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EDUCATION

- 2012 – 2017 **University of California**, San Diego, CA
Ph.D., Division of Biological Sciences - Ecology, Behavior, and Evolution Section
“Invasion increases ecosystem sensitivity to drought in southern California”
Supervised by Dr. Elsa E. Cleland
- 2007 – 2011 **Carleton College**, Northfield, MN
B.A. Biology, Environmental Studies, Cum Laude

APPOINTMENTS

- Sept. 2017 – **University of Guelph**, Guelph, Ontario, Canada
present Postdoctoral Research Fellow, Department of Integrative Biology
Supervised by Dr. Andrew S. MacDougall

PUBLICATIONS

16. Gilbert, B., A. S. MacDougall, T. Kadoya, M. Akasaka, J. R. Bennett, E. M. Lind, H. Flores-Moreno, J. L. Finn, Y. Hautier, E. T. Borer, E. W. Seabloom, P. B. Adler, E. E. Cleland, J. B. Grace, W. S. Harpole, **E. H. Esch**, J. L. Moore, J. Knops, R. L. McCulley, B. Mortensen, J. D. Bakker, and P. A. Fay. 2020. Climate and Local Environment Structure Asynchrony and the Stability of Primary Production in Grasslands. *Global Ecology and Biogeography*, *in press*.
15. Pérez Castro, S., **E. H. Esch**, V. Eviner, E. Cleland, and D. Lipson. 2020. Exotic herbaceous species interact with severe drought to alter soil N cycling in a semi-arid shrubland. *Geoderma*, 361. doi:10.1016/j.geoderma.2019.114111
14. **Esch, E. H.**, D. Lipson, and E. E. Cleland. 2019. Invasion and drought alter phenological sensitivity and synergistically lower ecosystem production. *Ecology*, **100**:e02802. doi:10.1002/ecy.2802
13. **Esch, E. H.**, J. Y. King, and E. E. Cleland. 2019. Species vary in susceptibility to UV degradation in a semi-arid ecosystem. *Plant and Soil*, **440**:265-276. doi:10.1007/s11104-019-04069-y
12. Puritty, C. E., **E. H. Esch**, Perez-Castro, S., Ryan, E. M., Lipson, D., and E. E. Cleland. 2019. Drought in Southern California coastal sage scrub reduces biomass of exotic species more than native species, but exotic growth recovers quickly when drought ends. *Plant Ecology*, **220**:151-169. doi:10.1007/s11258-019-00912-5
11. Cazelles, K., T. Bartley, M. M. Guzzo, M. H. Brice, A. S. MacDougall, J. R. Bennett, **E. H. Esch**, T. Kadoya, J. Kelly, S. Matsusaka, K. A. Nilsson, K. S. McCann. 2019. Homogenization of freshwater lakes: recent compositional shifts in fish communities are explained by gamefish movement and not climate change. *In press*. *Global Change Biology*. doi:10.1111/gcb.14829
10. Cleland, E. E., E. M. Lind, N. M. DeCrappeo, D. DeLorenze, R. A. Wilkins, P. B. Adler, J. D. Bakker, C. Sy. Brown, K. F. Davies, **E. H. Esch**, J. Finn, S. Gressard, D. S. Gruner, N. Hagenah, W. S. Harpole, Y. Hautier, S. E. Hobbie, K. S. Hofmockel, K. Kirkman, J. Knops, C. W. Kopp, K. J. LaPierre, A. S. MacDougall, R. L. McCulley, B. A. Melbourne, J. L. Moore, S. M. Prober, C. Riggs, A. C. Risch, M. Schuetz, C. Stevens, P. D. Wragg, J. Wright, E. T. Borer, and E. W. Seabloom. 2019. Belowground biomass

response to nutrient enrichment depends on light-limitation across globally distributed grasslands. *Ecosystems*, **22**:1466-1477. doi:10.1007/s10021-019-00350-4.

