohydrate levels in Phragmites Australis for AP Research project.
- Outcome: SUNY!

### **Aidan Brown**

Undergraduate Researcher, George Washington University

2022 – Present

- Project: Training deep learning model to detect and analyze tree canopy structures from drone images.
- Outcome: Won GWU Harlan Fellowship, Critical Zone Network Fellowship (2x), Accepted to GWU 5-Year BS/MS Program In Biology.

### **James Abend**

High School Student, Tri Cities, WA

2019

- Project: Processed samples for non-structural carbohydrate analysis.

### **Dakota DeRoos**

High School Student, Tri Cities, WA

2019

- Project: Processed samples for non-structural carbohydrate analysis.