

KENNETH H. FOREMAN

The Ecosystems Center,
Marine Biological Laboratory
Woods Hole, MA 02543
508-289-7348

Professional Preparation:

AB, Stanford University, 1974

Ph.D. Boston University Marine Program 1989

Major Professor: Dr. Ivan Valiela Thesis Title: *Regulation of benthic microalgal and meiofaunal productivity and standing stock in a salt marsh ecosystem: the relative importance of resources and predation.*

Professional Experience and Appointments:

2022-present– Research Scholar (MBL)

2004- 2022 – Program Director, Semester in Environmental Science (MBL)

2003-2007 – Co-Director, Environmental Hands-On-Lab Science Journalism Program (MBL)

1995-2003 - Associate Program Director, Semester in Environmental Science (MBL)

1989-1995 – Post-doctoral Research Associate, Boston University (NSF funded Waquoit Bay Land Margin Ecosystem research program)

1985-1987 - Course Coordinator - MBL Summer Marine Ecology Course
(Dr. Peter Frank University of Oregon, Course Director)

1977-1983 - Graduate Research Assistant - Boston University Marine Program

1975-1976 - Teaching Fellow - Boston University

1975 - Massachusetts Audubon Society Environmental Intern (Habitat assessment for reintroduction of Atlantic Salmon in New England)

1974 – Research Technician, Dept. of Pathology, University of Chicago Medical School
(Laboratory of Dr. Robert Wissler, biochemical analyses of aorta tissues from *Rhesus macaques* treated with diet and drugs to induce/treat atherosclerosis)

Pending, Current and Past Research Grants/Funding

Lead PI WHOI Sea Grant. *Restoration and Recovery of the Little Pond Ecosystem after Nutrient Load Reduction following Sewer Construction and Wastewater Diversion.* LOI Submitted and Pending \$360,340

Lead PI: The Problem with Falmouth's Water: Supporting Undergraduate Research & Civic Partnerships at the MBL (supports efforts to monitor response of Little Pond in Falmouth to diversion of wastewater from >1400 homes). Hermann Foundation - \$100,000

Lead PI: Evaluation of Permeable Reactive Barrier (PRB) Technology for Remediation of Residual Nitrate in Treated Wastewater Phase I (Jan-Dec 2019, \$60,531) and Phase II (Jan 2020- April 2021, \$27,375). Commonwealth of Massachusetts Coastal Zone Management Buzzards Bay National Estuary Program/EPA. & U.S. EPA Cooperative Agreement CE00A00623, Massachusetts EEA subaward contract CT ENV 4700092220*697

Lead PI: Testing efficacy of in-stream wood-chip reactor to remove nitrate through denitrification. Town of Falmouth 2017 (\$1,072)

Assessment of Groundwater Inputs to Little Pond after Sewer Installation/Wastewater Remediation. Town of Falmouth 2015 (\$2,040).

Microbial Consortia on Commercial Denitrifying Barriers: Who's doing the work? MIT SeaGrant 6/2012-6/2014 (J. Bowen, Northeastern Univ., Lead PI, K. Foreman, J. Vallino Co-PI's). \$100,000.

Nonlinear Feedbacks in Coupled Element Cycles During Eutrophication of Shallow Coastal Ecosystems. NSF Division of Earth Sciences Grant 0420575 7/04-6/09. \$1.7 million (MBL subcontract \$583,085). R.W. Howarth, (Lead PI), P. Berg, K. Foreman, A.Giblin, R. Marino, K. McGlathery (Co-PI's).

Modeling Microbial Biogeochemistry in Permeable Reactive Barriers. NSF Division of Chemical, Bioengineering, Environmental & Transport Systems Grant CBET-0756562 5/08-4/12. \$300,000. J. Vallino (Lead-PI), K. Foreman (Co-PI).

NOAA-CICEET, Effectiveness of Reactive Barriers for Reducing N-Loading to the Coastal Zone,9/04-8/07, \$210,000. J. Vallino (Lead-PI), K. Foreman (Co-PI).

Education Gifts/Grants for the SES Program > \$5000

2020-23 () Davis Educational Foundation Building on 25 Years of SES:
The Next Generation of Undergraduate Programming at the MBL

2018-19 Reynolds Family Fndn. (\$30,000); Charles & Patricia Robertson (\$19,500); Clowes Fnd/Bowles Family (\$15,693);Sirius Fund (\$10,000);.

