**Matthew James McCarthy, Ph.D.**

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**EDUCATION**

**2017 Ph.D. Marine Science**

 University of South Florida

Institute for Marine Remote Sensing

**2013 M.S. Marine Science**

 University of North Carolina Wilmington

Geospatial Analysis Lab

**2009 B.A. Anthropology**

 University of Florida

Classics and Geography Minors

**EMPLOYMENT HISTORY**

**Research Associate Scientist**

June 2020 – Present

Employer: Oak Ridge National Laboratory, Oak Ridge, TN

* Working in the National Security Sciences Directorate, my primary responsibilities are managing a diverse research portfolio (USD$1.5M annually) funded by the Department of Energy and external sponsors, developing algorithms applied to high-resolution satellite and aerial EO/SAR imagery for mapping and object detection, and advancing the state-of-the-art in remote sensing research by writing proposals and developing relationships with academic, industry, and government partners.

**Postdoctoral Research Scholar**

October 2017 – June 2020

Employer: University of South Florida, Saint Petersburg, FL

* Developing new algorithms for automated remote sensing research focused on terrestrial and benthic habitat mapping, coastal geomorphology, and flood risk mapping. Processing large volumes of satellite imagery data using high performance computing cluster resources and processing scripts (e.g. Python, Matlab). Using statistical models, multi-sensor remote sensing data, and machine learning combined with object- and spectral-based techniques to assess coastal change and predict coastal evolution.

**Instructor: Tools & Techniques in Science Communication**

August 2018 – June 2020

Employer: University of South Florida, Saint Petersburg, FL

* Developing course curriculum, organizing lecture and lab materials, and teaching graduate students how to effectively communicate science to multiple audiences, including the general public, resource managers, and other scientists. Students learn communication theory, and apply it via GIS, Adobe Photoshop and Illustrator, and Audacity podcast software to create multi-media communication products.

**Instructor: Introduction to Geographic Information Systems (GIS)**

November 2016 – June 2020

Employer: University of South Florida, Saint Petersburg, FL

* Developing the curriculum for and teaching a GIS course at USF to introduce students to the Arc interface, toolbox, ArcCatalog, and to create publication-quality figures.

**Graduate Research Assistant**

August 2012 – October 2017

Employer: University of South Florida, Saint Petersburg, FL

* Developing algorithms to study water quality and wetlands using satellite and aerial imagery with spatial analysis and remote sensing techniques.
* Responsibilities include study design, data collection, database creation, data analysis, mentoring of undergraduates and visiting scholars, and synthesizing and publishing results.

**Fish and Wildlife Technician**

November 2016 – February 2017

Employer: Florida Fish and Wildlife Conservation Commission, Saint Petersburg, FL

* Developed an algorithm to improve wetland-mapping accuracy using high-resolution satellite imagery and an ad hoc processing algorithm run over the USF supercomputing cluster for the CHIMMP Wetland Mapping group.

**Graduate Teaching Assistant**

Spring 2013, Spring 2016

Employer: University of South Florida, Saint Petersburg, FL

* Ocean Policy course, taught by Dr. Frank Muller-Karger and Dr. Mark Luther
* Responsibilities include organizing course materials, coordinating with guest lecturers, leading field trips, planning and leading two trips to Washington D.C. for Capitol Hill Oceans Week

**Science Writing and Geographic Information Systems Tutor**

August 2014 – December 2015

Employer: University of South Florida St. Petersburg, Saint Petersburg, FL

* Guided students through scientific writing and GIS assignments, encouraging them to become self-directed learners

**RESEARCH EXPERIENCE**

**Oak Ridge National Lab Portfolio**

PI Roles, ORNL 2020-present

I manage a broad range of research topics all focused on algorithm development applied to geospatial problems in sectors ranging from imagery preprocessing to object detection, and bathymetry/terrain mapping to change detection. My roles include everything from project and budgetary management to code development beginning with proposal writing and ending with delivery to the sponsor.

