

Meghan Graham MacLean

Curriculum Vitae

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Lecturer of Quantitative Ecology
Department of Environmental Conservation
University of Massachusetts - Amherst
Amherst, MA 01003

Research Associate
Harvard Forest, Harvard University
324 North Main Street
Petersham, MA 01366

EDUCATION

University of New Hampshire – Durham, NH

Doctor of Philosophy, *Natural Resources & Earth Systems Science*

December 2012

Minor: Cognate in College Teaching

Dissertation: “A multi-temporal image analysis of habitat modification in the Coastal Watershed, NH”

Advisor: Dr. Russell G. Congalton; Committee Members: Drs. Mark Ducey, Thomas Lee, Joel Hartter, and Mary Martin

University of New Hampshire – Durham, NH

Master of Science, *Natural Resources & the Environment*

December 2008

Thesis: “Evaluating accuracy issues in mapping benthic habitats: An investigation in the causes of misclassification and the importance of segmentation parameters”

Advisor: Dr. Russell G. Congalton

Clarkson University – Potsdam, NY

Bachelor of Science, double major in *Civil & Environmental Engineering, Physics*

May 2006

Study Abroad: University of South Australia, Spring 2005

RELATED WORK EXPERIENCE

Environmental Conservation Dept., University of Massachusetts – Amherst

September 2019 to present

Lecturer of Quantitative Ecology

- Taught *Introduction to Quantitative Ecology* to undergraduate students
- Planning to teach *Landscape Ecology & Conservation* and *Applied Ecological Statistics* to undergraduate and graduate students in Spring 2020
- Participate in and support the Society of American Foresters reaccreditation process for our undergraduate program

Harvard Forest, Harvard University

November 2017 to present

Research Associate

- Work with an interdisciplinary group of researchers to assess family forest owner’s forest management response to invasive forest insects
- Spatially predict how different family forest owners will respond to the Emerald Ash Borer
- Model interactions of forest insect spread, forest management, and climate change in the Connecticut River Watershed to assess how these global change drivers, and their interactions, will alter forest composition and carbon and other ecosystem functions and services

Tinkergarten

March 2017 to November 2017

Leader Community Manager

- Promoted the importance of time and learning in nature for young children, particularly within community parks and green spaces, including working with parks and greenspaces to find suitable locations for classes
- Identified learning and engagement opportunities for the 900+ Tinkergarten leaders

- Built and maintained a learning community via several online platforms and personal communications
- Helped leaders identify opportunities to engage with their local communities around the benefits of learning and playing in nature, particularly for young children (ages 18mo-8years) and new ways of communicating benefits

The School for Field Studies

October 2014 to March 2017

Assistant Dean, Office of Academic Affairs

- Collaborated with students, faculty, and staff to create inspiring field experiences for undergraduates that deepen their learning of and experiences with environmental issues
- Managed all academic aspects of program delivery for a portfolio of SFS centers across the globe, including: course content review; faculty hiring and performance review; and credit and grade approval for students
- Identified and designed new programs and courses and ensured the academics were fulfilling the strategic initiatives of SFS and met the requirements of the school of record, University of Minnesota
- Worked with centers to design Strategic Research Plans that incorporate local environmental issues and stakeholder needs into rigorous scientific research
- Maintained center budgets, determined appropriate centers for study abroad for certain students, and worked with operations and IT to ensure centers had the appropriate equipment, hardware, software and facilities
- Collaborated with student life and safety, admissions, marketing, and finance to: build enrollments, design and update marketing materials like the website, catalog, and student and faculty information packets, deal with sensitive student issues, and ensure programs run smoothly

Babson College

August 2012 to December 2014

Assistant Professor of Science, M-F

- Taught *Biodiversity and the Environment* and *Sustainable Energy Solutions*, and responsible for all aspects of course design and implementation, including lectures and laboratories
- Continued research in Forest Ecology (see below for list of projects)

Independent study advisor/co-advisor

- Designed independent student research projects
- Responsible for all aspects of mentoring and overseeing the students

Olin College of Engineering Research Experiences for Undergrads (REU) co-advisor – with Dr. Deb Chachra

