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## Education

Ph.D. Environmental Science, Policy & Mang., University of California, Berkeley, CA 2005  
B.A., Environmental Science, University of Virginia, Charlottesville, VA 1998

## Research Experience

Wildlife Health Researcher, U.S. Geological Survey 2005-present  
Faculty Affiliate, Montana State University 2006-present  
Graduate Student Researcher, U.C. Berkeley 1999-2005

## Publications

2019

Cotterill, G. G, P. C. Cross, J. A. Merkle, J. D. Rogerson, B. M. Scurlock and J. T. Du Toit (2019). "Parsing the effects of management efforts and environmental drivers on a chronic wildlife disease". In: *Journal of Applied Ecology* In Review, pp. 000-000.

Cross, P, D. J. Prosser, A. M. Ramey, E. M. Hanks and K. M. Pepin (2019). "Confronting models with data: The challenges of estimating disease spillover". In: *Philosophical Transactions of the Royal Society B: Biological Sciences* In review, pp. 000-000.

Kamath, P. L, K. Manlove, E. F. Cassirer, P. C. Cross and T. E. Besser (2019). "Genetic structure of *Mycoplasma ovipneumoniae* informs pathogen spillover dynamics between domestic and bighorn sheep in the western United States". In: *Scientific Reports* In review, pp. 000-000.

Manlove, K, M. Branan, R. S. Miller, E. F. Cassirer, K. Baker, D. Bradway, S. Sweeney, K. L. Marshall, P. C. Cross and T. E. Besser (2019). "Risk factors and productivity losses associated with *Mycoplasma ovipneumoniae* infection in United States domestic sheep operations". In: *Preventative Veterinary Medicine* In review, pp. 000-000.

Manlove, K, L. M. Sampson, B. Borremans, R. Miller, K. Pepin, T. Besser and P. Cross (2019). "A management-centered approach to modeling pathogen spillover risk at the wildlife-livestock interface". In: *Philosophical Transactions of the Royal Society B: Biological Sciences* In review, pp. 000-000.

Rayl, N. D, J. A. Merkle, K. M. Proffitt, E. S. Almberg, J. D. Jones, J. A. Gude and P. C. Cross (2019). "Elk migration influences the risk of disease spillover in the Greater Yellowstone Ecosystem". In: *Journal of Animal Ecology* In review, pp. 000-000.

Rayl, N. D, K. M. Proffitt, E. S. Almberg, J. A. Merkle, J. H. Jones, J. A. Gude and P. C. Cross (2019). "Modelling Elk-to-Livestock Transmission Risk to Predict Hotspots of Brucellosis Spillover". In: *Journal of Wildlife Management* 00.00, pp. 000-000. DOI: [10.1002/jwmg.21645](https://doi.org/10.1002/jwmg.21645).

Sokolow, S. H, N. Nova, K. Pepin, A. J. Peel, K. Manlove, P. C. Cross, D. J. Becker, R. K. Plowright, J. R. Pulliam, H. McCallum and G. A. De Leo (2019). "Ecological interventions to prevent and manage zoonotic pathogen spillover". In: *Philosophical Transactions of the Royal Society B: Biological Sciences* In Review.

2018

Astorga, F, S. Carver, E. S. Almberg, G. R. Sousa, K. Wingfield, K. D. Niedringhaus, P. Van Wick, L. Rossi, Y. Xie, P. Cross, S. Angelone, C. Gortázar and L. E. Escobar (2018). "International meeting on sarcoptic mange in wildlife, June 2018, Blacksburg, Virginia, USA". In: *Parasites & Vectors* 11, p. 449. ISSN: 1756-3305. DOI: [10.1186/s13071-018-3015-1](https://doi.org/10.1186/s13071-018-3015-1).

Brandell, E, E. S. Almberg, P. C. Cross, A. Dobson, D. Smith and P. Hudson (2018). "The invasion, dynamics, and consequences of infectious diseases in Yellowstone's wolves". In: *Yellowstone Wolves: Two Decades of Science and Discovery*. Ed. by D. Smith, D. MacNulty and D. R. Stahler. Chicago: University of Chicago, pp. 000-000.

Brennan, A, E. M. Hanks, J. A. Merkle, E. K. Cole, S. R. Dewey, A. B. Courtemanch and P. C. Cross (2018). "Examining speed versus selection in connectivity models using elk migration as an example". In: *Landscape Ecology* 33.6, pp. 955-968. ISSN: 0921-2973 1572-9761. DOI: [10.1007/s10980-018-0642-z](https://doi.org/10.1007/s10980-018-0642-z).

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Huyvaert, K. P, R. E. Russell, K. A. Patyk, M. E. Craft, P. C. Cross, M. G. Garner, M. K. Martin, P. Nol and D. P. Walsh (2018). "Challenges and opportunities developing mathematical models of shared pathogens of domestic and wild animals". In: *Veterinary Sciences* In revision.