9. Risch, A., S. Zimmermann, R. Ochoa-Hueso, M. Schütz, B. Frey, J. Firn, P. Fay, F. Hagedorn, E. Borer, E. Seabloom, W. Harpole, J. Knops, R. McCulley, A. Broadbent, C. Stevens, M. Silveira, P. Adler, V. Baez Jacome, L. Biederman, J. Blair, C. Brown, M. Caldeira, S. Collins, P. Daleo, A. di Virgilio, A. Ebeling, N. Eisenhauer, **E. Esch**, A. Eskelinen, N. Hagenah, Y. Hautier, K. Kirkman, A. MacDougall, J. Moore, S. Power, S. Prober, C. Roscher, M. Sankaran, J. Siebert, D. Speziale, P. Tognetti, R. Virtanen, L. Yahdjian, B. Moser. 2019. Soil net nitrogen mineralisation across global grasslands. *Nature Communications*, **10**:4981. doi:10.1038/s41467-019-12948-2
8. **Esch, E. H.**, A. A. Ashbacher, C. W. Kopp, and E. E. Cleland. 2018. Competition reverses the response of shrub seedling mortality and growth along a soil moisture gradient. *Journal of Ecology*, **106**:2096-2108. doi:10.1111/1365-2745.12964
7. Laurel M. Brigham, **E. H. Esch**, C. W. Kopp & E. E. Cleland. 2018. Warming and shrub encroachment decrease decomposition in arid alpine and subalpine ecosystems, Arctic, Antarctic, and Alpine Research, **50**:1. doi:10.1080/15230430.2018.1494941
6. MacDougall, A. S., E. Harvey, J. L. McCune, K. A. Nilsson, J. Bennett, J. Firn, T. Bartley, J. B. Grace, J. Kelly, T. D. Tunney, B. McMeans, S.-I. S. Matsuzaki, T. Kadoya, **E. Esch**, K. Cazalles, N. Lester, and K. S. McCann. 2018. Context-dependent interactions and the regulation of species richness in freshwater fish. *Nature Communications* 9:973. doi:10.1038/s41467-018-03419-1
5. Fauvelle, Mikael, **E. Esch**, and A. Somerville. 2017. Climate change and subsistence exchange in southern California: was western sea purslane a Channel Island trade good? *American Antiquity* **82**:183-188. doi:10.1017/aaq.2016.3
4. **Esch, E. H.**, E. Cleland, and D. Lipson. 2017. Direct and indirect effects of shifting rainfall on soil microbial respiration and enzyme activity in a semi-arid system. *Plant and Soil* **144**:333-346. doi:10.1007/s11104-016-3027-6
3. Cleland, Elsa, **E. Esch**, and J. McKinney. 2015. Priority effects vary with species identity and origin in an experiment varying the timing of seed arrival. *Oikos* **124**:33-40. doi:10.1111/oik.01433
2. **Esch, E. H.**, D. L. Hernández, J. R. Pasari, R. G. Kantor, and P. C. Selmants. 2013. Response of soil enzyme activity to grazing, nitrogen deposition, and exotic cover in a serpentine grassland. *Plant and Soil* **366**:671-682. doi:10.1007/s11104-012-1463-5
1. Hernández, D. L., **E. H. Esch**, C. J. Alster, M. J. McKone, and P. Camill. 2013. Rapid accumulation of soil carbon and nitrogen in a prairie restoration chronosequence. *Soil Science Society of America Journal* **77**:2029-2038. doi:10.2136/sssaj2012.0403

– *in prep or review (available on request)*–

Esch, E. H., S Pérez-Castro, D. A. Lipson, and E. E. Cleland. Invasion alters decomposition responses to drought through differential above- and below- ground sensitivity to microbial and microclimate influences. *In review*.

Esch, E. H. and A. S. MacDougall. Nutrient retention on farms enhanced by stoichiometric relationships between N and P on plant growth and subsequent resource uptake. *In prep*.

Esch, E. H., B. J. Arce, O. H. Carroll, A. J. Dolezal, A. M. Mazzorato, E. D. G. Fraser, J. M. Fryxell, K. S. McCann, B. Gilvesy, S. Krumholz, M. M. Campbell, and A. S. MacDougall. Implications of rising input costs, declining crop prices, and expanding marginal land use for valuing ecosystem services on farms. *In prep*.

