Nathan Lemoine

Research Scientist I - Colorado State University

Education

2015 **PhD., Biology**, *Florida International University*, Miami, FL.

2010 **M.S., Marine Science**, *University of South Alabama/Dauphin Island Sea Lab*, Mobile, AL.

2006 **B.S., Biology/Environmental Studies**, *University of Richmond*, Richmond, VA.

Appointments

2015 – present **Research Scientist/Affiliate Faculty**, *Department of Biology, Graduate Degree Program in Ecology, Colorado State University*, Ft. Collins, CO.

2016 – 2017 **Adjunct Faculty**, *Department of Ecology and Evolutionary Biology, University of Colorado*, Boulder, CO.

2014 **NIMBioS Visiting Scientist**, *University of Tennessee*, Knoxville, TN.

2013 – 2014 **Smithsonian Pre-Doctoral Fellow**, *Smithsonian Environmental Research Center*, Edgewater, MD.

2010 – 2013 **Presidential Fellow**, *Florida International University*, Miami, FL.

2007 – 2010 **Graduate Research Fellow**, *Dauphin Island Sea Lab*, Mobile, AL.

Publications (Published: 29, First Author: 17, In Press: 1)

† undergraduate author

In Prep **Lemoine, N.P.** and M.D. Smith. Drought and herbivores modify nutrient cycling in the semi-arid shortgrass steppe. *Plant Ecology (manuscript available on request)*

In Prep La Pierre, K.L., M.L. Avolio, **N.P. Lemoine**, F. Isbell, E. Grman, G.R. Houseman, S.E. Koerner, D.S. Johnson, K.R. Wilcox, and 67 others. Global change manipulations alter plant communities worldwide. *Science (Quantitative Ecologist, manuscript available on request)*

In Review Hoffman, A.M., H. Perretta†, **N.P. Lemoine**, M.D. Smith. Blue grama grass genotype affects palatability and preference by semi-arid steppe grasshoppers. *Ecological Entomology*

In Review **Lemoine, N.P.**, R.J. Griffin-Nolan, A.D. Lock, A.K. Knapp. Drought timing, not previous exposure to drought, determines sensitivity of two shortgrass species to water stress. *Oecologia*

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In Revision Knapp, A.K., C.J. Carroll, R.J. Griffin-Nolan, I. Slette, F. Chaves, L. Baur, A. Felton, J. Gray, A. Hoffman, **N.P. Lemoine**, W. Mao, A. Post, M. Smith. A reality check for climate change experiments: do they reflect the real world? *Ecology*

In Revision Craven, D., N. Eisenhaur, W. Pearse, Y. Hautier, C. Roscher, F. Isbell, M. Bahn, C. Beierkuhnlein, G. Boehnisch, N. Buchmann, C. Byun, J. Catford, B. Cerabolini, H. Cornelissen, J. Craine, E. de Luca, A. Ebeling, J. Griin, A. Hector, J. Hines, A. Jentsch, J. Kattge, J. Kreyling, V. Lanta, **N.P. Lemoine**, S. Meyer, V. Minden, V. Onipchenko, H. Polley, P. Reich, J. van Ruijven, B. Schamp, M.D. Smith, N. Soudzilovkaia, D. Tilman, A. Weigelt, B. Wilsey, P. Manning. Multiple facets of biodiversity drive the diversity-stability relationship. *Nature Ecology and Evolution*

In Revision **Lemoine, N.P.** Nutrient limitation alters the predicted thermal response curve of carrying capacity. *Ecology*

In Revision Koerner, S.E., M.D. Smith, D.E. Burkepile, N. Hanan, M.L. Avolio, S.L. Collins, A.K. Knapp, **N.P. Lemoine**, E.J. Forrestel, S. Eby, D.I. Thompson, The Grazing Consortium. Resolving variation in herbivore effects on plant biodiversity - dominance as a global mechanism. *Nature Ecology and Evolution*

In Press Rehm, E.M., M.B. Balsat†, **N.P. Lemoine**, J.A. Savidge. Spatial dynamics of habitat use informs reintroduction efforts in the presence of an invasive predator. *Journal of Applied Ecology (Quantitative Ecologist)*

