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## Education

2005 Ph.D. Environmental Science, Policy & Mang., University of California, Berkeley, CA

1998 B.A., Environmental Science, University of Virginia, Charlottesville, VA

## Research Experience

2005-present: Wildlife Health Researcher, U.S. Geological Survey

2009-present: Research Fellow, Wildlife Conservation Society

2006-present: Faculty Affiliate, Montana State University

1999-2005: Graduate Student Researcher, U.C. Berkeley

## Publications

### 2017

Maichak, E. J, B. M. Scurlock, P. C. Cross, J. D. Rogerson, W. H. Edwards, B. Wise, S. G. Smith and T. J. Kreeger (2017). "Assessment of the *Brucella abortus* Strain 19 ballistic vaccination program in elk on winter feedgrounds of Wyoming, USA". In: *Wildlife Society Bulletin* 00, pp. 000-000. DOI: 10.1002/wsb.734.

Manlove, K. R, E. F. Cassirer, R. K. Plowright, P. C. Cross and P. J. Hudson (2017). "Contact and contagion: Bighorn sheep demographic states vary in probability of transmission given contact". In: *Journal of Animal Ecology* 00, pp. 000-000. DOI: 10.1111/1365-2656.12664.

Pepin, K. M, S. L. Kay, B. D. Golas, S. S. Shriner, A. T. Gilbert, R. S. Miller, A. L. Graham, S. Riley, P. C. Cross, M. D. Samuel, et al. (2017). "Inferring infection hazard in wildlife populations by linking data across individual and population scales". In: *Ecology Letters* 00, pp. 000-000. ISSN: 1461-0248 (Electronic) 1461-023X (Linking). DOI: 10.1111/ele.12732. URL: <https://www.ncbi.nlm.nih.gov/pubmed/28090753>.

Sah, P, S. Leu, P. C. Cross, P. J. Hudson and S. Bansal (2017). "Unraveling the disease consequences and mechanisms of modular structure in animal social networks". In: *Proceedings of the National Academy of Science of the United States of America* 114.16, pp. 4165-4170. DOI: 10.1073/pnas.1613616114.

Toit, J. du, P. Cross and M. Valeix (2017). "Weaving wildlife into a framework for rangeland resilience". In: *Rangeland Systems: Processes, Management and Challenges*. Ed. by D. Briske. Springer, pp. 395-428. DOI: 10.1007/978-3-319-46709-2.

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Almberg, E. S, P. C. Cross, P. J. Hudson, A. P. Dobson, D. W. Smith and D. R. Stahler (2016). "Infectious diseases of wolves in Yellowstone". In: *Yellowstone Science* 24.1, pp. 47-49.

- Cross, P. C, E. S. Almberg, C. G. Haase, P. J. Hudson, S. K. Maloney, M. C. Metz, A. J. Munn, P. Nugent, O. Putzeys, D. R. Stahler, et al. (2016). “Energetic costs of mange in Yellowstone wolves estimated from infrared thermography”. In: *Ecology* 97.8, pp. 1938-1948. DOI: 10.1890/15-1346.1.
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- Kamath, P, J. Foster, K. Drees, C. Quance, G. Luikart, N. Anderson, P. Clarke, E. Cole, W. Edwards, J. Rhyhan, et al. (2016). “Genomics reveals historic and contemporary transmission dynamics of a bacterial disease among wildlife and livestock”. In: *Nature Communications* 7, p. 11448. DOI: 10.1038/ncomms11448.
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## 2015

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- Gorsich, E. E, V. O. Ezenwa, P. C. Cross, R. G. Bengis and A. E. Jolles (2015). “Context-dependent survival, fecundity and predicted population-level consequences of brucellosis in African buffalo”. In: *Journal of Animal Ecology* 84.4, pp. 999-1009. ISSN: 1365-2656 (Electronic) 0021-8790 (Linking). DOI: 10.1111/1365-2656.12356. URL: <http://www.ncbi.nlm.nih.gov/pubmed/25714466>.
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## 2012

Almberg, E. S, P. C. Cross, A. P. Dobson, D. W. Smith and P. J. Hudson (2012). "Parasite invasion following host reintroduction: a case study of Yellowstone's wolves". In: *Philosophical Transactions of the Royal Society B: Biological Sciences* 367.1604, pp. 2840-2851. DOI: 10.1098/rstb.2011.0369. URL: <http://rstb.royalsocietypublishing.org/cgi/doi/10.1098/rstb.2011.0369>.

