

ERIN L. LANDGUTH

Computational Ecology Lab • School of Public and Community Health Sciences • University of Montana
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Education

2010. *Ph.D. in Mathematical and Computational Ecology*
Dissertation: Mathematical and computational applications in disease and landscape ecology.
University of Montana – Missoula, MT (Advisors: E. Stone, S. Cushman)
2004. *M.S. in Atmospheric Sciences*
Thesis: Texture and spatial complexity analysis in remote sensing.
SD School of Mines and Technology – Rapid City, SD (Advisor: P. Zimmerman)
2002. *B.S. in Mathematics**
Undergraduate Thesis: Shuttle mechanic maneuvers and orbital mechanics.
SD School of Mines and Technology – Rapid City, SD (Advisor: D. Teets)
* 2013 Outstanding Recent Graduate Award

Research & Work Experience

- 2010 – . *Director, Computational Ecology Laboratory, University of Montana – Missoula, MT*
Established the Computational Ecology Laboratory (CEL: <http://cel.dbs.umt.edu>), the largest high performance computer laboratory on campus. My vision and research focus is to develop, optimize, and apply individual-based simulation programs for understanding relationships between biological processes, environment, and climate with population patterns across landscapes. My goal is to produce tools that will be valuable to natural resources managers, planners, decision makers, and scientists with a stake in maintaining biodiversity, from genes to ecosystems. I have coordinated multiple research grants and worked with researchers from around the world, on projects ranging from simulating rates of adaptation and evolutionary change in organisms across landscapes, to developing predictive space-time models of insect spread across the Western US. CEL members that I have supervised and supported have included software engineers, GIS analysts, and students/post docs across computer science, computational biology, quantitative statistics, and landscape genetics.
Supervisor: Dean Charlie Janson
- 2017 – . *Research Associate Professor, School of Public and Community Health Sciences, University of Montana – Missoula, MT*
Supervisor(s): Department Head Tony Ward and Dean Reed Humphrey
* 2016-2017 Merit Award recommended under faculty evaluation and approved by Dean Reed Humphrey
* 2016-2017 University of Montana Outstanding Performance Award
- 2010 – 2017. *Research Assistant Professor, Division of Biological Sciences, University of Montana – Missoula, MT*
I have led and successfully funded numerous research grants and brought nearly \$4,000,000 to the University of Montana through the Computation Ecology Lab. The

broad focus of this work is aimed at understanding the consequences of land use and climate change on the movement patterns, genetics, and connectivity of terrestrial and aquatic species. I apply my training and conduct research across a range of disciplines, including conservation and computational biology, landscape ecology, population and landscape genetics, and evolutionary biology. I collaborate with a diverse group of land managers, stakeholders, and scientists on basic and applied research questions related to both terrestrial and aquatic resource management and conservation issues. I have developed software programs, analytical tools, and web-based interactive platforms in response to scientific and land management needs.

Supervisor: Dean Charlie Janson

* 2013-2014 Merit Award recommended under faculty evaluation and approved by Dean Chris Comer.

* 2015-2016 Merit Award recommended under faculty evaluation and approved by Dean Chris Comer.

2008. *Research Assistant, RMRS-USDA-FS, University of Montana – Missoula, MT*
Research: Developing and applying an agent based model for adaptive evolution in complex and nonequilibrium environments.
Supervisor: S. Cushman
2008. *NSF EAPSI Fellow, Mathematics Department, University of Auckland – Auckland NZ*
Research: Modeling temporally-forced disease dynamics in a relapsing host-vector community.
Supervisor: V. Kirk
2007. *MEID Internship, Computer Science Department, University of California – Davis, CA*
Research: A cellular automata SIR model for landscape epidemiology.
Supervisor: J. Crutchfield
- 2006 – 2010. *NSF IGERT Trainee, Ecology of Infectious Diseases, University of Montana – Missoula, MT*
Research: Interdisciplinary and collaborative research for understanding the structure, dynamics, genetics, and behavior of host organisms and pathogens and the complex interplay between host, pathogen, and environment at multiple spatial and temporal scales.
Supervisors: E. Stone, S. Cushman, B. Holben
2006. *Outreach GEMS Coordinator, Walter Reed AIR – Washington D.C. & Polson, MT*
Coordinator of the Gains in the Education of Mathematics and Science (GEMS), based on a multi-disciplinary educational curriculum, and focused on age- and grade-appropriate hands-on activities, in areas such as science, engineering, mathematics, computational sciences, computational biology, biomedical sciences, chemistry and biology.
Supervisor: M. Jett
2005. *Professional Engineering Associate, RESPEC, Inc. – Rapid City, SD*
Contractor: Responsible for numerous software products and GIS toolboxes for mobile mapping devices designed for environmental remediation sites.
Supervisor: D. Hoyer

2004. *Research Scholar, Santa Fe Institute, Santa Fe, NM*
 Research: Embedding and Fourier analysis on Ameriflux data.
 Supervisors: J. Crutchfield
2004. *Research Assistant, Institute of Atmospheric Science, SD School of Mines and Technology – Rapid City, SD*
 Research: Spatial complexity and texture analysis in remote sensory imagery. Cellular automata modeling for plague in prairie dog populations for the Fort Belknap Reservation.
 Supervisors: P. Zimmerman, L. Vierling, M. Price