2018 Stuart-Haentjens, E., H.J. De Boeck, **N.P. Lemoine**, P. Mänd, G. Kröel-Dulay, I.K. Schmidt, A. Jentsch, A. Stampfli, W.R.L. Anderegg, M. Bahn, J. Kreyling, T. Wohlgemuth, F. Lloret, A. Classen, C. Gough, M.D. Smith. Precipitation as a predictor of production resistance and resilience to extreme drought. *Science of the Total Environment* 636:360-366 *(Quantitative Ecologist)*

2017 **Lemoine, N.P.**, J.D. Dietrich, M.D. Smith. Climatic and environmental constraints on three aspects of flowering in three dominant tallgrass species. *Functional Ecology* 31:1894-1902 *(Haldane Prize Nominee)*

2017 Wilcox, K.R., Z. Shi, L.A. Gherardi, **N.P. Lemoine**, S.E. Koerner, D.L. Hoover, E. Bork, K.M. Byrne, J. Cahill Jr., S.L. Collins, S. Evans, A.K. Gilgen, P. Holub, L. Jiang, A.K. Knapp, L. Yahdjian, D. LeCain, J. Liang, P. Garcia-Palacios, J. Penuelas, W.T. Pockman, M.D. Smith, S.R. White, K. Zhu, Y. Luo. Asymmetric responses of primary productivity to climate extremes: a synthesis of grassland precipitation manipulation experiments. *Global Change Biology* 23:4376-4386

2017 **Lemoine, N.P.** Predation risk reverses the potential effects of warming on plant-herbivore interactions by altering the relative strengths of trait- and density-mediated interactions. *The American Naturalist* 190:337-349

2017 **Lemoine, N.P.**, D. Doublet†, J-P. Salminen, D.E. Burkepile, J.D. Parker. Responses of plant phenology, growth, defense, and reproduction to interactive effects of warming and insect herbivory. *Ecology* 98:1817-1828

2017 Rode, M.†, **N.P. Lemoine**, M.D. Smith. Prospective evidence for independent nitrogen and phosphorus limitation of grasshopper (*Chorthippus curtipennis*) growth in a tallgrass prairie. *PLoS One* 12:e0177754 *(Corresponding Author)*

2017 Burkepile, D.E., R.W.S. Fynn, D.I. Thompson, **N.P. Lemoine***, S.E. Koerner, S. Eby, N. Hagenah, K.R. Wilcox, S.L. Collins, K.P. Kirkman, A.K. Knapp, M.D. Smith. Herbivore size matters for productivity-richness relationships in African savannas. *Journal of Ecology* 105:674-686 *(Quantitative Ecologist)*

2017 **Lemoine, N.P.**, D.E. Burkepile, J.D. Parker. Insect herbivores increase mortality and reduce tree seedling growth of some species in temperate forest canopy gaps. *PeerJ* 5:e3102

2016 **Lemoine, N.P.**, J. Sheffield, J.S. Dukes, A.K. Knapp, M.D. Smith. The Terrestrial Precipitation Analysis (TPA) web tool: a resource for characterizing long-term precipitation regimes and extremes. *Methods in Ecology and Evolution* 7:1396-1401

2016 Burkepile, D.E., D.I. Thompson, R.W.S. Fynn, S.E. Koerner, S. Eby, N. Govender, N. Hagenah, **N.P. Lemoine**, K.J. Matchett, K.R. Wilcox, S.L. Collins, K.P. Kirkman, A.K. Knapp, M.D. Smith. Fire frequency drives habitat selection by a diverse herbivore guild impacting top-down control of plant communities in an African savanna. *Oikos* 125:1636-1646 *(Quantitative Ecologist)*

2016 Hamerlinck, G., **N.P. Lemoine**, G.R. Hood, K.C. Abbott, A.A. Forbes. Meek women with powerful daughters: effects of novel host environments and small trait differences on parasitoid wasp competition. *Oikos* 125:1516-1527 *(Quantitative Ecologist)*

2016 **Lemoine, N.P.**, A. Hoffman, A. Felton, L. Baur, F. Chaves, J. Gray, Q. Yu, M.D. Smith. Underappreciated problems of low statistical power in ecological field studies. *Ecology* 97:2554-2561