Esch, E. H., K. M. Doherty, and A. S. MacDougall. Optimal resource allocation theory predicts canola response to variable rainfall and nutrient levels. *In prep*.

FELLOWSHIPS AND GRANTS

- 2019 **Food From Though Travel Grant.** Fully funded to present work at the Canadian Society for Ecology and Evolution Annual Meeting, Fredericton, NB.
- 2018 **Food From Though Travel Grant.** Fully funded to present work at the Canadian Society for Ecology and Evolution Annual Meeting, Guelph, ON.
- 2016 – 2017 **University of California Institute for the Study of Ecological Effects of Climate Impacts Fellow.** Studying the proportional roles of biotic and abiotic decomposition across a natural precipitation gradient in coastal sage scrub ecosystems.
- 2015 – 2016 **University of California Carbon Neutrality Initiative Student Fellow.** Awarded to conduct research on the potential of semi-arid shrublands to store carbon under different invasion and precipitation scenarios.
- 2013 – 2017 **NSF Graduate Research Fellowship.** Five-year scholarship awarded to study the how invasion alters ecosystem response to shifting precipitation regimes in Southern California coastal sage scrub.
- 2014 – 2016 **National Socio-Environmental Synthesis Center Fellow.** Evaluate the social and ecological tradeoffs in defensible space practices in southern California's wildland urban interfaces relating to fire dynamics.
- 2014 – 2015 **California Native Plant Society, Bristlecone Chapter, DeDecker Grant.** Grant awarded to examine the roles of warming and shifting plant communities on decomposition rates in California's White Mountains.
- 2014 – 2015 **White Mountain Research Station Minigrant.** Awarded to offset research station fees associated with project investigating decomposition and warming in alpine environments.
- 2013 – 2014 **Jeanne Marie Messier Memorial Grant.** Awarded for research studying the role of locally adapted microbial communities and associated ecosystem process rates.
- 2013 – 2014 **California Native Plant Society Grant.** Awarded to study the effects that altered precipitation will have on both above- and below- ground processes in a coastal sage scrub ecosystem.
- 2012 – 2013 **Ruth Stern Graduate Fellowship.** Merit-based fellowship received with offer of acceptance into University of California San Diego's Division of Biological Sciences Program.
- 2012 – 2013 **Mildred E. Mathias Graduate Student Research Grant.** Grant awarded to understand how altered precipitation regimes and the role of invasive species jointly affect belowground microbial processes.

INVITED SEMINARS

- 2019 **Canadian Society for Ecology and Evolution Annual Meeting,** Fredericton, NB, Canada. Invited seminar: "Nitrogen addition enhances terrestrial phosphorus retention."
- 2017 **Carleton College Biology,** Northfield, MN. Invited seminar: "Invasion increases ecosystem sensitivity to drought in southern California."
- 2017 **University of Guelph Integrative Biology,** Guelph, ON, Canada. Invited seminar: "Invasion increases ecosystem sensitivity to drought in southern California."
- 2015 **University of California Carbon and Climate Neutrality Summit,** La Jolla, CA. Invited speaker: "Voices of the Future" panelist.

CONFERENCE PRESENTATIONS (only first author presentations listed)

- 2019 **Esch, Ellen. H.** and A. S. MacDougall. 40 years of global phenological change. Climate Impacts Research Centre Autumn Research Symposium, Abisko, Sweden.