Refereed Publications

1. Macdonald EA, Cushman SA, Landguth EL, Hearn AJ, Malhi Y, Macdonald DW (2018) Simulating impacts of rapid forest loss on population size, connectivity and genetic diversity of Sunda clouded leopards (*Neofelis diardi*) in Borneo. PLOS ONE. PONE-D-18-00993R1.
2. Escalante M, Leon G, Arturo RL, **Landguth EL**, Manel S (2018) The interplay of riverscape features and exotic introgression on the genetic structure of the Mexican golden trout (*Oncorhynchus chrysogaster*). Journal of Biogeography. DOI: 10.1111/jbi.13246
3. Day C, **Landguth EL**, Bearlin A, Holden ZA, Whiteley AR (2018) Using simulation modeling to inform management of invasive species: A case study of eastern brook trout suppression and eradication. Biological Conservation, 221, 10-22.
4. Palmer C, **Landguth EL**, Stone E, Johnson T (2018) The dynamics of vector-borne relapsing diseases. Mathematical Biosciences, 297, 32-42.
5. Prachi T, Joshi A, Vaidyanathan S, **Landguth EL**, Ramakrishnan U (2018) Maintaining tiger connectivity and minimizing extinction into the next century: Insights from landscape genetics and spatially-explicit simulations. Biological Conservation, 218, 181-191.
6. Cushman SA, Macdonald EA, Landguth EL, Malhi Y, Macdonald DW (2017) Multiple-scale prediction of forest loss risk across Borneo. Landscape Ecology. DOI 10.1007/s10980-017-0520-0.
7. Kristensen TV, Puckett EE, **Landguth EL**, Hast J, Carpenter C, Sajecki JL, Belant JL, Berringer J, Means M, Cox J, Eggert LS, White Jr D, Smith KG (2018) Spatial genetic structure in American black bears (*Ursus americanus*): female philopatry is variable and related population history. Heredity, 130, 329-341.
8. Cooper LA, Ballantyne AP, Holden ZA, **Landguth EL** (2017) Disturbance impacts on land surface temperature and gross primary productivity in the western United States. Journal of Geophysical Research – Biogeosciences, 122, 930-946.
9. Shirk A, **Landguth EL**, Cushman SA (2017) A comparison of individual-based genetic distance metrics for landscape genetics. Molecular Ecology Resources, DOI: 10.1111/1755-0998.12684.
10. Stucki S, Orozco-terWengel P, Forester B, Colli L, Masembe C, Negrini R, **Landguth EL**, Jones M, Duruz S, Bruford M, Taberlet P, Joost S (2016) High performance computation of landscape genomic models including local indicators of spatial association. Molecular Ecology Resources. 10.1111/1755-0998.12629.
11. Shirk A, **Landguth EL**, Cushman SA (2017) A comparison of regression methods for model selection in individual-based landscape genetic analysis. Molecular Ecology Resources. DOI: 10.1111/1755-0998.12709.
12. Schwabl P, Llewellyn M, **Landguth EL**, Andersson BA, Kitron U, Costales JA, Ocana S, Grijalva MJ (2016) Prediction and prevention of parasitic diseases using a landscape genomics framework. Trends in Parasitology. DOI: <http://dx.doi.org/10.1016/j.pt.2016.10.008>.

13. **Landguth EL**, Holden ZA, Mahalovich MF, Cushman SA (2017) Using landscape genetics simulations for planting blister rust resistance whitebark pine in the US Northern Rocky Mountains. *Frontiers in Genetics*, section Evolutionary and Population Genetics. Research topic: "The least cost path from landscape genetics to landscape genomics: challenges and opportunities to explore NGS data in a spatially explicit context". <https://doi.org/10.3389/fgene.2017.00009>.
14. Franckowiak R, Panasci M, Jarvis K, Acuna-Rodriguez I, **Landguth EL**, Fortin M-J, Wagner HH (2017) Model selection with multiple regression on distance matrices leads to incorrect inferences. *PLoS ONE*. PONE-D-16-40179R1
15. Creech T, Epps C, **Landguth EL**, Wehausen JD, Crowhorst R, Holton B, Monello RJ (2017) Simulating the spread of selection-driven genotypes using landscape resistance models for desert bighorn sheep. *PLOS ONE*, <https://doi.org/10.1371/journal.pone.0176960>.
16. Zeller K, Creech T, Millette K, Crowhurst R, Long R, Balkenhol N, Wagner HH, **Landguth EL** (2016) Using simulations to evaluate Mantel-based methods for assessing landscape resistance to gene flow. *Ecology and Evolution*. DOI: 10.1002/ece3.2154.
17. Smith A, **Landguth EL**, Banks S, M Bull, D Driscoll, M Gardner (2016) Disturbance and succession influence genetic diversity through habitat-mediated dispersal. *Royal Society Proceedings B*. doi: 10.1098/rspb.2015.2934.
18. Davies, ID, Cary GJ, **Landguth EL**, Lindenmayer DB, Banks SC (2016) Implications of recurrent disturbance for genetic diversity. *Ecology and Evolution*, 6, 1181-96. DOI: 10.1002/ece3.1948.
19. Johnson TL^{co}, **Landguth EL**^{co}, Stone E (2016) Modeling relapsing disease dynamics in a host vector community. *PLoS Neglected Tropical Diseases*. 10.1371/journal.pntd.0004428.
^{co}- Contributed equally to this work.
20. Scribner K, Lowe W, **Landguth EL**, et al. (2016) Applications of Genetic Data to Improve Management and Conservation of River Fishes and Their Habitats. *Fisheries*, 41, 174-188.
21. **Landguth EL**, Bearlin A, Day C, Dunham J (2016) CDmetaPOP: an individual-based, eco-evolutionary model for spatially-explicit simulation of landscape demogenetics. *Methods in Ecology and Evolution*. 8, 4-11, doi: 10.1111/2041-210X.12608
22. Kraus RHS, et al., **Landguth EL** (2016) Peer review: Matchmaker aims to cut journal shopping. *Nature Correspondence*, 531, doi:10.1038/531448e.
<http://www.nature.com/nature/journal/v531/n7595/full/531448e.html>.
23. Forester B, Jones M, Joost S, **Landguth EL**, Lasky J (2016) Detecting spatial genetic signatures of local adaptation in heterogeneous landscapes. *Molecular Ecology*, 25, 104-120.
24. Cushman S, **Landguth EL** (2016) Spatially heterogeneous environmental selection strengthens evolution of reproductively isolated populations in a Dobzhansky-Muller system of hybrid incompatibility. *Frontiers in Genetics*, section Evolutionary and Population Genetics. Research topic: "The least cost path from landscape genetics to landscape genomics: challenges and opportunities to explore NGS data in a spatially explicit context" <http://dx.doi.org/10.3389/fgene.2016.00209>.
25. **Landguth EL**, Johnson NJ, Cushman SA (2015) Clusters of incompatible genotypes evolve with limited dispersal. *Frontiers in Genetics, Evolutionary and Population Genetics*. doi:10.3389/fgene.2015.00151
26. Noonan CW, Conway K, **Landguth EL**, McNew T, Pfau J, Black B, Szeinuk J, Flores R (2015) Multi-pathway exposure assessment for an asbestos-exposed Superfund community. *Journal of Exposure Science and Environmental Epidemiology*. doi:10.1038/jes.2014.25.
27. Cooke GM, **Landguth EL**, Beheregaray LB (2014) Riverscape genetics and replicated ecological speciation across an Amazonian ecotone. *Evolution*, 68, 1947-1960.
28. **Landguth EL**, Schwartz MK (2014) Evaluating sample allocation and effort in detecting population differentiation for discrete and continuously distributed individuals. *Conservation Genetics*, 15, 981-992.

