

## Paul Chafee Cross

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### Education

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2005	<b>Ph.D. Envi. Sci., Policy &amp; Mang.,</b> <i>University of California</i> , Berkeley, CA
1998	<b>B.A., Environmental Science,</b> <i>University of Virginia</i> , Charlottesville, VA

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### RESEARCH EXPERIENCE

WILDLIFE HEALTH RESEARCHER, USGS - BOZEMAN, MT 2005-present RESEARCH FELLOW, WILDLIFE CONSERVATION SOCIETY 2009-present FACULTY AFFILIATE, MONTANA STATE UNIVERSITY 2006-present RESEARCH FELLOW, MAMMAL RESEARCH INSTITUTE, UNIV. OF PRETORIA 2007-2010 GRADUATE STUDENT RESEARCHER, UC BERKELEY 1999-2005 RESEARCH ASSISTANT, UNIV. OF BOTSWANA Summer 1998 FIELD ASSISTANT, SMITHSONIAN INSTITUTE Summer 1997

### PUBLICATIONS

Submitted Almberg, E; PC Cross, A Dobson, D Smith, M Metz, D Stahler, P Hudson. In review. Social living mitigates the costs of a chronic illness in a cooperative carnivore. *Ecology Letters*. Benavides, J, PC Cross, D Caillaud, BM Scurlock, WH Edwards, S Creel. In review. Estimating titer-loss from age-seroprevalence data of elk brucellosis. *J. of the Royal Society Interface*. Brennan, A, PC Cross, S Creel. In review. Relating irrigation, habitat and wolves to elk group size distributions using quantile regression. *Behavioral Ecology*. Cole, EK, AM Foley, JM Warren, BL Smith, SR Dewey, DG Brimeyer, WS Fairbanks, H Sawyer, PC Cross. Submitted. Changing migratory patterns in the Jackson elk herd. *J. of Wildlife Management*. Cross, PC, E Maichak, J Rogerson, KM Irvine, J Jones, D Heisey, WH Edwards, BM Scurlock. In review. Estimating the phenology of elk brucellosis transmission with hierarchical models of cause-specific and baseline hazards. *J. of Wildlife Management* Cubaynes, S, DR MacNulty, DR Stahler, DW Smith, ES Almberg, S Schindler, RK Wayne, BM Von Holdt, PC Cross, AP Dobson, PJ Hudson, and T Coulson. In revision. The rise of the black wolf: Disease outbreak frequency determines optimal mate choice and coloration patterns. du Toit, JT, PC Cross, M Valeix. Submitted. Weaving wildlife into a framework for rangeland resilience. In *Rangeland Systems: Processes, Management and Challenges*, ed. DD Briske. Springer. Foley, AM, PC Cross, DA Christianson, BM Scurlock, Scott Creel. Submitted. Influences on winter elk calf:cow ratios in southern Greater Yellowstone Ecosystem. *J. Wildlife Management*. Gorsich, E, PC Cross, R Bengis, VO Ezenwa, A Jolles. Online. Context-dependent survival, fecundity, and predicted population-level consequences of brucellosis in African buffalo. *J. Animal Ecology* Hand, BK, DW Raiford, WH Lowe, PC Cross, NJ Anderson, S Chen, G Luikart. In review. The importance of assessing uncertainty in landscape genetics: Examples using elk connectivity mapping in the Greater Yellowstone Ecosystem. *J. of Heredity* Sepulveda, M, K Pelican, PC Cross, A Eguren, R Singer. Online. Fine-scale movements of rural domestic dogs in sensitive conservation areas in the South American temperate forest. *Mammalian Biology*.

2014 Benavides, JA, PC Cross, G Luikart, S Creel. 2014. Limitations to estimating bacterial cross-species transmission using genetic and genomic markers: inferences from simulation modeling. *Evolutionary Applications*. 7(7) 774-787. Brennan, A, PC Cross, MD Higgs, WH, Edwards, BM Scurlock, S Creel. 2014.