2017-18 Reynolds Family Fndn. (\$30,000); Clowes Fnd/Bowles Family (\$15,225); Sirius Fund (\$10,000);

2016-17 Reynolds Family Fndn. (\$50,000); Lubin Family Fndn. (\$5,000);

2014-16 Reynolds Family Fnd (\$130,000), Sirius Fund (\$12,000), Judy & Michael Steinhardt Fnd (\$5000)

2011-13 Arthur Vining. Davis Fndn. (\$150,000, Developing Ecological Genomics Curriculum in The SES)

2011-14 Davis Educational Foundation (\$263,000 support for SES)

2010-14 The Clowes Fund, Inc. (\$250,000 for endowment for the SES); Harken Fdn (\$250,000)

2008 Dorr Foundation (\$26,581 for equipment for the SES)

2007-10 Davis Educational Foundation (\$290,000 support for Semester in Environmental Science)

2004 - A.V. Davis Foundation (\$150,000, endowment for SES)

2003 - Blum-Kovler Foundation (\$5000 for SES); Harold Whitworth Pierce Foundation (\$25,000 for SES); C.V. Starr Foundation (\$250,000 for SES)

2000 - A.W. Mellon Foundation with Jerry Melillo (\$1.0 million for SES)

Peer Reviewed Publications:

*undergraduate intern co-authors

**Semester in Environmental Science alumnus/a

1. Hiller-Bittrolff, K.A.,** **K. Foreman**, A.N. Bulseco-McKim, J Benoit, and J.L. Bowen (2018). Effects of mercury addition on microbial community composition and nitrate removal inside permeable reactive barriers. *Environmental Pollution* 242:797-806.
2. Hiller, K.A.** , **K.H. Foreman**, D.Weisman, and J.L. Bowen (2015) Permeable Reactive Barriers Designed To Mitigate Eutrophication Alter Bacterial Community Composition and Aquifer Redox Conditions *Applied Env. Microbiology* 81:7114-7124
3. Howarth, R.W., M. Hayn**, R.M. Marino, N. Ganju, **K.H. Foreman**, K. McGlathery, A. Giblin, P. Berg and J.D. Walker. (2014). Metabolism of a nitrogen enriched coastal marine lagoon during summertime. *Biogeochemistry* 118:1-20.
4. Hayn, M.** , R.W. Howarth, R.M. Marino, N. Ganju, P. Berg, **K. H. Foreman**, A. Giblin, K. McGlathery. (2013). Exchange of Nitrogen and Phosphorus between a Shallow Seagrass dominated Lagoon and Coastal Waters. *Estuaries and Coasts*. 37(1) DOI:0.1007/s12237-013-9699-8
5. Berg, Peter, Matthew H. Long, Markus Huettel, Jennie E. Rheuban, Karen J. McGlathery, Robert W. Howarth, **K. H. Foreman**, Anne E. Giblin, and Roxanne Marino (2013) Eddy correlation measurements of oxygen fluxes in permeable sediments exposed to varying current flow and light. *Limnol. Oceanogr.*, 58(4), 2013, 1329–1343
6. Thoms, T.* , A.E. Giblin and **K.H. Foreman** (2003). Multiple Approaches to Tracing Nitrogen Loss in the West Falmouth Wastewater Plume. *Biological Bulletin* 205:242-243.
7. Tomasky, G. J. Barak* , I. Valiela, P. Behr, L. Soucy and **K. Foreman**. 1999. Nutrient limitation of phytoplankton growth in Waquoit Bay, Massachusetts, USA: a nutrient enrichment study. *Aquat. Ecol.* 33(2):147-155.
8. **Foreman, K.H.** 1999. The Semester in Environmental Science at the Marine Biological Laboratory. *Council on Undergraduate Research Quarterly* 19:165-170.
9. Valiela, I., J. McClelland, J. Hauxwell, P.J. Behr, D. Hersh and **K. Foreman** 1997. Macroalgal blooms in shallow estuaries: Controls and ecophysiological and ecosystem consequences. *Limnol. & Oceanogr.* 42:1105-1118.
10. Kirkpatrick, J.* , **K. Foreman** and I. Valiela. 1998. Dissolved inorganic nitrogen flux and mineralization in Waquoit Bay sediments as measured by core incubations. *Biol. Bull.* 195:240-41.
11. Sardá, R., I. Valiela and **K.H. Foreman**. 1996. Decadal shifts in a salt marsh macroinfaunal community in response to sustained long-term experimental nutrient enrichment. *J. Exp. Mar. Biol. Ecol.* 205:63-81.
12. Valiela, I., P. Peckol, C. D'Avanzo, K. Lajtha, J. Kremer, W.R. Geyer, **K. Foreman**, D. Hersh, B. Seely, T. Isajui and R. Crawford. 1996. Hurricane Bob on Cape Cod: Analysis of disturbance to Waquoit Bay ecosystem. *American Scientist* 84:154-165.
13. **Foreman, K.H.**, I. Valiela and R. Sardá. 1995. Controls of benthic marine food webs. *Scientia Marina* 59 (Suppl. 1):119-128.
14. Sardá, R. and **K.H. Foreman**.(1995). Differences in benthic invertebrate assemblages in two estuaries of Waquoit Bay receiving disparate nutrient loads. *Biol. Bull.* 189:245-246.