29. Cushman SA, Lewis J, **Landguth EL** (2014) Why did the bear cross the road? Comparing performance of multiple resistance surfaces and connectivity modeling methods. *Diversity*, 6, 844-854. doi:10.3390/d6040844.
30. **Landguth EL**, Muhlfeld CC, Waples, RS, Jones L, Lowe WH, Lucotch J, Neville H, Luikart G (2014) Combining demographic and genetic factors to map population vulnerability in stream species. *Ecological Applications*. 24, 1505–1524.
31. Hand BK, **Landguth EL**, Cushman SA (2014) Assessing multi-taxa sensitivity to the human footprint, habitat fragmentation and loss by exploring alternative scenarios of dispersal ability and population size. *Biodiversity and Conservation*. 10.1007/s10531-014-0747-x.
32. Beheregaray LB, **Landguth EL**, Cooke GM (2014) Ecological Speciation in the Tropics: Insights from Comparative Phylogeography and Landscape Genetics of Amazonian Fishes. *Frontiers in Genetics*. Research topic "Origin of tropical diversity: from clades to communities" 10.3389/fgene.2014.00477.
33. Jones MR, Forester BR, Teufel AI, Adams RV, Anstett DN, Goodrich BA, Joost S, Manel S, **Landguth EL** (2014) Integrating spatially-explicit approaches to detect adaptive loci in a landscape genomics context. *Evolution (Special Issue: Evolutionary Landscape Genetics)*, 67, 3455-3468.
34. Wasserman T, Cushman SA, Littel JS, Shirk AJ, **Landguth EL** (2013) Population connectivity and genetic diversity of American marten (*Martes americana*) in the United States northern Rocky Mountains in a climate change context. *Conservation Genetics*, 14, 529-541.
35. Cushman SA, Shirk AJ, **Landguth EL** (2013) Landscape genetics and limiting factors. *Landscape Ecology*, 14, 263-274.
36. Oyler-McCance SJ, Fedy BC, **Landguth EL** (2013) Sample design effects in landscape genetics. *Conservation Genetics*, 14, 275–285.
37. Cushman, SA, Landguth EL (2013) Evaluating Population Connectivity for Species of Conservation Concern in the American Great Plains. *Biodiversity and Conservation*, DOI: 10.1007/s10531-013-0541-1.
38. Cushman, SA, Wasserman TN, **Landguth EL**, Shirk A (2013) Re-evaluating casual modeling with Mantel tests in landscape genetics. *Diversity (Special Issue: Genetic Diversity and Molecular Evolution)*, 5, 51-72.
39. Hand BK, Chen S, Anderson N, Beja-Pereira A, Cross PC, Ebinger M, Edwards H, Garrott RA, Kardos M, Kauffman M, **Landguth EL**, Middleton A, Schwartz M, Scurlock B, White PJ, Zager P, Luikart G (2013) Limited maternal gene flow among elk herds in the Greater Yellowstone Ecosystem revealed by mtDNA. *Journal of Fish and Wildlife Management*. 19, 1-4
40. Cushman SA, Lewis JS, **Landguth EL** (2013) Evaluating the intersection of a regional wildlife connectivity network with highways. *Movement Ecology*, doi:10.1186/2051-3933-1-12
41. Blair C, Weigel DE, Balazik M, Keeley ATH, Walker FM, **Landguth EL**, Cushman S, Murphy M, Waits L, Balkenhol N (2012) A simulation-based evaluation of methods for inferring linear barriers to gene flow. *Molecular Ecology Resources*, 12, 822-833.
42. **Landguth EL**, Cushman SA, Johnson NA (2012) Simulating natural selection in landscape genetics. *Molecular Ecology Resources*, 12, 363-368.
43. Cushman SA, Shirk AS, **Landguth EL** (2012) Separating the effects of habitat area fragmentation and matrix resistance on genetic differentiation in complex landscapes. *Landscape Ecology*, 27, 369-380.
44. Graves TA, Wasserman TN, Ribeiro M, **Landguth EL**, Spear SF, Balkenhol N, Higgins CB, Fortin M-J, Cushman SA, Waits LP (2012) The influence of landscape characteristics and home-range size on the quantification of landscape-genetics relationships. *Landscape Ecology*, 27, 253-266.
45. Muhlfeld CC, D'Angelo V, Kalinowski ST, **Landguth EL**, Downs CC, Tohtz J, Kershner JL (2012) A fine-scale assessment of using barriers to conserve native stream salmonids: A case study in Akokala Creek, Glacier National Park, USA. *The Open Fish Science Journal*, 5, 9-20.

