Emma J. Hudgins, PhD

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Research

Research Experience

Carleton University, Postdoctoral Fellow, **PI:** Prof. Joseph Bennett — 2020-
The production of general rules of thumb for the best invasive pest management strategies, and for the budgetary balance between management and surveillance, informed by Mixed Integer Linear Program-based management optimizations, in collaboration with Natural Resources Canada-Canadian Forest Service (NRCan-CFS).

McGill University, MSc/PhD student, **PI:** Prof. Brian Leung — 2015-2020
General multispecies models for various stages of United States invasive forest insect and pathogen invasions that are applicable at large scales, including a more descriptive understanding of the initial establishment and dispersal phases of invasions, and delineating the impacts caused by species across space and time.

University of Queensland, Visiting Scholar**, PI:** Prof. Eve McDonald-Madden — 2018
A 3-month Michael Smith Foreign Study term during which I learned Mixed Integer Linear Programming techniques and developed skills in decision theory as it is applied to conservation planning and invasive species management.

McGill University, Honours Researcher**, PI:** Prof. Brian Leung — 2014-2015
The creation of a GLM-based model of spatial predictors of invasive species spread in the U.S. validated through theoretical simulations.

Canadian Rivers Institute, University of New Brunswick, Summer Student (3 NSERC USRAs), **PI:** Prof. R. Allen Curry — 2012-2015
Field technician for a variety of limnological and fish conservation studies, including a lake classification system for the province of New Brunswick and an impact assessment of a large dam on Atlantic salmon populations.

Redpath Museum, McGill University, Independent study researcher**, PI:** Prof. Anthony Ricciardi — 2014
A behavioural ecology experiment testing the impact of predator chemical cues on an invasive invertebrate's predatory behaviour

Education

McGill University, PhD in Biology 2016-2020
Supervisory Committee: Brian Leung (Supervisor), T. Jonathan Davies, Patrick M. A. James
Thesis: *Predicting biological invasions across species: developing generalized models*

2015-2016

McGill University, MSc in Biology
Supervisory Committee: Brian Leung (Supervisor), T. Jonathan Davies, Patrick M. A. James
(Fast-tracked to PhD after 1yr)

McGill University, Bachelor of Science, Honours Biology, Minor Environment 2011-2015
CGPA: 3.97 (First Class Honours, Dean's Honour List)
Honours Supervisor: Prof. Brian Leung
Thesis: *Statistical modelling of forest pest spread across the United States*

Non-Academic Employment

Tierra Co., Independent Statistical Consultant 2019-2019
Developing spatial metrics of crime risk

Funding Earned (total = CAD $235,233)

Amount ($)		
90,000	FRQNT B3X Postdoctoral Scholarship	2020
990	McGill Research Travel Award	2018
6,000	NSERC Michael Smith Foreign Study Supplement	2018
105,000	NSERC Alexander Graham Bell CGS-D	2017
755; 988	Quebec Centre for Biodiversity Science Excellence Award	2016; 2018
500	McGill Biology GREAT Travel Award	2016
17,500	*NSERC Alexander Graham Bell CGS-M*	2015
13,500	*NSERC Undergraduate Student Research Award (x3)*	2012; 2013; 2014

Publications

16. Palacio, F., Callaghan, C. T., Cardoso, P., **Hudgins, E.J.,** Jarzyna, M., Ottaviani, G., Riva, F., Roza, C., Shirey, V., & Mammola, S. A protocol for reproducible functional diversity analyses. *Submitted. Methods in Ecology and Evolution. Preprint: https://ecoevorxiv.org/yt9sb/*

15. Soto, I., Cuthbert, R.N., Kouba, A., Capinha, C., Turbelin, A., **Hudgins, E.J.,** Diagne, C., Courchamp, F., & Haubrock, P.J. Global economic costs of herpetofauna invasions. *Submitted. Conservation Biology.*

14. Hanson, J.O., McCune, J.L., Chadès, I., Proctor, C.A., **Hudgins, E.J.,** & Bennett, J.R., Optimizing ecological surveys for conservation. *Submitted. Journal of Applied Ecology.*

13. Edwards, B.P.M, Binley, A.D., English, W.B., **Hudgins, E.J.**, & Snow, S.S. : A highly anomalous Red-winged Blackbird (*Agelaius phoeniceus*) song. *In review. Canadian Field Naturalist.*

12. Reid, C.H., **Hudgins, E.J.,** Guay, J.D., Patterson, S., Medd, A.M., Cooke, S.J., & Bennett, J.R. The state of Canada's biosecurity efforts to protect biodiversity from species invasions. *In press. FACETS.*