15. Sardá, R., I. Valiela, **K.H. Foreman** (1995). Life Cycle, demography and production of *Marenzelleria viridis* (Verrill, 1873) in a salt marsh of Southern New England. *J. Mar. Biol. Assoc. U.K.* 75:725-738.
16. Sardá, R., **K.H. Foreman** and I. Valiela (1995). Macroinfauna of a Southern New England salt marsh: Seasonal dynamics and production. *Mar. Biol.* 121:431-445.
17. Giblin, A.E., **K.H. Foreman** and G.T. Banta. 1995. Biogeochemical processes and marine benthic community structure: Which follows which?, pp. 37-44. In: C. G. Jones and J. H. Lawton (eds.), *Linking Species and Ecosystems*.
18. J.L. Boxhill*, L. Santiago Vazquez*, T.R. Harrison* and **K.H. Foreman** and J.N. Kremer (1994). Daily variation in phytoplankton production in two subestuaries of Waquoit Bay, MA. *Biol. Bull.* 187:284-85.
19. Harrison, T.R.* , J.L. Boxhill*, L.Z. Santiago Vásquez*, **K.H. Foreman** and J.N. Kremer (1994). Comparison of phytoplankton and ecosystem gross production in the Quashnet River, an estuary of Waquoit Bay, MA. *Biol. Bull.* 187:287-88.
20. McDonnell, K.* , M. Rudy*, I. Valiela and **K.H. Foreman** (1994). The effect of coastal land use on inorganic nutrient concentrations in groundwater entering estuaries of Waquoit Bay, MA. *Biol. Bull.* 187:276-77.
21. Rudy, M.* , K. McDonnell*, I. Valiela and **K.H. Foreman** (1994). Dissolved organic nitrogen in groundwater entering three estuaries of Waquoit Bay, Massachusetts: correlations with coastal land mosaics. *Biol. Bull.* 187:278-79.
22. Vazquez, L.Z.* , J.L. Boxhill*, T.R. Harrison*, J.N. Kremer and **K.H. Foreman** (1994). The effects of wind speed and direction on stratification and phytoplankton production in an estuary of Waquoit Bay. *Biol. Bull.* 187:285-86.
23. Sardá, R., **K.H. Foreman** and I. Valiela (1992). Controls of benthic invertebrate populations and production of salt marsh tidal creeks: experimental enrichment and short- and long-term effects. In *Marine Eutrophication and Population Dynamics*, pp. 85-91. G. Colombo et al., Eds. Olsen & Olsen, Pub. Fredensborg, DK.
24. Valiela, I., **K.H. Foreman**, M. LaMontagne, D. Hersh, J. Costa, C.D. D'Avanzo, M. Babione, Chi-Ho Sham, J. Brawley, P. Peckol, B. DeMeo-Anderson and K. Lajtha. 1991. Coupling of watersheds and coastal waters: Sources and consequences of nutrient enrichment in Waquoit Bay. *Estuaries* 15:443-457.
25. Valiela, I., J. Costa, **K.H. Foreman**, J.M. Teal, B. Howes and D. Aubrey. 1990. Transport of groundwater-borne nutrients from watersheds and their effects on coastal waters. *Biogeochemistry* 10:177-197.
26. **Foreman, K.H.** (1989). Regulation of benthic microalgal and meiofaunal productivity and standing stock in a salt marsh ecosystem: the relative importance of resources and predation. Ph.D. Dissertation, Boston University. 224 pp.
27. Valiela, I., J. Wilson, R. Buchsbaum, C. Rietsma, D. Bryant, **K.H. Foreman**, and J.M. Teal (1984) Importance of chemical composition of salt marsh litter on decay rates and feeding by detritivores. *Bull. Mar. Sci.* 35:261-269.
28. Wiltse, W.I., **K.H. Foreman**, J.M. Teal, and I. Valiela (1984) Effects of predators and food resources on the macrobenthos of saltmarsh creeks. *J. Mar. Res.* 42:923-942.

