NATHAN L. BROUWER PHD

Data scientist specializing in complex ecological data

I am an ecological data scientist and educator with 15 years of experience extracting insights from messy data and communicating the results. I specialize in using generalized-linear mixed models (GLMMs) to analyze data from long-term observational studies. I have also taught myself key aspects of bioinformatics, phylogenetics, machine learning and population genomics. Note - All blue text is hyperlinked to relevant online materials.

🖥 RESEARCH & PROFESSIONAL EXPERIENCE

present | 2018

Assistant Teaching Professor - General & Quantitative Biology
University of Pittsburgh Dept. of Biological Sciences

- **R programming**: Develop and deliver curriculum for **Computational Biology** course, focusing on machine learning, reproducibility, and high-dimensional data (4 semesters).
- **Data analysis**: Instructor for **Biostatistics** (1 semester) and consultant on stats curriculum for lab classes.
- **Science communication**: Teach scientific writing, non-majors biology, intro biology lecture, Ecology & Evolution Seminar - African Ecology, and labs.

2018 | 2015

Post-doctoral Research Associate - Avian Conservation
National Aviary of Pittsburgh

- **GLMMS**: Analyzed decade-long multisite tropical bird population and community datasets.
- **Data cleaning**: Cleaned and merged diverse datasets of environmental, remote sensing and organism traits data.
- **R packages**: Implemented models of migratory bird populations as reproducible software.
- **Computational ecology**: Developed sensitivity and uncertainty analyses methods for for migration models.

2017 | 2016

Adjunct Professor - Biological Data Analysis
Duquesne Unv. & California Unv. of PA

- **R programming & data science**: Taught grad (Duq., Spring 2017) and undergrad data analyses courses (CalU, Fall 2016 and 2017).

2015 | 2009

Graduate Student
Department of Biological Sciences, University of Pittsburgh

- Graduate Research Fellow (2009-2010, 2014-2015) and NSF Pre-Doctoral Fellow (2010-2013).
- **GLMMs**: Determined appropriate model structures and analyzed data.
- **Data cleaning**: Updated, cleaned and managed data for decade-long plant demographic experiment.
- **Field work**: Designed and conducted research on plant demography.

CONTACT INFO

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📞 517-898-5440

🎓 EDUCATION

B.S., Biology, with Honors 2002.
Seattle Pacific University.

Phd, Biological Sciences -
Ecology & Evolution 2015.
University of Pittsburgh.

🔧 SKILLS

💾 R packages

🐙 GitHub

🗄 Open Science

R programming

GLMMs (`nlme`, `lme4`, `glmmTMB`, `brms`)

GAMMs (`mgcv`)

Reproducible reports & pipelines

RMarkdown

Tidyverse

Data visualization with `ggplot2`

Scientific communication

2008 | 2009

Science Writer
Quantum Scientific Publishing
• Wrote and edited customized biology materials for online charter schools.

2007 | 2008

Graduate Student / NSF Pre-Doctoral Fellow
Dept. of Zoology, Michigan State State University
• **Data Cleaning**: Cleaned, organized and analyzed large-scale avian community ecology dataset.

2006 | 2004

Peace Corps Volunteer - Agroforestry Outreach
National Agricultural Research Institute, The Gambia, West Africa
• **Science communication**: Assisted in staff development and conducted outreach on sustainable agriculture.

2004 | 2002

Infecious Disease Research Scientist
University of Washington Department of Allergy & Infectious Disease
• **Lab work**: Conducted experiments on pathogen cell-adhesion proteins.

📖 PUBLICATIONS - SCIENCE EDUCATION

2022

Ecology for All!
Curated compilation of Open-Access ecology resources and new content.
Gowarnis, **Brouwer** et. al.

• **Original content**:
• Chapter 9: Ecology of Populations, section 9.1
• Chapter 10: Population modeling, sections 10.1, 10.2, and 10.4

2021

Computational Biology for All! vs 0.9
An open access book for bioinformatics and computational biology.
Brouwer

2021

A Little Book of R for Bioinformatics vs. 2.0
Open-access bioinformatics primer.
Coghlan (au.) & **Brouwer** (ed., au)

📦 R PACKAGES (AVAILABLE ON GITHUB)

redstart
R implementation and replication of Runge & Marra (2005) *Modeling Seasonal Interactions in the Population Dynamics of Migratory Birds*.
Brouwer *et al.*

combio4all
A repository of functions and data useful for introductory bioinformatics and computational biology.
Brouwer & Coghlan

📄 PUBLICATIONS

2019
Direct effects of a non-native invader erode native plant fitness in the forest understory
Journal of Ecology 108:189–198
Bialic-Murphy, **Brouwer** & Kaliz.

- 🔧 **GLMM**
- 🗄 Dryad

2019
Stream acidification and reduced availability of pollution-sensitive aquatic insects are associated with dietary shifts in a stream-dependent Neotropical migratory songbird.
PeerJ 6:e5141
Trevelline, Nuttle, Porter, **Brouwer** *et al.*

- 🔧 **Unsupervised Machine Learning** (NMDS)
- 🗄 PeerJ Appendix

2018
DNA metabarcoding reveals the importance of aquatic prey subsidies and the structure of dietary niches in a community of breeding riparian songbirds.
Oecologia 187: 85-98
Trevelline, **Brouwer** *et al.*

- 🔧 **Unsupervised Machine Learning** (NMDS)

2018
Avian community characteristics and demographics reveal how conservation value of regenerating tropical dry forests changes with forest age
PeerJ 6: e5217
Latta, **Brouwer** *et al.*

- 🔧 **GLMM**, `ggplot`
- 🗄 GitHub

2017
Long-term monitoring reveals an avian species credit in secondary forest patches of Costa Rica
PeerJ 6: e3539
Latta, **Brouwer** *et al.*

- 🔧 **GLMM**, `ggplot`
- 🗄 Harvard Dataverse

2017
Increased photosynthetic performance of an invasive forest herb mediated by deer overabundance
AoB Plants 9: plx011
Heberling, **Brouwer** & Kalisz.

- 🔧 **GAMM**
- 🗄 GAMM - GitHub
- 🗄 AoB Plants

PUBLICATION TOPICS

Demographic models

Longitudinal GLMMs

Species interactions

Tropical birds

Invasive species

2015 ● **Mutualism-disrupting allelopathic invader drives carbon stress and vital rate decline in a forest perennial herb**
AoB Plants 7: plv014
Brouwer, Hale & Kalisz.

- 🔧 **GLMM**, `ggplot2`

2005 ● **Defining the interaction of the *Treponema pallidum* adhesin Tp0751 with laminin**
Infection & Immunity. 73: 7485-7494.
Cameron, **Brouwer**, *et al.*

2004 ● ***Treponema pallidum* fibronectin-binding proteins**
Journal of Bacteriology. 186:7019-7022.
Cameron, **Brouwer** *et al.*