

PROFESSOR JOHN A. VUCETICH

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I. SCHOLARLY PURSUITS

conservation ethics, predation dynamics, population genetics, wolves and moose of Isle Royale

II. EDUCATION

1995 B.S., Biological Sciences, Michigan Technological University.

1999 Ph.D., Forest Sciences, Michigan Technological University.

(Dissertation topic: Demographic and genetic components of extinction risk.)

III. POSITIONS HELD

2014 – present: Professor, SFRES, MTU

2011 – 2014: Associate Professor, SFRES, MTU

2006 – 2011: Assistant Professor, SFRES, MTU

2010 – present: Adjunct Faculty, Michigan State University, Department of Fisheries & Wildlife

1999 – 2006: Research Assistant Professor, SFRES, MTU

2004 – Visiting Scholar, Yellowstone National Park (worked in the park for 4 weeks with D. Smith)

1996 – Visiting Scholar, Department of Zoology, Ohio State University, (worked at OSU for one semester; Sponsor: Dr. P. Parker).

IV. UNIVERSITY COURSES

Ethics, Natural Resources and the Environment (FW3115), SFRES, MTU, 2013 – present.

Conservation Ethics (FW5180), SFRES, MTU, 2006 – present.

Population Ecology (FW4260), SFRES, MTU, 2006 – present.

Wildlife Ecology and Management (FW4610), SFRES, MTU, 2011 – 2013.

Mammalogy (FW4240), SFRES, MTU, 2006 – 2010.

Isle Royale Field Ecology Camp (FW4630), SFRES, MTU, 2000 – 2003.

Ecological Modeling (FW4140), SFRES, MTU, 1999 – 2001.

Perspectives on Extinction & Loss of Biodiversity: a Freshman Seminar (UN1001), MTU, Fall 2000.

Conservation Biology (FW341), SFRES, MTU, Spring 1998.

College Algebra (MA130), Department of Mathematics, MTU, 1994 – 1996.

Trigonometry (MA131), Department of Mathematics, MTU, 1994 – 1996.

V. SCIENTIFIC PUBLICATIONS

I have authored or co-authored more than 80 peer-reviewed articles that have been collectively cited more than 1,961 (web of science). My H-index is 27 (Web of Science) and 36 (Google Scholar). I have also authored more than 30 book chapters and formal reports.

A. Conservation Philosophy & Ethics (roughly ordered by significance)

1. Vucetich JA, MP Nelson (2010). Sustainability: virtuous or vulgar? *Bioscience* 60, 539-544.
2. Vucetich, JA, JT Bruskotter, MP Nelson (2015). Evaluating whether nature's intrinsic value is an axiom of or anathema to conservation. *Conservation Biology* 29, 321-332.
3. Vucetich, JA, MP Nelson, MK Phillips (2006). The normative dimension & legal meaning of 'endangered' & 'recovery' within the United States' Endangered Species Act. *Conservation Biology* 20, 1383-1390.
4. Nelson, MP, JA Vucetich (2009). On Advocacy by Environmental Scientists: What, Whether, Why

