

RACHEL R. CARLSON

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EDUCATION

2018–2022 PhD in Environment and Resources (Dec. 1, 2022)
Stanford University

Advisors: Dr. Greg Asner and Dr. Larry Crowder

Research Collaborators: Pa‘a Pono Miloli‘i, Kalanihale, Hawai‘i Marine Education and Research Center, The Nature Conservancy

2012-2013 Master’s of Science in International Politics
Trinity College, Dublin

George J. Mitchell Scholar, Class of 2013

2010-2011 Master’s of Civil and Environmental Engineering
Rice University

2007-2010 Bachelor of Arts in English (postcolonial studies), *Summa Cum Laude*
Rice University

School for International Training, Dakar, Senegal (December-May 2010)

RESEARCH INTERESTS

I am an interdisciplinary coastal ecologist who combines approaches from spatial ecology and marine governance to analyze and promote coastal resilience under climate change. I apply remote sensing, field-based methods, and data science to map and understand land-sea interactions and changes in coastal ecosystems under climate stress.

RESEARCH EXPERIENCE

Dec 2022 to present

Chancellor’s Postdoctoral Fellow, University of California, Davis at the Bodega Marine Laboratory

- Analyze freshwater impacts on ocean acidification in Washington, Oregon, and California.
- Develop remote sensing methods to create maps of coastal vulnerability and resistance to ocean acidification (climate refugia).
- Assist a large-scale, multi-agency partnership synthesizing ocean acidification data along the North American west coast in fisheries critical to coastal communities including tribes.

2018 to present

Affiliate Scientist, Center for Global Discovery and Conservation Science, Arizona State University

- Conduct coral restoration research, support K-12 educational programs, develop outreach materials, and co-instruct lessons on coral science in classrooms and work-study programs.

Winter 2021

Research Assistant, Bertarelli Program in Marine Sciences, Stanford University

- **Fieldwork:** Chagos Archipelago
- Conducted dive- and lab-based research tasks on a 5-week shipboard scientific expedition.
- Used field techniques including photoquadrats, settlement tiles, and Diver Operated Video fish monitoring and ID to assist research on the community ecology of remote reefs.

2018

Data Science Fellow, National Center for Ecological Analysis and Synthesis, UC Santa Barbara

- Analyzed geospatial data on salmon habitat and distribution using Python, R, and GDAL.
- Created metadata, conducted dataset quality control, and archived, visualized, and analyzed large raster datasets. Delivered graduate-level training in geospatial programming.

2013 to Dec 2017: Policy career. See “Government and Policy Experience”.

2012 to 2013

Graduate Independent Research, Trinity College, Dublin (Dublin, Ireland)

Research Assistant, Armed Conflict Location and Event Dataset (Dublin, Ireland)

- Conducted Master’s research on the “Resource Curse”, i.e., political violence in countries with high natural resource wealth (see Publications).
- Coded newspaper articles in sub-Saharan Africa to build a public database on political violence in developing countries (<https://www.acleddata.com/>).

2009 to 2010

Research Assistant, Dr. Pedro Alvarez lab, Rice University (Houston, TX)

- Conducted experiments on water purification using nanoparticle-coated membrane filters.
- Compared methods of removing human enteric viruses from water using iron oxides.

Spring 2009

Undergraduate Independent Research, School for International Training

- **Fieldwork:** Dakar and Kédougou, Sénégal
- Designed and led research on oral literature, postcolonial oral poetry, and transition to the written novel in West African *griot* storytellers.

Summer 2009

Center for Civic Engagement Research Fellowship, Katha Khazana school (New Delhi, India)

- Assisted education programs on drinking water and sanitation for the low-income district of Govindpuri, New Delhi.
- Conducted ethnographic and literary research on Chipko Andolan environmental movement in Uttarakhand, India.

2007 to 2009

Century Research Scholar, Dr. Robert Stein lab, Rice University (Houston, TX)

- Performed statistical, survey-based research on homeowner environmental actions.
- Investigated environmental behavior through collective-action theoretical frameworks.