- Advised two undergraduate students from different engineering undergraduate programs research and design a tool for assessing spatial thinking skills and the self-efficacy of those skills in engineering and business undergrads

University of New Hampshire

August 2007 to August 2012

Instructor of Note for *Photo Interpretation & Photogrammetry*

- Responsible for all lectures, laboratories, and grading

Appointed Head Teaching Assistant for *Introduction to Geographic Information Systems (GIS)*

- Created the syllabus for the lab portion of the course
- Trained and guided three Teaching Assistants
- Taught two, three-hour in-depth lab sections per week and held all grading responsibilities

Teaching Assistant and lecturer in *Photo Interpretation & Photogrammetry*, *Remote Sensing of the Environment*, and *Introduction to GIS*, and guest lecturer in *Advanced GIS* and *Digital Image Processing*

Mentor for the Basic and Applied Spatial Analysis Lab (BASAL)

- Helped organize and advise three undergraduate and four graduate students

GIS and Remote Sensing consultant for the Natural Resources and the Environment Department

- Working with scientists of various levels of education and experience to help them use remote sensing and GIS appropriately within their own research

RESEARCH EXPERIENCE

New England Future Scenarios and Carbon

September 2019 to Present

- Model recent trends in forest management throughout New England based on recent harvesting trends in FIA and other sources, as well as changes in management that are appropriate for the stakeholder defined narratives
- Estimate the carbon consequences, using a carbon accounting approach, of each of the land use decisions in each of the scenarios

Forest Insects and Family Forest Owner Management

November 2017 to Present

- Collaborate with interdisciplinary scientists to create a model of family forest owner management response to invasive insects
- Model the current and future spread of a few example invasive insects: hemlock woolly adelgid (*Adelges tsugae*), emerald ash borer (*Agrilus planipennis*), and European gypsy moth (*Lymantria dispar*) within the Connecticut River Watershed in New England
- Model effects of introduced insects and climate stressors on host tree species using Landis-II – a mechanistic forest growth and development model
- Model the interacting effects of these invasive insects, family forest owners' management decisions, and climate change and how these interactive effects may lead to alterations of forest management rates and long term trajectories of forest biodiversity and carbon

Maple Sugar Production in New England Future Scenarios

November 2018 to Present

- Use five future scenarios of changes in land use and harvest regimes within New England to predict the potential of the maple sugar industry in the next 50 years

Evaluating the Impact of *A. manicatum* on Local Ecosystems

January 2013 to February 2018

- Assess the current spread of the invasive European Wool Carder Bee (*Anthidium manicatum*)
- Determine which geographical features (e.g. land cover type or measures of urbanization) best predict the distribution of the species within New England and New York state
- Use MaxEnt and ArcGIS to model the predicted distribution of *A. manicatum*
- Design a weighted sampling method to evaluate the accuracy of the initial MaxEnt model, create a more refined model of distribution, and assess the correlation between the location of the invasive species and native bumble bees

Experiential Education in the Sciences

September 2012 to December 2017

- Design, implement, and assess science courses with a large experiential component for non-science majors
- Design and implement a new science curriculum that is not only focused on experiential education, but also builds from course to course while also allowing for student choice
- Work with local stakeholders from around the globe to identify the most pressing environmental issues of the locale and the challenges to implementing change, as well as design coursework and research around these topics
- Devise best teaching practices for environmental courses being taught abroad with an interdisciplinary cohort of students and design qualitative and quantitative methods for assessing learning

Measuring Forest Edge Depth using LiDAR

January 2014 to January 2017

- Devised a new method for identifying areas that would qualify as "edge" within the Harvard Forest, in Petersham MA, using LiDAR
- Used Photosynthetically Active Radiation (PAR) and vegetation composition to identify edge depths along transects in the field
- Assessed the ability of aerial LiDAR to identify edge similar edge depths along the field measured transects