**Coastal morphologic and oceanographic mapping and change assessment**

Postdoctoral Research, University of South Florida, 2018-2020

This postdoctoral research expands on that of my dissertation to leverage state-of-the-art satellite imagery, supercomputing resources, field data, and local knowledge to map coastal terrestrial and benthic habitats and evaluate change over time. I have pursued this research via local-scale (i.e. watershed) time-series mapping, and large-scale (i.e. Gulf-wide) 3-dimensional mapping at unprecedented 2-meter resolution. The driving motivation is to understand and model coastal evolution for predicted ecosystem and morphologic change. An area of particular interest is Florida’s Big Bend – the longest stretch of undeveloped coastline in the continental US – for use as an experimental setting largely devoid of direct anthropogenic intervention where coastal evolution constitutes a canary-in-the-coalmine regarding expected changes to more developed coasts.

**Wetland mapping in Tampa Bay**

Dissertation Project and FWC Collaboration, University of South Florida, 2016-2017

The goal of this project was to utilize the very high spatial resolution of new satellite technology to improve wetland-mapping accuracy and efficiency. I developed the project and methodology, and applied it to two study areas in Tampa Bay before expanding to cover the entire Tampa Bay watershed. Resulting wetland maps were more accurate than existing state- and federal-agency wetland maps.

**Coastal water-quality drivers**

Dissertation Project, University of South Florida, 2012-2017

Using in-situ and satellite-derived time-series of turbidity in 11 estuaries around the Gulf of Mexico, I determined the land-cover change, meteorological and oceanographic drivers of water quality trends and extreme events.

**Mapping Fiji’s coral and benthic habitats**

Collaboration with University of Fiji, Fiji, 2015-2018

Through a USAID grant, I trained researchers from Fiji in the use of spatial analysis and remote sensing data and software to map their benthic natural resources. I also traveled to Fiji for 5 weeks to guide them through a field verification and laboratory data-processing campaign.

**Remote sensing for environmental management**

Dissertation Project, University of South Florida, 2015-2017

In recognition of a reticence of environmental managers to adopt unfamiliar remotely sensed products for management use, I led a group of researchers with expertise in remote-sensing of corals, wetlands, water quality, fisheries and public health to publish a review of examples when such products had been successfully employed to accomplish management objectives. We hope it will encourage more managers to adopt this technology and its products for better management.

**Coastal habitat mapping and change detection**

Thesis Project, University of North Carolina Wilmington, 2010-2012

For my M.S. thesis, I mapped coastal habitats on a barrier island in North Carolina using multi-sensor, high-spatial resolution satellite imagery, and led a field verification campaign to evaluate accuracy and assess habitat and geomorphological change over time.

**GRANTS AND AWARDS (selection)**

**2023 FY23 NSSD Core Values Champion**, awarded for demonstrating service through his dedication to community outreach, DEI efforts, and cross-disciplinary partnerships to help advance remote sensing research for all.

**2023 Principal Investigator, DOE: $170,000**

 “Monitoring and Modeling Hydropower Capacity for Ukraine”

**2022 Principal Investigator, NGA BIGR: $500,000**

“Automated Model for Improved Mapping of Country-Scale High-Resolution Coastal Bathymetry”

**2018 Team member, NSF Big Data Spokes: $999,922**

 “Enhanced 3-D Mapping for Habitat, Biodiversity, and Flood Hazard Assessments of Coastal and Wetland Areas of the Southern US”

**2018 Co-PI, NOAA NERRS Science Catalyst Grant: $185,348**

 “Mapping Terrestrial and Benthic Habitat Change to Address Mangrove and Seagrass Migration and Die-Off in Response to Recent and Long-Term Environment Diversity”

**2018 Co-PI Microsoft® AI for Earth Azure Grant: $10,000**

 “Mapping of Florida’s Coastal Zone for Climate Change and Biodiversity Assessments”

**2015 Team member, USAID: $100,000**

 “Developing base maps of tropical aquatic resources in the Pacific”

**2012 Team member, EPA STAR: $734,122**

 “Ecological Assessment of Generalized Littoral Environments Decision-Support System”

**2016** Gulf Oceanographic Charitable Trust Endowed Fellowship in Marine Science **$10,000**

**2012** NOAA Walter B. Jones Memorial Award for Excellence in Coastal and Marine Graduate Study

**PEER-REVIEWED PUBLICATIONS**

**McCarthy, M.J.,** “Deforestation,” in *An Unflinching Look: Elegy for Wetlands*, ed. Benjamin Dimmitt (Athens, GA: University of Georgia Press, 2023), 95-98. Book chapter.