2016 Zaneveld, J.R., D.E. Burkepile, A.A. Shantz, C.E. Pritchard, R. McMinds, J. Payet, R. Welsh, A. Simoes-Correa, **N.P. Lemoine**, S. Rosales, C. Fuchs†, J. Maynard, R. Vega-Thurber. Overfishing and nutrient pollution interact with temperature to disrupt coral reefs down to microbial scales. *Nature Communications* 7:11833

2016 **Lemoine, N.P.**, A.A. Shantz. Increased temperature causes protein-limitation by reducing nitrogen digestion efficiency in the ectothermic herbivore *Spodoptera exigua* (Lepidoptera: Noctuidae). *Physiological Entomology* 41:143-151

2016 **Lemoine, N.P.**, D.E. Burkepile, J.D. Parker. Quantifying differences between native and introduced species. *Trends in Ecology and Evolution* 31(5):372-381

2016 Shantz, A.A., **N.P. Lemoine***, D.E. Burkepile. Nutrient loading alters the performance of key nutrient exchange mutualisms. *Ecology Letters* 19(1):20-28 *(Quantitative Ecologist, Faculty of 1000 Recommendation, George Mercer Award Nominee)*

2015 **Lemoine, N.P.**, J. Capdevielle†, J.D. Parker. Effects of *in situ* climate warming on larval monarch (*Danaus plexippus*) development. *PeerJ* 3:e1293

2015 **Lemoine, N.P.**, J. Shue, B. Verrico†, D. Erickson, W.J. Kress, J.D. Parker. Phylogenetic relatedness and leaf functional traits, not introduced status, influence community assembly. *Ecology* 96(10):2605-2612

2015 **Lemoine, N.P.** Climate change may alter monarch spring migration and summer breeding ground distributions. *PLoS One* 10:e0118614

2014 Cook-Patton, S.C, L. Maynard†, **N.P. Lemoine**, J. Shue, J.D. Parker. Cascading effects of a highly specialized beech-aphid-fungus interaction on forest regeneration. *PeerJ* 2:e442

2014 **Lemoine, N.P.**, D.E. Burkepile, J.D. Parker. Variable effects of temperature on insect herbivory. *PeerJ* 2:e376 *(Featured Article)*

2014 **Lemoine, N.P.**, S.T. Giery, D.E. Burkepile. Differing consumer stoichiometric constraints across ecosystems. *Oecologia* 174:1367-1376

2013 **Lemoine, N.P.**, W.A. Drews†, D.E. Burkepile, J.D. Parker. Temperature alters feeding behavior of a generalist herbivore. *Oikos* 122:1669-1678

2013 Giery, S.T., **N.P. Lemoine**, C.M. Hammerschlag-Peyer, R. Abbey-Lee, C.A. Layman. Bidirectional trophic linkages couple a canopy and understory foodweb. *Functional Ecology* 27(6):1436-1441

2013 Parker, J.D, M.E. Torchin, R.A. Hufbauer, **N.P. Lemoine***, C. Alba, D.M. Blumenthal, O. Bossdorf, J.E. Byers, A.M. Dunn, R.W. Heckman, M. Hejda, V. Jarosik, A. Kanarek, L.B. Martin, S.E. Perkins, P. Pysek, K. Schierenbeck, C. Schloeder, R. van Klinken, K.J. Vaughn, W. Williams, L. Wolfe. Do invasive species perform better in their new ranges? *Ecology* 94(5):985-994 *(Quantitative Ecologist, Faculty of 1000 Recommendation)*

2013 Burkepile, D.E., J. Allgeier, A. Shantz, C.E. Pritchard, **N.P. Lemoine**, L. Bhatti, C.A. Layman. Carnivorous fishes as vectors of nutrients on coral reefs: the role of nutrient supply in facilitating seaweed abundance. *Scientific Reports* 3:1493

2012 **Lemoine, N.P** and D.E. Burkepile. Temperature-induced mismatches between metabolism and consumption reduce consumer fitness. *Ecology* 93(11):2483-2489

2012 **Lemoine, N.P.** and J.F. Valentine. Structurally complex habitats provided by *Acropora palmata* alter ecosystem processes on a patch reef in the Florida Keys National Marine Sanctuary. *Coral Reefs* 31(3):779-786