POLICY and GOVERNMENT EXPERIENCE

2013 to Dec 2017

Environmental Protection Specialist (GS-13), U.S. Environmental Protection Agency
Washington, DC

- Supported watershed conservation and coastal protection projects in over 30 communities in partnership with 200+ stakeholders.
- Advised budget decisions, managed several contracts, and served as Project Officer on a large interagency agreement.
- GIS lead for nationwide Vulnerability Assessment for Harmful Algal Blooms. Awarded the EPA Gold Medal for Exceptional Service.
- Lead Coordinator (2015-16) for the Source Water Collaborative, a partnership of 27 national organizations dedicated to reducing pollutants in freshwater.
- Designed and developed DWMAPS, EPA's mapping software for pollution in drinking water.
- Assisted agency response to chemical spill in the Charleston, WV public water supply and a harmful algal bloom in Toledo, OH.
- Led technical assistance in flood resilience and equitable development (~5 cities/year) in partnership with FEMA, the U.S. Army Corps of Engineers, and local governments.
- Co-author of EPA's response to H.R. 212 (presented to Congress), a Strategic Plan for assessing and managing algal toxins.

Jan to July 2016

Presidential Management Fellow (EPA rotation), CNMI Bureau of Environ. and Coastal Quality
Saipan, Commonwealth of the Northern Mariana Islands

- Designed and developed Reef Report, a smartphone app for coral reef and water quality monitoring.
- Developed Chamorro and Carolinian (local language) versions of the app.
- Led initiative to aggregate data relevant to Environmental Impact Statements and coastal permitting. Developed inter-agency Environmental Impact Assessment review process.

2012-2013

Policy Intern, Trócaire
Maynooth, Ireland

- Assisted advocacy campaigns to improve transparency in mining, oil, and gas industries with nonprofits in Africa and Asia.
- Led trainings for international activists on implementing a new European Parliament policy for gas/mining revenue transparency (reducing revenue leakage).

2011-2012

Research Assistant, UN Food and Agriculture Organization (UNFAO)
Conakry, Guinea; Dakar, Senegal; Kedougou, Senegal

- Conducted household survey in rural villages on economic uses of riparian ecosystems.
- Led semi-structured interviews based on World Bank survey method (LSMS).
- Used findings to provide baseline data, metrics, and guidance for watershed protection pilot programs in Senegal and Guinea.

PEER-REVIEWED PUBLICATIONS

- **Carlson, R.R.**, Foo, S.A., Crowder, L.B., Burns, J., Asner, G.P. (2022). Untapped policy avenues to support coral reef protection. *PNAS*.
- **Carlson, R.R.**, Li, J., Crowder, L.B., Asner, G.P. (2022). Large-scale Effects of Turbidity on Coral Bleaching in the Hawaiian Islands. *Frontiers in Marine Science*, 1678.
- Li, J., **Carlson, R.R.**, Knapp, D.E., & Asner, G.P. (2022). Shallow coastal water turbidity monitoring using Planet Dove satellites. *Remote Sensing in Ecology and Conservation*.
- **Carlson, R.R.**, Evans, L.J., Foo, S.A., Grady, B.W., Li, J., Seeley, M., ... & Asner, G.P. (2021). Synergistic Benefits of Conserving Land-Sea Ecosystems. *Global Ecology and Conservation*, e01684.
- Frawley, T.H., Blondin, H.E., White, T.D., **Carlson, R.R.**, Villalon, B., & Crowder, L.B. (2021). Fishers as foragers: Individual variation among small-scale fishing vessels as revealed by novel tracking technology. *Fisheries Research*, 238, 105896.
- Asner, G.P., Vaughn, N., Grady, B.W., Foo, S.A., Anand, H., **Carlson, R.R.**, ... & Martin, R.E. (2021). Regional Reef Fish Survey Design and Scaling Using High-Resolution Mapping and Analysis. *Frontiers in Marine Science*, 894.
- **Carlson, R.R.** (2020). How Trump's embattled environment agency prepared me for a PhD. *Nature*.
- **Carlson, R.R.**, Foo, S.A., Asner, G.P. (2019). Land use impacts on coral reef health: a ridge-to-reef perspective. *Frontiers in Marine Science*, 562.

UNDER SUBMISSION:

- **Carlson, R. R.**, Crowder, L.B., Martin, R.E., Asner, G.P. The effect of reef morphology on coral recruitment across multiple scales.
- **Carlson, R.R.**, Klitzke, J., Reguero, B., Crowder, L.B., Asner, G.P., Daily, G.C. Coastal business perception of coral value and willingness to pay for coral restoration.
- Foo, SA, **Carlson R. R.**, Asner G.P. Environmental drivers of fish recruit populations in West Hawaii.