Multiple ways to be dense and transmit disease: patterns in elk aggregation and increasing brucellosis. *Ecosphere*. 5(10):138. Hand, BK, S Chen, N Anderson, A Beja-Pereira, PC Cross, M Ebinger, WH Edwards, RA Garrott, M Kardos, M Kauffman, A Middleton, M Schwartz, PJ White, P Zager, EL Landguth & G Luikart. 2014. Sex-biased gene flow among elk in the Greater Yellowstone Ecosystem. *Journal of Fish and Wildlife Management*. 5(1) 124-132. Jones, J, MJ Kauffman, KL Monteith, BM Scurlock, SE Albeke, PC Cross. 2014. Supplemental feeding alters migration of a temperate ungulate. *Ecological Applications*. Kamath, PL, D Elleder, L Bao, PC Cross, JH Powell, M Poss. 2014. The population history of endogenous retroviral elements in mule deer (*Odocoileus hemionus*). *Journal of Heredity*. 105(2): 173-187. Manlove, KR, EF Cassirer, PC Cross, PK Plowright, PJ Hudson. 2014. Costly connections: Social groups shape pneumonia transmission among bighorn lambs (*Ovis canadensis*). *Proc. Roy. Soc. B*. 281:20142331 Viana, M, R Mancy, R Biek, S Cleaveland, PC Cross, JO Lloyd-Smith, DT Haydon. 2014. Assembling evidence for identifying reservoirs of infection. *Trends in Ecology and Evolution*. 29(5): 270-279. 2013 Bright, PR, HT Buxton, LS Balistreri, LB Barber, FH Chapelle, PC Cross, DP Krabbenhoft, GS Plumlee, JM Sleeman, DE Tillitt, PL Tocciano, and JR Winton 2013. U.S. Geological Survey environmental health science strategy-Providing environmental health science for a changing world: U.S. Geological Survey Circular 1383-E, 43 p. Brennan, A, PC Cross, S Creel, JP Beckmann, M Higgs, RW Klaver & BM Scurlock. 2013. Testing the consequences of modeling rather than measuring snow accumulation in studies of animal ecology. *Ecological Applications*. 23(3)643-653. Brennan, A, PC Cross, DE Ausband, A Barbknecht, & S Creel. 2013. Comparing automated howling devices to snow-tracking in a wolf survey. *Wildlife Bulletin* 37(2):389-393. Cassirer, EF, RK Plowright, K Manlove, KA Potter, PC Cross & PJ Hudson. 2013. Spatio-temporal dynamics of pneumonia in bighorn sheep (*Ovis canadensis*). *Journal of Animal Ecology*. 82:518-528. Cross, PC, D Caillaud, D Heisey. 2013. Underestimating the effects of spatial heterogeneity due to individual movement and spatial scale. *Landscape Ecology* 28(2) 247-257. Cross, PC, E Maichak, A Brennan, BM Scurlock, J Henningsen, G Luikart. 2013. An ecological perspective on the changing face of *Brucella abortus* in the western United States. *OIE Review*. 32(1):79-87 Cross, PC, TG Creech, MR Ebinger, K Manlove, K Irvine, J Henningsen, J Rogerson, BM Scurlock, & S Creel. 2013. Female elk contacts are neither frequency nor density dependent. *Ecology* 94(9): 2076-2086. Joseph, MB, JR Mihaljevic, AL Arellano, JG Kueneman, DL Preston, PC Cross, PTJ Johnson. 2013. Taming wildlife disease: closing the loop between science and management. *Journal of Applied Ecology*. 50:702-712. Plowright, RK, K Manlove, F Cassirer, PC Cross, T Besser & PJ Hudson. 2013. Use of exposure history to identify patterns of immunity to pneumonia in bighorn sheep (*Ovis canadensis*) population. *PLoS ONE*. 8(4):e61919. Powell, JH, ST Kalinowski, MD Higgs, MR Ebinger, NV Vu & PC Cross. 2013. Microsatellites indicate minimal barriers to mule deer movement across Montana. *Wildlife Biology*. 19:102-110.

