

# HELENA M. GARCIA

Environment, Ecology and Energy Program (E3P) · University of North Carolina at Chapel Hill  
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## EDUCATION

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<b>Ph.D.</b> University of North Carolina at Chapel Hill Environment, Ecology and Energy Program Advisors: Dr. Miyuki Hino & Dr. Antonia Sebastian <i>Dissertation: Repetitive Flood Exposure, Vulnerability, and Risk Mitigation Strategies</i>	May 2026 (anticipated)
<b>M.S.</b> University of Michigan School for Environment and Sustainability, Conservation Ecology - Aquatic Sciences	2021
<b>B.C.E.</b> University of Delaware Civil Engineering, <i>Magna Cum Laude</i> Minors: Environmental Engineering & Spanish	2018

## PROFESSIONAL EXPERIENCE

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<b>Graduate Research Assistant</b> , The University of North Carolina at Chapel Hill Environment, Ecology and Energy Program; Carolina Population Center; Coastal Resilience Center <i>Research Advisors: Miyuki Hino, Antonia Sebastian, Philip Berke</i>	2021-present
<b>Doctoral Economics Intern</b> , Environmental Defense Fund Climate Resilience Research Team <i>Internship Advisors: Carolyn Kousky, Karina French, Jesse Gourevitch, Adam Gold</i>	2023
<b>Graduate Research Assistant</b> , University of Michigan School for Environment and Sustainability	2019-2021
<b>Water Resources Designer I</b> , McCormick Taylor, Inc. - Baltimore, MD	2018-2019

## RESEARCH INTERESTS

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Flood exposure & risk; Natural hazard & climate impacts; Social vulnerability; Resilience, recovery & adaptation; Geospatial statistics; Machine learning; Risk mitigation; Climate mobility; Environmental planning

## HONORS & AWARDS

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UNC E3P STREAM (Service, Teaching, Research Excellence and Mentoring) Award	2025
American Geophysical Union 2024 Outstanding Student Presentation Award, Natural Hazards Section	2025
NSF Young Investigators Award*, 8th International Conference on Flood Management	2022
*supporting attendance to workshop	
University of Michigan Dow Sustainability Fellow	2020
University of Michigan School for Environment and Sustainability Jonathan Bulkley Water Prize	2020
University of Michigan School for Environment and Sustainability Dean's Challenge Fellowship Recipient	2019
RJN Foundation Civil and Environmental Engineering Award	2018
W. David & W. Corder Teter Civil Engineering Scholarship	2016, 2017
University of Delaware College of Engineering Student of Distinction	2015, 2016

## PUBLICATIONS

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*Published in peer reviewed journals*

1. Garcia, H.M., Sebastian, A., Fitzmaurice, K.P., Hino, M., Collins, E.L., Characklis, G.W. (2025). Reconstructing Repetitive Flood Exposure Across 78 Events From 1996 to 2020 in North Carolina, USA. *Earth's Future*, 13, e2025EF006026, <https://doi.org/10.1029/2025EF006026>.
2. Smiley, A.M.H., Grimley, L.E., Garcia, H.M., Sebastian, A., Berke, P., Hino, M., Piehler, M.F. (2025). Coastal squeeze reduces nitrogen removal services provided by wetlands: insights from an interdisciplinary framework. *Environmental Research Letters*, 20(11), 114015, <https://doi.org/10.1088/1748-9326/ae0cde>.

