Shelby M. Ahrendt

CONTACT INFORMATION

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EDUCATION

University of Washington, Seattle, WA

Ph.D., Civil and Environmental Engineering, (Expected: June, 2023)

- Thesis Title: *Hydrogeomorphic hazards: the influences of sediment on river flooding*
- Advisor: Dr. Alex Horner-Devine

St. Olaf College, Northfield, MN

B.A., Physics & Studio Art, (May 2017)

- Advisors: Dr. Brian Borovsky & Dr. Amy Kolan

STUDY ABROAD

Delft University of Technology, Delft, The Netherlands

Sept. 2021 – June 2022, dissertation research abroad

- Topic: Effects of floods on river bed elevation change in the Waal River, the Netherlands
- Advisor: Dr. Astrid Blom

Danish Institute for Study Abroad, Copenhagen, Denmark

Sept. 2015 - Dec. 2015, undergraduate semester abroad

- Architecture Foundations Studio
- Arctic Glaciology

EXPERIENCE

Graduate Research Assistant, *Seattle, WA* Sep. 2018 – Present

Conduct river basin data-studies to test for shifting river geomorphology; implement hydrogemorphic models to study sediment-driven effects on flood risk

- University of Washington, Dept. of Civil & Environmental Engineering
- Lab Group: Environmental Fluid Mechanics

Fulbright Research Fellow, *Delft, The Netherlands* Sep. 2021 – June 2022

Visiting research fellow at TU Delft, conducting dissertation research on flood hazard shifts as a result of sediment-transport and changes in river geometry

- Technical University of Delft, Dept. of Civil & Environmental Engineering
- Section: Rivers, Ports & Waterways

Groundwater Modeler, *Urbana, IL* Dec 2017 – Aug 2018

Utilized FloPy to initialize, run, and calibrate groundwater MODFLOW models; developed model frameworks to accommodate real-time field data; created IPython notebook teaching materials for FloPy

- Illinois State Water Survey, Univ. of Illinois at Urbana-Champaign
- Section: Groundwater Modeling

Undergraduate Research Assistant, *Northfield, MN* June 2016 – Aug 2016

Wrote MATLAB scripts to extract ice sheet elevation information from CrySat-2 radar altimetry data; created digial elevation model of Hercules Dome, Antarctica

- St. Olaf College, Physics Dept.
- Lab: St. Olaf Center for Geophysicsl Studies of Ice & Climate
- Advisor: Dr. Robert Jacobel

Conservation Corps Crew:
Leader (2017), Member (2014) *Estes Park, CO* May – Aug 2014, 2017

2017: Independently lead crew of six on backcountry projects including bridge design, trail construction & maintenence

2014: Collaborated with the US Forest Service to construct and maintain trails, fell hazard trees, conduct backcountry patrol and repair washout areas; completed Grade-A chainsaw sawyer training

- Rocky Mountain Conservancy Conservation Corps

Peer-Reviewed Publications

4. **Ahrendt, S. M.,** Blom, A., Van Denderen, R. P., Schielen, R. M. J., Horner-Devine, A. R., (in review) Geometric floodplain controls on riverbed elevation change within and between flood events

3. Wuming, N., Morgan, J., Horner-Devine, A., Kumar, N., **Ahrendt, S.** (submitted) Impacts of Sea-Level Rise on Morphodynamics and Riverine Flooding in an Idealized Estuary

2. **Ahrendt, S.**, Horner-Devine, A. R., Collins, B., Morgan, J., Istanbulluoglu, E., (2022) Channel Conveyance variability can influence flood risk as much as streamflow variaibility in western Washington State, *Water Resources Research.* https://doi.org/10.1029/2021WR031890

1. Morgan, J. A., Kumar, N., Horner-Devine, A. R., **Ahrendt, S.**, Istanbullouglu, E., Bandargoda, C., (2020), Simulating large-scale and long-term fluvial morphodynamics: The efficacy of using a morphological acceleration factor. *Geomorphology, 356,* p. 107088 https://doi.org/10.1016/j.geomorph.2020.107088