Spatial Assessment of Mountain Mint as a Pest Deterrent

March 2013 to October 2013

- Designed protocol for assessing the spatial effects of mountain mint (*Pycnanthemum muticum*) as a pest deterrent in an organic apple orchard
- Planted mint and used a variety of insect sampling protocol (e.g. sweep netting, bee bowls, sticky traps, damage assessment) to assess pest, predator, and pollinator diversities and abundances

Forest Fragmentation and Invasive Plants in New Hampshire January 2009 to August 2015

- Monitored land cover change using new image processing techniques, such as object-based image analysis
- Assessed different land use/land cover change detection methods
- Determined if forest fragmentation was a significant predictor of woody invasive species location in coastal NH
- Developed a new forest fragmentation software program (PolyFrag) in Python to be used within ESRI's ArcGIS
- Tested PolyFrag against existing forest fragmentation programs such as FRAGSTATS
- Collaborated with scientists with various levels of training and with the NH chapter of The Nature Conservancy for the data use and transfer of results

Sampling Methods for Forest Stands

January 2009 to January 2013

- Used the R statistical software package to run a bootstrapping method for determining the appropriate number of prism samples needed within a forest stand when identifying forest cover type within stands delineated using object based image analysis methods
- Collected field data regarding forest stand composition using a GPS and a Trimble Yuma

Benthic Habitat Mapping

August 2007 to December 2008

- Used remote sensing techniques, object-based image analysis, GIS, and statistical analyses to determine differences between two maps of benthic habitats
- Collaborated with scientists at government and private agencies to determine causes of errors in benthic maps

PEER-REVIEWED PUBLICATIONS & MANUSCRIPTS

Thompson, J.R., J. Plisinski, K. Fallon-Lambert, M. Duveneck, L. Morrale, M. McBride, **M.G. MacLean**, M. Weiss, L. Lee, *in press*. Spatial simulation of co-designed land-cover change scenarios in New England: Alternative futures and their consequences for conservation priorities. *Earth's Future*.

MacLean, M.G., J. Holt, M. Borsuk, M. Markowski-Lindsay, B.J. Butler, D.B. Kittredge, M.J. Duveneck, D. Laflower, D. Orwig, J.R. Thompson, *in review*. Potential impacts of insect induced salvage harvests in mixed forests. *Forests*. <https://doi.org/10.3390/f11050498>

Beaury, E.M., A. Barker-Plotkin, C. Brown-Lima, E.J. Fusco, B. Griffin, S. Jourbran, B.B. Laginhas, **M.G. MacLean**, L. Munro, M. Nelson, S. Talbot, B.A. Bradley, 2020. Regional Invasive Species & Climate Change Management Challenge: Taking Action. Managing invasive species in the context climate change. RISSC outreach publication. <https://doi.org/10.7275/k8q5-4f71>.

Markowski-Lindsay, M., M. Borsuk, B.J. Butler, M.J. Duveneck, J. Holt, D.B. Kittredge, D. Laflower, **M.G. MacLean**, D. Orwig, and J.R. Thompson, 2020. Compounding the disturbance: Family forest owner reactions to invasive forest insects. *Ecological Economics*. 167. DOI: 10.1016/j.ecolecon.2019.106461.

Holt, J., **M.G. MacLean**, M. Borsuk, M. Markowski-Lindsay, B.J. Butler, D.B. Kittredge, D. Orwig, D. Laflower, J.R. Thompson, 2019. Classifying landowners into functional types to characterize responses to forest insects. *People and Nature*. DOI: 10.1002/pan3.10065

Graham, K.K., and **M.G. MacLean**, 2018. Presence-only modeling is ill-suited for a recent generalist invader, *Anthidium manicatum*. *Ecological Indicators*. 89:56-62. DOI: 10.1016/j.ecolind.2018.02.002

MacLean, M.G., 2017. Edge influence detection using aerial LiDAR in Northeastern US deciduous forests. *Ecological Indicators*. 72:310-314. DOI: 10.1016/j.ecolind.2016.08.034

MacLean, M.G., H. Hertler, and M. Seifert, 2016. Undergraduate research at The School for Field Studies (SFS) Center for Marine Resource Studies in the Turks and Caicos Islands. In: How Undergraduate Research Advances Science Policy, Spring *CUR Quarterly*. 36(3):21-27. DOI: 10.18833/curq/36/3/3.