**McCarthy, M.J.**, Hughes, D., Patterson, J., Channer, M., McGee, M., Meade, S., Moss, K., and Trask, P. (2023) Automated Remote Sensing Tools to Counter Illicit Maritime Activity: Vessel Detection, Bathymetry and Topography from WorldView Imagery. *International Journal of Remote Sensing, https://doi.org/10.1080/01431161.2023.2247525*

**McCarthy, M.J.**, Otis, D., Hughes, D., and Muller-Karger, F.E. (2022) Automated High-Resolution Satellite-Derived Coastal Bathymetry Mapping. *International Journal of Applied Earth Observation and Geoinformation,* doi.org/10.1016/j.jag.2022.102693

**McCarthy, M.J.**, Dimmitt, B., DiGeronimo, S., and Muller-Karger, F.E. (2021) Forest Loss is Accelerating along US Gulf Coast. *Estuaries and Coasts,* doi.org/10.1007/s12237-021-01000-6

**McCarthy, M.J.**, Jessen, B., Barry, M., Figueroa, M., McIntosh, J., Murray, T., Schmid, J., and Muller-Karger, F. (2020) Automated High-Resolution Time Series Mapping of Mangrove Forests Damaged by Hurricane Irma in Southwest Florida. *Remote Sensing,* doi.org/10.3390/rs12111740

**McCarthy, M.J.**, Jessen, B., Barry, M., Figueroa, M., McIntosh, J., Murray, T., Schmid, J., and Muller-Karger, F. (2020) Mapping Hurricane Damage: A Comparative Analysis of Satellite Monitoring Methods. *International Journal of Applied Earth Observations and Geoinformation,* doi.org/10.1016/j.jag.2020.102134

Singh, A.A., Maharaj, A., Kumar, M., Singh, P., Singh, S., Muller-Karger, F., **McCarthy, M.**, Joseph, L., Damlamian, H., Begg, Z. (2019) Developing High Resolution Baseline Coast Resource Maps Using WorldView-2 Imagery for a Coastal Village in Fiji. *Frontiers in Marine Science,* doi.org/10.3389/fmars.2019.00207

**McCarthy, M.J.**, Radabaugh, K.R., Moyer, R.P., and Muller-Karger, F.E. (2018) Enabling efficient, large-scale, high-spatial resolution wetland mapping using satellites. *Remote Sensing of Environment*, doi.org/10.1016/j.rse.2018.02.021

**McCarthy, M.J.**, Dimmitt, B., and Muller-Karger, F.E. (2018) Rapid Coastal Forest Decline in Florida’s Big Bend. *Remote Sensing*, doi.org/10.3390/rs10111721

**McCarthy, M.J.**, Muller-Karger, F.E., Otis, D.B., and Méndez-Lázaro, P. (2018) Impacts of 40 years of land cover change on water quality in Tampa Bay, Florida. *Environmental Pollution*, doi.org/10.1080/23312041.2017.1422956

**McCarthy, M.J.**, Otis, D.B.,Méndez-Lázaro, P., and Muller-Karger, F.E. (2018) Water quality drivers in 11 Gulf of Mexico estuaries. *Remote Sensing*, doi.org/10.3390/rs10020255

Naidu R., Muller-Karger F., **McCarthy M.** (2018) Mapping of Benthic Habitats in Komave, Coral Coast Using WorldView-2 Satellite Imagery. In: Leal Filho W. (eds) Climate Change Impacts and Adaptation Strategies for Coastal Communities. Climate Change Management. Springer, Cham