*Submitted to peer reviewed journals*

1. Fitzmaurice K.P., **Garcia, H.M.**, Sebastian, A., Thomson, H., Zeff, H.B., Characklis, G.W. (2025). Flood impacts on the financial stability of residential mortgage borrowers: An integrated modeling approach. Under review at *Natural Hazard and Earth Systems Sciences*. Preprint: <https://doi.org/10.5194/egusphere-2025-2049>.
2. Schlumberger, J., Stolte, T., **Garcia, H.M.**, Sebastian, A., Jäger, W., Ward, P., de Ruiter, M., Šakić Trogrlić, R., Tijssen, A., Madruga de Brito, M. (2025). Stocktaking of methods for assessing dynamic vulnerability in the context of flood hazard research. Under review at *Natural Hazards and Earth System Sciences*. Preprint: <https://doi.org/10.5194/egusphere-2025-850>.
3. Gourevitch, J.D., Gold, A.C., **Garcia, H.M.** (2025). The value of wetlands in reducing flood losses. Under review at *Proceedings of the National Academies of Sciences*.
4. Khanal, K., Kaza, N., Kittner, N., Bradbury, K., **Garcia, H.M.** (2025). Characterizing solar PV exposure to flood risk in Central and Coastal North Carolina. Under review at *International Journal of Critical Infrastructure Protection*.

*Working papers*

1. Plough, J.P., Hino, M., Sebastian, A., **Garcia, H.M.**, Klass-Warch, H. Identifying Obstacles to Equitable Flood Mitigation Funding. Planned submission Fall 2025.
2. **Garcia, H.M.**, Hino, M., Frankenberg, E., Kwass-Mason, I., Sebastian, A., Anarde, K. Flooding and Residential Mobility: Longitudinal Evidence from North Carolina. Planned submission Spring 2026.

*Datasets*

1. **Garcia, H.M.**, Sebastian, A., Fitzmaurice, K.P., Hino, M., Collins, E.L., Characklis, G.W. (2024). NC Flood Extent Archive (NC-FLDEX): Flood Extent Rasters (30m) for 78 NC-FLDEX Events 1996-2020 [V5], UNC Dataverse, <https://doi.org/10.15139/S3/DOKK16>.

*Reports*

1. **Garcia, H.M.**, Murphy, L., Wendland, B., Wu, T. (2021). Assessing Equity and Environmental Justice in the Great Lakes Restoration Initiative, <https://dx.doi.org/10.7302/971>.

## PRESENTATIONS & POSTERS

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\* denotes primary presenter(s)

*Invited Talks*

1. **Garcia, H.M.\***, Sebastian A., Hino, M., Fitzmaurice, K.P., Collins, E.L., Characklis G.W. *Event-based approaches to understanding flood exposure and impacts in North Carolina*. NOAA Climate Adaptation Partnerships (CAP) monthly meeting. Virtual. May 2025.
2. **Garcia, H.M.\***, & Smiley A.M.H.\* *Incorporating Ecosystem Services into Flood Resilience Planning in New Bern, North Carolina*. North Carolina Sea Grant Advisory Board. Raleigh, NC. November 2022.
3. **Garcia, H.M.\*** *Examining Social Equity in Great Lakes Restoration*. Great Lakes International Joint Commission 210th Water Quality Board Meeting. Virtual. October 2020.

*Oral Conference Presentations*

1. **Garcia, H.M.\***, Hino, M., Frankenberg, E., Anarde, K. Repetitive Flood Exposure and Residential Mobility Trends in Eastern North Carolina. *Columbia MR2025: Mobility, Adaptation, and Wellbeing in a Changing Climate*. New York City, NY. June 2025.
2. **Garcia, H.M.\***, Fitzmaurice, K., Sebastian, A., Hino, M., Collins, E., Characklis, G.W. Risks from repetitive flood exposure: Insights from the North Carolina Flood Extent Archive (1996-2020). *2025 Association of Environmental Engineering and Science Professors (AEESP) Research and Education Conference*. Durham, NC. May 2025.

