

# Peter D. Billman

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## EDUCATION

### Graduate Certificate in Applied Statistics

Aug 2020 – Nov 2020

Montana State University, Bozeman

### Master of Science in Earth Sciences

Aug 2017 - May 2020

Montana State University, Bozeman- GPA: 3.88

Co-Advisors: Erik A. Beever & David B. McWethy

*Assessing environmental drivers of occupancy, abundance, and elevational range retraction at the range core of a climate-sensitive mammal*

### Bachelor of Science in Fish and Wildlife Ecology

Jan 2013 - May 2016

Montana State University, Bozeman- GPA: 3.60

Minor: Water Resources

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## RESEARCH INTERESTS

Global change ecology • range limits • biogeography • evolutionary ecology • population ecology • landscape ecology • biophysical gradients • stress response and physiology • metapopulation ecology • demography

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## PEER-REVIEWED PUBLICATIONS

7. Beever, E.A., Ray, C., **Billman, P.D.** et al. *In Prep.* Assessing the adaptive capacity of montane species in the face of contemporary climate change.
6. **Billman, P.D.**, E.A. Beever, Smith, A.B. and D.K. Ryals. *In Prep.* Assessing the robustness of a predicted future-climate stronghold, using spatial and temporal patterns in occupancy and abundance.
5. **Billman, P.D.**, Freeman, B.G., Carroll, K.A. and D.J. Schleicher. *In Prep.* Do species' abundances lean upslope prior to shifting their lower and upper elevational limits?
4. Parker, T., Fraser, H., Nakagawa, S., Gould, E., Fidler, F. Vesk, P., Griffith, S., . . . **Billman P.D.** et al. *In Prep.* Same data, different analysts: variation in effect sizes due to analytical decisions in ecology and evolutionary biology.
3. Stewart, J., Beever, E.A., Ray, C., Doak, D., **Billman, P.D.** et al. *In Prep.* Interpreting Signal in Species-Climate Relationships with Intraspecific Variability.
2. **Billman, P.D.**, Beever, E.A., Thurman, L.L., McWethy, D.B., and K.C. Wilson. *In Press at Global Change Biology.* Evaluating the environmental factors influencing distributional shifts and abundance at the range core of a climate-sensitive mammal.
1. Smith, A.B., Beever, E.A., Kessler, A.E., Johnston, A.N., Ray, C., Epps, C.W., Lanier, H.C., Klinger, R.C., Rodhouse, T.J., Varner, J., Perrine, J., Seglund, A., Hall, E., Galbreath, K., Anderson, C., **Billman, P.D.** et al. 2019. Alternatives to genetic affinity as a context for within-species response to climate. *Nature Climate Change*. **9**(10): 787–794.

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## RESEARCH EXPERIENCE

### Graduate Research Assistant

Aug 2017-May 2020

*Department of Earth Sciences, Montana State University*

- **Project aim:** to identify the direct and indirect environmental drivers influencing abundance, occupancy, and elevational shifts in montane-dwelling mammals, using the American pika (*Ochotona princeps*) as a model species. To do so, we used a space-for-time substitution design encompassing 64 elevational transects across the Northern Rocky Mountains, USA.
- Designed and executed field-based study of 760 remote field sites over three years.
- Used information-theoretic approaches to investigate of underlying physiological mechanisms
- Recruited and mentored three undergraduate students in data collection and analysis for their independent research projects relating to this species and climate change.

### Research Assistant

May 2016-Aug 2017

*U.S. Geological Survey-Northern Rocky Science Center, Bozeman MT*

- Primarily responsible for extensive database management and manipulation
- Conducted field surveys in California, New Mexico, and Montana for American pika evidences to document local extirpations.
- Mapped field locations (talus fields), using GIS programs, to be surveyed by field crews across all of northern New Mexico, Grand Teton National Park, Yellowstone National Park, and several national forests across the West.
- Assisted in literature reviews and preparation of numerous publications.
- Taught challenging field protocols for surveying habitats of American pikas to volunteers in Yellowstone National Park and Bandelier National Monument, NM.

### Undergraduate Researcher-Independent Research

May 2014-May 2016

*Montana State University, Bozeman MT*

- **Project aim:** to explore alpine plant migrations in mountain systems using phylogenetic approaches.
- Coordinated and performed two-year study of *Aquilegia flavescens* (yellow columbine) across six western states and two Canadian provinces to understand migration of this species since the latest Quaternary Glaciation.
- Analyzed numerous DNA intron regions, quantifying and comparing genetic substitutions, additions, and deletions.
- Collaborated with professors, national park staff, and museum staff to obtain both fresh specimens as well as herbarium specimens in the United States and Canada.
- Disseminated results orally at four conferences in three different states, as well as through written reports for the appropriate agencies.