29. Valiela, I., B. Howes, R. Howarth, A. Giblin, **K. Foreman**, J.M. Teal, and J.E. Hobbie (1982) *Regulation of primary production and decomposition in a salt marsh ecosystem*. Pages 151-168 in B. Gopal, R.E. Turner, R.G. Wetzel and D.F. Whigham, eds. *Wetlands: Ecology and Management*. Nat. Inst. of Ecology, Jaipur, and Internat. Sci. Publ.
30. Wagner, W.* and **K. Foreman** (1981) The response of benthic diatoms to the exclusion of macroconsumers. *Proc. Indiana Acad. Sci.* 91:237-246.

Technical Reports

- Barnes, J., K. Foreman, L. Poppe, B. Stumpcke, O. Zafirio (2001). Ashumet Plume Citizens Committee Water Quality Assessment: Conclusions and Program Options, Report to Town of Falmouth Board of Selectmen.
- Vallino and Foreman (2008). Effectiveness of Reactive Barriers for Reducing N-Loading to the Coastal Zone. Submitted to the NOAA/UNH Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET)

Selected Recent Abstracts and Presentations at Professional Society Meetings:

- Foreman, K., J. Vallino, A. Tucker,** C. Knauss and R.McHorney. Nitrate removal from groundwater entering an estuary by a wood-chip permeable reactive barrier: long-term performance. Coastal Estuarine Research Federation, 2017
- Erban, L.; Crusius, J.; Koopmans, D.; Giblin, A.; Kroeger, K.; Foreman, K.; Bratton, J., Radon-222 as a Tracer of Coastal Groundwater Discharge: Examining Controls on Spatial Variability of Radon-222. *Estuarine Research Federation (ERF) 2007*
- Foreman, K., R. McHorney, A. Vincent, A.,* Moreau, S.,* Anderson, M.,* Lombardo, P.; Vallino, J., Can Permeable Reactive Barriers Really Work to Remediate Groundwater-borne Nitrate Inputs to Coastal Ecosystems? *ERF 2007*
- Funk, C.; McHorney, R.; Foreman, K.; Crusius, J.; Howarth, R.; Marino, R.; McGlathery, K.; Berg, P., Watershed and Estuarine Processing of Groundwater Borne Nutrients. *ERF 2007*
- McGlathery, K.; Ferdie, M.; Berg, P.; Foreman, K.; Giblin, A.; Howarth, R.; Marino, R., Biotic Feedbacks During Eutrophication of Coastal Bays: The role of plants in the "coastal filter". *ERF 2007*
- Lombardo, P., N. Brown, J. Barnes, K. Foreman, and W. Robertson. Holistic Approach for Coastal Watershed Nitrogen Management. In Proceedings of the 2005 National Onsite Wastewater Recycling Association Annual Meeting. Conference Proceedings, Cleveland, OH, October 2005. Lowrance, R., L.S. Altier, J.D. Newbold, R.R. Schnabel, P.M. Groffman, J.M. Denver,

Selected Seminars and Invited Presentations

- Hamilton College Departmental Seminar "Innovative Solutions to Nutrient Pollution and Eutrophication in the Coastal Zone –Linking Education to Research" - February 2019
- Waquoit Bay National Estuarine Research Reserve Coastal Training Program Workshop on Using Permeable Reactive Barriers to address Nitrogen Pollution, April 2017
- Tisbury Waterways Association Annual Meeting – October 2016 *The Nitrogen Problem on Cape Cod – Sources, Sewers and Innovative Strategies for Improving Water Quality in Coastal Ponds*.
- Waquoit Bay Research Reserve - March 2012 *Wastewater problems on Cape Cod: Can Woodchips be used to Cleanup our Groundwater*.