3. **Garcia, H.M.\***, Hino, M., Frankenberg, E., Anarde, K. Residential mobility patterns following repetitive food exposure in eastern North Carolina, USA. *Population Association of America (PAA) Annual Conference*. Washington, DC. April 2025.
4. Fitzmaurice, K.P.\*, **Garcia, H.M.**, Sebastian, A., Thomson, H., Zeff, H.B., Characklis, G.W. Role of Insurance, Equity, and Liquidity in the Post-Flood Financial Resilience of Residential Mortgage Borrowers. *New Orleans Forum on Climate Linked Economics at the 105<sup>th</sup> American Meteorological Society (AMS) Meeting*. New Orleans, LA. January 2025.
5. **Garcia, H.M.\***, Sebastian, A., Fitzmaurice, K.P., Hino, M., Characklis, G.W., Collins, E. L. Mapping repetitive damage hotspots in North Carolina: Insights from 78 flood events (1996-2020). *2024 North Carolina Coastal Conference*. New Bern, NC. November 2024.
6. Plough, J.P.\*, Hino, M., Sebastian, A., **Garcia, H.M.**, Klass-Warch, H. Identifying Obstacles to Equitable Flood Mitigation Funding. *Preparing for a Changing Climate Conference*, Palo Alto, CA. October 2024.
7. Fitzmaurice, K.P\*, **Garcia, H.M.**, Sebastian, A., Thomson, H., Zeff, H.B., Characklis, G.W. Role of insurance, equity, and liquidity in post-flood financial resilience of residential mortgage borrowers. *2024 American Geophysical Union (AGU) Fall Meeting*. Washington, DC. December 2024.
8. Hino, M.\*, Plough, J.P.\*. **Garcia, H.M.**, Sebastian, A. Identifying obstacles to equitable flood mitigation funding. *Association of Collegiate Schools of Planning (ACSP) Annual Conference*. Seattle, WA. November 2024.
9. Sebastian, A.\*. **Garcia, H.M.**, Zeff, H.B., Thomson, H., Fitzmaurice, K.P., Characklis, G.W. Developing a Database of Repetitive Flood Exposure to Improve Estimates of Flood Outcomes (and Other Applications) *Symposium on Hurricane Risk in a Changing Climate (SHRCC 2024)*. Honolulu, HI. June 2024.
10. Fitzmaurice, K.P.\*. **Garcia, H.M.**, Sebastian, A., Characklis, G.W. Repetitive flooding, uninsured damage, and household financial stability: a model-based evaluation of strategies for increasing insurance uptake in flood-prone, lower-income areas. *2024 NC Water Resource Research Institute (WRRI) Annual Conference*. Raleigh, NC. March 2024.
11. **Garcia, H.M.\***, Fitzmaurice, K.P., Sebastian, A., Characklis, G.W. Validation of machine learning methods for reconstructing repetitive flood damage exposure in North Carolina, 1996-2020. *2024 NC Water Resource Research Institute (WRRI) Annual Conference*. Raleigh, NC. March 2024.
12. **Garcia, H.M.\***, Fitzmaurice, K.P., Characklis, G.W., Zeff, H.B., Thomson, H., **Sebastian, A.** Validation of Machine Learning Methods for Reconstructing Repetitive Flood Damage Exposure in North Carolina, 1996-2020. *2023 American Geophysical Union (AGU) Fall Meeting*. San Francisco, CA. December 2023.
13. Quintal, H.C.\*. **Garcia, H.M.**, Cawley, M., **Sebastian, A.**, Mapping Spatially Compounding Hazards across a North Carolina County using Random Forest. *2023 American Geophysical Union (AGU) Fall Meeting*. San Francisco, CA. December 2023.
14. **Garcia, H.M.\***, Sebastian, A., Thomson, H., Zeff, H.B., Characklis, G.W. Dynamic Vulnerability: Reconstructing Historical Flood Footprints and Exposure in Eastern North Carolina. *2022 American Geophysical Union (AGU) Fall Meeting*. Chicago, IL. December 2022.
15. **Garcia, H.M.\***, Smiley A.M.H.\*., Grimley, L.E., Sebastian, A., Hino, M., Berke, P. [An interdisciplinary approach to quantifying flood mitigating ecosystems services and identifying beneficiaries in New Bern, North Carolina](#). *2022 North Carolina Coastal Conference*. Raleigh, NC. November 2022.
16. **Garcia, H.M.\***, Grimley, L.E., Smiley, A.M.H., Ruiz, J., Berke, P., Hino, M., Sebastian, A. Integrating Ecosystem Services into Flood Resilience Planning in New Bern, NC. *NSF 8th International Flood Conference on Management (NSF-ICFM8)*. Iowa City, IA. August 2022.
17. Smiley, A.M.H.\*., Grimley, L.E., **Garcia, H.M.**, Ruiz, J., Berke, P., Hino, M., Piehler, M., Sebastian, A. Integrating Ecosystem Services into Flood Resilience Planning in New Bern, NC. *Joint Aquatic Sciences Meeting*. Grand Rapids, MI. May 2022.