### Research Assistant

Oct 2015-May 2016

*Craighead Research Institute, Bozeman MT*

- Responsible for data entry, database management and creation, as well as QC/QA
- Conducted statistical analyses on climate-vegetation-occupancy relationships for various sites in the Gallatin Range, Montana.
- Explored relationships between microclimates and site occupancy using climate (iButton) sensors.
- Processed camera trap images to document pika behavior.

### Aquatic Field Assistant

Sep 2014-June 2015

*Adventurers and Scientists for Conservation, Bozeman MT*

- **Project Aim:** to investigate, document, and quantify microplastic abundance in the Gallatin River in Yellowstone National Park, in the first-of-its-kind study of freshwater rivers

- Received extensive training on water sampling and park protocol for backcountry research.
- Collected water samples from the most remote reach of the Gallatin River in the backcountry of northwestern Yellowstone National Park in June, September, December, and May by means of hiking and cross-country skiing.

**Wildlife Reserve Internship****May-June 2015***Velgevonden Wildlife Reserve, Waterberg Biosphere, South Africa*

- Assisted reserve ecologists in diverse work in the mountainous region of South Africa.
- Measured the impact of elephants on plant species.
- Identified grass and tree species and determined mammalian carrying capacities.
- Assisted in the tranquilizing and translocating of nine rhinos and one lion across reserves.
- Tracked individual animals via radio telemetry and tracks.
- Operated camera traps for *Panthera*, as well as processed and organized imagery by species.
- Constructed mammalian population counts using line transect methods.

**Research Lab Assistant****Feb 2014-June 2014***Zambian Carnivore Program (ZCP)-Bozeman, MT*

- Organized, managed, and entered field data into numerous Access databases.
- Collated multiple databases to streamline work flows before conducting QC/QA
- Identified African wild dogs and hyena individuals and packs using field photos and camera trap images.
- Communicated with scientists in the field what was needed from them and vice versa to ensure high data quality.

**Caribbean Coral Reef Health Analysis****Dec 2013-Jan 2014***Ecosystem Field Studies- University of Montana, Missoula, MT*

- Project Aim: to assess coral reef health by studying the presence and behavior of two indicator species of butterflyfish.
- Learned and Identified and tens of coral reef species, including both corals and algae alike.
- Designed quadrat plots to quantify coral health at locations where the focal fish species were present.
- Discovered widespread decay of this particular reef off the Yucatan Peninsula, potentially related to nearby septic leakage.

**GRANTS AND FELLOWSHIPS** (\*indicates undergraduate mentee/collaborator)

2021-2026- Jorgensen Fellowship, University of Connecticut  
**\$100,000**

2021-2023- NSF Research Traineeship- Team TERRA  
**\$34,000**

2019- College of Letters and Science Student Research Travel Grant, MSU Bozeman  
**\$750**

2019- Northwest Scientific Association Research Grant

*"Investigating the Effects of Aridity and Climate Change on a North American Alpine Mammal, Using a Space-for-Time Approach"*

**\$1,500**

2019- College of Letters and Science Student Research Travel Grant, MSU Bozeman  
**\$300**

- 2018- Sigma Xi Grant-in-Aid  
*"Responses of the American Pika (Ochotona princeps) to Changing Climates Using a Space-for-Time Analysis"*  
**\$400**
- 2018- American Society of Mammalogists- Grants-In-Aid of Research  
**\$1,500**
- 2018- \*MSU Undergraduate Scholars Program (LSD)  
*"An Investigation into the Relationship Between Topography and Occupancy in Mammals, Using a GIS-Based Approach"* **\$1,800**
- 2018- \*Institute on Ecosystems Undergraduate Research Grant (LSD)  
**\$4,000**
- 2018- \*Institute on Ecosystems Undergraduate Research Grant (AEH)  
**\$4,000**
- 2017- Institute on Ecosystems Graduate Funding  
*"Spatial response of the American pika (Ochotona princeps) to contemporary climate change in Montana"*  
**\$500**
- 2017- American Alpine Club Research Grant  
*"Understanding how changing snowpacks and water availability affect patterns of distributional change in the American pika"*  
**\$250**
- 2015- MSU Undergraduate Scholars Program recipient  
*"Multi-Region Intron Analysis of the Biogeographical and Phylogenetic Relationships within *Aquilegia flavescens* (Yellow columbine)"*  
**\$1,800**
- 2014- MSU Undergraduate Scholars Program recipient  
*"Multi-Region Intron Analysis of the Biogeographical and Phylogenetic Relationships within *Aquilegia flavescens* (Yellow columbine)"*  
**\$1,800**