46. **Landguth EL**, Fedy B, Garey A, Mumma M, Emel S, Oyler-McCance S, Cushman SA, Wagner HH, Fortin MJ (2012) Effects of sample size, number of markers, and allelic richness on the detection of spatial genetic pattern. *Molecular Ecology Resources*, 12, 276-284.
47. **Landguth EL**, Hand BK, Glassy JM, Cushman SA, Sawaya M (2012) UNICOR: a species corridor and connectivity network simulator. *Ecography*, 12, 9-14.
48. **Landguth EL**, Muhlfeld CC, Luikart G (2012) CDFISH: an individual-based, spatially-explicit, landscape genetics simulator for aquatic species in complex riverscapes. *Conservation Genetics Resources*, 4, 133-136.
49. Cushman SA, **Landguth EL** (2012) Multi-taxa population connectivity in the Northern Rocky Mountains. *Ecological Modelling*, 231, 101-112.
50. Shirk AS, Cushman SA, **Landguth EL** (2012) Simulating pattern-process relationships to validate landscape genetic models. *International J. Ecology*, doi:10.1155/2012/539109.
51. **Landguth EL**, Balkenhol N (2012) Relative sensitivity of neutral versus adaptive genetic data for assessing population differentiation. *Conservation Genetics*, 13, 1421-1426.
52. Short Bull R, Cushman SA, Mace R, Chilton T, Kendall K, **Landguth EL**, Schwartz MK, McKelvey K, Allendorf FW, Luikart G (2011) Why replication is important in landscape genetics: case of the American black bear in the Rocky Mountains. *Molecular Ecology*, 20, 1092-1107.
53. Balkenhol N, **Landguth EL** (2011) Simulation modeling in landscape genetics: on the need to go further, *Molecular Ecology*, 20, 667-670.
54. Wasserman TN, Cushman SA, Shirk AS, **Landguth EL**, Littel JS (2011) Simulating the effects of climate change on population connectivity of American marten (*Martes americana*) in the northern Rocky Mountains, USA. *Landscape Ecology*, doi:10.1007/s1098001196538.
55. **Landguth EL**, Cushman SA, Schwartz MK, Murphy M, McKelvey KS, Luikart G (2010) Quantifying the lag time to detect barriers in landscape genetics. *Molecular Ecology*, 19, 4179-4191.
56. **Landguth EL**, Cushman SA, Murphy M, Luikart G (2010) Relationships between migration rates and landscape resistance assessed using individual-based simulations. *Molecular Ecology Resources* (Special Issue: Methodological Advances – Inference of Spatial Structure), 10, 854-862.
57. Cushman SA, **Landguth EL** (2010) Spurious correlations and inferences in landscape genetics. *Molecular Ecology*, 19, 3592-3602.
58. Cushman SA, **Landguth EL** (2010) Scaling landscape genetics. *Landscape Ecology*, 25, 967-979
59. **Landguth EL**, Cushman SA (2010) CDPOP: a spatially explicit cost distance population genetics program. *Molecular Ecology Resources*, 10, 156-161.

Other Publications/Books

-
1. Clevenger A, Sawaya MA, **Landguth EL** (2018) Mitigating multi-species mortality and fragmentation on the Trans-Canada Highway through Mount Revelstoke and Glacier National Parks, British Columbia. Technical Report, Canada Parks.
 2. Forester B, **Landguth EL**, Hand B, Balkenhol N (2018) Chapter X: Wildlife landscape genomics. In *Population Genomics* eds. Hohelenhoe P, Springer. Pp online.
 3. **Landguth EL**, Cushman SA, Balkenhol N (2015) Chapter 6: Simulation modeling in landscape genetics. In *Landscape Genetics* eds. Balkenhol N, Waits L, Cushman S. Wiley, London. pp 99-116.
 4. **Landguth EL**, Holden ZA, Mahalovich MF (2015) A landscape genomics simulation framework for assisted migration in Whitebark Pine across the northern Rocky Mountains, USA. *USDA Forest Health & Protection Report*. pp 42.
 5. Holden ZA, Jolly WM, Parson R, Warren A, **Landguth EL**, Abatzoglou J (2013) TOPOFIRE: A system for monitoring insect and climate induced impacts on fire danger in complex terrain. Consortium for Integrated Climate Research in Western Mountains.

6. Muhlfeld C, Jones LA, Al-Chokhachy R, Luikart G, **Landguth EL** (2012) Conference Paper: Using spatially explicit models to assess potential effects of climate warming on native salmonids in the Northern Rockies. American Fisheries Society 142nd Annual Meeting.
7. Cushman SA, **Landguth EL**, Flather CH (2011) Phase I: Climate change and connectivity: Assessing landscape and species vulnerability. Final Report to Great Plains Landscape Conservation Cooperative. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 103 p.

Manuscripts Submitted

1. Purdy JE, Graham JM, Holden ZA, **Landguth EL** (in revisions) Estimation of Spatio-Temporal Autologistic Regression Model via Maximum Generalized Pseudolikelihood. Journal of Agricultural, Biological, and Environmental Statistics.
2. Stalke A, Andrews K, Forester B, **Landguth EL** (in revisions) Missingness in outlier detection testing for GEA methods. Molecular Ecology Resources.
3. Nathan L, Mamoozadeh N, Tumas HR, Gunselman S, Klass K, Metcalfe A, Edge C, Waits L, Spruell P, Lowery E, Connor E, Bearlin A, Fortin M-J, **Landguth EL** (in revisions) A simulation framework for evaluating fish hybridization dynamics in heterogeneous riverscapes. Molecular Ecology.
4. Mims M, Day C, Hinkle J, Fuller M, Burkhart J, Bearlin A, DeHann P, Holden Z, **Landguth EL** (in review) Riverscape genetics simulation framework for Bull Trout reintroductions.