2007 **Lemoine N.P.**†, N. Buell†, A.L. Hill, M.S. Hill. Assessing the utility of sponge microbial symbiont communities as models to study global climate change: a case study with *Halichondria bowerbanki*. In: Custdio, M. R., G. Lbo-Hajdu, E. Hajdu, and G. Muricy (eds.). Porifera Research: Biodiversity, Innovation, and Sustainability, Srie Livros 28. Museu Nacional, Rio de Janeiro. pp:419-425

† undergraduate author

Grants and Fellowships (Received: $411,604, Pending: $885,148)

Pending

2017 **National Science Foundation**, *DEB Ecosystems*, *$885,148*, Predicting the effects of extreme drought on insect herbivore control of grassland ecosystem function.
Sole PI

Current

2015 **United States Department of Agriculture**, *NIFA-AFRI Postdoctoral Fellowship*, *$149,704*, Predicting effects of increased climate variability on consumer regulation of ecosystem function in US rangelands.
Sole PI

Past

2015 **National Institute for Mathematical and Biological Synthesis**, *Postdoctoral Fellowship*, *$107,000*, A new statistical framework for assessing community assembly mechanisms. *(Offered but declined)*.
PI

2014 **Florida International University**, *Dissertation Year Fellowship*, *$16,600*.

2014 **Florida International University**, *Dissertation Evidence Acquisition Grant*, *$8,300*, PI.

2013 **Smithsonian Environmental Research Center**, *Graduate Fellowship*, *$15,500*.
Will global change disrupt trophic transfer in marsh ecosystems?

2013 **National Science Foundation**, *Doctoral Dissertation Improvement Grant*, *$15,294*, Assessing the effects of climate change on biotic interactions structuring herbivore communities..
PI

2010 **Florida International University**, *Presidential Fellowship*, *$75,000*.

2007 **University of South Alabama**, *Graduate Research Fellowship*, *$32,000*.

2007 **Dauphin Island Sea Lab**, *Exxon-Mobile Research Fellowship*, *$2,000*.

2006 **University of Richmond**, *Student Travel Grant*, *$1,000*.

2005 **University of Richmond**, *Robert F. Smart Research Fellowship*, *$4,000*.

2005 **University of Richmond**, *Research Grant*, *$500*.

Teaching (Full Lecture Courses: 2, Seminars: 4, Labs: 3)

2016 – 2017 **EBIO 4410/5410 - Biometry**, *University of Colorado*.

2016 **ECOL 592 - Principles of Data Visualization Using R and ggplot2**, *Colorado State University*.

2016 **Ecology 600 - Community Ecology**, *Colorado State University*.

2015 **Introduction to Bayesian Data Analyses Workshop**, *Colorado State University*.

2014–2015 **Introduction to R for Ecologists Workshop**, *Florida International University*.

2012 – 2014 **Data Management and Introduction to Statistics**, *Smithsonian Environmental Research Center*.

2011 **Biology 1011L: General Biology II Lab**, *Florida International University*.

2011 **Biological Oceanography 3043L: Marine Biology and Oceanography Lab**, *Florida International University*.

2010 **Biology 3043L: Ecology Lab**, *Florida International University*.

Professional Experience

2017 **QUBES Making Meaning Through Modeling: *Problem Solving in Biology***, *Michigan State University*, Lansing, MI.

2014 **NCAR Graduate Workshop on Environmental Data Analytics**, *National Center for Atmospheric Research*, Boulder, CO.

2013 **Joint 2013 MBI-NIMBioS-CAMBAM Summer Graduate Workshop: *Connecting Biological Data with Mathematical Models***, *University of Tennessee*, Knoxville, TN.

Students and Committees

2017 **Madison Rode**, *Colorado State University*, Honors Thesis Committee Chair.

Software

2015 – present **Lead developer of *EcoPy: A Python module for multivariate data analysis***.

2015 – present **Lead developer of the Terrestrial Precipitation Analysis package**.

