

# Clark Rushing | Assistant Professor

Department of Wildland Resources and the Ecology Center, Utah State University

📞 +1 435 797 0337 • ✉ clark.rushing@usu.edu  
🌐 www.rushinglab.com • 🐦 clarkrushing • 🌐 rushinglab

## EDUCATION

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**Ecology and Evolutionary Biology** Princeton University, Princeton, NJ  
B.A. 2005

**Behavior, Ecology, Evolution, and Systematics** University of Maryland, College Park, MD  
PhD 2014

## PROFESSIONAL EXPERIENCE

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**2018 - present:** Department of Wildland Resources and the Ecology Center, Utah State University. Assistant professor

**2016 - present:** Smithsonian Migratory Bird Center. Research associate

**2016-2018:** Patuxent Wildlife Research Center. Postdoctoral fellow

**2015-2016:** Smithsonian Migratory Bird Center. George Didden postdoctoral fellow

**2014-2015:** Smithsonian Migratory Bird Center. James Smithson postdoctoral fellow

**2005-2007:** Environmental Protection Agency. Remedial Project Manager

## PUBLICATIONS

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### At a glance

*Number of publications:* 20

*Total citations:* 381

*Average impact factor:* 4.52

1. Rushing, C, R Rohrbaugh, C Fiss, C Rosenberry, A Rodewald, and ... (2020). Long-term variation in white-tailed deer abundance shapes landscape-scale population dynamics of forest-breeding birds. *Forest Ecology And Management* **456**, 117629.
2. Rushing, C, M Rubenstein, J Lyons, and M Runge (2020). Using value of information to prioritize research needs for migratory bird management under climate change: a case study using federal land acquisition in the United States. *Biological Reviews* <https://doi.org/10.1111/brv.12602>.
3. Parker, H, J Larkin, D Heggenstaller, J Duchamp, M Tyree, and ... (2020). Evaluating the impacts of white-tailed deer (*Odocoileus virginianus*) browsing on vegetation in fenced and unfenced timber harvests. *Forest Ecology And Management* **473**, 118326.

4. Rushing, C, J Royle, D Ziolkowski, and K Pardieck (2020). Migratory behavior and winter geography drive differential range shifts of eastern birds in response to recent climate change. *Proceedings Of The National Academy Of Sciences* <https://doi.org/10.1073/pnas.2000299117>.
5. Cohen, E, C Rushing, F Moore, M Hallworth, J Hostetler, and ... (2019). The strength of migratory connectivity for birds en route to breeding through the Gulf of Mexico. *Ecography* **42** (4), 658-669.
6. Roy, C, N Michel, C Handel, S Van Wilgenburg, J Burkhalter, K Gurney, and ... (2019). Monitoring boreal avian populations: how can we estimate trends and trajectories from noisy data? *Avian Conservation And Ecology* **14** (2).
7. Rushing, C, J Royle, D Ziolkowski, and K Pardieck (2019). Modeling spatially and temporally complex range dynamics when detection is imperfect. *Scientific Reports* **9** (1), 1-9.
8. Rushing, C (2019). Estimability of migration survival rates from integrated breeding and winter capture–recapture data. *Ecology And Evolution* **9** (2), 849-858.
9. Cooper, N, C Rushing, and P Marra (2019). Reducing the conservation reliance of the endangered Kirtland’s warbler through adaptive management. *The Journal Of Wildlife Management* **83** (6), 1297-1305.
10. Cohen, E, J Hostetler, M Hallworth, C Rushing, T Sillett, and P Marra (2018). Quantifying the strength of migratory connectivity. *Methods In Ecology And Evolution* **9** (3), 513-524.
11. Rushing, C, J Hostetler, T Sillett, P Marra, J Rotenberg, and T Ryder (2017). Spatial and temporal drivers of avian population dynamics across the annual cycle. *Ecology* **98** (11), 2837-2850.
12. Rushing, C, P Marra, and C Studds (2017). Incorporating breeding abundance into spatial assignments on continuous surfaces. *Ecology And Evolution* **7** (11), 3847-3855.
13. Rushing, C, T Ryder, and P Marra (2016). Quantifying drivers of population dynamics for a migratory bird throughout the annual cycle. *Proceedings Of The Royal Society B: Biological Sciences* **283** (1823), 20152846.
14. Rushing, C, P Marra, and M Dudash (2016). Winter habitat quality but not long-distance breeding dispersal influences apparent reproductive success in a migratory bird. *Ecology* **97** (5), 1218-1227.
15. Rushing, C, T Ryder, A Scarpignato, J Saracco, and P Marra (2016). Using demographic attributes from long-term monitoring data to delineate natural population structure. *Journal Of Applied Ecology* **53** (2), 491-500.
16. Boves, T, G Fairhurst, C Rushing, and D Buehler (2016). Feather corticosterone levels are related to age and future body condition, but not to subsequent fitness, in a declining migratory songbird. *Conservation Physiology* **4** (1), cow041.
17. Tesson, S, B Okamura, R Dudaniec, W Vyverman, J Löndahl, and ... (2015). Integrating microorganism and macroorganism dispersal: modes, techniques and challenges with particular focus on co-dispersal. *Ecoscience* **22** (2-4), 109-124.
18. Rushing, C, M Dudash, C Studds, and P Marra (2015). Annual variation in long-distance dispersal driven by breeding and non-breeding season climatic conditions in a migratory bird. *Ecography* **38** (10), 1006-1014.
19. Rushing, C, M Dudash, and P Marra (2015). Habitat features and long-distance dispersal modify the use of social information by a long-distance migratory bird. *Journal Of Animal Ecology* **84** (6), 1469-1479.
20. Rushing, C, T Ryder, J Saracco, and P Marra (2014). Assessing migratory connectivity for a long-distance migratory bird using multiple intrinsic markers. *Ecological Applications* **24** (3), 445-456.