### CONFERENCE PRESENTATIONS *(\*indicates undergraduate mentee)*

- Billman, P. D.** Beever, E. McWethy, D., Thurman, L.L. 2020. Assessing alternative drivers of abundance, occupancy, and elevational range retractions at the range core of a climate-sensitive mammal. Ecological Society of America (ESA) Annual Meeting, Salt Lake City, Utah.
- Billman, P. D.** Beever, E. and McWethy, D. June 2019. Investigating the impacts of contemporary climate change using a space-for-time approach in montane systems. American Society of Mammalogists Annual Meeting. Washington D.C.
- Billman, P. D.** Apr. 2019. Quantifying the Effects of Contemporary Climate Change on an alpine Mammal, Using a Space-for-Time Substitution. Earth Science Colloquium. Bozeman, MT.
- Robinson, M.R.\*, **Billman, P. D.**, Willey, D. and Beever, E.A. Feb. 2019. Investigation of the distribution of the American pika (*Ochotona princeps*) of Southwest Montana in relation to potential climate changes. MSU Student Research Celebration. Bozeman, Montana.
- Dudley, L.S.\*, **Billman, P. D.**, McWethy, D.B., and Beever, E.A. Apr. 2019. Assessing the impacts of aridity and climate change on American pikas in the Northern Rocky Mountains. National Conference of Undergraduate Research (NCUR). Atlanta, GA

- Robinson, M.R.\*, **Billman, P. D.**, Willey, D. and Beever, E.A. Feb. 2019. Investigation of the distribution of the American pika (*Ochotona princeps*) of Southwest Montana in relation to potential climate changes. Biology19. Zürich, Switzerland.
- Robinson, M.R.\*, **Billman, P. D.**, Willey, D. and Beever, E.A. Apr. 2018. Investigation of the distribution and occupancy of the American pika (*Ochotona princeps*) of Southwest Montana in relation to potential climate changes. National Conference of Undergraduate Research (NCUR). Oklahoma City, OK.
- Billman, P. D.** and Lavin, M. Apr. 2016. Multi-Intron Analysis of *Aquilegia flavescens* in the Northern Rocky Mountains. National Conference of Undergraduate Research (NCUR). Asheville, NC.
- Billman, P. D.** and Lavin, M. Apr. 2016. Multi-Intron Analysis of *Aquilegia flavescens* in the Central and Northern Rocky Mountains. MSU Student Research Celebration. Bozeman, MT.
- Billman, P. D.** and Lavin, M. Apr. 2015. Microsatellite Analysis of the Biogeographical and Phylogenetic Relationships Within *Aquilegia flavescens* (Yellow columbine). National Conference of Undergraduate Research (NCUR). Cheney, WA.
- Billman, P. D.** and Lavin, M. Apr. 2015. Microsatellite Analysis of the Biogeographical and Phylogenetic Relationships Within *Aquilegia flavescens* (Yellow columbine). MSU Student Research Celebration. Bozeman, MT.

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## MENTORING

### *Undergraduate Research Student Projects*

<b>Lyman Dudley</b> - Geographic Information Systems	<b>2018-2020</b>
<b>Megan Robinson</b> - Conservation Biology	<b>2016-2019</b>
<b>Kenny Wilson</b> - Environmental Studies	<b>2018-2019</b>
<b>Aimee Heffernan</b> - Conservation Biology	<b>2018</b>

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## TEACHING EXPERIENCE

Teaching Faculty- Lab Instructor: **Principles of Biological Systems** (BIOB 170), MSU Bozeman

- Spring 2021
- Teaching three lab sections- 51 students
- TA rating: **4.96/5**
- Course rating: 4.51/5

Lab Instructor: **Principles of Biological Systems** (BIOB 170), MSU Bozeman

- Fall 2020
- Teaching three lab sections- 45 students
- TA rating: **4.57/5**
- Course rating: 4.11/5

Lab Instructor: **Earth System Sciences** (ERTH 101), MSU Bozeman

- Spring 2020
- Teaching three lab sections- 55 students
- TA rating: **4.77/5**
- Course rating: 4.6/5