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Merkle, J. A, P. C. Cross, B. M. Scurlock, E. K. Cole, A. B. Courtemanch, S. R. Dewey and M. J. Kauffman (2018). "Linking spring phenology with mechanistic models of host movement to predict disease transmission risk". In: *Journal of Applied Ecology* 55, pp. 810-819. ISSN: 00218901. DOI: [10.1111/1365-2664.13022](https://doi.org/10.1111/1365-2664.13022).

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Benavides, J. A, D. Caillaud, B. M. Scurlock, E. J. Maichak, W. H. Edwards and P. C. Cross (2017). "Estimating loss of *Brucella abortus* antibodies from age-specific serological data in elk". In: *EcoHealth* 14, pp. 234-243. DOI: [10.1007/s10393-017-1235-z](https://doi.org/10.1007/s10393-017-1235-z).

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Cassirer, E. F, K. R. Manlove, E. S. Almberg, P. L. Kamath, M. Cox, P. Wolff, A. Roug, J. Shannon, R. Robinson, R. B. Harris, B. J. Gonzales, R. K. Plowright, P. J. Hudson, P. C. Cross, A. Dobson, et al. (2017). "Pneumonia in bighorn sheep: Risk and resilience". In: *The Journal of Wildlife Management*. ISSN: 0022541X. DOI: [10.1002/jwmg.21309](https://doi.org/10.1002/jwmg.21309).

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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](https://doi.org/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. URL: [www.nps.gov/yell/learn/ys-24-1-infectious-diseases-of-wolves-in-yellowstone.htm](http://www.nps.gov/yell/learn/ys-24-1-infectious-diseases-of-wolves-in-yellowstone.htm).

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, A. C. Stewart and D. W. Smith (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](https://doi.org/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, J. Treanor, R. Wallen, S. Robbe-Austerman and P. Cross (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](https://doi.org/10.1038/ncomms11448).

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Conner, M. C, M. Ebinger, J. A. Blanchong and P. C. Cross (2008). "Infectious disease in cervids of North America: Data, models, and management challenges". In: *Annals of the New York Academy of Sciences* 1134, pp. 146-172. DOI: [10.1196/annals.1439.005](https://doi.org/10.1196/annals.1439.005).

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## 2007

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Hines, A., V. O. Ezenwa, P. C. Cross and J. Rogerson (2007). "Effects of supplemental feeding on gastrointestinal parasite infection in elk (*Cervus elaphus*): Preliminary observations". In: *Veterinary Parasitology* 148.3-4, pp. 350-355. DOI: [10.1016/j.vetpar.2007.07.006](https://doi.org/10.1016/j.vetpar.2007.07.006).

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Cross, P. C. and W. M. Getz (2006). "Assessing vaccination as a control strategy in an ongoing epidemic: Bovine tuberculosis in African Buffalo". In: *Ecological Modelling* 196, pp. 494-504. DOI: [10.1016/j.ecolmodel.2006.02.009](https://doi.org/10.1016/j.ecolmodel.2006.02.009).

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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>.

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### 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

van Manen, F.T., Smith, D.W., Haroldson, M.A., Stahler, D.R., Almberg, E.S., Whitman, C.L., and Cross, P.C., 2018, Canine distemper virus antibody titer results for grizzly bears and wolves in the Greater Yellowstone Ecosystem 1984-2014: U.S. Geological Survey data release, <https://doi.org/10.5066/P96E4UCK>.

Merkle, JA, PC Cross, BM Scurlock, EK Cole, AB Courtemanch, SR Dewey, MJ Kauffman, and KE Szcudronski, 2017, Elk movement and predicted number of brucellosis-induced abortion events in the southern Greater Yellowstone Ecosystem (1993-2015): U.S. Geological Survey data release, <https://doi.org/10.5066/F7474803>.

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Cross, PC, DM Heisey, JA Bowers, CT. Hay, J Wolhuter, P Buss, M Hofmeyr, A Michel, R Bengis, T Bird, IJ Whyte, JT Du Toit, and WM Getz. 2009. Buffalo herd tracking with VHF and GPS data. <http://www.Movebank.org>.

Cross PC, Heisey DM, Bowers JA, Hay CT, Wolhuter 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. <http://dx.doi.org/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
- 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