## GRANTS AND AWARDS

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### At a glance

Total research funding (last 5 years): ~ \$540,000

Grants.....		
<b>CAREER: Leveraging community science and technology to quantify the role of breeding vs. non-breeding demographic processes in determining range limits of migratory birds</b>	<b>\$1,017,506 (pending)</b>	<b>2020</b>
<i>National Science Foundation</i>		
<b>Addressing Data Gaps to Conserve Black Rosy-finch in Utah (Co-PI)</b>	<b>\$20,500</b>	<b>2020</b>
<i>Utah Endangered Species Mitigation Fund</i>		
<b>Effects of piñon-juniper woodland treatments on the Pinyon Jay (Co-PI)</b>	<b>\$310,000</b>	<b>2020</b>
<i>U.S. Fish &amp; Wildlife Service, Science Applications</i>		
<b>Assessing potential of UV light emitters to mitigate bird window strikes (Co-PI)</b>	<b>\$61,216</b>	<b>2020</b>
<i>Utah Ag. Experiment Station</i>		
<b>Social and Environmental Effects of Desiccation in the Great Salt Lake (Co-PI)</b>	<b>\$35,000</b>	<b>2020</b>
<i>Utah State University Office of Research</i>		
<b>Utah Black Rosy-finch Abundance and Distribution Study (PI)</b>	<b>\$15,000</b>	<b>2019</b>
<i>Tracy Aviary Conservation Grant Program</i>		
<b>Quantifying limiting factors of <i>P. amoena</i> along an elevational gradient (PI)</b>	<b>\$20,000</b>	<b>2019</b>
<i>Utah State University Office of Research</i>		
<b>Utah Black Rosy-finch Study (Co-PI)</b>	<b>\$15,000</b>	<b>2018</b>
<i>Tracy Aviary Conservation Grant Program</i>		
<b>Migration ecology and connectivity the eastern Painted Bunting (PI)</b>	<b>\$41,960</b>	<b>2018</b>
<i>U.S. Fish &amp; Wildlife Service, Neotropical Migratory Bird Conservation Act</i>		
<b>Conservation Partnerships for eastern Painted Buntings (PI)</b>	<b>\$25,000</b>	<b>2016</b>
<i>Disney Conservation Fund</i>		
Fellowships.....		
<b>George Didden Conservation Biology Post-doctoral fellowship</b>	<b>\$50,000</b>	<b>2015-16</b>
<i>Smithsonian Institution</i>		
<b>James Smithson Post-doctoral fellowship</b>	<b>\$50,000</b>	<b>2014-15</b>
<i>Smithsonian Institution</i>		
<b>Pre-doctoral fellowship</b>	<b>\$15,000</b>	<b>2012-13</b>
<i>Smithsonian Institution</i>		
<b>Ann G. Wylie Dissertation fellowship</b>	<b>\$10,000</b>	<b>2013</b>
<i>University of Maryland</i>		
<b>Darwin fellowship</b>	<b>\$2,000</b>	<b>2008</b>
<i>University of Maryland</i>		
Awards.....		
<b>2013: Cooper Ornithological Society. Student Presentation Award</b>		

2013: University of Maryland. Jane Pritchard Outstanding Teaching Assistant Award