Manuscripts in Preparation

1. Banks S, **Landguth EL** (in prep) Temporal dynamics versus changing landscapes: implications for landscape genetics inference.
2. Fuller M, Day C, Mims M, Burkhart J, Hinkle J, Bearlin A, DeHann P, Holden Z, **Landguth EL** (in prep) Reintroduction success of Bull Trout under barrier removal and habitat improvements.
3. **Landguth EL**, Cushman SA, Shirk A (in prep) Simulating polygenic selection in landscape genetics.
4. **Landguth EL**, Eckert A, Whipple A, Forester B, Cushman SA, Shirk A (in prep) Simulating epigenetic inheritance in landscape genetics.
5. Holden ZA, Egan JM, McKeever K, Lockman I, Jackson M, Swanson A, **Landguth EL** (in prep) Distribution of root disease across northern Region 1.
6. Holden ZA, et al., **Landguth EL** (in prep) TOPOFIRE: a decision support system for fire behavior modeling.
7. Holden ZA, **Landguth EL**, Semmens S, Graham J, Urbanski S, Jolly M, Noonan C (in prep) PM 2.5 for the western USA.
8. Stone E, Bayatmokhtari E, **Landguth EL** (in prep) Archetype mapping and compartmental SIR modeling of influenza dynamics for Montana, USA.
9. Stark B, Graham J, Holden ZA, **Landguth EL** (in prep) Spatio-temporal modeling of flu and causal dynamics of influenza across Montana, USA.
10. **Landguth EL**, Graham J, Holden ZA, Semmens E, Smith P, Jolly M, Urbanski S, Noonan C (in prep) The influence of fires on lower respiratory tract infections in Montana: a multi-modeling and methods approach to infer causations.
11. Zarn K, Robinson Z, Small M, Fortin M-J, Simmons R, Lukacs P, Day C, **Landguth EL** (in prep) Management tradeoffs between habitat restoration and non-native suppression activities on Westslope Cutthroat trout.
12. Day C, **Landguth EL**, Simmons R (in prep) Trojan YY introductions and suppression activities on non-native populations.

Research Grants (Post Graduate)**Funding to date: \$4,267,051**

* Pending support not included in total

*Project/Proposal Title: Quantitative methods for ecological forecasting
 Source of Support: Canada Collaborative Research and Training Experience Program
 Total Award/Budget: \$1,000,000
 Performance Period: 2018–2023
 Name of PI on Project: Theresa Burg (Co-I: Erin Landguth)
 Location of Project: University of Lethbridge (University of Montana)

*Project/Proposal Title: Modeling factors that influence children’s respiratory health
 Source of Support: NIH CoBRE
 Total Award/Budget: \$400,000
 Performance Period: 2019-2023
 Name of PI on Project: Erin Landguth (Center PI: Curtis Noonan)
 Location of Project: University of Montana

*Project/Proposal Title: RoL:FELS DNA methylation as a nexus of genetic, transgenerational, and environmental influences on trait expression: insights into rules behind phenotypes from a non-model forest species
 Source of Support: NSF Rules of Life
 Total Award/Budget: Pre-proposal
 Performance Period: 2018–2021
 Name of PI on Project: Jeremy Johnson (CO-I: Landguth)
 Location of Project: Northern Arizona State; University of Montana

*Project/Proposal Title: Improving landscape genetics models for research in complex, fire-prone ecosystems.
 Source of Support: Australian Research Council
 Total Award/Budget: \$ 332,000
 Performance Period: 2018–2020
 Name of PI on Project: Sam Banks (CO-I: Landguth)
 Location of Project: The Australian National University

*Project/Proposal Title: Species-genetic diversity correlations: Patterns, processes, and their implication in conservation
 Source of Support: Concurso Regular FONDECYT 2017, Chile
 Total Award/Budget: \$ 100,000
 Performance Period: 2018-2020
 Name of PI on Project: Angeline Bertin (CO-I: Landguth)
 Location of Project: University of La Serena

Project/Proposal Title: RoL:FELS
 Source of Support: NSF Rules of Life: EAGER: Landscape Phenomics: Predicting vulnerability to climate change by linking environmental heterogeneity to genetic and phenotypic variation.
 Total Award/Budget: Full-proposal
 Performance Period: 2018–2021

Name of PI on Project: Chris Funk (CO-I: Landguth)
Location of Project: Colorado State University; University of Montana

Project/Proposal Title: Modeling factors that influence children's respiratory health
Source of Support: Montana INBRE
Total Award/Budget: \$90,000
Performance Period: 2018–2019
Name of PI on Project: Erin Landguth
Location of Project: University of Montana

Project/Proposal Title: Creating drought and climate variables for western US.
Source of Support: USDA Forest Service
Total Award/Budget: \$ 18,000
Performance Period: 2018–2023
Name of PI on Project: Erin Landguth
Location of Project: University of Montana

Project/Proposal Title: Landscape connectivity for Pronghorn
Source of Support: Montana Department of Transportation
Total Award/Budget: \$55,000
Performance Period: 2018-2020
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: New Mexico State-wide Wildlife Habitat Linkage Assessment
Source of Support: Resource Legacy Fund
Total Award/Budget: \$17,000
Performance Period: 2017-2019
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: New Mexico State-wide Wildlife Habitat Linkage Assessment
Source of Support: New Mexico Department of Game and Fish
Total Award/Budget: \$50,000
Performance Period: 2017-2018
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: Prediction of root disease occurrence and severity across forests of the Northern region
Source of Support: USDA, Forest Service, Northern Region
Total Award/Budget: \$60,000
Performance Period: 2017-2022
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: Landscape genetics modeling of bighorn sheep in Idaho
Source of Support: Idaho Fish and Game

Total Award/Budget: \$5,500
Performance Period: 2017-2018
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: Informing brook trout suppression through landscape genomics analysis in the lower Pend Oreille River.
Source of Support: Seattle City Light
Total Award/Budget: \$ 194,104
Performance Period: 2017–2020
Name of PI on Project: Andrew Whiteley (CO-I: Landguth)
Location of Project: University of Montana