Presentations (Total: 23, Invited: 14)

2018 **University of Maryland**, *College Park, MD*.
An integrative approach to predicting plant-insect interactions under future climates *(Invited Speaker)*

2018 **San Diego State University**, *San Diego, CA*.
An integrative approach to predicting plant-insect interactions under future climates *(Invited Speaker)*

2018 **Harvard University**, *Cambridge, MA*.
An integrative approach to predicting plant-insect interactions under future climates *(Invited Speaker)*

2018 **North Carolina State University**, *Raleigh, NC*.
An integrative approach to predicting plant-insect interactions under future climates *(Invited Speaker)*

2017 **Utah State University**, *Logan, UT*.
Predicting the effects of global change on species interactions, population dynamics, and community composition *(Invited Speaker)*

2017 **University of Texas**, *Austin, TX*.
An integrative approach to predicting plant-insect interactions under future climates *(Invited Speaker)*

2017 **Smithsonian Environmental Research Center**, *Edgewater, MD*.
An integrative approach to predicting plant-insect interactions under future climates *(Invited Speaker)*

2017 **Ecological Society of America**, *Portland, OR*.
Warming increases the importance of plant nutritional quality to herbivore performance *(Invited Speaker)*

2017 **University of Saskatchewan**, *Saskatoon, Canada*.
Emergent impacts of warming on plant-herbivore interactions: connecting physiology to communities *(Invited Speaker)*

2017 **University of British Columbia**, *Vancouver, Canada*.
Emergent impacts of warming on plant-herbivore interactions: connecting physiology to communities *(Invited Speaker)*

2016 **International Joint Project Meeting**, *Erguna, China*.
Assessing the impact of invertebrate herbivores on grassland ecosystem function *(Invited Speaker)*

2015 **CSU Megalab**, *Fort Collins, CO*.
Phylogenetic relatedness and leaf functional traits, not introduced status, influence community assembly *(Invited Speaker)*

2015 **CSU Forest and Rangeland Stewardship**, *Fort Collins, CO*.
Climate warming effects on plant-insect interactions *(Invited Speaker)*

2015 **Ecological Society of America**, *Baltimore, MD*.
Warming alters fitness trade-offs in *Oenothera biennis* caused by herbivory

2015 **FIU Graduate Student Symposium**, *Miami, FL*.
Warming modifies tolerance to herbivory in *Oenothera biennis* *(Best Presentation)*

2014 **Evolution**, *Raleigh, NC*.
Evolutionary history and traits, not invasive status, influence community assembly

2014 **FIU Graduate Student Symposium**, *Miami, FL*.
Phenotypic plasticity and population subsidies reverse competitive outcomes

2013 **Entomological Society of America**, *Austin, TX*.
Climate change modifies interactions between invasive herbivores and native plants *(Invited Speaker)*

2013 **Ecological Society of America**, *Minneapolis, MN*.
Temperature alters feeding behavior of a generalist herbivore

2013 **Benthic Ecology Meeting**, *Savannah, GA*.
Temperature-induced mismatches between metabolism and consumption reduce consumer fitness

2012 **Smithsonian Environmental Research Center**, *Edgewater, MD*.
Effects of climate change on plant-herbivore interactions

2012 **FIU Graduate Student Symposium**, *Miami, FL*.
Deviations from the assumptions of the Metabolic Theory of Ecology lead to contrasting predictions

2010 **Benthic Ecology Meeting**, *Wilmington, NC*.
Successional trajectories of food web reorganizations on Caribbean coral reefs

Outreach

2013 **Family Day Public Open House**, *Smithsonian Environmental Research Center*.

2013 **Challenge for Elementary, Middle, and High School Students Essay Judge**, *Fairchild Tropical Botanical Garden*.

2011 **Partnership in Academic Communities of At-Risk High School Students in Math and Science**, *Florida International University*.

Media / Press Coverage

2017 **Statistical Modeling, Causal Inference, and Social Science**, *Type M errors in the wild – really the wild!*, http://andrewgelman.com/2017/09/16/type-m-errors-wild-really-wild/.

2017 **Uncommon Ground**, *Noisy data and small samples are a bad combination*, http://darwin.eeb.uconn.edu/uncommon-ground/blog/2016/09/23/noisy-data-and-small-samples-are-a-bad-combination/.

2017 **Smithsonian Shorelines**, *Scientists turn up the heat on herbivores and their food*, https://sercblog.si.edu/?p=8368.