IN PREP:

- **Carlson, R.R.**, Sharan, T., Asner, G.P. Geographic patterns in coral size class distributions in a Hawai'i (in prep).

Reviewer of publications in: *Global Change Biology, Coral Reefs, Ecology and Society, PeerJ, Ocean and Coastal Management*

- Asner GP, Foo SA, **Carlson RR**, Martin RE (2021). Analysis of the Revised Draft Environmental Impact Statement for Hawai'i Island by the Pet Industry Joint Advisory Council. Submission to the Board of Land and Natural Resources.
- Asner GP, Foo SA, **Carlson RR**, Martin, RE (2020). Analysis of the Draft Environmental Impact Statement Regarding Issuance of Commercial Aquarium Permits and Commercial Marine Licenses for the Island of O'ahu Submitted by the Pet Industry Joint Advisory Council.
- **Carlson RR**, Grady BW, Asner GP. South Kona Initiative Region Report (2020).
- **Environmental Protection Agency** (2015). Algal Toxin Risk Assessment and Management Strategic Plan for Drinking Water: Strategy Submitted to Congress to Meet the Requirements of P.L. 114-45. Doc. 810R04003.
- **Environmental Protection Agency Office of Water** (2015). Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water. EPA Report 815-R-15-010.
- **Ground Water Protection Council** (2014). Opportunities to Protect Drinking Water and Advance Watershed Goals Through the Clean Water Act: A Toolkit for State, Interstate, Tribal and Federal Water Program Managers
- **Environmental Protection Agency Office of Water** (2015). The Learning Exchange: An Information Sharing Platform for Source Water Protection. [website/software]. < <https://sourcewatercollaborative.org/connect-with-others/learningexchange/>>.
- **Carlson, RR (2015)**. Reef Report citizen-science reporting app. [website/software] <<https://dcrm.gov.mp/resources-publications/tools-and-apps/reef-report/>>.
- **Environmental Protection Agency Office of Water** (2015). A Call to Action—A Recommitment to Assessing and Protecting Sources of Drinking Water.
- **Environmental Protection Agency Office of Water** (2015). Drinking Water Mapping Application to Protect Source Waters. [website/software] <<https://www.epa.gov/sourcewaterprotection/drinking-water-mapping-application-protect-source-waters-dwmaps>>.
- **Environmental Protection Agency Office of Water** (2015). Source to Tap: How the Clean Water Act affects your drinking water.
- **Carlson, RR** (2013). Decentralization and Domestic Conflict: Tax Strategies for Confronting the Resource Curse. [Master's thesis submitted to Trinity College, Dublin]
- **Carlson, RR**, Bedi T (2013). Capital Flight Monitoring and Advocacy. Trocaire issue report.
- **Carlson, RR** (2012). UN FAO Fouta Djallon Highlands Integrated Natural Resources Management Project: 503 GEF Rapport de stage.
- **Carlson, RR** (2010). An Ecocritical Approach to Multispecies Postcolonial Literatures. [Undergraduate thesis submitted to Rice University]
- **Carlson, RR.** (2007-2010). 6 creative-writing publications in award-winning university literary magazine, R2: The Rice Review.

HONORS

FEDERAL SERVICE AWARDS

Presidential Management Fellow, 2014-2016

USEPA Gold Medal for Exceptional Service, 2015

The highest agency honor. Granted in recognition of efforts to protect children and adults from cyanotoxins in drinking water.

USEPA Office of Water “Rising Star” Award, 2015

Awarded to one employee in the Office of Water for early career accomplishments at EPA.

USEPA Mason Hewitt Award for Excellence in GIS, 2017

Awarded to one team at the EPA for GIS technical excellence that is of national significance.

USEPA Office of Water Achievement in Science and Technology, 2014

Team award for GIS-based national vulnerability assessment on harmful algal blooms.

USEPA Office of the Administrator Bronze Medal for Commendable Service, 2017

Team award for EPA technical assistance to communities in smart-growth planning and green infrastructure.