Project/Proposal Title: Next Generation Genetic Monitoring
Source of Support: NIMBioS Investigative Workshop
Total Award/Budget: Workshop and travel support,
www.nimbios.org/workshops/WS_nextgen
Performance Period: 2016
Name of PI on Project: Sean Hoban (CO-I: Landguth)
Location of Project: University of Tennessee

Project/Proposal Title: Modeling the combined effects of landscape resistance and adaptive evolution on landscape genomics of Fremont cottonwood and southwestern white pine.
Source of Support: USFS RJVA
Total Award/Budget: \$260,000
Performance Period: 2015–2018
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: A system to forecast the demographic and genetic viability of salmonid fish across broad regions under changing climates
Source of Support: NASA ROSES A.36 Earth Science Applications: Ecological Forecasting
Total Award/Budget: \$190,509 Phase I; \$716,000 Phase II
Performance Period: 2013–2014; 2015–2017
Name of PI on Project: Seth Wegner (CO-I Landguth)
Location of Project: Trout Unlimited, University of Montana, and University of Georgia

Project/Proposal Title: Landscape genetics guide NTD interventions: Chagas disease in Ecuador and Peru
Source of Support: NIH Academic Research Enhancement Award (R15)
Total Award/Budget: \$426,721
Performance Period: 2015-2017
Name of PI on Project: Mario Grijalva (CO-I Landguth)
Location of Project: Ohio University and University of Montana

Project/Proposal Title: A prototype system for predicting insect and climate-induced impacts on fire hazard in complex terrain

Source of Support: NASA ROSES A.35 Earth Sciences Applications: Wildland Fires
 Total Award/Budget: \$149,526 Phase I; \$1,300,000 Phase II
 Performance Period: 2013-2014; 2015-2017
 Name of PI on Project: Zack Holden (CO-I Landguth)
 Location of Project: Fire Lab RMRS and University of Montana

Project/Proposal Title: Spring School 2014: A Practical, hands-on introduction to landscape genetics
 Source of Support: Volkswagen Stiftung Foundation
 Total Award/Budget: \$40,000
 Performance Period: March 2014
 Name of PI on Project: Niko Balkenhol (CO-I Landguth)
 Location of Project: University of Gottingen

Project/Proposal Title: Riverscape genetics of Westslope cutthroat in the Boundary System, Washington: simulation modeling of dam removal, reintroduction and sampling strategies
 Source of Support: Seattle City Lights
 Total Award/Budget: \$196,264
 Performance Period: 2013–2015
 Amendment: \$311,000 (2016 – 2018)
 Name of PI on Project: EL Landguth
 Location of Project: University of Montana

Project/Proposal Title: The North Pacific Forest Landscape Corridor and Connectivity Project: Assessing landscape and species vulnerability.
 Source of Support: USFWS NPLCC
 Total Award/Budget: \$41,243
 Performance Period: 2011–2012
 Name of PI on Project: EL Landguth
 Location of Project: University of Montana

Project/Proposal Title: A multi-scale approach for remotely mapping pine-beetle attacks over time and associated fire hazard.
 Source of Support: USFS WWTAC
 Total Award/Budget: \$20,000
 Performance Period: 2011–2013
 Name of PI on Project: Russel Parsons (CO-I Landguth)
 Location of Project: University of Montana

Project/Proposal Title: Developing methods for detecting ADS data using multi-temporal Landsat data.
 Source of Support: USFS Cooperative Agreement
 Total Award/Budget: \$60,000
 Performance Period: 2010–2013
 Name of PI on Project: EL Landguth
 Location of Project: University of Montana

Project/Proposal Title: Prioritizing White bark pine genetic and restoration activities
Source of Support: USFS Cooperative Agreement
Total Award/Budget: \$20,000
Performance Period: 2010–2015
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: Predicting climate change impacts on river ecosystems and salmonids across the Pacific Northwest: Combining vulnerability modeling, landscape genomics, and economic evaluations for conservation
Source of Support: USGS Climate Science Center
Total Award/Budget: \$87,828
Performance Period: 2012-2014
Name of PI on Project: Clint Muhlfeld (CO-I Landguth)
Location of Project: University of Montana

Project/Proposal Title: Developing and applying an agent based model for adaptive evolution in complex and nonequilibrium environments
Source of Support: USFS RJVA
Total Award/Budget: \$129,250
Performance Period: 2010-2012
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: Conifer genomics and climate change
Source of Support: USFS RJVA
Total Award/Budget: \$14,150
Performance Period: 2010-2012
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: Effects of climate change on wildlife populations, habitat and connectivity in the Rocky Mountains
Source of Support: USFS RJVA
Total Award/Budget: \$66,686
Performance Period: 2010-2013
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: Modeling habitat connectivity for wildlife species across the Western United States under alternative future climate regimes
Source of Support: USFS RJVA
Total Award/Budget: \$167,455
Performance Period: 2010-2014
Name of PI on Project: EL Landguth
Location of Project: University of Montana

Project/Proposal Title: Developing and applying an agent-based gene flow model for salmonids in complex and nonequilibrium stream environments

Source of Support: USGS CESU

Total Award/Budget: \$22,815

Performance Period: 2011-2012

Name of PI on Project: EL Landguth

Location of Project: University of Montana

Teaching Experiences

Spring 2018. *Instructor.* 'BIOL595: Landscape Genetics: developing best practices for testing landscape effects on gene flow' at University of Montana.

Fall 2016. *Workshop.* 'Next Generation Genetic Monitoring', a NIMBioS Investigative Workshop. November 7-9, 2016, University of Tennessee, Knoxville.

Spring 2016. *Instructor.* 'BIOL595: Landscape Genetics: developing best practices for testing landscape effects on gene flow' at University of Montana.

March 2014. *Workshop/Spring School.* A practical, hands-on introduction to landscape genetics, University of Göttingen, Germany.