- USGS Performance Award (2016-2012, 2010-2007)
- USDA grant to Univ of Washington, \$96,000 Livestock-wildlife disease modeling 2016
- USGS Grade Promotion
- MT FWP cooperative agreement \$45,000 Cattle disease risk assessment. 2015
- USGS, PI \$ 133,000 Greater Yellowstone ecosystem disease research.
- NIMBioS Workshop (Co-PI) ~\$60,000 2013
- NSF Dissertation Improvement Grant (Co-PI) \$19,343
- USGS, PI \$ 98,000 Greater Yellowstone ecosystem disease research
- USGS Powell Center Grant, Co-PI (declined) 2012
- 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.
- USGS Best Paper in Biology 2011
- USGS Grade Promotion
- NSF-NIH Ecology of Infectious Disease Program, co-PI \$1,971,033, 2010
- USGS, PI \$75,000, Park Oriented Biological Support Grant
- USGS, PI \$39,000, Modeling environmental transmission of Chronic Wasting Disease 2009
- USGS, Co-PI \$320,000, Global Climate Change Initiative 2008
- Co-PI \$112,180, Wyoming Livestock-Wildlife Disease Initiative
- Co-PI \$281,000, Wyoming Game and Fish Department: Tracking elk movements.
- USGS, Co-PI \$750,000 with Mary Poss (Penn State): Viral tracking of mule deer and elk. 2007

- NPS, PI \$10,000: Brucellosis in Yellowstone National Park 2006
- USGS, PI \$210,000 for chronic wasting disease research. 2005
- NSF-NIH Ecology of Infectious Disease Grant. \$1.8 million. Initiated, co-authored, and developed the research program with Dr. Wayne Getz. 1999

## Invited Presentations

- Glasgow University Ecology Seminar, Glasgow, UK. 2017
- University of California at Berkeley, Wildlife Seminar
- Plenary, 12th Western States and Provinces Deer and Elk Workshop. Sun Valley, ID.
- Center for Infectious Disease Dynamics, Penn State University.
- Utah State University Ecology Seminar. Logan, UT 2016
- UCLA Ecology Seminar, Los Angeles, CA.
- Patuxent USGS Seminar.
- Georgetown Ecology Seminar, Washington, D.C.
- 50th Anniv. Mammal Research Institute, South Africa
- K-5 science and technology night, Bozeman MT.
- MT Conservation Biology Evening Lecture, Bozeman MT 2015
- The National Academy of Sciences, Washington DC
- Wildlife Society Meeting, Winnipeg, Canada 2014
- Ecology Seminar, University of Sherbrooke, Canada
- NIH Rocky Mountain Lab, Hamilton MT
- 18th Congreso Chileno de Medicina Veterinaria, Santiago, Chile
- Dept. Seminar, Univ. Catolica, Valdivia, Chile
- Public Talk, Emerging wildlife pandemics, Menlo Park, CA
- Steering Committee & Speaker. Foreign Animal Disease, Shepardsstown WV 2013
- Interagency Bison Management Plan Meeting. Chico MT
- European Conservation Biology Meeting, Glasgow UK 2012
- Wildlife disease management workshop, Penn State Univ. 2011
- Ecology and Evolution of Infectious Disease Meeting, Santa Barbara.
- Invited Participant, RAPPID-NIH Movement and Mosquito-Transmitted Diseases Meeting, Washington D.C.
- Invited Keynote, Berryman Institute Biennial Meeting, Logan UT. 2010
- Invited Participant, RAPPID-NIH Movement and Mosquito-Transmitted Diseases Meeting, Washington D.C.
- Kopriva Lecture [Invited] MSU College of Arts and Science, Bozeman, MT 2009
- Dept. Seminar, Colorado State University, Fort Collins, CO
- 10th Biennial Conference of Research on the Colorado Plateau Speaker, ESA,

## Service

- Associate Editor, Ecological Applications ongoing
- Northern Yellowstone Cooperative Wildlife Working Group.
- Chair, USGS Animal Use and Care Committee for NOROCK.
- Reviewer of the USDA Cattle Fever Tick Eradication Program. 2018-2019
- Associate Editor, Journal of Wildlife Management 2015-2017
- National Academy of Science Panel Member: Revisiting Brucellosis in the GYE
- Dept. Homeland Security IPT for outbreak response and assessment tools. 2016
- Red Wolf Recovery Implementation Team, USFWS. 2014
- Participant, Wildlife Conservation Society Wildlife Health Program, Internal Strategic Workshop for future research.
- Steering Committee, Group Leader & Speaker. Foreign Animal Disease National Preparedness Workshop. USGS/DHS/USDA/CDC. 2013

- Member Environmental Health Strategic Science Planning Team 2011
- Co-coordinator & originator, NIH & DHS RAPIDD Working group on cross-species transmission. 15 participants
- Participant, NIH & DHS RAPIDD Working group on movement and mosquito-borne diseases.
- USGS representative. Northern Rockies NEON committee.
- 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
- Participant, Yellowstone National Park Science Agenda Workshop, Bozeman MT
- 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
- Participant, Disease and conservation of mammals, Conservation International 2006
- USGS representative. Greater Yellowstone Interagency Brucellosis Committee 2005-8

## 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, USGS FSP, USGS Study Plans

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

## Press and Outreach

- [Naturally Speaking](#) 2017
- [Bozeman Daily Chronicle](#) 2016
- [The 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
- Yellowstone Wolf Citizen Science Webpage: <[www.yellowstonewolf.org](http://www.yellowstonewolf.org)>

## References

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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

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