2012

Almberg, ES, PC Cross, AP Dobson, DW Smith & PJ Hudson. 2012. Disease invasion after reintroduction: A case study of sarcoptic mange in Yellowstone's wolves. *Philosophical Transactions of the Royal Society*. 367:2840-2851. Creech, T, PC Cross, S Creel, E Maichak, & B Scurlock. 2012. Altered feeding styles dramatically reduces elk contact rates. *Journal of Wildlife Management*. 67(5):877-886. Cross, PC, Creech, TG, MR Ebinger, DM Heisey, K Irvine, & S Creel. 2012. Wildlife contact analysis: emerging methods, questions, and challenges. *Behavioral Ecology and Sociobiology*. 66(10):1437-1447 \*authors contributed equally Forristal, VE, S Creel, ML Taper, B Scurlock & PC Cross. 2012. Effects of supplemental feeding and aggregation on stress hormone concentrations in elk. *Journal of Wildlife Management* 76(4):694-702. Plowright, RK, PC Cross, GM Tabor, E Almberg, L Bienen, & P Hudson. 2012. Climate- change adaptation and disease dynamics. Pages 111-121 In AA Aguirre, RS Ostefeld & P Daszak (eds.) *New Directions in Conservation Medicine: Applied Cases of Ecological Health*. Oxford Univ. Press, Inc. New York. Ryan, SJ, PC Cross, J Winnie, CT Hay, JA Bowers & WM Getz. 2012. Characterizing the relationship between NDVI and forage for African buffalo (*Syncerus caffer*) in Kruger National Park, South Africa. *Journal of Wildlife Management*. 76(7):1499-1508

2011 Almberg, ES, DL Mech, PC Cross, DW Smith, JW Sheldon & RL Crabtree. 2011. Infectious disease in Yellowstone National Park's canid community. *Yellowstone Science*. 19(2):16-25 Almberg, ES, PC Cross, D Heisey, CJ Johnson & BJ Richards. 2011. Modeling routes of chronic wasting disease transmission: Environmental prion persistence promotes deer population decline and extinction. *PLoS ONE*. 6(5)e19896. Bai, Y, PC Cross, L Malania, M Kosoy. 2011. Isolation of *Bartonella capreoli* from elk in the northern Rocky

Mountains. *Veterinary Microbiology*. 148:329-332. Ebinger, MR, PC Cross, R Wallen, PJ White & J Treanor. 2011. Modeling Brucellosis Management in Bison: A Heuristic Model of Management Actions on Disease Dynamics. *Ecological Applications* 21:2944-2959 LaBeaud, AD, PC Cross, WM Getz, A Glinka & CH King. 2011. Rift Valley fever virus infection in African buffalo (*Syncerus caffer*) herds in rural South Africa: Evidence of inter-epizootic transmission. *American Journal of Tropical Medicine and Hygiene*.84(4):641-646. Serrano, E, PC Cross, M Beneria, A Ficapal, J Curia, S Marco, X Lavín & I Marco. 2011. Brucellosis management in a free-ranging red deer population via livestock control efforts in northwest Spain. *Epidemiology and Infection*.139:1626-1630. 2010 Almberg, ES, PC Cross & DW Smith. 2010. Modeling the spatial scale and multi-host dynamics of canine distemper virus in Greater Yellowstone Ecosystem carnivores. *Ecological Applications* 20(7):2058-2074. Cross, PC, DM Heisey, BM Scurlock, WH Edwards, MR Ebinger, & A Brennan. 2010. Mapping brucellosis increases relative to elk density using hierarchical Bayesian models. *PLoS One* 5:e10322 Cross, PC, EK Cole, AP Dobson, WH Edwards, KL Hamlin, G Luikart, AD Middleton, BM Scurlock & PJ White. 2010. Probable causes of increasing elk brucellosis in the Greater Yellowstone Ecosystem. *Ecological Applications* 20:278-288. Cross, PC, MR Ebinger, V Patrek, & R Wallen. 2010. Brucellosis in cattle, bison, and elk: Management conflicts in a society with diverse values. Pages 81-94 In J Johnson (ed.) *Knowing Yellowstone: Science in America's First National Park*. Boulder, CO: Taylor Trade Publishing. Heisey, DM, EE Osnas, PC Cross, DO Joly, JA Langenberg, & MW Miller. 2010. Linking process to pattern: estimating spatiotemporal dynamics of a wildlife epidemic from cross-sectional data. *Ecological Monographs* 80:221-240. Heisey, DM, EE Osnas, PC Cross, DO Joly, JA Langenberg & MW Miller. 2010. Rejoinder - Shifting through model space. *Ecology* 91:3503-3514 Polansky, L, G Wittemyer, PC Cross, CJ Tambling & WM Getz. 2010. From moonlight to movement and synchronized randomness: Fourier and wavelet analyses of animal location time series data. *Ecology* 91:1506-1518. Wittekindt, NE, A Padhi, SC Schuster, J Qi, F Zhao, L Tomsho, L Kasson, M Packard, P Cross, & M Poss. 2010. Nodeomics: pathogen detection in vertebrate lymph nodes using meta-transcriptomics. *PLoS One* 5(10):e13432