Creech, T, P. C. Cross, B. Scurlock, E. Maichak, J. Rogerson, J. Henningsen and S. Creel (2012). "Effects of low-density feeding on elk-fetus contact rates on Wyoming feedgrounds". In: *Journal of Wildlife Management* 76.5, pp. 877-886. DOI: 10.1002/jwmg.331.

Cross, P. C, T. G. Creech, M. R. Ebinger, D. M. Heisey, K. Irvine and S. Creel (2012). "Wildlife contact analysis: emerging methods, questions, and challenges". In: *Behavioral Ecology and Sociobiology* 66.10, pp. 1437-1447. DOI: 10.1007/s00265-012-1376-6.

Forristal, V. E, S. Creel, M. Taper, B. Scurlock and P. C. Cross (2012). "Effects of supplemental feeding and aggregation on fecal glucocorticoid metabolite concentrations in elk". In: *Journal of Wildlife Management* 76.4, pp. 694-702. DOI: 10.1002/jwmg.312.

Plowright, R. K, P. C. Cross, G. M. Tabor, E. S. Almberg, L. Bienen and P. J. Hudson (2012). "Anthropogenic change and conservation medicine". In: *New Directions in Conservation Medicine: Applied Cases of Ecological Health*. Ed. by A. Aguirre, R. S. Ostfeld and P. Daszak. New York: Oxford University Press. Chap. 8, pp. 111-121.

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## 2011

Almberg, E. S, L. D. Mech, P. C. Cross, D. W. Smith, J. Sheldon and R. Crabtree (2011). "Infectious disease in Yellowstone National Parkâs canid community". In: *Yellowstone Science* 19.2, pp. 16-25.

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## 2010

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## 2005

Cross, P. C., J. O. Lloyd-Smith and W. Getz (2005). "Disentangling association patterns in fission-fusion societies using African buffalo as an example". In: *Animal Behavior* 69.2, pp. 499-506. DOI: 10.1016/j.anbehav.2004.08.006.

Cross, P. C., J. O. Lloyd-Smith, P. L. Johnson and W. M. Getz (2005). "Duelling timescales of host mixing and disease recovery determine disease invasion in structured populations". In: *Ecology Letters* 8, pp. 587-595. DOI: 10.1111/j.1461-0248.2005.00760.x.

Lloyd-Smith, J. O., P. C. Cross, C. J. Briggs, M. Daugherty, W. M. Getz, J. Latto, M. S. Sanchez, A. B. Smith and A. Swei (2005). "Should we expect population thresholds for wildlife disease?" In: *Trends in Ecology & Evolution* 20.9, pp. 511-519. DOI: 10.1016/j.tree.2005.07.004. URL: [://000232128300011 ](://000232128300011 ).

## 2004

Cross, P. C., J. O. Lloyd-Smith, J. Bowers, C. Hay, M. Hofmeyr and W. M. Getz (2004). "Integrating association data and disease dynamics in a social ungulate: bovine tuberculosis in African buffalo in the Kruger National Park". In: *Annales Zoologici Fennici* 41, pp. 879-892. URL: <http://www.jstor.org/stable/23736148>.

Macandza, V., N. Owen-Smith and P. C. Cross (2004). "Forage selection by African buffalo (*Syncerus caffer*) through the dry season in two landscapes of the Kruger National Park". In: *South African Journal of Wildlife Research* 34.2, pp. 113-121.

## 2003

Caron, A., P. C. Cross and J. du Toit (2003). "Ecological implications of bovine tuberculosis in African Buffalo herds". In: *Ecological Applications* 13.5, pp. 1338-1345. DOI: 10.1890/02-5266.

