

# Emma J. Hudgins, PhD

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## Education

**Establishment:** McGill University (September 2016 – September 2020)

**Program of Study:** PhD in Biology

**GPA:** 4.00

**Funding Earned:** NSERC Alexander Graham Bell CGS-D (\$105,000 over 3yr)

**Supervisory Committee:** Brian Leung (Supervisor), T. Jonathan Davies, Patrick M. A. James

**Project Description:** I aimed to build general multispecies models for the various stages of species invasions that are applicable at the large scales. My research has focused on both a more descriptive understanding the initial establishment and dispersal phases of invasions and delineating the impacts caused by species across space and time, to more prescriptive analyses of optimal management practices to control invasive spread and limit economic losses. I am interested in uncovering broad generalities that emerge across species in spite of their idiosyncrasies, as a consequence of anthropogenic processes. My current study system is invasive forest pests, where human transport (via firewood and analogous mechanisms) is the main source of these largescale generalities.

**Establishment:** McGill University (September 2015 – August 2016)

**Program of Study:** MSc in Biology

**GPA:** 4.00

**Funding Earned:** NSERC Alexander Graham Bell CGS-M (\$17,500 over 1yr)

**Supervisory Committee:** Brian Leung (Supervisor), T. Jonathan Davies, Patrick M. A. James

**Project Description:** Same as above (Fast-tracked to PhD after 1yr)

**Establishment:** McGill University (August 2011- May 2015)

**Program of Study:** Bachelor of Science, Biological, Biomedical and Life Sciences: Honours Biology, Minor Environment

**Graduating CGPA:** 3.97 (First Class Honours, Dean's Honour List)

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## Teaching

**Course:** BIOL 373 - Biometry (Fall 2015, 2016, 2017, 2018, 2019)

**Institution:** McGill University

**Description:** An accelerated biostatistics course intended for students pursuing undergraduate research. Includes lectures on statistical theory and computer labs focusing on the R programming language.

**Roles:** Led laboratory sessions, held office hours, graded assignments, lab reports, exams, attended to online discussion boards, designed exam questions. Guest lectured once per term. Acted as a replacement lecturer for one lecture in Fall 2019.

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**Course:** ENVR 202 – The Evolving Earth (Winter 2015, 2016, 2017, 2019)

**Institution:** McGill University

**Description:** An introductory environmental science course spanning themes of ecology and evolution, geography, geology, and atmospheric science in lecture format.

**Roles:** Graded exams, assignments and papers, held office hours, led tutorial lectures, attended to the online discussion board.

**Course:** BIOL 308 – Ecological Dynamics

**Institution:** McGill University

**Description:** An intermediate course covering topics in population ecology and dynamic ecological models. Included lab assignments conducted using MATLAB.

**Roles:** As an undergraduate TA, I assisted in lab and tutorial sessions and acted as a resource for student questions.

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## Academic Work Experience

**Dr. Eve McDonald-Madden Lab, University of Queensland (February 2018-May 2018)**

**Position:** Visiting Scholar

**Responsibilities:** I completed a 3-month research term at UQ in Brisbane, Australia to develop my skills in decision theory and optimization as it applies to invasive species management. I interacted with many members of the Centre for Excellence in Environmental Decisions, spearheaded by Dr. Hugh Possingham, the current Chief Scientist at The Nature Conservancy. I also travelled to the Universities of Melbourne and of New South Wales to network with researchers across applied ecological fields. It was during this time that I learned how to use Python to write my own GUROBI optimization programs to solve conservation decision problems.

**Dr. Brian Leung Lab, McGill (September 2014-May 2015)**

**Position:** Honours Researcher

**Responsibilities:** I worked on an Honours project focusing on the creation of a modified regression model technique for invasive forest pest spread across the United States validated through theoretical simulations.

**Canadian Rivers Institute (CRI), University of New Brunswick (May 2012 – September 2015)**

**Position:** Summer Student (3 NSERC USRAs)

**Responsibilities:** I aided graduate students in their various applied freshwater ecology projects. This included creating GIS maps of fish species distributions by creating a database of catch records, assessing the effect of a hydroelectric dam on salmon passage at various life stages, measured the bathymetry and abiotic conditions of a river downstream of a dam, assessing the potential for a commercial Brown Bullhead fishery in the province of New Brunswick, developing a preliminary lake classification system for New Brunswick based on community assessments of representative lakes in the province, confirming the presence of a rare fish (Redbreast Sunfish) in the province, and assessing the effectiveness of stocking Atlantic salmon fry in one river.