2009 Bar-David, S, I Bar-David, PC Cross, SJ Ryan, CU Knechtel & WM Getz. 2009. Methods for assessing movement path recursion with application to African buffalo in South Africa. *Ecology* 90(9): 2467-2479. Cross, PC, D Heisey, J Bowers, CT Hay, J Wolhuter, P Buss, M Hofmeyr, A Michel, TLF Bird, JT Du Toit & WM Getz. 2009. Disease, predation and demography: assessing the impacts of bovine tuberculosis on African buffalo by monitoring at individual and population levels. *Journal of Applied Ecology* 46: 467-475. Cross, PC, J Drewe, V Patrek, G Pearce MD Samuel & RJ Delahay. 2009. Host population structure and implications for disease management. Pages 9-30 In RJ Delahay, GC Smith, & MR Hutchings (eds.) *Management of Disease in Wild Mammals*. Springer-Verlag Tokyo, Inc. Tokyo. Maichak, EJ, BM Scurlock, JD Rogerson, LL Meadows, AE Barbknecht, WH Edwards, and PC Cross. 2009. Effects of management, behavior, and scavenging on risk of brucellosis transmission in elk of western Wyoming. *Journal of Wildlife Diseases* 45:398-410. Oosthuizen, C, PC Cross, JA Bowers, CT Hay, MR Ebinger, P Buss, M Hofmeyr, EZ Cameron. 2009. Chemical immobilization of African buffalo (*Syncerus caffer*) in Kruger National Park: Evaluating effects on movement, survival and reproduction. *Journal of Wildlife Management* 73(1): 149-153. Wolhuter, J, RG Bengis, BK Reilly, & PC Cross. 2009. Clinical demodicosis in African Buffalo (*Syncerus caffer*) in the Kruger National Park. *Journal of Wildlife Diseases* 45:502-504.

2008 Conner, MM, JA Blanchong, MR Ebinger, & PC Cross. 2008. Infectious disease in cervids of North America: models, data, & management challenges. *The Year in Ecology and Conservation Biology* 1134: 146-172. Hay, CT, PC Cross, & P Funston. 2008. Tradeoffs of predation and foraging explain sexual segregation in African buffalo (*Syncerus caffer*). *Journal of Animal Ecology* 77:850-858. \* authors contributed equally. LaBeaud, AD., PC Cross, WM Getz, & CH King. 2008. Rift Valley Fever Virus infection in African Buffalo (*Syncerus caffer*) herds in rural South Africa: Evidence of inter-epizootic transmission. *American Journal of Tropical Medicine and Hygiene* 79:332. Winnie, JA Jr., PC Cross, WM Getz. 2008. Habitat quality and heterogeneity influences distribution, individual and herd behavior in African Buffalo (*Syncerus caffer*). *Ecology* 89:1457-1468.