Bard College- February 2012, *Nutrient Remediation on Cape Cod*

Brandeis University - Invited Guest Lecturer on Nitrogen Cycle in Environmental Science
Course: November, 2010, 2011, 2012

Lafayette College – November 2009, *Human Disruption of the Nitrogen: Consequences and Cures in the Coastal Zone*

Rollins College, January 2007 – *Innovative Solutions to Nutrient Pollution in the Coastal Zone.*

M.S. and Ph.D. Committee Member

Mark Lever MS 2002 *Controls on Microphytobenthic Biomass in Waquoit Bay, MA*, Boston University Marine Program)

Molly Graffam 2020 SUNY-Stony Brook School of Marine Sciences - *Biogeochemistry of Permeable Reactive Barriers and Nitrogen Removing Biofilters*

Undergraduate Senior Thesis, REU and Summer Internship Advisees

- 2022 Natalie O’Hern (Wellesley College) and Alicia Yodlowsky (PEP^β, North Carolina A&T)
Assessing impacts of sewerage on a coastal salt pond
- 2019 Boya Cui (summer intern, senior thesis) Dickinson College
- 2017 Sarah Messenger (summer intern and senior thesis) Trinity University; Research Assistant Toolik LTER at MBL Ecosystems Center, currently Ph.D. program Woods Hole Oceanographic/MIT.
- 2016 Vincent Cropper (PEP, West Virginia University)
- 2015 Wyntin Goodman (summer PEP student, University of Maryland, Eastern Shore)
- 2014 Angelique Taylor (summer PEP student, Florida Agricultural and Mechanical University)
- 2013 Jordan Allen (summer PEP student, Savannah State University, Savannah, GA)
- 2012 Collin Knauss (Senior Thesis, Colorado College, Colorado Springs, CO)
- 2010 Kenly Hiller (Senior Thesis, Connecticut College, New London, CT) –Ph.D. at U. Mass Boston 2017; currently Data Scientists Tessella Engineering/Analytics
- 2007 Margaret Waldron (Senior Thesis, Lawrence University, Appleton, Wisconsin)
- 2006 Mark Anderson (REU, San Francisco State University, San Francisco, CA)
- 2005 Jennifer Reimer (Senior Thesis, Clark University, Wooster, MA)
- 2004 Julie Hike (January Term Project Advisor, Colby College, Waterville, ME)
- 1998 John Kirkpatrick (REU, Harvard University) – Ph.D. University of Washington 2005; currently professor Evergreen State University
- 1993 Kristin Gribble (REU, Lawrence University) – Ph.D. WHOI/MIT Joint Program, currently Associate Scientist, MBL
- 1992 Gretchen Gettle (Summer Intern, Boston University Marine Program) – now Senior Lecturer Aquatic Biogeochemistry, UNESCO-IHE
- 1984 Wendy Wagner (Summer Intern, Hanover College) – now Joel A. Worsham Centennial Professor of Environmental Law, University of Texas

^β The Partnership Education Program (PEP) is a cross-institutional program intended to increase diversity in the Woods Hole scientific community by providing internships to students drawn from predominantly minority serving colleges and universities.

Public and Community Service Activities Relevant to Environmental Policy:

2021-present, member Falmouth municipal Water Quality Management Committee

2008-2021, member, Chair (2014, 2017) and Vice-Chair (2015,18,19), Town of Falmouth Zoning Board of Appeals

2002-2010, Planning Board representative to Municipal Nutrient Management Working Group providing guidance to long-ranging wastewater planning in the Town of Falmouth.

1998-2004, Municipal Nitrogen Offset Committee responsible for developing strategies for spending \$8.5 million in funds awarded to the Town of Falmouth from the Air Force Center for Environmental Excellence to mitigate N-loading to local coastal ponds.

1996-2007, Falmouth Planning Board (Chair 2002-2004) – responsible for long term municipal planning and drafting of local zoning regulations based on state statutes.

1998 – 2005, Member, Town of Falmouth Municipal Land Bank Committee responsible for prioritizing spending of \$38,000,000 in open-space funding

1998-2002, Town of Falmouth Representative to Mashpee Wildlife Refuge Management Committee

1991-2010, MBL Research Services Committee (advised MBL administration on instrumentation, services, space required to support research and education at the laboratory).

1986-2008; **2020-present**, Board of Directors, 300 Committee Land Trust (President 1991-93) – responsible for purchase and conservation of more than 2500 acres of open land.