**Dr. Anthony Ricciardi Lab, Redpath Museum, McGill (January 2014-May 2014)**

**Responsibilities:** I worked on an independent research project studying the behaviour of *Gammarus pulex*, an invasive amphipod species in Ireland, in response to brown trout chemical cues. I worked under the supervision of a PhD

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student (Josephine Iacarella) in Dr. Ricciardi's lab. I collected over 60 hours of behavioural data while coding the amphipod behaviour in JWatcher, and built general linear models in R for statistical analysis. Josephine and I published the paper we produced from this project in the Canadian Journal of Fisheries and Aquatic Sciences.

**Dr. David Green Lab, Redpath Museum, McGill (January 2013-May 2013)**

**Responsibilities:** I measured American and Fowler's toads using calipers and mined morphological data from online museum databases for a PhD student's (David O'Connor) phylogeography project.

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**Non-Academic  
Work  
Experience**

**Tierra Co. (February 2020-Current)**

**Position:** Independent Statistical Consultant

**Responsibilities:** Providing quantitative expertise to a Mexico City – based security insights firm.

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**Volunteerism  
and Service**

**Carleton Biology Department Board (Sept 2020-Current)**

**Position:** Alternate postdoc representative

**Responsibilities:** Representing postdoctoral fellows and research associates at board meetings and voting on relevant issues.

**McGill Biology Graduate Students Association (Sept 2019-Sept 2020)**

**Position:** Social Media Representative

**Responsibilities:** I am responsible for updating the BGSA Facebook, Twitter, and Instagram pages with content related to our events and initiatives.

**Faculty of Science Committee on Equity and Climate, McGill University (September 2019-Current)**

**Position:** Graduate student representative

**Responsibilities:** Representing graduate science students on a faculty-wide committee of undergraduate, graduate, staff and faculty members dedicated to addressing issues of inequity, bias, and improving workplace climate at McGill University.

**Postgraduate Students Society of McGill University Equity Committee (September 2017 – May 2020)**

**Position:** Biology Graduate Student Representative

**Responsibilities:** Informed the graduate school- wide committee of current issues facing Biology graduate students relating to equity and diversity. Helped plan equity-focused events, drafted graduate student statements on equity issues relevant to McGill and Quebec, helped draft a sexual assault policy for graduate students applicable outside of a purely academic context, assisted in an accessibility audit of graduate student spaces.

**Biology Department Day and Equity Workshop (3 events from 2017-2019)**

**Position:** Co-organizer

**Responsibilities:** Planned an equity, diversity and inclusion workshop for graduate Biology students with the help of McGill's Provost's office. Secured funding for the event and planned catering, student oral presentations, poster sessions, professor debates, and photography competitions.

**STEMM Diversity @ McGill (September 2017-November 2017)**

**Position:** Volunteer and speaker

**Responsibilities:** I helped access library archives for photos of women and

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persons of colour who had previously graduated from McGill in STEM fields to display at the STEM Diversity @ McGill event launch. I also spoke at the launch about my work with the Equity in STEMM Working Group and lobbied for increased equity infrastructure across the Faculties of Science and Medicine.

**Equity in STEMM Working Group (January 2016-Current)**

**Position:** Co-founder

**Responsibilities:** This working group was founded in response to several equity and diversity-related incidents across the Faculties of Science and Medicine at McGill. The group met regularly to draft letters to the faculties to demand increased equity training infrastructure for students, staff and faculty in order to limit instances of discrimination build healthy communities across departments. The working group was instrumental in prompting the Faculty of Science and Medicine to create their own Faculty-level equity committees. The committee also worked to increase equity and diversity programming, representation, and constitutional considerations across STEMM graduate departments' student societies.

**McGill Biology Graduate Students Association (Sept 2017-Current)**

**Position:** Equity and Diversity Representative

**Responsibilities:** I ensured that all BGSA events ran in an inclusive fashion and that all students were free from isolation, discrimination and harassment on campus. I organized equity workshops, collected equity and diversity data via surveys, and act as a point of contact for student support.

**Santropol Roulant (September 2012 – June 2016)**

**Responsibilities:** I ran McGill's branch of the largest Meals-On-Wheels in Montréal. Santropol Roulant produces meals locally and sustainably for those living with a loss of autonomy. I coordinated all McGill volunteers and fundraising for the organization. I also helped with cooking and delivering of the meals. I also worked in their community garden that grows the food used to produce the meals.

**The McGill Biology Student Union (September 2013-May 2014)**

**Responsibilities:** I acted as VP Sustainability on the MBSU's executive. I organized all fundraising for the organization, and ensured all of our events ran sustainably, which included composting initiatives and the use of reusable dishware at all of our events. I was also the undergraduate representative for the Biology Department's Green Committee.