2007 Conner, MM, JE Gross, PC Cross, MD. Samuel, DT McKinnon, MM Miller, & MR Ebinger. 2007. Scale-dependent approaches to modeling spatial epidemiology of chronic wasting disease. E-book publication. Utah Division of Wildlife Resources. <http://wildlife.utah.gov/diseases/cwd/e-book/> Cross, PC, WH Edwards, B Scurlock, E Machaik, & J Rogerson, 2007. Management and climate impacts on brucellosis in elk of the Greater Yellowstone Ecosystem. *Ecological Applications* 17(4):957-964. Cross, PC, PLF Johnson, JO Lloyd-

Smith, & WM Getz. 2007. Utility of  $R_0$  as a predictor of disease invasion in structured populations. *Journal of the Royal Society Interface* 4:315-324. Cross, PC, G Plumb. 2007. Disease ecology of the Yellowstone National Park. *Yellowstone Science*. 15(2):4-7. <http://www.nps.gov/yell/planyourvisit/yellsci-issues.htm> (Also served as guest editor of this edition). Getz, WM, S Fortmann-Roe, PC Cross, AJ Lyons, SJ Ryan, CC Wilmers. 2007. LoCoH: Non-parametric kernel methods for constructing home ranges and utilization distributions. *PLoS One* 2(2):e207. Hines, AM, VO Ezenwa, PC Cross, & JR Rogerson. 2007. Effects of supplemental feeding on gastrointestinal parasite infection in Rocky Mountain Elk (*Cervus elaphus*). *Veterinary Parasitology* 148(3-4):350-355.

2006 Cross, PC & WM Getz. 2006. Combining data and models of bovine Tb in African buffalo to assess research directions and management options. *Ecological Modelling* 196:494-504. Getz, WM, JO Lloyd-Smith, PC Cross, S Bar-David, PLF Johnson, TC Porco, & MS Sánchez. 2006. Modeling the invasion and spread of contagious disease in heterogeneous populations. In Feng, Z., Dieckmann, U., Levin, S.A. (eds.) *Disease Evolution: Models, Concepts, and Data Analysis*, AMS/DIMACS Vol. 71:113-144 Michel, AL, RG Bengis, DF Keet, M Hofmeyer, LM de Klerk, PC Cross, AE Jolles, D Cooper, IJ Whyte, & P Buss. 2006. Wildlife tuberculosis in South African game reserves: implications and challenges. *Veterinary Microbiology* 112:91-100.

2005 Lloyd-Smith, JO, PC Cross, CJ Briggs, M Daugherty, WM Getz, J Latto, M Sanchez, A Smith, A Swei. 2005. Population thresholds for disease invasion and persistence in natural populations. *Trends in Ecology and Evolution* 20(9):511-519. Cross, PC, JO Lloyd-Smith, PLF Johnson, & WM Getz. 2005. Duelling timescales of host mixing and disease spread determine invasion of disease in structured populations. *Ecology Letters* 8:587-595. Cross, PC, JO Lloyd-Smith, & WM Getz. 2005. Disentangling individual associations in fission and fusion societies. *Animal Behaviour* 69(2):499-506.

2004 and earlier Macandza, V, N Owen-Smith, PC Cross. 2004. Forage selection by African buffalo (*Syncerus caffer*) through the dry season in two landscapes of the Kruger National Park. *South African Journal of Wildlife Research* 34(2):113-121. Cross, PC, JO Lloyd-Smith, J Bowers, CT Hay, M Hofmeyr, & WM Getz. 2004. Integrating association data and disease dynamics: an illustration using African Buffalo in Kruger National Park. *Annales Zoologici Fennici* 41:879-892. Caron, A, PC Cross, & JT du Toit. 2003. Ecological implications of bovine tuberculosis in African Buffalo herds. *Ecological Applications* 13(5):1338-1345. Cross, PC & SR Beissinger. 2001. Using logistic regression to analyze the sensitivity of PVA models: a comparison of methods based on African Wild Dogs. *Conservation Biology* 15(5):1335-1346.