Spring 2014. *Instructor.* 'BIOL595: Landscape Genetics: developing best practices for testing landscape effects on gene flow' at University of Montana.

2012 – 2013. *Affiliate Faculty.* Department of Fisheries & Wildlife, Oregon State University – Corvallis, OR. Committee Service and Advising: (PhD graduate student T Creech) on evaluating current and future genetic diversity and connectivity of desert bighorn sheep.

2012. *Instructor.* 'BIOL595: Landscape Genetics: developing best practices for testing landscape effects on gene flow' at University of Montana. Co-lead the online version of the course that was broadcasted across ~25 universities world-wide, and supervised three student projects (all of which are in preparation for publication currently).

2011 – current. *Montana Institute on Ecosystems Faculty Fellow.* A recently developed Institute on interdisciplinary research and education across Montana's universities.

2011. *Workshop.* Simulation modeling in landscape genetics, Monash University, Australia.

2011. *Guest Lecturer.* Computational Biology, Montana Integrative Learning Experience for Students, University of Montana.

2010. *Research Assistant.* NCEAS Landscape Genetics DGS, University of California – Santa Barbara, CA. Co-developed and co-instructed for 'Landscape Genetics: developing best practices for testing landscape effects on gene flow', a NCEAS Distributed Graduate Seminar. This course was broadcasted across 8 universities world-wide and produced 5 student-lead publications in landscape genetics.

2009. *Co-instructor.* Co-developed 'BIOL495: Spatial epidemiology application in GIS' at the University of Montana through the NSF IGERT Montana-Ecology of Infectious Diseases program.

2009. *Workshop.* Simulation modeling in landscape genetics, CONGEN, University of Montana – Flathead Biological Station.

2009. *Guest Lecturer.* BIOL595: Advanced population genetics, Division of Biological Sciences, University of Montana.

2008. *Guest Lecturer.* CS577: Computer simulations, Computer Science Dept., University of Montana.

2007. *Guest Lecturer.* MATH414: Ordinary differential equations, Mathematics Dept., University of Montana.

- 2004 – 2013. *Tutor*. All levels of mathematics and currently involved with Frenchtown, Montana high school algebra students.
2004. *Teaching Assistant*. Institute of Atmospheric Science, SD School of Mines and Technology – Rapid City, SD. Designed GIS and IDL components for senior-level remote sensing courses (Remote Sensing of the Environment and Advanced GIS), as well as taught GIS workshops.
2000. *Teaching Assistant*. Mathematics Department, SD School of Mines and Technology.

Invited Seminar Presentations

2017. Prediction and prevention of disease systems in a landscape genomics framework. CMCI/IBEST Seminar Series, University of Idaho.
2016. An eco-evolutionary metapopulation simulation model for population viability analysis in riverscape demogenetics: Case examples in the Sullivan watershed, Washington, USA. American Fisheries Society meeting Reno, Nevada.
2015. “Scape” genetics: application in rivers and disease ecology. Department of Biology Seminar Series, University of Missouri.
2015. An eco-evolutionary metapopulation simulation model for population viability analysis in riverscape demogenetics: Case examples in the Sullivan watershed, Washington, USA. IBEST Seminar Series, University of Idaho.
2015. An evolutionary demogenetics simulation framework: linking environmental effects to evolutionary processes through movement and natural selection. IALE 2015 Eco-evolutionary models Symposium, Portland Oregon.
2012. Simulating natural selection in landscape genetics: applications in conservation and speciation genetics. University of Toronto, Department of Ecology and Evolutionary Biology Seminar Series, Toronto, CA.
2011. Simulating natural selection in landscape genetics. University of Provence, Conversation Biology Department, Marseille, France.
2011. Simulation modelling in landscape genetics: on the need to go further. Talkfest-Keynote Speaker, Melbourne, AU.
2011. Simulating natural selection in landscape genetics. International Conference in Landscape Genetics, Bialowieza, Poland.
2010. Simulation Modeling in Landscape Genetics. University of Idaho, College of Natural Resources, Moscow Idaho.

Presentations at Scientific Conferences

2018. Does population of origin affect translocation success in bighorn sheep? Kim Andrews, Erin Landguth, [Frances Cassirer](#), Hollie Miyasaki, Lisette Waits, Northern Wild Sheep and Goat Council. May 2018, Whitefish, Montana.
2018. The utility of simulations in understanding population dynamics in fresh waters: evaluating demography, genetics, and reintroductions of a threatened char, [Meryl Mims](#), Andrew Bearlin, Jacob Burkhart, Casey Day, Jason Dunham, Matthew Fuller, Jameson Hinkle, Erin Landguth, Special Session on Emerging Approaches to Modeling Population and Community Dynamics in Fresh Waters: Society for Freshwater Science. May 2018, Detroit, Michigan.
2017. Simulating the spread of selection-driven genotypes using landscape resistance models for desert bighorn sheep. [Tyler Creech](#), Clinton Epps, Erin Landguth, John Wehausen,