Conference Presentations

15. **Ahrendt, S.** (Presenter), Blom, A., VanDenderen, R. P., Schielen, R. M. J., Horner-Devine, A. R., The influence of floodplain geometry on riverbed elevation change within and between floods Poster Presentation at the Netherlands Centre for River Studies, NCR-Days Conference; April 2022; Delft, The Netherlands

14. Schwat, E. (Presenter), Knuth, F., Istanbulluoglu, E., Horner-Devine, A., Shean, D., Keck, J., **Ahrendt, S.**, Morgan, J. (2021, December). Historical Aerial Images and Structure from Motion Software Allow Repeat Measurement of Sediment Yields in Proglacial Environments, Poster presentation at the American Geophysical Union Fall Meeting; Dec 2021

13. **Ahrendt, S.** (Presenter), Horner-Devine, A., Collins, B., Morgan, J. A., Istanbulluoglu, E., Kumar, N., River morphodynamics and flood risk in Western Washington State, US Poster presented at the River, Coastal, Estuarine Morphodynamics Conference; Nov 2021; Online

12. **Ahrendt, S.** (Presenter), Horner-Devine, A., Kumar, N., Morgan, J. A., Collins, B., Istanbulluoglu, E. "Understanding Morphologic Flood Risk Relevant to River Management in Western Washington State" Oral Presentation at the American Geophysical Union Fall Meeting; Dec 2020; Online

11. Morgan, J. A. (Presenter), Kumar, N., Horner-Devine, A., **Ahrendt, S.**, Ni, W., Istanbulluoglu, E., The effect of upstream sediment supply on flood risk, Poster presentation at the American Geophysical Union Fall Meeting; Dec 2020; Online

10. Ni, W. (Presenter), Horner-Devine, A., Kumar, N., Morgan, J. A., **Ahrendt, S.**, Sun, Z. Impacts of Sea-Level Rise on Morphodynamics and Flooding in an Idealized Estuary, Poster presentation at the American Geophysical Union Fall Meeting; Dec 2020; Online

9. **Ahrendt, S.** (Presenter), Horner-Devine, Kumar, N., A., Morgan, J. A., Collins, B., Istanbulluoglu, E. River Morphology and Flood Risk in the Pacific Northwest Oral Presentation at the Community Surface Dynamics Modeling System: Summer Science Series; July 2020; Online

8. **Ahrendt, S.**, (Presenter) A. Horner-Devine, N. Kumar, J. Morgan, B. Collins, E. Istanbulluoglu, C. Bandargoda, A. Pfeiffer, How is channel capacity connected to flood risk in high sediment supply mountain basins? Oral presentation at the American Geophysical Union Fall Conference; Dec 2019; San Francisco, CA

7. Morgan, J. A. (Presenter), Kumar, N., Horner-Devine, A., Ni, W., **Ahrendt, S.,** Istanbulluoglu, E. Simulating flood risk in a lowland river with high sediment supply. Poster presentation at the American Geophysical Union Fall Conference; Dec 2019; San Francisco, CA

6. **Ahrendt, S.** (Presenter), Morgan, J. A., Horner-Devine, A., Kumar, N., Keck, J., Duan, Z., Istanbulluoglu, E., Bandaragoda, C., Collins, B., Pfeiffer, A. A mountain-to-coast hydrogeomorphic modeling framework for flood risk prediction Poster Presentation at the Comminty Surface Dynamics Modeling System Meeting; May 2019; Boulder, CO

5. **Ahrendt, S.** (Presenter), Istanbulluoglu, E., Horner-Devine, A., Mauger, G., Bandaragoda, C., Collins, B., Lundquist, J., Montgomery, D., Kumar, N., Shean, D., Pfeiffer, A., Morgan, J. A., Duan Z., Riedel, J., Kennard P., Anderson, S., Jaeger, K., Whorton E. Integrated Modeling of HydroGeomorphic Hazards (MoHGeoH): Floods, landslides and sediment Poster Presentation at the National Science Foundation PREEVENTS PI Meeting; Sept 2018; Washington D.C.