MacLean, M.G., and R.G. Congalton, 2015. A comparison of landscape fragmentation analysis programs for identifying possible invasive plant species locations in forest edge. *Landscape Ecology*. 30(7):1241-1256. DOI: 10.1007/s10980-015-0175-7.

Winrich, C., V.L. Rodgers, **M.G. MacLean**, D.M. Blodgett, and J. Schaefer, 2015. Science Education as Entrepreneurial Thought and Action® Methodology. In V.L. Crittenden, K. Esper, N. Karst, and R. Slegers (Eds.) *Evolving*

Entrepreneurial Education: Innovation in the Babson Classroom (pp. 159-174). Bingley, UK: Emerald Group Publishing Limited.

- MacLean, M.G.**, and R.G. Congalton, 2013b. PolyFrag: A vector-based program for computing landscape metrics. *Journal of GIScience and Remote Sensing*. 50(6):591-603.
- MacLean, M.G.**, and R.G. Congalton, 2013a. Applicability of multi-date land cover mapping using Landsat 5TM imagery in the Northeastern US. *Photogrammetric Engineering & Remote Sensing*. 79(4):359-368.
- MacLean, M.G.**, M.J. Campbell, D.S. Maynard, M.J. Ducey, and R.G. Congalton, 2013. Requirements for prism sampling polygons in an object-based image analysis classification. *International Journal of Remote Sensing*. 34(7):2531-2547.
- MacLean, M.G.**, 2012. A multi-temporal image analysis of habitat modification in the Coastal Watershed, NH. PhD Dissertation, University of New Hampshire, Durham, NH. 178 pp.
- MacLean, M.G.** and R. Congalton, 2011. Investigating issues in map accuracy when using an object-based approach to map benthic habitats. *Journal of GIScience and Remote Sensing*. 48(4):457-477.
- Graham, M.**, 2008. Evaluating accuracy issues in mapping benthic habitats: an investigation in the causes of misclassification and the importance of segmentation parameters. MS Thesis, University of New Hampshire, Durham, NH. 113 pp.

PRESENTATIONS

- MacLean, M.G.** 2019. Impacts of invasive species, RISCC network representative. Invited webinar for the Yellowstone Coordinating Committee – Invasive Species Subcommittee. 23 October 2019.
- MacLean, M.G.**, 2019. Land Use and Land Cover Change. Invited guest lecture in: Global Change Biology, 3 October 2019, UMass-Amherst, Amherst, MA
- MacLean, M.G.**, 2019. Reading Journal Articles like a Pro – a Harvard Forest REU workshop. 11 July 2019. Harvard Forest, Petersham, MA.
- MacLean, M.G.**, 2019. Careers in science – Arnold Arboretum of Harvard University REU lunch series. 9 July 2019. Harvard University, Boston, MA.
- MacLean, M.G.** and J. Thompson, 2019. The potential impacts of insect induced harvests in mixed forests. In: *North American Forest Ecology Workshop*, 23-27 June 2019. Flagstaff, AZ.
- MacLean, M.G.** and B. Butler, 2019. Changing dynamics for Family Forest ownerships in the northeastern US. In: *NESAF Annual Winter Meeting*, 27-29 March 2019. Burlington, VT.
- MacLean, M.G.**, M. Markowski-Lindsay, J. Holt, B.J. Butler, D.B. Kittredge, M. Borsuk, M.J. Duveneck, D. Laflower, D.A. Orwig, D.R. Foster, J.R. Thompson, 2019. Potential impacts of insect-induced salvage harvests in mixed forests of New England (poster). In: *2019 Harvard Forest Symposium*, 19 March 2019. Petersham, MA.
- MacLean, M.G.**, J. Rapp, and M. Duveneck, 2018. What happens to maple syrup in the different New England Landscape Futures scenarios? In: *S3 RCN Capstone Meeting*, 14-15 November 2018. UMass-Amherst, Amherst, MA.
- MacLean, M.G.**, G. Lovett, D. Orwig, and J. Thompson, 2018. Interactions of Forest Insects and Pathogens with other Global Change Drivers. In: *Long Term Ecological Research Network All Scientists' Meeting*, 30 September – 4 October, 2018, Pacific Grove, CA.
- MacLean, M.G.**, M. Duveneck, D. Laflower, A. Chmurzynski, J. Thompson, 2018. The importance of interacting global change drivers when modeling forest disturbance in New England. In: *2018 Ecological Society of America Annual Meeting*, 5-10 August 2018, New Orleans, LA.
- MacLean, M.G.**, 2018. Mapping forest edge - successes and challenges. In: *Harvard Forest Seminar Series*, 15 February 2018. Harvard Forest, Petersham, MA.
- MacLean, M.G.**, 2018. Modeling Emerald Ash Borer (EAB) Spread. Guest lecture and lab at the Conway School, 30 January & 6 February 2018, Easthampton, MA.