- 2019 **Esch, Ellen H.** and A. S. MacDougall. Nitrogen addition enhances terrestrial phosphorous retention. Canadian Society for Ecology and Evolution Annual Meeting, Fredericton, NB, Canada.
- 2018 **Esch, Ellen H.** and A. S. MacDougall. More at the Margin: leveraging ecosystem services on marginal lands to improve agricultural sustainability and slow trends of farming costs outpacing yield gains. Canadian Society for Ecology and Evolution Annual Meeting, Guelph, ON, Canada.
- 2016 **Esch, Ellen H.**, E. E. Cleland, D. Lipson. Effects of altered precipitation on green-up phenology in coastal sage scrub. Ecological Society of America Annual Meeting, Ft. Lauderdale, FL.
- 2015 **Esch, Ellen H.**, E. E. Cleland, D. Lipson. Effects of altered precipitation and invasion on ecosystem processes in coastal sage scrub. California Invasive Plant Council Annual Meeting, San Diego, CA. ****runner up best oral student presentation****
- 2015 **Esch, Ellen H.**, E. E. Cleland, D. Lipson. Direct and indirect effects of altered of shifting rainfall on soil activity at the Elliott Chaparral Reserve. University of California San Diego Natural Reserve System 50th Year Anniversary Celebration, La Jolla, CA. ****winner best student poster****
- 2015 **Esch, Ellen H.**, E. E. Cleland, D. Lipson. Effects of altered precipitation on decomposition rates in coastal sage scrub. Ecological Society of America Annual Meeting, Baltimore, MD.
- 2015 **Esch, Ellen H.**, E. E. Cleland, D. Lipson. Effects of altered precipitation on ecosystem processes in coastal sage scrub. Association for Environmental Studies and Sciences, La Jolla, CA.
- 2015 **Esch, Ellen H.**, E. E. Cleland, D. Lipson. Effects of altered precipitation on ecosystem processes in coastal sage scrub. California Higher Education Sustainability Conference, San Francisco, CA.
- 2015 **Esch, Ellen H.**, E. E. Cleland, D. Lipson. Effects of altered precipitation on ecosystem processes in coastal sage scrub. University of California San Diego Division of Biology Retreat, Lake Arrowhead, CA.
- 2014 **E. H. Esch**, E. E. Cleland. Climate change effects on soil respiration: altered precipitation and invasion in a chaparral system. Mathias Symposium, Bodega Bay, CA.
- 2013 **Esch, E. H.**, E. Cleland, D. Lipson. Climate change effects on soil microbial communities: Altered precipitation and invasion in a chaparral system. Ecological Society of America Annual Meeting, Minneapolis, MN.
- 2012 **Esch, E. H.**, D. L. Hernandez, J. Pasari, R. Kantor, P. C. Selmants. Response of soil enzyme activity to grazing, nitrogen deposition, and exotic cover in a serpentine grassland. Ecological Society of America Annual Meeting, Portland, OR.
- 2012 **Esch, Ellen H.**, C. J. Alster, D. L. Hernandez, M. J. McKone, P. Camil. Soil carbon and nitrogen accumulation: 10 years in a prairie restoration experiment. The Prairie Enthusiasts Annual Meeting, Menomonie, WI.

TEACHING EXPERIENCE

Co-instructor

- 2019 Conservation Biology. University of Guelph. BIOL 3130.
- 2018 Ecological Methods. University of Guelph. BIOL 4110.

Instructional Assistant

- 2016 Ecological Field Research in Australia & New Zealand. Carleton College BIOL 212.
- 2016 Australia Marine Ecology. Carleton College BIOL 250.
- 2016 Evolutionary Ecology of Australia & New Zealand. Carleton College BIOL 307.
- 2015 Biostatistics. UC San Diego BIEB 100.
- 2013 Evolution. UC San Diego BIEB 150.

- 2013 Ecology Laboratory. UC San Diego BIEB 121.
 2011 - 2012 Population Ecology. Carleton College BIOL 350.
 2012 Ecosystems Ecology. Carleton College BIOL 321.

Guest Lecture

- 2018 Invasive Plant Ecology. University of Guelph Graduate Class. "Climate change and invasion."
 2015 Agriculture Biotechnology for the 21st Century. UC San Diego BISP 194. "How global climate change impacts ecosystems."

PROFESSIONAL EXPERIENCE

- 2012 – current Participant in the Nutrient Network Global Research Cooperative.
 2018 Primary convener "Agroecosystems in the 21st Century" for the 2018 Canadian Society for Ecology and Evolution Annual Meeting.
 2016 Primary convener "GC32C: Semi-arid Shrublands under Changing Climates" for the 2016 American Geophysical Union Annual Meeting.
 2014 – 2016 Co-PI "Fire on the Fringe", National Socio-Environmental Synthesis Center, Maryland, MD.

