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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

11. **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*. doi: 10.1007/s11104-019-04069-y
10. 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. doi: 10.1007/s11258-019-00912-5
9. 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. Firn, 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*. doi: 10.1007/s10021-019-00350-4.
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 review or revision*–

- Esch, E. H.**, D. Lipson, and E. E. Cleland. Invasion alters ecosystem response to drought via increased phenological sensitivity. *In revision at Ecology*.
- Pérez Castro, S., **E. H. Esch**, V. Eviner, E. Cleland, and D. Lipson. Exotic herbaceous species interact with severe drought to alter soil N cycling in a semi-arid shrubland. *In review at Ecology*.
- Cazelles, Kevin, T. Bartley, M. Guzzo, M-H. Brice, A. S. MacDougall, **E. H. Esch**, J. Bennet, T. Kadoya, J. Kelly, S-I. S. Matsuzaki, and K. Nilsson, K. McCann. Homogenization of freshwater lakes: does gamefish movement outpace climate change? *In revision at Global Change Biology*.
- Esch, E. H.**, Arce, B. J., Carroll, O. H., Dolezal, A. J., Mazzorato, A. C. M., Fraser, E. D. G., Fryxell, J. M., McCann, K. S., Gilvesy, B., Krumholz, S., Campbell, M. M., MacDougall, A. S. Implications of rising input costs, declining crop prices, and expanding marginal landuse for valuing ecosystem services on farms. *Submitted to Nature*.

FELLOWSHIPS AND GRANTS

- 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

- 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 (*presenter)

- 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, oral presentation, Guelph, ON, Canada.
- 2017 Cleland, Elsa E.*, **E. H. Esch**, and D. Lipson. Invasion alters ecosystem response to drought via shorter growing seasons and lower carbon capture. Ecological Society of America Annual Meeting, oral presentation, Portland, OR.
- 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, oral presentation, Ft. Lauderdale, FL.
- 2016 Cleland, Elsa E.*, **E. H. Esch**, D. Lipson. Exotic herbaceous species are more sensitive than native coastal sage scrub species to shifting rainfall regimes. Ecological Society of America Annual Meeting, poster presentation, Ft. Lauderdale, FL.
- 2016 Brigham, Laurel. M.*, **E. H. Esch**, C. Kopp, E. Cleland. Effect of warming and shrub encroachment on rates of litter decomposition and nitrogen mineralization in an alpine ecosystem. Ecological Society of America Annual Meeting, poster presentation, 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, oral presentation, San Diego, CA. **runner up best 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, poster presentation, 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, oral presentation, 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, poster presentation, 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, poster presentation, 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, poster presentation, Lake Arrowhead, CA.
- 2014 Shih, Jennifer, M. Sanchez, **E. H. Esch**, D. Lipson, J. Kim, E. E. Cleland. The response of photosynthetic biomass production to experimental rainfall manipulations differs between native shrubs and exotic herbaceous species in a coastal sage scrub ecosystem. Ecological Society of America Annual Meeting, poster presentation, Sacramento, CA.
- 2014 **E. H. Esch**, E. E. Cleland. Climate change effects on soil respiration: altered precipitation and invasion in a chaparral system. Mathias Symposium, oral presentation, Bodega Bay, CA.
- 2013 Cleland, Elsa E.*, R. Abbott, E. T. Borer, E. J. DeLorenze, N. M. DeCrappeo, **E. H. Esch**, S. Gressard, W. S. Harpole, C. Kopp, E. M. Lind, E. W. Seabloom. The role of nutrient, light, and soil-moisture limitation on root allocation across global grasslands. Ecological Society of America Annual Meeting, oral presentation, Minneapolis, MN.
- 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, poster presentation, 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, poster presentation, Portland, OR.
- 2012 Hernandez, D. L.*, **E. H. Esch**, C. Alster, M. J. McKone, P. Camill. Rapid accumulation of soil carbon and nitrogen in restored prairie is not predicted using a chronosequence approach. Ecological Society of America Annual Meeting, oral presentation, 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, poster presentation, Menomonie, WI.
- 2011 Alster, C.*, **E. H. Esch**, D. L. Hernandez, M. J. McKone, P. Camill. Soil carbon and nitrogen accumulation in a 15-year prairie restoration experiment. Ecological Society of America Annual Meeting, oral presentation, Austin, TX.

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 – current 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 **rare Charitable Research Reserve**, Cambridge, ON, Canada. Lead “ecology basics” and “biodiversity and agriculture” public outreach walks.

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 programming 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.