

Madeline C. Hayes

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EDUCATION:

Master of Science in Remote Sensing and Geospatial Sciences

May 2022

Boston University, Boston, MA

Bachelor of Science in Environmental Sciences

May 2019

University of Vermont, Burlington, VT

Concentration: Environmental Analysis and Assessment | **Minor:** Geospatial Technologies

Honors and Awards:

Presidential Scholar, University of Vermont

Aug 2015 - May 2019

Dean's List, University of Vermont

Fall 2018 - Spring 2019

PROFESSIONAL EXPERIENCE:

GIS Consultant

Jun 2022 - Present

ERM

- Generate, edit, and curate spatial data products for clients on complex multiyear projects in several industries, including mining, power, oil and gas, manufacturing, chemical, renewables, and government.
- Author geoprocessing scripts and tools with Python and R for daily tasks to increase production and accuracy while decreasing client cost.
- Publish and maintain web-based map services and applications, including ESRI Web Apps and PowerBI dashboards.
- Coordinate and oversee data management and database use for a variety of analyte and geological data.

Research Assistant, NASA MEaSUREs

Jan 2022 - Present

Boston University, Center for Remote Sensing

Boston, MA

- Collected training and validation data for local-to global scale annual mapping of land cover, land use, and land cover change from satellite imagery, utilizing Google Earth Engine.
- Researched land cover and land use information to ensure detailed characterization of product accuracy.

Remote Sensing Analyst and Unoccupied Aircraft Systems (UAS) Pilot

Dec 2019 - Aug 2021

Duke University, Marine Robotics and Remote Sensing Lab

- Executed UAS mapping missions to generate data products with structure from motion techniques.
- Applied remote sensing analysis techniques, including classification and change assessment, to UAS photogrammetry products.
- Created and edited vector and raster data for GIS integration and further manipulation.
- Developed deep learning models for detection and enumeration of seabirds from drone imagery with 92% average accuracy.
- Created a method to monitor turbidity from multispectral drone imagery, resulting in a forecasting model with proportionately high accuracy.

GIS Technician Team Lead and Unoccupied Aircraft Systems (UAS) Pilot

Jun 2018 - Nov 2019

University of Vermont, Spatial Analysis Lab

- Led UAS operations, including flight planning, data acquisition, data processing, and GIS integration for projects in agriculture, conservation, land cover, infrastructure, transportation, construction, and natural resources.
- Created and integrated GIS data layers to manually correct land cover data for tree canopy change detection, carbon stock estimation, impervious surface classification, pollution modeling, and building extraction, resulting in wall-to-wall high resolution land cover data and supplementary products for Vermont.
- Trained and mentored a team of 20 technicians and UAS pilots.

RESEARCH EXPERIENCE:

Remote Sensing for Water Quality Research

Jul 2020 - Jul 2021

Duke University, Marine Robotics and Remote Sensing Lab

- Collaborated with the North Carolina Department of Environmental Quality to determine utility of drone technology for water quality assessment
- Conducted multispectral drone flight operations before, during, and after dredging events
- Created a Python programming workflow to extract turbidity measurements from raw images, including radiometric calibration and georeferencing of imagery
- Generated turbidity heat maps and image mosaics for comparison to in-situ measurements

Artificial Intelligence for Seabird Population Monitoring Research

Jan 2020 - May 2021

Duke University, Marine Robotics and Remote Sensing Lab

- Processed drone imagery collected by the Wildlife Conservation Society in Argentina to generate orthorectified maps with photogrammetric techniques
- Built, trained, validated, and deployed a convolutional neural network for the automated detection and enumeration of seabirds in the Falkland Islands, Argentina
- Ran inference on entire seabird colony areas to generate automated detections
- Evaluated geostatistical techniques for breeding pair and active nest analysis

PRESENTATIONS

Hayes, M.C. (April 2021). "Deep learning and drones to automate seabird population counts," ESRI Imagery and Remote Sensing Educators Summit.

Hayes, M.C. (March 2021). "Deep learning and drones to automate seabird population counts," Drones in the Coastal Zone Workshop.

Hayes, M.C. (November 2019). "Mapping water chestnut from above," North American Lake Management Society Symposium, Burlington, VT.

Hayes, M.C. (April 2019). "Mapping water chestnut from above," University of Vermont Student Research Conference, Burlington, VT.

PAPERS

Hayes, M.C., P.C. Gray, G. Harris, W.C. Sedgwick, V.D. Crawford, N. Chazal, S. Crofts, and D.W. Johnston (2021). Drones and deep learning produce accurate and efficient monitoring of large-scale seabird colonies. *Ornithological Applications*, 123, 1-16. DOI: 10.1093/ornithapp/duab022

Hayes, M.C., B. Puckett, C. Deaton, J.T. Ridge (2021). Estimating dredge-induced turbidity using drone imagery. *Preprints*, 2022010424. DOI: 10.20944/preprints202201.0424.v1

TEACHING EXPERIENCE:

Teaching Fellow, Crises of Planet Earth

Jan 2022 - May 2022

Boston University, College of Arts and Sciences

Teaching Fellow, Introduction to Climate and Earth System Science

Sep 2021 - Dec 2021

Boston University, College of Arts and Sciences

Teaching Assistant, Intro to GIS

Aug 2018 - Dec 2018

University of Vermont, Rubenstein School of Environment and Natural Resources

SKILLS AND CERTIFICATIONS:

ESRI (ArcGIS Pro, ArcMap, ArcGIS Online), Python, SQL, R, Pix4D, Google Earth Engine

FAA Part 107 Licensed Remote Pilot, 100+ flight hours