2016 **The EEB & Flow**, *The problematic effect of small effects*, http://evol-eco.blogspot.ca/2016/09/the-problematic-effect-of-small-effects.html.

2016 **Colorado State University - SOURCE**, *Are invaders 'different'? Nope, says CSU biologist*, http://source.colostate.edu/are-invaders-different-nope-says-csu-biologist/.

2015 **Smithsonian Science News**, *Warming temperatures may mean more monarch generations in some areas of North America*, http://smithsonianscience.si.edu/2015/08/warming-temperatures-may-mean-more-monarch-generations-in-some-areas-of-north-america/.

2014 **PeerJ**, *Interview with an Author*, http://blog.peerj.com/post/85650418408/interview-with-an-author-nathan-lemoine.

Professional Service

2017 – present **Drought-Net Steering Committee Member**.

Peer Review (43 total reviews)

Reviewer for the following journals, *Acta Physiologiae Plantarum (1), Annals of Applied Biology (1), Biological Invasions (5), BMC Ecology (1), Ecography (1), Ecology (7), Ecoscience (1), Ecosphere (1), Ecology Letters (3), Functional Ecology (1), Journal of Animal Ecology (1), Journal of Ecology (3), Journal of Thermal Biology (1), Methods in Ecology and Evolution (1), NeoBiota (1), New Phytologist (1), Oecologia (4), Oikos (3), PeerJ (1), PLoS One (2), Plant Ecology (2), Proceedings of the Royal Society - B (1).*
Number of reviews in parentheses

NSF Ad Hoc Reviewer (1).

Invited Working Groups

2016 **LTER Community Responses to Resource Experiments: Communities to Ecosystems**, *Lead PIs: Kimberly LaPierre and Meghan Avolio*, Role: Quantitative Ecologist.

2015-2016 **Drought-Net**, *Lead PI: Melinda Smith*, Role: Data Manager / Quantitative Ecologist.

2015 – 2016 **Grazing Consortium**, *Lead PI: Sally Koerner*, Role: Quantitative Ecologist.

2015 – 2016 **LTER Community Responses to Resource Experiments**, *Lead PIs: Kimberly LaPierre and Meghan Avolio*, Role: Quantitative Ecologist.

2015 – 2016 **iDiv Evolution of Stability**, *Lead PIs: Dylan Craven and Will Pearse*, Role: Quantitative Ecologist.

Undergraduate Mentoring (6 co-authors)

2017 – 2018 **Abigail Lathrop-Melting**, *Colorado State University*, Undergraduate Intern.

2017 – 2018 **Sam Rollman**, *Colorado State University*, Undergraduate Intern.

2015 – 2018 **Abigail Lock**, *Colorado State University*, Undergraduate Intern.

2017 **Holly Perretta**, *Colorado State University*, Undergraduate Intern.

2015 – 2017 **Megan Coyle**, *Colorado State University*, Undergraduate Intern.

2016 – 2017 **Tarun Multhineni**, *Colorado State University*, Web Development Intern.

2016 – 2017 **Kiloaulani Kaawa-Gonzalez**, *Colorado State University*, Undergraduate Intern.

2016 **Madison Rode**†, *Colorado State University*, REU.

2016 **Jeremy Tabke**, *Colorado State University*, Undergraduate Intern.

2015 **Erica Duda**, *Colorado State University*, Undergraduate Intern.

2015 **Brianna Magbual**, *Colorado State University*, Undergraduate Intern.

2014 **Megan Palmer**, *Smithsonian Environmental Research Center*, REU.

2014 **Jillian Capdevielle**†, *Smithsonian Environmental Research Center*, Undergraduate Intern.

2014 **Dejeanne Doublet**†, *Smithsonian Environmental Research Center*, REU.

2013 **Lauren Maynard**†, *Smithsonian Environmental Research Center*, REU.

2012 **Willem Drews**†, *Smithsonian Environmental Research Center*, Undergraduate Intern.

2012 **Brittany Verrico**†, *Smithsonian Environmental Research Center*, REU.

2011 **Joseph Barger**, *Florida International University*, Undergraduate Intern.

2011 **Amaury Marquez**, *Florida International University*, Undergraduate Intern.