#### *Poster Conference Presentations*

1. **Garcia, H.M.\***, Sebastian, A., Fitzmaurice, K.P., Characklis, G.W., Collins, E.L. Event-based Flood Exposure Mapping in North Carolina, 1996-2020. *2024 American Geophysical Union (AGU) Fall Meeting*.

Washington, DC. December 2024. **2024 Outstanding Student Presentation Award (OSPA) (Natural Hazards Section)**

2. Lord, A.M.\*., Fitzmaurice, K., **Garcia, H.M.**, Sebastian, A., Characklis, G.W. Quantifying Flood-Related Mortgage Credit Risk Through Regression and Machine Learning. *2024 American Geophysical Union (AGU) Fall Meeting*. Washington, DC. December 2024.
3. **Garcia, H.M.\***, Berke, P. How resilience planning threatens poor and vulnerable communities: A case study of New Bern, North Carolina. *Association of Collegiate Schools of Planning (ACSP) Annual Conference*. Toronto, ON. November 2022.
4. **Garcia, H.M.\***, Brines, S., Do, H.X., Anderson, E., Gronewold, A. Coastal water level variability, inundation, and impacts on nearshore infrastructure. *2020 American Geophysical Union (AGU) Fall Meeting*. \*Virtual due to COVID-19. December 2020.
5. **Garcia, H.M.\***, Brines, S., Wong, B., Brown, C., Gronewold, A. Incorporating remote-sensing data to impce conceptual floodplain modeling in Southeast Michigan *International Association for Great Lake Resaerch (IAGLR) Conference*. \*Virtual due to COVID-19. June 2020.

## TEACHING & MENTORSHIP

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### Undergraduate Student Research Mentor

2023-present

Advising four undergraduate students working on research projects using geospatial data related to flood exposure, with a focus on teaching GIS skills and R for data cleaning, analysis, and visualization.

### Guest Lecture on Repetitive Flooding and Impacts in North Carolina

Fall 2025

Department of Geography and Environment, University of North Carolina, Chapel Hill, NC

GEOG 141: Geography for Future Leaders

### Guest Lecture on Climate Adaptation in North Carolina

Spring 2025

Environment, Ecology and Energy Program, University of North Carolina, Chapel Hill, NC

ENEC/PLCY 373: Confronting Climate Change in the Anthropocene: Science to Policy Solutions

### Graduate Teaching Assistant

Spring 2024

Environment, Ecology and Energy Program, University of North Carolina, Chapel Hill, NC

ENEC 201: Environment & Society; 2 sections with 18 and 13 students

## GRANTS & FELLOWSHIPS

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1. NC Sea Grant Coastal Resilience Team Competition. *Incorporating Ecosystem Services into Flood Resilience Planning in New Bern, North Carolina* (01/01/2022-12/31/2023; \$20,000). Student Team: Anne Smiley (PhD), Lauren Grimley (PhD), Helena Garcia (PhD), Jacqueline Ruiz (BA).
2. University of Michigan Dow Sustainability Master's Fellowship. *Championing Community Stormwater Solutions* (01/01/2020-12/31/2020; \$20,000). Student Team: Madeeha Ayub (MUD), Helena Garcia (MS), Collin Knauss (MBA, MS), Clare Kucera (MS, MURP), Jeremy Nyitrai (MS, MSE), Eva Roos (MLA, MS).