MENTORSHIP

Graduate students

- 2018 – 2019 Mentor theses of B. Arce (M.Sc), O. Carroll (Ph.D.), A. Dolezal (M.Sc), A. Mazzoratto (M.Sc), and D. Noble (M.Sc).

R.E.U. students

- 2016 P. Ratsimbazafy. Won full fellowship to present poster at the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) Annual Meeting. Won poster presentation award.
 2015 S. Booth. Won full fellowship to present poster at Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) Annual Meeting.

Undergraduate students

- 2018 – 2019 K. Doherty and S. Ramirez. Advised senior theses.
 2014 – 2016 L. Brigham. Advised senior thesis. Won Strategies for Ecology Education, Diversity and Sustainability (SEEDS) fellowship to present poster Ecological Society of America meeting (2016).
 2013 – 2014 M. Sanchez. Advised senior thesis. Won Strategies for Ecology Education, Diversity and Sustainability (SEEDS) fellowship to present poster Ecological Society of America meeting (2015).
 2013 – 2014 J. Shih. Advised senior thesis. Won Strategies for Ecology Education, Diversity and Sustainability (SEEDS) Fellowship to present poster Ecological Society of America meeting (2015).
 2012 – 2017 Mentored 7 other undergraduates enrolled in Independent Research (BISP 99, BISP 199).

SERVICE AND OUTREACH ACTIVITIES

Public outreach and science education

- 2018 – 2019 **rare Charitable Research Reserve**, Cambridge, ON, Canada. 60 hours. Communicate research findings and natural history on public outreach walks and to area high schools.

- 2014 – 2018 **San Diego Natural History Museum Docent**, San Diego, CA. Over 300 hours. Lead hikes to general public audiences communicating ecology and natural history across San Diego County. Major contributor to book published in conjunction with San Diego Natural History Museum. “Coast to Cactus: The Canyoneer Trail Guide to San Diego Outdoors” (2016).
- 2015 – 2016 **Lake Morena County Park**, Campo, CA. Invited speaker: “Ecology Basics” (public lecture as part of evening campground programming).
- 2016 **Instructor for “California Shaman: bridging native plants & modern drug development,”** La Jolla, CA. Designed programing for a week-long diversity program in the UCSD Chemistry and Pharmacy Dept. for ~30 area high school students introducing them to traditional medicinal uses of coastal sage scrub plants.
- 2015 **Instructor for “Climate change: measuring the plant community at the Scripps Coastal Reserve,”** La Jolla, CA. Created and lead a field-based ecology laboratory for Triton Summer STEM Academy, a week-long, residential diversity program in the UCSD Biological Sciences Division for ~60 high school students.
- 2015 – 2016 **Created “Ecology, Art, and Kumeyaay” programming**, La Jolla, CA and Chula Vista, CA. Designed and implemented program merging ecological concepts, art, and Native American uses of plants to second graders at La Jolla Country Day School (May and October 2015) and first graders at Chula Vista Learning Community School (May 2016) reaching ~200 students.
- 2013 – 2016 **Research symposium judge**, San Diego, CA. Provided supportive and critical feedback for the University of California San Diego Biology Division’s Undergraduate Research Showcase

University service

- 2018 Organizer of professional development series for graduate students at University of Guelph.
- 2018 Committee member on Mental Health, Diversity and Equity at University of Guelph.
- 2017 Lead a research and ecology tour of the Scripps Coastal Reserve for UC San Diego Biology Dean’s Leadership Council (April) and UC San Diego Alumni weekend (June).
- 2013 – 2015 Graduate Student Recruitment Committee member at UC San Diego.
- 2013 – 2014 Graduate Student Representative for Biology at UC San Diego.
- 2013 – 2014 Ecology, Behavior, and Evolution section student organizer at UC San Diego.

Peer review

- Grants National Science Foundation Long-Term Research in Environmental Biology
- Manuscripts American Midland Naturalist, American Journal of Botany, Applications in Plant Sciences, Catena, Ecological Engineering, European Journal of Soil Science, Forests, Geoderma, Journal of Ecology, Journal of Vegetation Science, Oecologia, Plant and Soil, PLOS ONE, and Scientific Reports.