Bosquilia, R.W.D., Neale, C.M.U., Duarte, S.N., Longhi, S.J., Ferraz, S.F., Muller-Karger, F.E., and **McCarthy, M.J.** (2018) Temporal evaluation of evapotranspiration for sugar cane, planted forest and native forest using Landsat 8 images and a two-source energy balance. *Computers and Electronics in Agriculture*, doi.org/10.1016/j.compag.2018.06.003

**McCarthy, M.J.**, Colna, K.E., El-Mezayen, M.M., Laureano-Rosario, A.E., Méndez-Lázaro, P., Otis, D.B., Toro-Farmer, G., Vega-Rodriguez, M., and Muller-Karger, F.E. (2017). Satellite remote sensing for coastal management: A review of successful applications. *Environmental Management*, doi.org/10.1007/s00267-017-0880-x

Méndez-Lázaro, P., Muller-Karger, F.E., Otis, D., **McCarthy, M.J.**, and Rodriguez, E. (2017). A Heat Vulnerability Index to Improve Urban Public Health in San Juan, Puerto Rico. *International Journal of Biometeorology*, doi.org/10.1007/s00484-017-1319-z

**McCarthy, M.J.**, Merton, E.J., and Muller-Karger, F.E. (2015). Improve coastal wetland mapping using very-high 2-meter spatial resolution imagery. *International Journal of Applied Earth Observation and Geoinformation*,doi.org/10.1016/j.jag.2015.03.011

Méndez-Lázaro, P., Muller-Karger, F.E., Otis, D., **McCarthy, M.J.**, and Peña-Orellana, M. (2014). Assessing climate variability effects on dengue incidence in San Juan, Puerto Rico. *International Journal of Environmental Research and Public Health,* doi.org/10.3390/ijerph110909409

**McCarthy, M.J.**, and Halls, J. N. (2014). Habitat Mapping and Change Assessment of Coastal Environments: An Examination of WorldView-2, QuickBird, and IKONOS Satellite Imagery and Airborne LiDAR for Mapping Barrier Island Habitats. *International Journal of Geo-Information,* doi.org/10.3390/ijgi3010297

**PROFESSIONAL SERVICE/MEMBERSHIP**

**2020-present** Advisory committee member: Mangrove Coast Collaborative Project

**2020-present** ASPRS Regional Board Member: Tennessee State Representative

**2020-present** ASPRS member

**2018-present** AGU member

**2015-present** AAAS member

**2023** Session Chair, ASPRS Mid-South Regional Conference

**2020-2022** Advisory committee member: Florida Red Tide Communication Team

**NON-PUBLISHED ABSTRACTS OR PRESENTATIONS (selection)**

2023 Automated Model for Improved Mapping of Country-Scale High-Resolution Coastal Bathymetry. Oral Presentation: **McCarthy, M.J.**, Stramski, D., Hughes, D., Reynolds, R., and Joshi, I. AGU Fall Meeting 2023.

2023 Maritime Geoscience for National Security:
Coastal Terrain, Emergency Response, and Counter-Trafficking. Oral Seminar: **McCarthy, M.J.** Bethune-Cookman University

2023 Maritime Geoscience for National Security:
Coastal Terrain, Emergency Response, and Counter-Trafficking. Oral Seminar: **McCarthy, M.J.** University of Tennessee Knoxville

2023 Automated remote sensing tools to counter illicit maritime activity. Oral Presentation: **McCarthy, M.J.**, and Hughes, D. GEOINT 2023.

2023 Automated High-Resolution Satellite-Derived Bathymetry. Oral Presentation: **McCarthy, M.J.**, and Hughes, D. ASPRS Mid-South Regional Conference.

2022 Automated High-Resolution Characterization of the Shoreline Environment: Elevation, Bathymetry, and Spectral Mapping. Poster Presentation: **McCarthy, M.J.**, and Hughes, D. AGU Fall Meeting 2022.

2022 Mapping Hurricane Damage and Recovery: Rookery Bay Mangroves and New Real-Time Techniques. Oral Presentation: **McCarthy, M.J.**, and Hughes, D. Restore America’s Estuaries 2022.