- and How. *Conservation Biology* 23, 1090–1101.
5. Vucetich, JA, MP Nelson (2007). What are 60 warblers worth?: killing in the name of conservation. *Oikos* 116, 1267-1278.
 6. Vucetich JA, JT Bruskotter, MP Nelson, RO Peterson, JK Bump (2016). Evaluating the principles of wildlife conservation: a case study of wolf (*Canis lupus*) hunting in Michigan, United States. *Journal of Mammalogy* 98, 53-64.
 7. Vucetich, J. A., and M. P. Nelson (2014). Wolf Hunting and the Ethics of Predator Control. In *The Oxford Handbook of Animal Studies*. Ed. L Kalof. (Oxford University Press, Oxford, UK). DOI: 10.1093/oxfordhb/9780199927142.013.007.
 8. Vucetich, JA, MP Nelson. 2013. The Infirm Ethical Foundations of Conservation. In M. Bekoff (ed.), *Ignoring Nature No More*, Univ. Chicago Press.
 9. Vucetich, JA, MP Nelson, JT Bruskotter (2017). Triage falls short because conservation is not like emergency medicine. *Frontiers in Ecology and Evolution* 5,45.
 10. Vucetich, JA. 2010. Wolves, Ravens and a New Purpose for Science. In: Moore, K & Nelson MP (eds.), *Moral Ground: Our Obligation to the Future*, Trinity University Press, San Antonio, TX, Pp 337-342.
 11. Vucetich JA, Nelson MP, Peterson RO (2012). Managing wolves on Isle Royale: What should be done if an icon of wilderness culture dies out? *The George Wright Forum*, 29, 126–147.
 12. Vucetich, JA & MP Nelson (2008). Distinguishing experiential & physical conceptions of wilderness. Pages 611-631 in Nelson MP & JB Callicott (eds.) *The Wilderness Debate Rages on: Continuing the Great New Wilderness Debate*. University of Georgia Press
 13. Nelson, MP and JA Vucetich (2012). Environmental Ethics for Wildlife Management. In D Decker, SJ Rily, WF Siemer (eds.), *Human Dimensions of Wildlife Management*, Johns Hopkins Press.
 14. Bruskotter JT, JA Vucetich, S Enzler, A Treves, and MP Nelson (2013). Removing protections for wolves and the future of the U.S. Endangered Species Act (1973). *Conservation Letters*. DOI: 10.1111/conl.12081
 15. Vucetich, JA (2013). Wolves and their place in the great hierarchy of life. In Thiel, D (ed) *Wild Wolves We Have Known*. International Wolf Center.
 16. Nelson MP, JT Bruskotter, JA Vucetich, G Chapron (2016). Emotions and the ethics of consequence in conservation decisions: Lessons from Cecil the Lion. *Conservation Letters* 9, 302-306.
 17. Ripple WJ, G Chapron, JV López-Bao, SM Durant, JA Vucetich et al. (2016). Saving the world's terrestrial megafauna. *BioScience* 66, 807-812.
 18. Bruskotter JT, MP Nelson, JA Vucetich (2015). Hunted predators: Intrinsic value. *Science* 349(6254):1294.
 19. Gore ML, MP Nelson, JA Vucetich, AM Smith, MA Clark (2011). Exploring the ethical basis for conservation policy: the case of inbred wolves on Isle Royale, USA. *Conservation Letters* 4, 394-401.
 20. Nelson MP, JA Vucetich (2015). Triumph, not Triage. *The Environmental Forum* 32, 32-35
 21. Vucetich JA, MP Nelson, CK Batavia (2015). The Anthropocene: Disturbing Name, Limited Insight, pages 66-74 in *After Preservation: Saving American Nature in the Age of Humans*, edited by BA Minter and SJ Pyne (University of Chicago).
 22. Nelson, MP, JA Vucetich, KD Moore (2014). So You Say You Love Fish. Pages 129-134 in *Future of Fisheries: Perspectives for Emerging Professionals*, edited by William Taylor, Nancy Leonard, and Abigail Lynch, American Fisheries Society.
 23. Vucetich JA, Nelson MP, Batavia C (2014). The Anthropocene: disturbing name, limited insight. In *After Preservation* edited by B. Minter and S. Pyne (University of Chicago Press). *forthcoming*.
 24. Nelson MP, Vucetich JA (2013). The value of wilderness. in *The International Encyclopedia of Ethics*, edited by Hugh LaFollette, Wiley-Blackwell, print pages 5476-5484, DOI: 10.1002/9781444367072.wbiee645.
 25. Nelson, MP, JA Vucetich (2012). The ethics of sustainability science. *Nature Education Knowledge* 3(10):12 (<http://www.nature.com/scitable/knowledge/library/sustainability-science-ethical-foundations-and-emerging-challenges-24319566>)
 26. Nelson, MP, JA Vucetich, PC Paquet, JK Bump (2011). North American Model: An Inadequate Construct? *The Wildlife Professional* 5, 58-60.
 27. Nelson, MP, JA Vucetich, RO Peterson, LM Vucetich (2011). The Isle Royale Wolf-Moose Project (1958-present) and the Wonder of Long-Term Ecological Research. *Endeavour* 35, 30-38.