### Grant Participation as Student Researcher

- NSF Human-Environment and Geographic Sciences – *The effects of chronic flooding on coastal migration* (Grant No. BCS-2215195)
- DHS Coastal Resilience Center – *Identifying obstacles to equitable flood mitigation funding* (Grant No. 15STCRC00001-07-01)
- NOAA RISA Program – *Innovating a community-based resilience model on climate and health equity in the Carolinas* (NOAA-OAR-CPO-2021-2006677)
- DHS Coastal Resilience Center – *A landscape study of social equity data needs and its access and availability to support the disaster resileince of marginalized communities* (Grant No. 15STCRC00001-07-01)
- NSF Growing Convergence Research – *Climate resilience in the coastal zone* (Grant No. OIA-2021086)
- North Carolina Policy Collaboratory – *Strengthening flood resilience in Eastern North Carolina* (Session Law 2019-224)

## PROFESSIONAL SERVICE

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American Geophysical Union (AGU) Student Convener Session NH43C  
North Carolina Coastal Conference Session Convener  
Environment, Ecology and Energy Program (E3P) Seminar Series Organizer  
Graduate School Interest Advising for Undergraduates at UNC  
Manuscript reviewer: *NHESS*, *npj Natural Hazards*, *Nature Water*

Fall Meeting 2024  
November 2024  
2024  
2021-2022

## SKILLS

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Communication: Spanish (heritage speaker with some professional use)  
Software: ArcGIS, ArcGIS Pro, GitHub, Jupyter Notebooks, Overleaf, R Markdown, Quarto  
Programming: R, Python, MATLAB, Bash scripting, high-performance computing workflows (Slurm)  
Hydraulic & Hydrologic Models: HEC-HMS, HEC-RAS

## MEDIA APPEARANCES

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### 2025

North Carolina State Climate Office, One year after Hurricane Helene, new perspectives on our worst storms  
UNC News, [Hurricane season has been busy. So have Carolina researchers](#)  
CBS17 News, [Homebuyers urged to assess flood risks and insurance costs amid turbulent weather in North Carolina](#)  
WRAL News, [UNC study: 43% of flooded NC buildings were outside of FEMA's hazard zones](#)  
UNC News, [New study reveals widespread and overlooked flooding across NC](#)  
WPTF Afternoon News, [Helena Garcia, Ph.D. candidate at UNC-Chapel Hill, discusses extreme rainfall and inland flooding in North Carolina](#)  
WBTV, [UNC study reveals widespread, overlooked flooding](#)  
Spectrum News 1, [New study finds flaws in FEMA's North Carolina Flood Maps](#)  
The News & Observer, [UNC study sees flooding outside NC high-risk areas. Can AI reveal blind spots?](#)  
NBC News, [New study targets past flooding as key to helping property owners assess climate threats](#)  
WECT, [New study reveals widespread flooding across NC is more common than previously thought](#)  
NC Health News, [From flooded basements to smarter planning: What NC storm survivors can teach us](#)  
WRAL News, [Record rainfall in Chapel Hill reveals growing inland flood risks](#)  
CoastalReview, [UNC study: Repeat flooding more widespread than thought](#)  
WUNC, [FEMA floodplains determine who must get insurance. NC's are insufficient](#)

### 2022

NC Sea Grant, [NC Sea Grant Announces Winners of the Coastal Resilience Team Competition](#)  
UNC Institute for the Environment, [UNC-Chapel student team wins inaugural North Carolina Sea Grant's Coastal Resilience Team Competition](#)