- MacLean, M.G.**, 2016. Quantifying remaining core forest: LiDAR as a new method for mapping edge. In: *2016 Ecological Society of America Annual Meeting*, 8-12 August 2016, Ft. Lauderdale, FL.
- MacLean, M.G.** and M. Seifert, 2016. User-inspired and place-based field research at the School for Field Studies. In: *The Council on Undergraduate Research Biennial Conference 2016*, 26-28 June 2016, Tampa, FL.
- Winrich, C. and **M.G. MacLean**, 2015. Electricity: Generating interest in Physics and Sustainability. In: *2015 American Association of Physics Teachers Winter Meeting*, 3-6 January 2015, San Diego, CA.
- MacLean, M.G.**, 2014. Mapping forest edge using aerial LiDAR. In: *2014 American Geophysical Union Fall Meeting*, 15-19 December 2014, San Francisco, CA.
- MacLean, M.G.** and R. Congalton, 2013. Predicting woody invasive species presence using a new fragmentation program: PolyFrag. In: *American Society of Photogrammetry & Remote Sensing 2013 Annual Conference*, 24-28 March 2013, Baltimore, MD.
- MacLean, M.G.**, 2013. Spatial Data and Geographic Information Systems: Their uses in both ecology and business. In: *Babson Science Seminar Series*, 21 February 2013, Babson College, Babson Park, MA.
- MacLean, M.G.** and R. Congalton, 2012b. Map accuracy assessment issues when using an object-oriented approach. In: *American Society of Photogrammetry & Remote Sensing 2012 Annual Conference*, 19-23 March 2012, Sacramento, CA.
- MacLean, M.G.** and R. Congalton, 2012a. Creating land cover maps from single or multi-date images: Which are more accurate? In: *Association of American Geographers 2012 Annual Conference*, 24-28 February 2012, New York, NY.
- MacLean, M.G.**, 2011. Spatial thinking and Landscape Ecology in Southeastern New Hampshire. Invited talk in: *Tufts University Ecology Reading Group Meeting*, 16 December 2011, Tufts University, Medford, MA.
- MacLean, M.G.**, 2011. Determining the appropriate number of prism samples in Northeastern forest stands for collecting remote sensing reference data. In: *Northeastern Mensurationists Organization 2011 Annual Meeting*, 2-4 October 2011, Quebec City, Quebec, CA.
- MacLean, M.G.** and R. Congalton, 2011. Using object-oriented classification to map forest community types. In: *American Society of Photogrammetry & Remote Sensing 2011 Annual Conference*, 1-5 May 2011, Milwaukee, WI (Bethesda: American Society for Photogrammetry and Remote Sensing), 10 pp.
- MacLean, M.G.** and R. Congalton, 2010. Mapping and analysis of fragmentation in southeastern New Hampshire. In: *American Society of Photogrammetry & Remote Sensing/Cartography & GIS 2010 Fall Specialty Conference*, 15-19 November 2010, Orlando, FL (Bethesda, American Society for Photogrammetry and Remote Sensing), 5 pp.
- MacLean, M.G.**, A. Rudko, and R. Congalton, 2010. Multi-temporal image analysis of the Coastal Watershed, NH. In: *American Society of Photogrammetry & Remote Sensing 2010 Annual Conference*, 26-30 April 2010, San Diego, CA (Bethesda: American Society for Photogrammetry and Remote Sensing), 7 pp.
- Graham, M.** and R. Congalton, 2009b. A comparison of the 1992 and 2001 National Land Cover Datasets in the Lamprey River Watershed, NH. In: *American Society of Photogrammetry & Remote Sensing/Management Association for Private Photogrammetric Surveyors 2009 Fall Conference*, 16-19 November 2009, San Antonio, TX (Bethesda: American Society for Photogrammetry and Remote Sensing), 8 pp.
- Graham, M.** and R. Congalton, 2009a. Evaluating issues in map accuracy: A study of mapping benthic habitats on the Texas gulf coast. In: *American Society of Photogrammetry & Remote Sensing 2009 Annual Conference*, 9-13 March 2009, Baltimore, MD (Bethesda: American Society for Photogrammetry and Remote Sensing), pp. 23-34.