2013: American Ornithological Society. Student Travel Award

2012: University of Maryland. Student Travel Award

## TALKS

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- Oral papers.....
- Van Tatenhove, A., Rushing, C.S. (2020) Spatial and temporal variation in survival and connectivity of North American pelicans. North American Ornithological Conference.
- Savides, K., Rushing, C.S. (2020) Utilizing RFID to characterize differences in migratory phenology of Lazuli Buntings across an elevational gradient. North American Ornithological Conference.
- Sharp, A., Ruiz-Gutierrez, V., Cotina, A., Bridge, E., Kelly, J., Sillett, S., Rushing, C.S. (2020) Using Tracking Data to Explore the Range-Wide Migratory Connectivity of Painted Buntings. North American Ornithological Conference.
- Rushing, C.S., Van Tatenhove, A., Sharp, A., Ruiz-Gutierrez, V., Sillett, S., Sykes, P.W. (2020) Accounting for Survivorship Bias in Estimation of Migratory Connectivity from Archival Tags. North American Ornithological Conference.
- Van Tatenhove, A., Rushing, C.S. (2020) Spatial and temporal variation in survival and connectivity of North American pelicans. Ecological Society of America Annual Meeting.
- Rushing, C.S., C. Joos (2019) Addressing population declines with full annual cycle models: Current advances and data needs. American Ornithological Society Annual Meeting, Anchorage, AK.
- Rushing, C.S., N.J. Hostetter, R Boettcher, JE Lyons (2019) A general framework to integrate repeated count and mark-resight data. American Ornithological Society Annual Meeting, Anchorage, AK.
- Rushing, C.S. (2017) Estimability of migration survival rates from integrated CJS models. Euring Analytical Conference, Barcelona, Spain.
- Sillett, T.S., C.S. Rushing (2017) Survival of passerines during spring and fall migration: the importance of carry-over effects. Euring Analytical Conference, Barcelona, Spain.
- Rushing, C.S., S. Sillett, P.P. Marra, T.B. Ryder (2016) Using integrated population models to estimate seasonal survival and full-annual-cycle drivers of population dynamics. North American Ornithological Conference, Washington, DC.
- Rushing, C.S. (2016) Developing full annual cycle population models to advance migratory bird conservation. North American Ornithological Conference, Washington, DC.
- Rushing, C.S., L. Powell (2016) Developing a full annual cycle model for a rapidly declining but data poor migratory bird, the Rusty Blackbird. North American Ornithological Conference, Washington, DC.
- Ryder, T.B., C.S. Rushing, T. Wilbert, S. Sillett, P.P. Marra (2015) Thinking outside the black box: Novel approaches to measuring recruitment and source-sink dynamics in migratory species. Ecological Society of America Annual Meeting, Baltimore, MD.
- Rushing, C.S., T.B. Ryder, P.P. Marra (2015) Regional variation in the strength of breeding vs non-breeding factors limiting populations of a declining migratory bird. Ecological Society of America Annual Meeting, Baltimore, MD.

- Rushing, C.S., E.B. Cohen, J.A. Hostetler, P.P. Marra (2014) Quantifying the influence of long-distance dispersal on migratory connectivity strength. American Ornithologists Union Annual Meeting, Estes Park, CO.
- Rushing, C.S., T.B. Ryder, P.P. Marra (2014) Combining demographic data, migratory connectivity, and remote sensing data to quantify drivers of population dynamics in a migratory bird. American Ornithologists Union Annual Meeting, Estes Park, CO.
- Rushing, C.S., M.R. Dudash, P.P. Marra (2013) Climate drives long-distance dispersal in a migratory bird. American Ornithologists Union/Cooper Ornithological Society Annual Meeting, Chicago, IL. (Cooper Ornithological Society Student Presentation Award).
- Rushing, C.S., M.R. Dudash, P.P. Marra (2012) Quantifying the reproductive consequences of long-distance dispersal in a migratory bird, the American redstart. North American Ornithological Conference, Vancouver, BC.
- Rushing, C.S., M.R. Dudash, P.P. Marra (2011) Reproductive consequences of long-distance dispersal in a migratory bird, the American redstart. BEES graduate program recruitment, University of Maryland, College Park, MD.