2022 Automated 2-Meter Resolution Satellite-Derived Bathymetry. Oral Presentation: **McCarthy, M.J.,** Otis, D., Hughes, D., and Muller-Karger, F. Ocean Sciences Meeting 2022.

2021 Automated High-Resolution Satellite-Derived Bathymetry of the Florida Keys. Oral Presentation: **McCarthy, M.J.,** and Hughes, D. ASPRS 2021 Conference.

2020 Remote Sensing for Coastal Research: Hurricanes, Sea-Level Rise, and Supercomputers. Invited Speaker: **McCarthy, M.J.** Research in Progress Seminar Series, Department of Biology, East Carolina University.

2020 Coastal Habitats Integrated Mapping and Monitoring Program workshop, St. Petersburg, FL. Oral Presentation: **McCarthy, M.J.**, Muller-Karger, F., Jessen, B., Murray, T., Schmid, J., McIntosh, J., Figueroa, M., and Barry, M., “Gulf-wide high resolution automated wetland mapping and hurricane damage assessment”.

2020 Earth Day 50 – Using Science To Predict, Plan, and Protect Florida, hosted by the Environmental Defense Fund and University of South Florida. **Dr. Matt McCarthy**, Congressman Vern Buchanan, Corey Schrodt, Dr. Mark Luther, Captain Casey Streeter, Dr. Frank Muller-Karger, Dawn Sirreffs.

2019 American Geophysical Union Fall Meeting, San Francisco, CA

 Oral Presentation: McCarthy, M.J., Muller-Karger, F., Dixon, T., Gibeaut, J., Morin, P., Murray, T., Rodgers, M., and DiGeronimo, S., “Enhanced 3-D Mapping for Habitat, Biodiversity, and Flood Hazard Assessments of the Southern US”.

2019 NERRS 2019 Annual Meeting, Charleston, SC

 Poster Presentation: McCarthy, M.J., Muller-Karger, F., Jessen, B., Murray, T., Schmid, J., McIntosh, J., and Figueroa, M., “New Technologies to Identify Coastal Habitat Change”.

2019 Coastal & Estuarine Research Federation, Mobile, AL

 Oral Presentation: McCarthy, M.J., Muller-Karger, F., Jessen, B., Murray, T., Schmid, J., and McIntosh, J., “Using Satellites and Supercomputers to Assess Wetland Degradation and Address Coastal Management Needs”.

2018 NERRS 2018 Annual Meeting, Minneapolis, MN

 Poster Presentation: McCarthy, M.J., Muller-Karger, F., Jessen, B, Murray, T., Schmid, J., and McIntosh, J., “Mapping Terrestrial and Benthic Habitat Change to Address Mangrove and Seagrass Migration and Die-off in Response to Recent and Long-term Environmental Drivers”.

2017 Ocean Carbon & Biogeochemistry Summer Science Workshop, Woods Hole, MA. Poster Presentation: McCarthy, M.J., Moyer, R., Radabaugh, K., and Muller-Karger, F., “Large-scale, high-resolution wetland mapping with satellites for improved blue carbon estimates”.

2017 Coastal Habitats Integrated Mapping and Monitoring Program workshop, St. Petersburg, FL. Oral Presentation: **McCarthy, M.J.,** Moyer, R., Radabaugh, K., and Muller-Karger, F., “Semi-automated wetland mapping using high-resolution imagery in Tampa Bay”.

2016 Symposium on Climate Change Adaptation in the Pacific Region, Lautoka, Fiji

Poster presentation: Naidu, R., Maharaj, A.A., **McCarthy, M.J.**, “Coupling satellite data with in-situ observations to classify coral reef environment in Viti Levu, Fiji”.

2016 Pacific-American Climate Fund group, University of Fiji, Lautoka, Fiji

 Oral presentation: **McCarthy, M.J.,** “Land Cover Mapping and Change Detection”.