11. **Hudgins, E. J.,** Koch, F. H., Ambrose, M. J., & Leung, B. Hotspots of pest-induced US urban tree death, 2020-2050.. *In revision,* Biological Invasions*. Preprint: https://doi.org/10.1101/2021.04.24.441210*

10. Turbelin, A.J., Diagne,C., **Hudgins, E.J**., Moodley, D., Haubrock, P.J., *et al.* Species on the move: Stowaways and contaminants cause the greatest economic impacts. *In revision. Biological Invasions. Preprint: https://doi.org/10.21203/rs.3.rs-440305/v1*

9. Ahmed, D.A.*, **Hudgins, E.J.*,** Cuthbert, R.N.*, Kourantidou, M., Diagne, C., *et al.* Managing biological invasions: the cost of inaction. *Resubmitted. Biological Invasions. Preprint: https://doi.org/10.21203/rs.3.rs-300416/v1*

8. Ahmed, D. **Hudgins, E.J.,** Cuthbert, R., Haubrock, P. J., Renault, D., Bonnaud, E., Diagne, C., & Courchamp, F. Modelling the damage costs of invasive alien species. *In press. Biological Invasions. Preprint: https://doi.org/10.21203/rs.3.rs-380351/v1*

7. Crystal-Ornelas, R., **Hudgins, E.J.,** Cuthbert, R. N., Haubrock, P. J., Fantle-Lepczyk, J., Angulo, E., Kramer, A., Ballesteros-Mejia, L., Leroy, B., Leung, B., López-López, E., Diagne, C., & Courchamp, F. Economic costs of biological invasions within North America. *NeoBiota (2021) 67, 485.*

6. **Hudgins, E.J.,** Liebhold, A.M., & Leung, B. Comparing generalized to customized models for United States invasive forest pests*. Ecological Applications (2020) 30 (1), e01988.*

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

4. **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.*

3. **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.*

2. 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

1. 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.*

***equivalent contribution**

Selected Presentations

Oral presentations

Crystal-Ornelas, R., **Hudgins, E.J.*,** Cuthbert, R. N., Haubrock, P. J., Fantle-Lepczyk, J., Angulo, E., Kramer, A., Ballesteros-Mejia, L., Leroy, B., Leung, B., López-López, E., Diagne, C., & Courchamp, F. Economic costs of biological invasions within North America. Presented at the Invasive Species Council of British Columbia's annual meeting. Regional conference, Oct. 6, 2021.

Hudgins, E. J.*, Koch, F. H., Ambrose, M. J., & Leung, B. Urban tree deaths from invasive alien forest insects in the United States, 2020-2050. Presented at theInternational Association for Landscape Ecology – North America conference, April 12, 2021, in the organised symposium "Forecasting Biological Invasions".

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 23rd, 2019 (International Conference – Graduate work). Winner – Best Student Presentation.

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 (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 8th, 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 6th, 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 20th, 2018. (International invited seminar – Graduate work)

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 15th, 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 23rd , 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 8th, 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 16th, 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 11th, 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 28th, 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 15th, 2015. (McGill Undergraduate Symposium – Honours work).

*** presenting author**

Poster Presentations

Hudgins, E.J.*, Davies, T.J., Leung, B. *A unifying phylogenetic model for the effect of host phylogenetic diversity on invasive pest establishment.* Poster presented at the British Ecological Society Festival of Ecology. Dec 14-18th, 2020. (International Conference – Graduate work).

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 Resouces Canada's Forest Pest Management Forum, December 3-5th, 2019 (National Conference – Graduate work).

*** presenting author**

Research Skills

Programming Languages: R (excellent), Python (very good), bash/shell (very good), STAN (very good), CSS (good), Markdown (good), LaTeX (good), MATLAB (good), SAS (good), C/C++ (basic).

Software: GUROBI, QGIS/ArcGIS, RStudio, SAS, MATLAB, SPSS, Git(Hub), Open Science Framework

Quantitative methods: Routine use of GLMM, GAM, Boosted Regression Trees, Bayesian methods, simulation modelling, Latin Hypercube sampling, Nelder-Mead methods, genetic algorithms, neural networks, mixed-integer linear programming (MILP). I deploy many of my algorithms in a parallel-processing framework.

Field Techniques: Tropical ecology field course in Barbados, Limnology field course at Mont-Ste-Hilaire, QC, 4 years of limnological/fisheries field experience.