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**Skills**

**Quantitative:** I have a very strong base in the R and Python programming languages and bash (shell) scripting. I am comfortable with MS Excel, QGIS, ArcGIS, SAS, and MATLAB, and use GitHub for version control and hosting of my CSS and markdown-based webpage and scripts associated with my published work. I also have working knowledge of C and C++. I have a strong proficiency in statistics and quantitative methods. I use modern applied statistical tools every day, including GLMM, GAM, Boosted Regression Trees, Bayesian methods, simulation modelling, Latin Hypercube sampling, and numerical optimization. I am also proficient in using MARXAN for simulated annealing optimizations, and GUROBI software in concert with Python to solve global optimization problems through mixed-integer linear programming (MILP). I deploy many of my algorithms in a parallel-processing framework.

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**Field:** I took two field ecology courses during my undergrad, one in tropical ecology in Barbados, and another in Limnology at Mont-Ste-Hilaire, QC. I am familiar with a number of limnological and fisheries sampling techniques, and have 4 years of limnological/fisheries field experience.

**Language:** English (native) and French (conversational),

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## **Publications**

**Hudgins, E.J.**, Davies, T. J., & Leung, B. A unifying phylogenetic model of amplification and dilution effects of host biodiversity on pest establishment. *In prep.*

Helmus, M. R., & **Hudgins, E. J.** Risk of cashing out the global invasion credit: An emerging agricultural pest in the U.S. heralds a new era of invasive species impacts. *In prep.*

**Hudgins, E. J.**, Koch, F. H., Ambrose, M. J., & Leung, B. Estimating damage to urban trees from US invasive forest pests. *In prep.*

**Hudgins, E.J.**, Liebhold, A.M., & Leung, B. Comparing generalized to customized models for United States invasive forest pests. 2019. *Ecological Applications*.

Leung, B., **Hudgins, E. J.**, Potapova, A., & Ruiz-Jaen, M. (2019). A new baseline for countrywide  $\alpha$ -diversity and species distributions: illustration using >6000 plant species in Panama. *Ecological Applications* (2019) 29(3): e01866.

**Hudgins, E.J.**, Liebhold, A.M., & Leung, B. Corrigendum: Predicting the spread of all invasive forest pests in the United States. *Ecology Letters* (2018) 21(11): 1752-1754.

**Hudgins, E.J.**, Liebhold, A.M., & Leung, B. Predicting the spread of all invasive forest pests in the United States. *Ecology Letters* (2017) 20(4): 426-435.

Iacarella, J.C., **Hudgins, E.J.**, Dick, J.T.A., & Ricciardi, A. Predatory behaviour of an invasive amphipod in response to the presence of conspecifics and predation risk. *Canadian Journal of Fisheries and Aquatic Sciences* (2017) 75(1): 131-140

Hudgins, J., **Hudgins, E.J.**, Ali, K., & Mancini, A. Citizen science surveys elucidate key foraging and nesting habitat for two endangered marine turtle species within the Republic of Maldives. *Herpetology Notes* (2017) 10: 463-471.

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## **Oral Presentations**

**Hudgins, E.J.\***, Koch, F. H., Ambrose, M. J., Leung, B., *Estimating the economic damages of United States invasive forest pests*. Presented at the World Conference on Natural Resource Modelling, May 23<sup>rd</sup>, 2019 (International Conference – Graduate work). Winner – Best Student Presentation.

Hudgins, J.A.\* , **Hudgins, E.J.**, *How to get meaningful results from opportunistic photo-ID data*. Presented at the International Sea Turtle Symposium, February 2nd, 2019. (International Conference - Side project).

**Hudgins, E.J.\***, Liebhold, A. M., & Leung B. *Comparing generalized to customized models for United States invasive forest pests*. Presented at the Quebec Centre for Biodiversity Science Symposium, December 12th, 2018

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(Regional Conference - Graduate work).

**Hudgins, E.J.\***, Liebhold, A. M., & Leung B. *Comparing generalized to customized models for United States invasive forest pests*. Presented at the Ecological Society of America Annual Meeting, August 8<sup>th</sup>, 2018. (International Conference - Graduate work).

**Hudgins, E.J.\***. Optimal control of the spread of invasive forest pests in the United States. Presented at the Mathematics of Biological Systems Management conference, University of Melbourne, April 6<sup>th</sup>, 2018. (International conference – Graduate work)

**Hudgins, E.J.\***. Optimal control of the spread of invasive forest pests in the United States. Presented at the University of Queensland's Centre for Biology and Conservation Science's weekly seminar series, March 20<sup>th</sup>, 2018. (International invited seminar – Graduate work)

Hudgins, J.A.\* , **Hudgins, E.J.**, *Determining abundance, apparent survival, and temporary emigration for hawksbill turtles using opportunistic photo-ID data in the Republic of Maldives*. Presented at the International Sea Turtle Symposium, February 18<sup>th</sup>, 2018. (International Conference - Side project).