## 2001

Cross, P. C. and S. Beissinger (2001). "Using logistic regression to analyze the sensitivity of PVA models: a comparison of methods based on African Wild Dog models". In: *Conservation Biology* 15.5, pp. 1335-1346. DOI: 10.1111/j.1523-1739.2001.00031.x. ## Grey Literature

Ebinger, MR & PC Cross. 2008. Surveillance for brucellosis in Yellowstone bison: The power of various strategies to detect vaccination effects. National Park Service, Mammoth, WY, YCR-2008-04. 69 pages.

## Databases

Cross, P.C. D. M. Heisey, J. A. Bowers, C. T. Hay, J. Wollhuter, P. Buss, M. Hofmeyr, A. Michel, R. Bengis, T. Bird, I. J. Whyte, J. T. Du Toit, and W. M. Getz. 2009. Buffalo herd tracking with VHF and GPS data. Movebank.org.

Cross PC, Heisey DM, Bowers JA, Hay CT, Wollhuter J, Buss P, Hofmeyr M, Michel AL, Bengis RG, Bird TLF, Du Toit JT, Getz WM (2008) Data from: Disease, predation and demography: assessing the impacts of bovine tuberculosis on African buffalo by monitoring at individual and population levels. Dryad Digital Repository. doi:10.5061/dryad.5hh3h

Gorsich EE, Ezenwa VO, Cross PC, Bengis RG, Jolles AE (2015) Data from: Context-dependent survival, fecundity, and predicted population-level consequences of brucellosis in African buffalo. Dryad Digital Repository. <http://dx.doi.org/10.5061/dryad.p6678>

## Students

- Gavin Cotterill. In progress. Managing disease in the supplemental feeding grounds of Wyoming. Utah State University. Co-supervisor: JT Du Toit
- Ellen Brandell. In progress. Disease impacts on wolves in Yellowstone National Park. Penn State University. Co-supervisor: PJ Hudson
- Angela Brennan. 2014. Broad-scale determinants of elk aggregation and brucellosis seroprevalence. Montana State University. Co-supervisor: S Creel.
- Tyler Creech. 2011. Heterogeneity in the fine-scale contact patterns of elk as determined by proximity collars. Montana State University. Co-supervisor: S Creel
- Victoria Forristal (formerly Patrek). 2009. Masters. Fat but not happy: The Effects of Supplemental Feeding on Stress Hormone Levels in Elk. Montana State University. Co-supervisors: M Taper, S Creel
- Craig Hay. 2006 Choice of Social environment of male buffalo (*Syncerus caffer*) in the Kruger National Park, South Africa. Tshwane University of Technology. South Africa. Co-supervisor: P Funston
- Chris Oosthuizen. 2006. Honour's thesis: Chemical immobilization of African buffalo (*Syncerus caffer*) in Kruger National Park: Evaluating effects on survival and reproduction. University of Pretoria. South Africa. Co-supervisor: E Cameron

## Field Supervisor

- Manlove, K. 2017. Penn State University. Supervisor: PJ Hudson
- Almberg, ES. 2015. The Invasion, Dynamics, and Impacts of Infectious Disease in Yellowstone's Wolf Population. Penn State University. Supervisor: PJ Hudson
- Bowers, JA. 2006. Master's thesis: Feeding patch selection of African Buffalo (*\*Syncerus caffer caffer()*) in the central region of the Kruger National Park. Tshwane University of Technology. South Africa
- Tania Bird. 2004. Master's thesis: Influence of bovine tuberculosis (*Mycobacterium bovis*) on condition and reproductive success of females African buffalo (*Syncerus caffer*) in Kruger National Park. University of Pretoria. South Africa
- Shane Abeare. 2004. Master's thesis: Dry season habitat and patch selection by African buffalo herds: test of a new home range estimator. University of Pretoria. South Africa
- Valerio Macandza 2002. Master's thesis: Forage selection by African buffalo in the late dry season in two landscapes. Witwatersrand University. South Africa
- Alex Caron. 2001. Master's thesis: Ecological implications of bovine tuberculosis in African Buffalo. University of Pretoria. South Africa

## Teaching

- Data Analysis and Multi-level / Hierarchical Modeling in Ecology (1 credit) Fall 2009. MSU.