Languages: English (native) and French (conversational)

Certifications: PADI Open Water Diver, WHMIS, Pleasure Craft Operator's Card**,** Backpack Electrofishing Certificate

Teaching

Lecturing

Course lecturer (co-Instructor of Record) ENSC 2002, Environmental Methods and Analysis, Carleton University — 2021

Teaching Assistant, BIOL 373, Biometry (5 semesters)**,** McGill University — 2015-2019

Teaching Assistant, ENVR 202, The Evolving Earth (4 semesters), McGill University — 2015-2019

Undergraduate Teaching Assistant, BIOL 308, Ecological Dynamics, McGill University — 2015

Supervision

Honour's thesis Supervisor, Marie Wright, Carleton University — 2021-2022

Research associate co-supervisor, Yuyan Chen, McGill University — 2021

High school student mentor – Talaria Summer Internship Program for marginalized students, Sarah Duguay — 2021

Independent Study Supervisor, ENSC 4901, Directed Studies (Chibudom Orji, Shujin Chen)**,** Carleton University — 2020-2021

Mentor, BIOL 5512, Advances in Applied Ecology**,** Carleton University — 2020

Service

Faculty and student governance

Carleton Biology Department Board, Postdoc rep. — 2021-2022

Geomatics and Landscape Ecology Laboratory Friday Discussions, Journal club coordinator (mailing list of >350) — 2021-2022

Carleton Biology Department Board, Alternate postdoc rep. — 2020-2021

McGill Biology Graduate Students Association, Social Media Rep. — 2019-2020

Faculty of Science Committee on Equity and Climate, McGill University, Graduate student representative — 2019-2020

Postgraduate Students Society of McGill University Equity Committee, Biology Graduate Student Representative 2017-2020
Biology Department Day and Equity Workshop (3 events), Co-organizer 2017-2019
STEMM Diversity @ McGill, Volunteer 2017
Equity in STEMM Working Group, Co-founder 2016-2019
McGill Biology Graduate Students Association, Equity and Diversity Rep. 2017-2019

Media coverage

LePage, M. *Many US cities will lose nearly all ash trees by 2060.* May 6, 2021. The New Scientist. https://www.newscientist.com/article/2276885-many-us-cities-will-lose-nearly-all-ash-trees-by-2060/#ixzz7CuDAOcyD. *Coverage of publication #11.*

Workshop organization

A new perspective on forest pest management conventional wisdom. Forthcoming 2-day workshop co-organized by myself, Joseph R. Bennett and Brian Leung, to be held at Carleton University January 17-18 2022 with 12 experts across disciplines.

Equitable Cities for Healthy People and Nature. Rapporteur, support person, web app developer, organized by Rachel Buxton virtually at Carleton University. 2 and 29 September 2021. (~50 virtual attendees, https://carleton.ca/naturalcities/)

Promoting GitHub use in EcoEvo Workshop. Co-organized with Rob Crystal-Ornelas and 5 others. 12 July 2021. Part of the Society for Open, Reproducible, and Transparent Ecology and Evolution (SORTEE) 2021 Conference.

Workshop attendance and committee membership

Carleton Geomatics and Landscape Ecology Laboratory Friday Discussion Group 2020-
Carleton Student Development Theory in Higher Education Workshop 2021
Carleton Cross-Cultural Competency Workshop 2021
Carleton Effective Communication and De-Escalation Skills Workshop 2021
Carleton Responding to Disclosures of Sexual Violence Workshop 2021
Carleton Indigenous Cultural Awareness Workshop 2021
InvaCost Workshop 2019
QCBS R Markdown Workshop
McGill Conservation, Ecology, Evolution, and Behaviour Discussion Group 2019
McGill Organismal Seminar Series 2017-2019
MARXAN Decision Support Tool Workshop
Gender Summit North America 2015-2020
Statistics and Biology Exchange Group 2018
Joint NIMBioS-MBI-CAMBAM Summer School 2017
IGSF Feminist Pedagogy Workshop 2015-2017
Quebec Centre for Biodiversity Science Data Visualization Workshop 2017
2017
2016

Peer review

Reviewer for:
Applied Vegetation Science, Biological Invasions, Diversity and Distributions, Ecology Letters, Forests, Journal of Applied Ecology, Journal of Biogeography
Journal of Ecology, Management of Biological Invasions, Nature Conservation, Royal Society Open Science, Urban Forestry & Urban Greening

Editorial Duties:
Frontiers in Insect Science – Invasive Insect Species (Review Editor)