- Rachel Crowhurst, Brandon Holton, Ryan Monello. Ecological Society of America, Portland, Oregon.
2017. Transovarial transmission in vector-borne relapsing diseases, Cody Palmer, Erin Landguth, Tammi Johnson, Emily Stone, SIAM Conference on Applications of Dynamical Systems.
2017. Effect of missing data and sample size on the performance of genotype-by-environment association methods, Amanda Xuereb, Erin Landguth, Brenna Forester, Kim Andrews, IALE Landscape Genetics Symposium, Baltimore MD.
2017. A riverscape genetics simulation framework to examine the effects and management implications of climate change on naturally hybridizing species, Hayley Tumas, Erin Landguth, Marie-Josée Fortin, Andrew Bearlin, IALE Landscape Genetics Symposium, Baltimore, MD.
2017. Bull Trout reintroductions into the lower Pend Oreille river system, Meryl Mims, Casey Day, Matt Fuller, Jacob Burkhart, Jameson Hickle, Andrew Bearlin, Erin Landguth. IALE Landscape Genetics Symposium, Baltimore, MD.
2016. Hybridization between Bull Trout and Dolly Varden in the Skagit system, Sam Gunselman, Erin Landguth, 2016 ScCS meeting, Sula Montana.
2016. Adaptive management using riverscape genetic simulation framework in the Sullivan system, Andrew Bearlin, Erin Landguth, Western Division American Fisheries Society Meeting, Reno Nevada.
2016. Day C, Landguth EL, Bearlin A. An individual-based, eco-evolutionary simulation model in riverscape genetics to simulate management strategies of native and non-native trout. International Society for Ecological Modeling, Towson University, MD, USA. May 2016.
2015. L.A. Cooper, A.P. Ballantyne, E.L. Landguth, Z.A. Holden. 2015. Ecosystem Disturbance Effects on Land Surface Temperature, Forest Carbon Stocks, and Primary Productivity in the Western United States. AGU Fall Meeting. December 16, San Francisco, CA.
2015. Using riverscape genetics as a model for reintroducing bull trout into the lower Pend Orielle river, Meryl Mims, Erin Landguth, 2015 ScCS meeting, Yakima Washington.
2015. Using riverscape genetics as a model for reintroducing bull trout into the lower Pend Orielle river, Meryl Mims, Erin Landguth, 2015 IALE Waterscape Genetics Symposium, Portland Oregon.
2014. Conservation Riverscape Genetics: A case example for westslope cutthroat trout in the Sullivan watershed, Washington, USA, Erin Landguth, Andrew Bearlin, Western Division American Fisheries Society Meeting, Mazatlan, MX, April 2014.
2013. Combining demographic and genetic factors to map population vulnerability in stream species, Erin Landguth, Clint Muhlfeld, et al., Western Division American Fisheries Society Meeting, Boise ID, April 2013.
2012. Landscape genetics and limiting factors, Sam Cushman, Andrew Shirk, Erin Landguth, Ecological Society of America, Portland OR.
2012. New null models of isolation by distance needed for landscape genetics, Tabitha Graves, Paul Beier, Jason Wilder, Erin Landguth, Montana chapter of the Wildlife Society, Great Falls MT, March 2012.
2012. New null models of isolation by distance needed for landscape genetics, Tabitha Graves, Beier, Wilder, Landguth. Arizona and New Mexico chapters of the Wildlife Society, Phoenix AZ, January 2012.
2011. CDFISH: a simulator of population genetics and connectivity in complex riverscapes. Erin Landguth, Clint Muhlfeld, Gordon Luikart, American Fisheries Meeting, September 2011.

2011. GARM: A Genetic Algorithm for Validation of Animal Movement Resistance Surfaces, Brian Hand, Erin Landguth, Doug Raiford, International Congress for Conservation, Auckland, NZ, December 2011.

Service and Outreach

2017. NSF Division of Environmental Biology review panel.
 2016. German Research Foundation review panel.
 2015. NSF DEB review panel.
 2015. Co-Organizer International Association of Landscape Ecology Symposium, Incorporating Eco-Evolutionary Processes into Population Models.
 2014 – 2017. Editorial Board, *Axios Review*.
 2014, 2016. Landscape genetics synthesis meeting and student project leader, Coeur d'Alene, Idaho.
 2013. Expert panel reviewer Vector Biology, National Institute of Health.
 2013. Expert external reviewer, Netherlands Organisation for Scientific Research.
 2012. Landscape genetics synthesis meeting and student project leader, University of Toronto.
 2010 – current. Journal Referee: *Molecular Ecology* ("Top Reviewer for *Molecular Ecology* 2012"), *Molecular Ecology Resources*, *Ecography*, *Methods in Ecology and Evolution*, *Heredity*, *Ecology and Evolution*, *Landscape Ecology*, *PLoS ONE*, *Journal of Marine Research*, *Oikos*, *Conservation Biology*, and *Proceedings of the Royal Society B*, *Bioinformatics*, *Conservation Genetics*, *WIREs Water*
 2010. Landscape genetics synthesis meeting and student project leader, University of Santa Barbara.

Graduate Students *Past Students

- *Brian Hand PhD advisor, Systems Ecology, U. Montana. "Modeling Connectivity in Landscape Genetics: Applications, Optimization and assessing uncertainty." Currently in a post-doc with G. Luikart, Flathead Lake Biological Station, University of Montana.
 *Leslie Jones PhD advisor, Systems Ecology, University of Montana. "High-resolution geostatistical modelling of stream temperatures in complex riverscapes: Assessing aquatic species vulnerabilities under a changing climate". Currently a program aquatic ecologist at Alaska Center for Conservation Science, University of Alaska Anchorage.
 Adriana Lozada PhD committee, Ciencias Biologicas, Mencion Ecologia de Zonas Aridas from Universidad de Las Serena: "Disentangling the effects of habitat size and isolation on the spatial components of species richness and evenness".
 Annie Cooper PhD committee, Systems Ecology, University of Montana. "Carbon dynamics in Mountain Pine Beetle induced forests". 2012-2018.
 Tyler Creech PhD committee, Wildlife Biology, Oregon State University. "Evaluating current and future genetic diversity and connectivity of desert bighorn sheep". 2012-2017.
 Lyric Yang MS committee, Mathematics, University of Montana. "Improvements to auto-logistic estimators and applications to Mountain Pine Beetle outbreaks."
 Cody Palmer PhD committee, Mathematics, University of Montana. "Systems of equations for relapsing disease dynamics."
 M. Oscarson MS committee, Environmental Sciences, Western Washington University. "Landscape genetics of mountain sheep."
 K. Hatlestad MS committee, Anthropology, University of Montana. "Simulating socio-natural systems."
 T. Haynam MS committee, Systems Ecology, "Mapping Greater Sage-Grouse in NW Wyoming."