AWARDS, HONORS, GRANTS, & FELLOWSHIPS

- UMass Amherst Mutual Mentoring Team Grant recipient (PI: R. Green, \$6,000, 2020-2021)
- New England Landscapes Futures module development grant (\$1,830, 2020)
- AZURE AI for Earth Grant recipient (\$15,000 in cloud computing, 2018)
- Babson Faculty Research Fund Summer Stipend and Research Grant (\$11,674.20, 2014-2015)
- Babson Faculty Research Fund Mini-Grant (\$2,500, 2013)
- Organized, implemented, and received funding for three SFS faculty led crowd-funded research projects (2016)

- 3rd Place, 2014 ERDAS Award for Best Scientific Paper in Remote Sensing for: Applicability of Multi-date Land Cover Mapping using Landsat 5TM Imagery in the Northeastern US, PE&RS, 79 (4), 359-368.
- Elected Chair of the American Society for Photogrammetry & Remote Sensing (ASPRS) Student Advisory Council (2010)
- Invited Speaker for a general session at the ASPRS/CaGIS 2010 Fall Specialty Conference, Orlando, FL
- Robert N. Colwell Memorial Fellowship (2012)
- Summer Teaching Assistant Fellowship (Summers 2008, 2009, 2010, 2011)
- NH Agricultural Experiment Station Grant MS-60 (under R. Congalton)
- Travel grants from the UNH Graduate School (2009, 2010, 2011)
- Travel grants from the Farrington Fund (2009, 2010, 2011)

PROFESSIONAL SERVICE

- Co-lead of the Harvard Forest Working Group on Diversity and Inclusion (2018-2019)
- Property steward for Kestrel Land Trust (MA), Southeast Land Trust (NH), (various years 2011-present)
- Served on the Babson Sustainability Committee and interim Math and Science Division representative to the Faculty Senate (2014)
- Coordinated and invited speakers for the Babson Science Seminar Series (2014)
- ASPRS Publications Committee Chair (2013-2014)
- Initiated and organized the first Annual GeoLeague competition between students in ASPRS (2011)
 - The competition poses a problem to the students of ASPRS that must be solved spatially, 5 teams competed in the first year
 - For the first year, I designed the problem as well as encouraged students groups and institutions to participate, and solicited donations for awards and prizes for the winning teams
- Student Assistant for the Annual and Fall ASPRS Conferences from 2009 to Spring 2011
 - Organized speakers and ensured that sessions in the conference ran smoothly
- Moderator for sessions in the Annual and Fall ASPRS Conferences from 2010 to 2013
- Referee for several journals: e.g. Landscape Ecology, Photogrammetric Engineering & Remote Sensing, International Journal of Remote Sensing, Forests
- Book reviewer for ASPRS (2013)
- Book reviewer for the Manual of Geographic Information Systems (Madden, 2009)
- Volunteer for Great Bay Discovery Center, Great Bay National Estuarine Reserve, UNH Tech Camp, Science Club for Girls, and Tufts Grad Student Outreach to local Schools