**Hudgins, E.J.\***, Liebhold, A. M., & Leung B. *Comparing generalized to customized models for United States invasive forest pests*. Presented at the Quebec Centre for Biodiversity Science Symposium, December 15<sup>th</sup>, 2017. (Regional Conference - Graduate work).

**Hudgins, E.J.\***, Liebhold, A. M., & Leung B. *Comparing generalized to customized models for United States invasive forest pests*. Presented at the Ecology and Evolution Lunches series, Nov 23<sup>rd</sup> , 2017. (Departmental invited seminar - Graduate work).

**Hudgins, E.J.\***, & Leung B. *The effect of host diversity on the establishment of United States invasive forest pests*. Presented at the McGill Conservation, Ecology, Evolution and Behaviour retreat, April 8<sup>th</sup>, 2017. (Departmental Conference - Graduate work).

**Hudgins, E.J.\***, Liebhold, A. M., & Leung B. *Forecasting United States forest invaders: A general predictive model for pest spread*. Presented at the Quebec Centre for Biodiversity Science Symposium, December 16<sup>th</sup>, 2016. (Regional Conference - Graduate work).

**Hudgins, E.J.\***, Liebhold, A. M., & Leung B. *Forecasting United States forest invaders: A general predictive model for pest spread*. Presented at the Ecological Society of America Annual Meeting, August 11<sup>th</sup>, 2016. (International Conference - Graduate work).

**Hudgins, E.J.\*** *Modelling invasive forest pest spread across the United States*. Presented at the Centre for Applied Mathematics in Biology of Medicine End-Of-Year Symposium. April 28<sup>th</sup>, 2015. (Provincial working group – Honours work).

**Hudgins, E.J.\*** *Modelling invasive forest pest spread across the United States*. Presented at McGill's Honours Symposium, April 15<sup>th</sup>, 2015. (McGill

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Undergraduate Symposium – Honours work).

Iacarella, J.C.\*, **Hudgins, E.J.**, Dick, J.T.A. & Ricciardi, A. *Predatory behavior of an invasive amphipod (*Gammarus pulex*) in the presence of fish cues and conspecifics*. Paper presented at the Canadian Aquatic Invasive Species Network Annual General Meeting, Gatineau, Ontario. April 2014. (National Conference – Independent Study Project work).

\* indicates presenting author

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## Poster presentations

**Hudgins, E.J.\***, Koch, F. H., Ambrose, M. J., Leung, B., *Estimating the economic damages of United States invasive forest pests*. Poster presented at Natural Resources Canada's Forest Pest Management Forum, December 3-5<sup>th</sup>, 2019 (National Conference – Graduate work).

\* indicates presenting author

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## Other publications

**Hudgins, E. J.** *Networking with gators: My trip to Fort Lauderdale*. January 26, 2018. Quebec Centre of Biodiversity Science Blog "Le Beagle", <https://lebeagle.qcbs.ca>.

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## Workshops/ Training/ Journal Clubs

**Name:** InvaCost Workshop (November 12-15, 2019)

**Location:** Saint-Rémy-Lès-Chevreuse, France

**Description:** Three-day workshop focused on building international collaborations amongst early-career researchers related to the newly-created InvaCost Database, which catalogs all reported economic costs of invasive species worldwide. I was selected to participate due to my expertise in ecological and economic modelling of invasive pests.

**Name:** QCBS R Markdown Workshop (March 5, 2019)

**Location:** McGill University

**Description:** One-day workshop discussing markdown languages, with a focus on R integration with Rmarkdown, knitr, and web integration through shiny.

**Name:** McGill Conservation, Ecology, Evolution, and Behaviour Discussion Group

**Location:** McGill University

**Description:** A weekly journal club where faculty and graduate students meet to discuss recent papers in allied fields.

**Name:** McGill Organismal Seminar Series

**Location:** McGill University

**Description:** A weekly departmental seminar series for organismal biology researchers where visiting researchers give presentations.

**Name:** MARXAN Decision Support Tool Workshop (March 7-8, 2018)

**Location:** University of Queensland

**Description:** A 2-day workshop in using QGIS and MARXAN to solve conservation planning decision problems via simulated annealing algorithms.