Lab Instructor: **Mammalogy** (BIOO 475), MSU Bozeman

- Fall 2019
- Taught three lab sections- 46 students
- TA rating: **4.93/5**
- Course rating: 4.66/5

Lab Instructor: **Introduction to GIS Science and Cartography** (GPHY 284), MSU Bozeman

- Spring 2019
- Taught one lab section- 17 students
- TA rating: **4.80/5**
- Course rating: 4.80/5

Lab Instructor: **Yellowstone: Scientific Lab** (ERTH 212), MSU Bozeman

- Fall 2018
- Taught three lab sections- 57 students
- TA rating: **4.67/5**
- Course rating: 4.29/5
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Lab Instructor: **Earth System Sciences** (ERTH 101), MSU Bozeman

- Spring 2018
- Taught three lab sections- 60 students
- TA rating: **4.76/5**
- Course rating: 4.85/5

## INVITED ORAL PRESENTATIONS

### 2019

- **Billman, P. D.** What Climate Change Means for American Pikas and Other Wildlife in the Northern Rocky Mountains. Mammalogy BIOO 475. Montana State University, Bozeman, MT.
- **Billman, P. D.** Microplastics: A Microscopic Local and Global Problem. Inland Ocean Coalition, Montana State University Chapter, Bozeman MT.
- **Billman, P. D.,** Anderson, M.E. Wildlife and Climate Change in the Northern Rocky Mountains. Restoration Ecology in Greater Yellowstone (NRSM 311), Wild Rockies Field Institute, University of Montana, Gravelly Mountains, MT.
- **Billman, P. D.** What can we learn from studying climate change in montane systems? Biogeography Course (GPHY 411), Montana State University, Bozeman, MT.

### 2018-

- **Billman, P. D.,** Beever, E.A., McWethy, D.B. Quantifying the Impacts of Aridity on American Pikas in the Northern Rockies, Using Space-For-Time Substitution. USGS Northern Rocky Science Center EcoLunch, Bozeman, MT.
- **Billman, P. D.,** Wilson, K.C., Dudley, L.S. Wildlife and Climate Change in the Northern Rocky Mountains. Restoration Ecology in Greater Yellowstone (NRSM 311), Wild Rockies Field Institute, University of Montana, Tobacco Root Mountains, MT.

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## PROFESSIONAL MEMBERSHIPS

Member, American Alpine Club  
Member, American Meteorological Society  
Member, American Society of Mammalogists  
Member, National Society of Collegiate Scholars  
Member, Northwest Scientific Association  
Member, Society of Conservation Biology  
Member, Wildlife Society-Montana State Chapter

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## SERVICE AND OUTREACH

### Montana Science Olympiad Event Captain - Water Quality & Long-Term Climate Change

- 2018, 2019, and 2021
- Wrote the exams for the statewide Science Olympiad competition, proctored them, and graded them, in aims to excite middle and high schoolers about long-term climate change and glaciology in 2018, and marine sciences in 2019 and 2021.

### National Conference of Undergraduate Research (NCUR)-Program Steering Committee

- 2019-2020
- Advised on the planning and program committee, where I was the sole graduate student representative in helping plan logistics for the NCUR conference that MSU was to host.

### Eagle Mount Ski Program Volunteer

- 2016-current
- Volunteered with an adaptive ski program where our goal is to get developmentally impaired kids out for ski lessons at mountain resorts. This role has taught me how to interact with diverse people and help them overcome challenges, all while giving back to my community.

### Graduate School Q&A Co-Organizer

- 2019
- Co-organized an event with another graduate student for undergraduate students in ecology and the environmental sciences to come in and ask questions related to the process of graduate school applications, what to expect, how to seek out funding, among numerous other topics.

### Child Advancement Project (CAP) Mentor

- 2013-2018
- Mentored an elementary school student interested in the sciences beginning in first grade year. I met with him weekly for 4.5 years, where we conducted science experiments, designed circuit boards, wrote up projects for classes, as well as completed independent study projects tailored to his interests across various aspects of STEM.

### Montana State University Orientation Leader

- 2015-2016
- Mentored and assisted approximately 200 freshmen throughout the summer, fall, and spring semesters to get them familiar with the campus, understanding the university policies, and registering for courses for their first semester at Montana State University.

### Middle School Science Fair Judge- Morning Star Elementary School

- 2013
- Assisted in judging the biological science's science fair projects at a local elementary school here in Montana and communicated with students the various strengths of their projects.