4. **Ahrendt, S.** (Presenter), Abrams, D. A Head-Specified Model; Concept Proof and Application in the Mahomet Aquifer, Presentation at the Mahomet Aquifer Consortium Meeting; July, 2018; Urbana, IL

3. Abrams, D. (Presenter), **Ahrendt, S.**, Hadley, D. Moving toward a real-time model of groundwater/surface water interactions in two heavily irrigated systems Presentation at the International Congress on Environmental Modelling and Software; June 2018; Ft. Collins, CO

2. Abrams, D. (Presenter), **Ahrendt, S.** ANIMATING THE POTENTIOMETRIC SURFACE OF A HEAVILY IRRIGATED AQUIFER, Presentation at the GSA Annual Meeting; Jan 2018; Indianapolis, IN

1. **Ahrendt, S**. (Presenter), Jacobel, Christianson, Steig, Porter (2016). A New Digital Elevation Model for Hercules Dome, Antarctica from CryoSat-2 Altimetry – Toward Site Selection for the Next Antarctic Deep Ice Core Poster presentation at the American Geophysical Union Fall Conference; Dec 2016; San Francisco, CA

Teaching & Mentoring

Research Advisor for Two Undergraduate Students June 2021 - Sept. 2022
University of Washington, Seattle, WA

- Contributed to NSF application for REU funding for undergraduate students to work on river & landslide modeling; advertised and interviewed position; operated as primary advisor for two students involving weekly check-ins, project development, and developing materials for learning Python coding and modeling

Earth Surface Processes Institute (ESPIn) Program Mentor June 2021
Community Surface Dynamics Modeling Systems Lab, Boulder, CO

- Mentored project teams in week long program on earth surface processes modeling; helped with Python coding bugs, provided programming advice and project guidance

Teaching Assistant: Hydraulics of Sediment Transport April 2021 - June 2021
University of Washington, Seattle, WA

- Lab instructor for weekly, hour-long labs on sediment-transport modeling in HEC-RAS; developed HEC-RAS project guidelins and augmented lab material; graded course homework and exams

Teaching Assistant: Hydrology & Environmental Fluid Mechanics April - June 2021
University of Washington, Seattle, WA

- Developed and taught weekly, hour-long workshops; attended synchronous virtual class sessions and facilitated in-class group work

Teaching Assistant: Intro to Fluid Mechanics Jan - March 2020
University of Washington, Seattle, WA

- Taught biweekly, hour-long workshops; ran lab sessions and office hours; proctored & graded tests; delivered class lecture on dimensional analysis

Python Workshop Instructor: ENIGMMA Program Jan 2020 - April 2020
Illinois State Water Survey, Urbana, IL

- Lead and co-led bi-weekly, two-hour workshops on using Python and FloPy for groundwater modeling; developed Jupyter Notebook Tutorials

Teaching Assistant: Introductory Astronomy Feb 2014 - May 2014
St. Olaf College Physics Dept., Northfield, MN

- Attended class lectures and facilitated in-class discussions; graded student work; set up and configured Celestron telescope equipment and instructed biweekly star-watching sessions