- Modeling Infectious Disease (3 day workshop) 2009. Univ. of Montana.
- EcoLunch Seminar (1 credit) Fall 2008. MSU.
- Plant-Disease Invasion Seminar (informal graduate seminar). Fall 2006. MSU.
- Wildlife Ecology (4 credits with lab) Spring 2005. Co-Lecturer UC Berkeley.
- Disease Ecology (1 credit) 2004. Co-supervised graduate seminar on disease ecology, UC Berkeley
- Modeling Infectious Disease (1 week short-course) 2001. Univ. of Witwatersrand, South Africa

### **Invited Classes**

- Diseases of the GYE. 1 lectures per year for an introductory class on the GYE. MSU.
- Disease Ecology. 2 lectures per year for upper-level ecology students. MSU
- Philosophy of Science. 2007. 2 classes. MSU.

### **Grants/Awards**

#### **2016**

- USGS Performance Award
- USDA grant to Univ of Washington, \$96,000 Livestock-wildlife disease modeling
- MT FWP cooperative agreement \$45,000 Cattle disease risk assessment.

#### **2015**

- USGS Performance Award
- USGS, PI \$ 133,000 Greater Yellowstone ecosystem disease research

#### **2014**

- USGS Performance Award

#### **2013**

- USGS Performance Award
- National Institute for Mathematical and Biological Synthesis (NIMBioS) Workshop (Co-PI) ~\$60,000
- NSF Dissertation Improvement Grant (Co-PI) \$19,343
- USGS, PI \$ 98,000 Greater Yellowstone ecosystem disease research

#### **2012**

- USGS Powell Center Grant, Co-PI (declined)
- USGS Performance Award
- USGS, PI \$75,000, Disease effects on Yellowstone Wolves.
- USFWS, PI\$45,000, Elk space-use of the National Elk Refuge.
- Morris Animal Foundation, Co-PI \$ 75,000, Developing an evidence base for managing bighorn sheep pneumonia.

## **2011**

- USGS Best Paper in Biology
- USGS Grade Promotion

## **2010**

- NSF-NIH Ecology of Infectious Disease Program, co-PI \$1,971,033, Effects of land-use, predation and management on wildlife contact and Brucella transmission in the Yellowstone Ecosystem
- USGS, PI \$75,000, Park Oriented Biological Support Grant: Effects of Sarcoptic Mange on Gray Wolves in Yellowstone National Park
- USGS Star Award for Performance

## **2009**

- USGS, PI \$39,000, Modeling environmental transmission of Chronic Wasting Disease
- USGS Star Award for Performance

## **2008**

- USGS, Co-PI \$320,000, Global Climate Change Initiative
- Co-PI \$112,180, Wyoming Livestock-Wildlife Disease Initiative
- Co-PI \$281,000, Wyoming Game and Fish Department: Tracking elk movements around the supplemental feedgrounds.

## **2007**

- USGS, Co-PI \$750,000 with Mary Poss (Penn State): Viral tracking of mule deer and elk.
- NPS, PI \$10,000: Brucellosis in Yellowstone National Park
- USGS Star Award

## **2006**

- USGS, PI \$210,000 for chronic wasting disease research.

## **1999**

- NSF-NIH Ecology of Infectious Disease Grant. \$1.8 million. Initiated, co-authored, and developed the research program with Dr. Wayne Getz.

## **Presentations**

### **2016**

Invited Speaker, Utah State University Ecology Seminar. Logan, UT

Invited Speaker, Monthly USGS Disease webinar.

Invited Speaker, UCLA Ecology Seminar, Los Angeles, CA. Invited Speaker, Patuxent USGS Seminar. Invited Speaker, Georgetown Ecology Seminar, Washington, D.C.

Ecology Society of America Annual Meeting. Fort Lauderdale, FL

Invited Speaker, 50th Anniv. Mammal Research Institute, South Africa  
Speaker, K-5 science and technology night, Bozeman MT.