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. Conner, MM, JE Gross, PC Cross, MD. Samuel, DT McKinnon, MM Miller, & MR Ebinger. 2007. Scale-dependent approaches to modeling spatial epidemiology of chronic wasting disease. E-book publication. Utah Division of Wildlife Resources. <http://wildlife.utah.gov/diseases/cwd/e-book/> Cross, PC, S Creel, WH Edwards, V Ezenwa, E Maichak, B Scurlock, J. Rogerson. 2006. Ecology and epidemiology of elk brucellosis. In 2005 Greater Yellowstone Interagency Brucellosis Committee Annual Report. Pg 14-15. <http://gyibc.com>

#### PUBLISHED DATABASES

Cross, P.C. D. M. Heisey, J. A. Bowers, C. T. Hay, J. Wolhuter, 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, 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. 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

Angela Brennan. 2014. Broad-scale determinants of elk aggregation and brucellosis seroprevalence. Montana State University. Co-supervisor: Scott Creel. Tyler Creech. 2011. Heterogeneity in the fine-scale contact

patterns of elk as determined by proximity collars. Montana State University. Co-supervisor: Scott 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: Mark Taper, Scott 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: Paul 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: Elissa Cameron

Field Supervisor Almberg, ES. Current PhD. Penn State University. Supervisor: Peter Hudson Manlove, K. Current PhD. Penn State University. Supervisor: Peter 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

Courses Taught 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. I initiated this class to provide a venue for graduate students to get practice giving seminars and provide feedback on ongoing projects. Plant-Disease Invasion Seminar (informal graduate seminar). Fall 2006. MSU. Compared the approaches of plant and disease ecologists to non-native invasions. 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.

Teaching Assistant Natural Resource Modeling (3 credits) 2003. UC Berkeley

## GRANTS & AWARDS

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. 2004, 2005 Graduate Assembly Travel Grant 2002-2004 Student Travel Grant 1999 NSF-NIH Ecology of Infectious Disease Grant. \$1.8 million. Initiated, co-authored, and developed the research program with Dr. Wayne Getz.

## CONFERENCES & PRESENTATIONS

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, 18° 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 2008 Invited Speaker, Ecology Seminar, Montana State University, Bozeman MT Poster, Society for Conservation Biology Montana Chapter, University of Montana. 2007 Invited Speaker, Social networks in humans and wildlife workshop, Penn State Univ. Speaker, Jackson Hole Cooperative Elk Working Group, Jackson WY 2006 Speaker, Ecological Society of America, Nashville, TN. 2005 Speaker, Departmental Seminar, Montana State University Invited Speaker, International Mammal Conference, Sapporo Japan. 2005 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. 2004 Best Poster, Wildlife Disease Association, San Diego CA. Attendee, Greater Limpopo Transfrontier Conservation Area AHEAD-WCS Meeting, Maputo, Mozambique 2003 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. 2002 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. 2001 Speaker, Wildlife Disease Association, Pilanesburg, South Africa. Speaker, University of Pretoria, Department of Zoology Annual Meeting, Pretoria. 1999 Poster, Wildlife Society, Population Viability Analysis, San Diego CA. 1998 Speaker, University of California Wildlife Lunch, Berkeley CA.

## SERVICE

### Ongoing

Associate Editor, Journal of Wildlife Management Red Wolf Recovery Implementation Team, USFWS. Northern Yellowstone Cooperative Wildlife Working Group. Chair, USGS Animal Use and Care Committee for NOROCK.

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 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. 2009 Organizer, Greater Yellowstone Brucellosis Research Meeting (2 days), 60 participants, 27 speakers, Bozeman MT Participant, Dept. of Interior Avian Influenza Preparedness workshop, Madison WI 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. 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 [1], Ecol App [5], J Anim Ecol [1], J App Ecol [6], Proc Roy Soc B [2], Phil Trans Roy Soc B [2], Biol Letters [1], Cons Bio [2], Biol Cons [1], Anim. Cons. [1], Biodiv Cons [1], Behavior [1], Envi. Cons. [1], J Wildl Dis [4], Wildl Bio [2], PloS ONE [6], EcoHealth [2], J. Theo. Bio. [2], SA J Wildl Res [1], Ann Zoo Fennici [1], Ecol Mod [1], USGS FSP [9], USGS Study Plans [4].

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 & OUTREACH

Thermal Wolves 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) [www.gyebrucellosis.net](http://www.gyebrucellosis.net)

## REFERENCES

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