- Invited seminars.....
- Rushing C.S. (2020). Population limitation in migratory birds: New approaches to old questions. Organismic and Evolutionary Biology Graduate Program, University of Massachusetts Amherst, Amherst, MA.
- Rushing C.S. (2019) Population dynamics of migratory birds across the annual cycle. Department of Zoology Seminar Series, Weber State University, Ogden, UT.
- Rushing C.S. (2018) Population dynamics of migratory birds across the annual cycle. Department of Wildland Resources Seminar Series, Utah State University, Logan, UT.
- Rushing C.S. (2018) Predicting the effects of climate change on migratory birds across their annual cycle. USU Climate Adaptation Science and Ecology Center, Interdisciplinary Research Forum, Logan, UT.
- Rushing C.S., S. Sillett, P.P. Marra, T.B. Ryder (2017) Developing full-annual-cycle models to inform conservation of declining migratory birds. Department of Natural Resources, Cornell University, Ithaca, NY.
- Rushing C.S., S. Sillett, P.P. Marra, T.B. Ryder (2016) Using integrated population models to estimate seasonal survival and full-annual-cycle drivers of population dynamics. Patuxent Wildlife Research Center, Laurel, MD.
- Rushing, C.S. (2016) Full-annual-cycle population models: Theory and application to migratory bird conservation. Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC.
- Rushing, C.S., P.P. Marra (2015) Developing a full-annual-cycle population model to support Wood Thrush conservation planning. North American Waterfowl Management Plan Science Support Team/Tri-initiative Science Team Joint Meeting, Ft. Collins, CO.
- Rushing, C.S. (2015) Full-annual-cycle population models: Theory and application to migratory bird conservation. Midwest Landbird Migration Monitoring Network Workshop, Forest Beach Migratory Preserve, WI.
- Rushing, C.S., M.R. Dudash, P.P. Marra (2013) Dispersal in migratory species: Moving beyond conventional paradigms. Symposium on Causes and Consequences of Dispersal, Lund University, Lund, Sweden.

- Public lectures.....
- Rushing, C.S. (2019) Harnessing technological advances to understand the decline of migratory birds. Stokes Nature Center, Logan, UT.
- Rushing, C.S., M.R. Dudash, P.P. Marra (2014) Causes and consequences of long-distance dispersal in a migratory bird, the American redstart. Howard County Audubon Society, Columbia, MD.
- Rushing, C.S., M.R. Dudash, P.P. Marra (2013) Causes and consequences of long-distance dispersal in a migratory bird, the American redstart. Prince Georges Audubon Society, College Park, MD.
- Posters.....
- Rushing, C.S. (2011) Carry-over effects, long-distance dispersal and reproductive success in a Neotropical migratory bird. Biosciences Research Day, University of Maryland, College Park, MD.
- Rushing, C.S. (2010) Using stable isotopes to quantify patterns of dispersal in a Neotropical migratory bird, the American redstart (*Setophaga ruticilla*). Biosciences Research Day, University of Maryland, College Park, MD.

## GRADUATE MENTORING

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- Graduate students (4).....
- Aimee Van Tatenhove (Ph.D.), Dustin Maloney (Ph.D.), Andrew Sharp (M.S.), Kim Savides (M.S.)
- Graduate committees (7).....
- Kristin Engebretsen (Ph.D.), Marilyn Wright (Ph.D.), Mark Bell (Ph.D.), Kylie Sinclair (M.S.), Zach Ahrens (M.S.), Chuck Carpenter (M.S.), Halie Parker (M.S.)

## TEACHING

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- University courses (instructor on record).....
- 2018 - present:** Utah State University. Plant and animal population ecology
- 2018 - present:** Utah State University. Applied Bayesian analysis for ecological data
- University courses (teaching assistant).....
- 2008 - 2014:** University of Maryland. Human anatomy and physiology
- Workshops and short courses.....
- 2014 - 2016:** Smithsonian-Mason School of Conservation. Ecology and Conservation of Migratory Birds
- 2018 - present:** American Ornithological Society Annual meeting. Spatial analysis in R

## PROFESSIONAL SERVICE

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2018 - present: The Condor. Associate Editor

2018 - present: Early Professionals committee, American Ornithological Society. Member

2015 - 2019: Demographic Monitoring subcommittee, NABCI. Member

2014 – 2017: International Wood Thrush Conservation Alliance. Member

## SYMPOSIUM ORGANIZER

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Keeping common birds common: Advances in migratory bird conservation (2016) Co-organized with K. Rosenberg, V. Ruiz-Gutierrez, C. Beardmore, and D. Demarest North American Ornithological Conference, Washington, DC

Study of avian life histories using integrated population models (2016) Co-organized with M. Weegman, B. Ross, S. Converse, D. Koons, and T. Arnold North American Ornithological Conference, Washington, DC

## SKILLS

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Programming.....

R, RStudio, WinBugs, JAGS, Nimble, git/Github, MARK, Presence

Field.....

Avian banding, nest searching, target netting, point count/distance sampling

Modeling.....

Generalized linear models, Hierarchical models, Survival analysis, Occupancy models, Integrated population models, Bayesian models/model selection

Laboratory.....

Stable isotope mass spectrometry