**Name:** Gender Summit North America 2017

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**Location:** Montreal, Quebec

**Description:** 2-day conference composed of workshops, presentations, panels, and discussions highlighting key challenges to gender equity across academia, government and industry in North America.

**Name:** Statistics and Biology Exchange Group (S-BEX) (Winter 2015-Winter 2017)

**Location:** McGill University/ Université de Montréal

**Description:** A weekly discussion group where biologists, epidemiologists and statisticians work collaboratively to solve one another's research problems.

**Name:** Joint NIMBioS-MBI-CAMBAM Summer School (Summer 2017)

**Location:** University of Tennessee, Knoxville

**Description:** A quantitative biology/epidemiology workshop focusing on fitting models to biological data. Topics covered included state space models, parameter estimation, identifiability analyses, game theory, network theory.

**Name:** IGSF Feminist Pedagogy Workshop (October 2016)

**Location:** McGill Institute for Gender, Sexuality, and Feminist Studies

**Description:** A workshop on how to improve the inclusiveness of teaching strategies and address historical inequities in order to better serve students.

**Name:** Quebec Centre for Biodiversity Science Data Visualization Workshop (Spring 2016)

**Location:** Gault Nature Reserve, McGill University

**Description:** A weekend workshop on data visualization. Topics covered included Inkscape, R plotting packages, and heuristics for strong visualizations.

**Name:** Quebec Centre for Biodiversity Science Intensive Course (Fall 2015)

**Location:** Gault Nature Reserve, McGill University

**Description:** A two-week graduate course covering recent advanced topics across fields of biodiversity science. Topics covered included species distribution models, phylogenetic analyses, taxonomic identification, valuation of ecosystem services, collaboration with indigenous peoples.

**Name:** QCBS Geostatistics Workshop (Fall 2015)

**Location:** Quebec Centre for Biodiversity Science, McGill University

**Description:** An introductory workshop covering geostatistical methods. Topics covered included kriging, raster work in R, variograms and semivariograms.

**Reviewer for:**

Journal of Applied Ecology

Journal of Biogeography

Biological Invasions

Diversity and Distributions

Ecology Letters

Forests

Royal Society Open Science

Nature Conservation

Applied Vegetation Science

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## **Certifications and Licensures**

PADI Open Water Diver  
Swiftwater Safety Rescue Technician Level 2  
McGill Lab Safety Course (WHMIS)  
Pleasure Craft Operator's Card  
Backpack Electrofishing Certificate  
Advanced Wilderness First Aid Certificate - *expired*  
Cardiopulmonary Resuscitation (CPR) Certificate - *expired*  
Workplace Standard First Aid Certificate - *expired*  
Automatic External Defibrillator (AED) certificate - *expired*  
National Lifeguard Service (NLS) Certificate- *expired*  
CPR Instructor Certificate- *expired*  
Lifesaving Instructor Certificate (LSI) – *expired*

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## **Honours**

Best Student Presentation Prize – World Conference on Natural Resource Modelling (2019) - \$500 USD  
McGill Graduate Mobility Award (McGill 2018) - \$858  
NSERC Michael Smith Foreign Study Supplement (McGill 2018) - \$6,000 CAD  
NSERC Alexander Graham Bell CGS-D (McGill 2017) - \$105,000 CAD  
Quebec Centre for Biodiversity Science Excellence Award (QCBS 2016, 2018) - \$755, \$988 CAD  
McGill Biology GREAT Travel Award - \$500 CAD  
Quebec Centre for Biodiversity Science Intensive Course Award (QCBS 2015) - \$1297 CAD  
Lorne Trottier Accelerator Award (McGill 2015) - \$10,000 CAD  
Arthur Willey Memorial Fellowship (McGill 2015) - \$2,500 CAD  
NSERC Alexander Graham Bell CGS-M (NSERC 2015) - \$17,500 CAD  
McGill Graduate Excellence Award (McGill 2015) - \$2,500 CAD  
Frank Rigler Prize in Ecology (McGill 2015) - \$980 CAD  
McGill Deans Honours List (McGill '13, '14, '15)  
Tomlinson Undergraduate Teaching Award (McGill 2014) - \$300 CAD  
Richard Adams Award (McGill 2014) - \$1,010 CAD  
Jurate Tanner Scholarship in Science (McGill 2014) - \$980 CAD  
McGill Biology Student Union Field Study Bursary (MBSU 2014) \$200  
Emily Ross Crawford Scholarship (McGill 2014) - \$850  
NSERC Undergraduate Research Award (NSERC '12), ('13), ('14) 3 x \$4,500  
McGill University Entrance Scholarship (McGill 2011) - \$3,000

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