2016 Ocean Sciences Meeting 2016, New Orleans, LA

 Poster presentation: Otis, D.B., Muller-Karger, F.E., **McCarthy, M.J.**, Méndez Lázaro, P., and Chen, F.R., “Analysis of suspended-sediment dynamics in Gulf of Mexico estuaries using MODIS/Terra 250-m imagery.”

2015 Bay Area Scientific Information Symposium, St. Petersburg, FL

 Poster presentation: **McCarthy, M.J.,** Merton, E.J., and Muller-Karger, F.E., “Coastal Wetland Mapping Using Very High-Resolution Satellite Imagery: Tampa Bay Case Study.”

2015 Coastal Habitat Independent Mapping and Monitoring workshop, St. Petersburg, FL

 Oral presentation: **McCarthy, M.J.,** Merton, E.J., and Muller-Karger, F.E., “Coastal Wetland Mapping Using Very High-Resolution Satellite Imagery: Tampa Bay Case Study.”

2014 American Geophysical Union Fall Meeting, San Francisco, CA

Oral presentation: Méndez Lázaro, P., Muller-Karger, F.E., Otis, D.B., **McCarthy, M.J.,** and Peña-Orellana, M., “Dengue Fever Trends and Climate Change in San Juan, Puerto Rico.”

2014 American Geophysical Union Fall Meeting, San Francisco, CA

Poster presentation: Otis, D.B., Muller-Karger, F.E., Méndez Lázaro, P., and **McCarthy, M.J.,** “Analysis of Coastal Sediment Plume Dynamics in Puerto Rico using MODIS/Terra 250-m Imagery.”

2014 Tampa Bay Regional Planning Council, St. Petersburg, FL

Oral presentation: **McCarthy, M.J.,** and Merton, E., “Improving Wetland Identification with Satellite Imagery: Fort De Soto Case Study”

2014 Guest lecture: Land Cover Mapping and Change Detection, presented in Dr. Frank Muller-Karger’s Remote Sensing Course, College of Marine Science, University of South Florida 3/6/2014.

2014 Guest lecture: Arc GIS Tips and Tricks, presented in Dr. Frank Muller-Karger’s Remote Sensing Course, College of Marine Science, University of South Florida 2/13/2014.

2013 Coastal and Marine Issues Presentation, Timber Pines Retirement Community D Club, Spring Hill, Fl.

2013 SouthEastern Division of the American Academy of Geographers (SEDAAG) conference, Roanoke, VA

Poster presentation: Halls, J. N., and **McCarthy, M. J.**, “WorldView-2, QuickBird and IKONOS Satellite Mapping and Change Assessment of Coastal Environments.”

2013 US Hydro Conference, New Orleans, LA

Poster presentation: **McCarthy, M.J.,** Muller-Karger, F., Chen, F., Otis, D., Méndez-Lázaro, P., “Extreme event impacts on water quality with a changing global climate.”

2012 SouthEastern Division of the American Academy of Geographers (SEDAAG) conference, Asheville, NC

Paper presentation: Halls, J. N., and **McCarthy, M. J.,** “An Integration of Satellite Imagery and LiDAR for Characterizing Change on a Barrier Island: An Example from Coastal North Carolina.”

2011 SouthEastern Division of the American Academy of Geographers (SEDAAG) conference, Savannah, GA

Graduate Honors Poster Competition: **McCarthy, M.J**., “Using Spatial Analysis Technology to Assess Habitat Change on North Carolina Barrier Islands” 3rd place finish.

2011 North Carolina Arc Users Group conference, Carolina Beach, NC

Oral Presentation: **McCarthy, M.J.,** “Using Spatial Analysis Technology to Assess Habitat Change on North Carolina Barrier Islands.”

2011 Geologic Society of America conference, Southeastern Section, Wilmington, NC

Poster Presentation: **McCarthy, M.J.,** “Predicted Habitat Inundation on Masonboro Island due to Sea Level Rise.”

2011 NC GIS conference, Raleigh NC

Oral Presentation: **McCarthy, M.J.,** “Using Spatial Analysis Technology to Assess Habitat Change on North Carolina Barrier Islands.”