Honors & Awards

- ***Open Earthscape Summer Fellowship*** ($10,750) 2022
  Community Surface Dynamics Modeling System
  The University of Colorado, Boulder
- ***Fulbright Research Fellowship*** ($18,000) 2021 – 2022
  The Netherlands Fulbright Commission &
  Netherlands-America Foundation (NAF)
- ***Ann Bostrom Research Award*** ($2,500) 2021
  University of Washington
- ***NSF Graduate Research Fellowship***, Honorable Mention 2019
- ***Valle Scholarship*** 2018
  Civil & Environmental Engineering Dept.
  University of Washington, Seattle
- ***Presidential Scholarship*** 2013-2017
  St. Olaf College
- ***Sigma Pi Sigma Physics Honor Society*** 2016
  Induction: St. Olaf College Physics Dept.
- ***Academic All-American*** 2014 & 2015
  US Collegiate Ski Nationals

- ***All-American Athlete*** 2014 & 2015
  US Collegiate Ski Nationals, Nordic Skiing
  - 2014: 1st Place (Team); 7th Place (Individual) *Bend, OR*
  - 2015: 8th Place (Individual) *Lake Placid, NY*

Professional Activities & Outreach

Reviewer
Water Resources Research

Conference Organization

- CSDMS 2023 Annual Meeting Scientific Program Committee Member: 2022
  "Patterns and Processes Across Scales"
  Boulder, CO

- AGU Fall Meeting Session Co-Chair & OSPA Liason: 2022
  "Modeling Earth Surface Processes Using Community Surface-Dynamics Software"
  Chicago, IL

- NCR Days 2022: "Anthropogenic Rivers" LOC Member 2022
  Technical University of Delft, The Netherlands

- River, Coastal, and Estuarine Morphodynamics (RCEM) 2021 2021
  Session Co-Chair:
  System Response to Anthropogenic Influence and Climate Change (Online)

- Program On Climate Change Summer Institute 2020
  Climate Extremes and Climate and Environmental Equity (Online)
  Hydrology Session Co-Organizer

Invited Lectures

- University of British Columbia, Oct 2022
  "River morphodynamics and flood risk in western Washington State, US"
  Western Coastal Collaboratorium (WCC) Seminar Series

- University of Washington, Field Measurements Course May 2022
  "Stream gaging and flooding in Washington State and beyond"

- St. Olaf College, Physics Dept. Colloquium June 2022
  Landscape Evolution Modeling: Growing and Eroding Mountains using Physics & Python

- Risk and Resilience DAT\Arathon, June 2022
  Techniques for communicating code using graphics

Writing

- Student Reflections on Earth Day 2021 2021
  "Managing Water Extremes"
  The Netherlands-America Foundation Newsletter

- Valle Fellowship Quarter 1 Blog 2018
  "A Peak A Week: Quarter 1"
  Notes on Starting a Graduate Research Project

Representative
Graduate Student Steering Committee: Program on Climate Change 2020 – 2022

Volunteer

University of Washington Fulbright Program: application feedback volunteer 2022
University of Washington Engineering Discovery Days 2019

Member

Sigma Pi Sigma Physics Honor Society 2016 – Present
American Geophysical Union 2017 – Present
Geological Society of America 2017 – Present
Rocky Mountain Conservancy 2015 – 2018

Skills & Certifications

Programming:

Advanced: Python (9 yrs), Mathematica (5 yrs)

Intermediate: MATLAB (4 yrs)

Basic: HTML (2 yrs), JavaScript (1 yr), CSS (1 yr), Microsoft Excel: Visual-Basic (1 yr), GNU Octave (1 yr)

GIS Software: QGIS (5 yrs), ArcGIS (3 yrs)

Numerical Models:
Landlab (4 yrs), HEC-RAS (2 yrs), MODFLOW (2 yrs), Delft3D (1 yr)

Graphics Programs:
Adobe Illustrator, InDesign & Photoshop (9 yrs), Blender 3D-Modeling (1 yr)

Field Skills:
Backcountry navigation
Canoe & Kayak Travel
Stream gaging
Geosurveying

Certifications:
Glacial Travel & Crevasse Rescue (2019)
Wilderness First Responder (2014-2021)
Class-A Chainsaw Sawyer (2015-2018)
Lead Belay Climbing (2011-2017)