ACADEMIC GRANTS AND AWARDS

Chancellor’s Postdoctoral Fellowship, 2022-2023

E-IPER Collaboration Grant, 2021

International Coral Reef Society Graduate Fellowship, 2020

David and Lucile Packard Graduate Research Fellowship, 2018-2022

National Science Foundation Graduate Research Fellow in Ecology, 2018-2022

E-IPER Summer Research Fund, 2019 and 2020

McGee Levorsen Research Grant, 2019

George J. Mitchell Scholarship (full tuition Master’s scholarship), 2012-2013

Rice University Trustee Distinguished Scholarship, 2007-2011

Minter Research Scholarship, 2010

Loewenstern Fellowship from Center for Civic Leadership, 2010

Louis J. Walsh Scholarship for Engineering Excellence, 2010

Samuel T. Sykes Jr. Scholarship for Engineering Excellence, 2009

Robert C. Byrd Honors Scholarship, 2007-2011

Rice University Century Research Scholarship, 2007-2009

Rice University Center for Civic Engagement Research Fellowship, 2008

TEACHING

Co-Developer and Lead Instructor	The Social Ocean (ENVRES 220), Stanford University, 2021 Graduate-level course. Topics included: community-based fisheries management, marine racial justice and decolonizing conservation, ecosystem services, and policy and legal strategies to confront ocean acidification. Faculty sponsor: Larry Crowder.
Co-Developer and Lead Instructor	The Social Ocean (ENVRES 220), Stanford University, 2022
Graduate Student Instructor	Environmental Governance (ENVRES 250), Stanford University, 2020
Guest Lectures	Stanford University: BIO 355, Coral Reefs of the Western Pacific (2020) Stanford University: ENVRES 250, Environmental Governance (2020) Santa Catalina School (2021) Arizona State University: Engineering Projects in Community Service (2022)

MENTORING AND EDUCATION

- **Hopkins Marine Station** (Monterey and Stanford, California), *Summer 2022*
Mentored lab intern Trisha Sharan in guided research on coral size class structure and seasonal coral recruitment in Hawai'i
- **Pa'a Pono Miloli'i (Miloli'i, Hawai'i), 2020 - 2021**
Mentored 4 high-school students from the Village of Miloli'i in marine research skills
- **Stanford Woods Inst. - Mentoring Undergraduates in Interdisciplinary Research (MUIR), Spring-Summer 2020**
Mentored Stanford undergraduate student Audrey Bennett in independent research on groundwater impacts on coral reefs in Hawai'i.
- **National Aquarium Volunteer (Baltimore, MD), 2016 - 2017**
Interacted with guests; designed and created live terrariums; maintained exhibits
- **826DC (Washington, DC), 2014 - 2015**
Weekend reading tutor for students in Harriet Tubman Elementary School.
- **Fighting Words (Dublin, Ireland), 2012 - 2013**
Creative writing tutor in after-school and weekend programs by Irish literary nonprofit.
- **Rice University Center for Communications Excellence (Houston, TX), 2009-2011**
Volunteer Academic Advisor and Writing Tutor. Tutored undergraduate and graduate students in English/writing, math, chemistry, physics.

SELECTED SERVICE and ACTIVITIES

LGBTQ+ IN SCIENCE

- **Equality EPA, elected Steering Committee member (Washington, DC), Jan to Dec 2018**
Provided support and guidance to LGBTQ employees, their families, and their allies in the federal government.
- **Stanford LGBTQ student mentor (Stanford, CA), 2018-2021**
Undergraduate mentor for Stanford OSTEM (“Out in STEM”); co-founded E-IQUEER, a queer student meetup group for my PhD program.

SELECTED STUDENT LEADERSHIP

- **Student Representative to faculty Executive Committee (Stanford, CA), 2020-2021**
Represented student perspectives on PhD program policies, requirements, and future direction. Interviewed new PhD program staff and participated in Committee meetings with faculty across seven Stanford schools.
- **Student Representative to Admissions Committee, Environment and Resources PhD (Stanford, CA), 2019-2020**
Read applications, interviewed PhD applicants, and coordinated student events during in-person interviews (e.g., student panel on PhD experiences).
- **President (2009-2011) and Conference Coordinator (2008-2009) Rice University Environmental Club (Houston, TX)**
 - Directed a city-wide environmental conference focused on corporate environmental responsibility.
 - Collaborated with Houston-area businesses and NGOs to stage student awareness events on environmental justice, climate change, and air pollution.
- **Editor-in-Chief (2010-2011) and Creative Nonfiction Editor (2008-2011) R2: The Rice Review (Houston, TX)**
Managed writers, editors, and artists to produce an annual literary magazine. Organized and hosted open mic nights and a reading series attracting Houston-area authors.
- **Ecological Representative, Rice University Facilities Engineering and Planning Department (Houston, TX), 2008-2010**
Managed environmental retrofits in residential colleges. Reduced waste in dining halls, implemented water-saving appliances and expanded Rice recycling program.
- **Student Policy Advisor, City of Houston Office of Environmental Programming (Houston, TX), Summer 2008**
Used survey analysis to advise city planning officials on strategies for implementing a neighborhood-based household energy conservation initiative called Grassroots Residential Energy Efficiency Now (G.R.E.E.N.).