## **2015**

Invited Speaker, MT Conservation Biology Evening Lecture, Bozeman MT  
Invited Speaker, The National Academy of Sciences, Washington DC  
Invited Speaker, Wildlife Society Meeting, Winnipeg, Canada

## **2014**

Invited Speaker, Ecology Seminar, University of Sherbrooke, Canada  
Speaker, Montana Wildlife Society Meeting, Bozeman MT  
Invited Speaker, NIH Rocky Mountain Lab, Hamilton MT  
Invited Speaker, 18th Congreso Chileno de Medicina Veterinaria, Santiago, Chile  
Invited Speaker, Dept. Seminar, Univ. Catolica, Valdivia, Chile  
Public Talk, Emerging wildlife pandemics, Menlo Park, CA

## **2013**

Steering Committee & Invited Speaker. Foreign Animal Disease Preparedness, Shepardstown WV Speaker,  
Western States Deer and Elk Meeting, Missoula MT  
Invited Speaker. Interagency Bison Management Plan Meeting. Chico MT

## **2012**

Invited Speaker. European Conservation Biology Meeting, Glasgow UK  
Poster, NSF Ecology of Infectious Disease Meeting, Berkeley, CA  
Invited Speaker & Workshop Participant, Bighorn Sheep disease ecology. Penn State Univ. State College PA

## **2011**

Speaker, The Wildlife Society Annual Meeting, Hawaii  
Invited Speaker, Wildlife disease management workshop, Penn State Univ.  
Invited Speaker, Ecology and Evolution of Infectious Disease Meeting, Santa Barbara.  
Invited Participant, NIH sponsored, Movement and the Spatial Dynamics of Mosquito-Transmitted Diseases Meeting, Washington D.C.

## **2010**

Invited Keynote, Berryman Institute Biennial Meeting, Logan UT.  
Invited Participant, NIH sponsored, Movement and the Spatial Dynamics of Mosquito-Transmitted Diseases Meeting, Washington D.C.

## **2009**

Kopriva Lecture [Invited] MSU College of Arts and Science, Bozeman, MT  
Invited Speaker, Dept. Seminar, Colorado State University, Fort Collins, CO  
Invited Speaker, EcoHealth Student Chapter, Bozeman, MT

Invited Speaker, 10th Biennial Conference of Research on the Colorado Plateau Speaker, Ecological Society of America, Albuquerque, NM

### **prior to 2009**

Invited Speaker, Ecology Seminar, Montana State University, Bozeman MT  
Invited Speaker, Social networks in humans and wildlife workshop, Penn State Univ.  
Speaker, Jackson Hole Cooperative Elk Working Group, Jackson WY  
Speaker, Ecological Society of America, Nashville, TN.  
Speaker, Departmental Seminar, Montana State University  
Invited Speaker, International Mammal Conference, Sapporo Japan.  
Speaker, Kruger National Park Annual Meeting, South Africa.  
Speaker, University of California Wildlife Lunch, Berkeley CA.  
Speaker & Attendee, Chronic Wasting Disease Technical Workshop, Park City UT.  
Speaker, NSF-NIH Ecology of Infectious Disease Meeting, Falls Church VA.  
Best Poster, Wildlife Disease Association, San Diego CA.  
Attendee, Greater Limpopo Transfrontier Conservation Area AHEAD-WCS Meeting, Maputo, Mozambique  
Speaker, Animal Behavior Society, Boise ID.  
Poster, NSF-NIH Ecology of Infectious Disease Meeting, Bethesda MD.  
Invited speaker, Conservation Research Center Smithsonian Institute, Speaker, SF Bay Area Conservation Biology Symposium, Berkeley CA.  
Speaker, University of Pretoria, Department of Zoology Annual Meeting, Pretoria.  
Speaker, South African Wildlife Management Association Annual Meeting, Pretoria.  
Speaker, University of California Wildlife Lunch, Berkeley CA.  
Speaker, Wildlife Disease Association, Pilanesburg, South Africa.  
Speaker, University of Pretoria, Department of Zoology Annual Meeting, Pretoria.  
Speaker, University of California Wildlife Lunch, Berkeley CA.