CONFERENCE PRESENTATIONS and WORKSHOP FACILITATION

2022 Western Society of Naturalists Annual Meeting (accepted)
2022 Ecological Society of America/Canadian Society for Ecology and Evolution Joint Meeting
2022 Ocean Sciences Meeting, online
2021 International Coral Reef Symposium, online
2020 International Marine Conservation Congress Annual Conference, online
2020 Hawaii Conservation Conference (accepted, withdrawn due to COVID)
2020 Ocean Sciences Meeting, San Diego, CA
2020 Invited lecturer, Santa Catalina School, Monterey CA
2020 Panelist, Summer Undergraduate Research in Geoscience and Engineering Program, online
2017 Building Blocks for Sustainable Communities workshop Co-facilitator (2-3 day participatory planning workshops) in Brownsville, TX; Pueblo, CO; Pine Ridge, SD, Kingston, NY; Miami, FL; Wareham, MA.
2017 Brownfields National Conference, Pittsburgh, PA
2016 National Source Water Collaborative Annual Meeting, Washington, DC
2016 Nonpoint Source Managers Annual Conference, Boston, MA
2016 National Water Quality Monitoring Conference, Tampa, FL
2016 EPA Region 8 Harmful Algal Blooms Symposium, Rapid City, SD
2015 National Association of Conservation Districts Annual Conference, New Orleans, LA
2015 American Water Works Association Annual Conference and Expo, Anaheim, CA
2015 Water Quality Technology Conference, Salt Lake City, UT
2015 American Planning Association "Tuesdays at APA" panelist, Washington, DC
2014 National Association of Conservation Districts Annual Conference, Orlando, FL
2014 Groundwater Protection Council Annual Conference, Washington, DC
2014 National Source Water Collaborative Annual Meeting, Washington, DC

SKILLS and CERTIFICATIONS

Languages: French (fluent) and Wolof (proficient)

Diving: AAUS Scientific Diver; PADI Advanced Open Water Diver; PADI Rescue Diver; CPR, First Aid, and Neurological Examination certified; 225 logged dives.

Boat: Member of U.S. Coast Guard Auxiliary; Flotilla Staff Officer for Diversity & Navigation (2021)

Computer: Python, R (including Markdown and Shiny), Linux Command Line, High-Performance Computing cluster, ESRI ArcGIS, QGIS, Stata, SPSS, and US Army Corps of Engineers watershed modeling tools (HEC-RAS, HEC-HMS), InVest natural capital models, Jupyter, Git version control, metadata creation

Research Skills:

Led or assisted field research using

- Benthic surveys (line transects, photoquadrats, timed count)
- Coral settlement tiles
- Water quality sampling (temperature, depth, salinity, turbidity, Photosynthetically Active Radiation, chlorophyll, nutrients)
- Hydrodynamic drifter buoys
- Structure-from-Motion photogrammetry
- Spectroscopy
- Surveys (social science)
- Semi-structured interviews.

Piloted small boats (Bombard C4 and Inmar inflatable boats).

Led computational research using

- Remote sensing
- Lagrangian Particle Tracking
- Bayesian and frequentist statistical methods

Trainings (selected):

- Introduction to environmental DNA (eDNA) research and analysis (one week; Berlin, Germany)
- Ocean Hackweek (one week; Seattle, WA)
- Zero-inflated GAMs and GAMMs for the analysis of spatial and spatial-temporal correlated data (two weeks; online)
- Calibration & Validation for Ocean Color Remote Sensing (one week, U. Maine).

REFERENCES

Available upon request