### **Service**

#### **Ongoing**

- Northern Yellowstone Cooperative Wildlife Working Group.
- Chair, USGS Animal Use and Care Committee for NOROCK.

#### **Previous**

- 2015-2017, Associate Editor, Journal of Wildlife Management
- 2016 National Academy of Science Panel Member
- 2016 Dept. Homeland Security IPT for outbreak response and assessment tools.
- 2014 Red Wolf Recovery Implementation Team, USFWS.
- 2014 Participant, Wildlife Conservation Society Wildlife Health Program, Internal Strategic Workshop for future research.
- 2013 Steering Committee, Group Leader & Speaker. Foreign Animal Disease National Preparedness Workshop. USGS/DHS/USDA/CDC.
- 2011 Member Environmental Health Strategic Science Planning Team
- 2011 Co-coordinator & originator, NIH & DHS RAPIDD Working group on cross-species transmission. 15 participants
- 2011 Participant, NIH & DHS RAPIDD Working group on movement and mosquito-borne diseases.
- 2011 USGS representative. Northern Rockies NEON committee.
- 2009 Organizer, Greater Yellowstone Brucellosis Research Meeting (2 days), 60 participants, 27 speakers, Bozeman MT

- 2009 Participant, Dept. of Interior Avian Influenza Preparedness workshop, Madison WI
- 2009 Participant, Yellowstone National Park Science Agenda Workshop, Bozeman MT
- 2008 Acting Chair, Northern Yellowstone Cooperative Wildlife Working Group.
- 2007 Steering Committee, Yellowstone National Park Wildlife Health Program Meeting.
- 2007 Participant, USDA workshop: The Science of Surveillance, Control and Eradication of Catastrophic Diseases in Wildlife, Pinagree Park CO
- 2006 Participant, Disease and conservation of mammals, Conservation International
- 2005-8 USGS representative. Greater Yellowstone Interagency Brucellosis Committee.

## Reviewer

*Journals* (since 2004): Nature, Ecol App, J Anim Ecol, J App Ecol, Proc Roy Soc B, Phil Trans Roy Soc, Biol Letters, Cons Bio, Biol Cons, Anim Cons, Biodiv Cons, Behavior, Envi Cons, J Wildl Dis, Wildl Bio, PloS ONE, EcoHealth, J Theo Bio, SA J Wildl Res, Ann Zoo Fennici, Ecol Mod [1], USGS FSP, USGS Study Plans

*Funding Agencies*: National Science Foundation [2], Wildlife Conservation Society [1], Wellcome Trust [1], Biotechnology and Biological Sciences Research Council UK [1], Natural Environment Research Council UK [1], South African National Research Foundation [1], Alberta Prion Research Institute [2], National Institutes of Health [1]

## Press and Outreach

- Economist 2015
- NSF Science 360 2015
- The Wildlife Professional 2015
- New Zealand Herald 2013
- Discovery Channel Curiosity X-Ray Yellowstone 2012
- Wired Magazine 2012
- Science World Scholastic Magazine 2012
- Billings Gazette 2010
- Examiner.com 2010
- [www.yellowstonewolf.org](http://www.yellowstonewolf.org)

## References

Dr. Claudia Regan, Center Director, Northern Rocky Mountain Science Center, USGS, 2327 University Way, Suite 2, Bozeman MT 59715. Phone: (406) 994-7972 Email: [cregan@usgs.gov](mailto:cregan@usgs.gov)

Mr. Brandon Scurlock, Brucellosis-Feedground-Habitat Supervisor, Wyoming Game and Fish Department, Pinedale Office, PO Box 850, Pinedale, WY 82941 Phone: (307) 367-4347ext224 Email: [bscurlock@wyo.gov](mailto:bscurlock@wyo.gov)

Dr. Doug W. Smith, Yellowstone Center for Resources, Wolf Project, Yellowstone National Park, WY 82190 Phone: (307) 344-2242 Email: [doug\\_smith@nps.gov](mailto:doug_smith@nps.gov)