28. Carroll, C, Vucetich, JA, Nelson, MP, Rohlf, DJ, Phillips, MK (2010). Geography and Recovery under the U.S. Endangered Species Act. *Conservation Biology* 24, 395-403.
29. Nelson, MP & JA Vucetich (2009). Preservation. Pages 180-184 in Encyclopedia of Environmental Ethics and Philosophy, Edited by: J. Baird Callicott and Robert Frodeman (Farmington Hills, MI: Macmillan).
30. Nelson, MP, RO Peterson, & JA Vucetich (2008). The Isle Royale Wolf-Moose Project, 50 Years of Challenge & Insight. *George Wright Society* 25, 98-113. [Invited Essay]
31. Bump, JK & JA Vucetich (2007). Pyramid of ideas: the art of generating novel research questions. *Frontiers in Ecology & the Environment* 10, 555-556.
32. Theberge, JB; Theberge, MT; Vucetich, JA; Paquet, PC (2006). Pitfalls of Applying Adaptive Management to a Wolf Population in Algonquin Provincial Park, Ontario. *Environmental Management* 37, 451-460.
33. Oelfke, J, RO Peterson, JA Vucetich, & LM Vucetich (2003). Wolf handling at Isle Royale: Can we find another approach? *George Wright Society* 20, 50-58.
34. Nelson MP, JA Vucetich (2014). Wolves and Ravens, Science and Ethics: Traditional Ecological Knowledge Meets Long-Term Ecological Research. In *Keepers of the Green World* edited by M Nelson and D. Ware (Cambridge Univ Press).
35. Goralnik, L, JA Vucetich, MP Nelson (2013). Ethics. In *Achieving Sustainability: Visions, Principles, and Practices*, ed. Debra Rowe. Detroit: Macmillan Reference, USA.
36. Vucetich JA, RO Peterson, & MP Nelson. (2010). Will the future of Isle Royale wolves & moose always differ from our sense of their past? in *The World of Wolves, new perspectives on ecology, behaviour & policy*. (Eds. M Musiani, L Boitani & P Paquet) Univ Calgary Press, Pp 123-154.

B. Predation Dynamics

1. Vucetich, JA, RO Peterson, & CL Schaefer (2002). The effect of prey and predator densities on wolf predation. *Ecology* 83, 3003-3013.
2. Vucetich JA, Hebblewhite M, Smith DW, Peterson RO (2011). Predicting Prey population dynamics from kill rate, predation rate and predator-prey ratios in three wolf- ungulate systems. *Journal of Animal Ecology* 80, 1236-1245.
3. Vucetich, JA; Smith, DW; Stahler, DR (2005). Influence of harvest, climate, and wolf predation on Yellowstone elk, 1961-2004. *Oikos* 111, 259-270.
4. Vucetich, JA & RO Peterson (2004). The influence of top-down, bottom-up, & abiotic factors on the moose (*Alces alces*) population of Isle Royale. *Proc Roy Soc Lond, B* 271, 183-189.
5. Wilmers, CC, ES Post, RO Peterson, & JA Vucetich (2006). Predator disease out-break modulates top-down, bottom-up and climatic effects on herbivore population dynamics. *Ecology Letters* 9, 383-389.
6. Peterson R, Vucetich JA, Bump J, Smith DW. (Invited paper) (2014). Trophic cascades in a multi-causal world: Isle Royale and Yellowstone. *Annual Review of Ecology and Systematics*. DOI: 10.1146/annurev-ecolsys-120213-091634.
7. Sand H, Vucetich JA, Zimmermann B, Wabakken P, Wikenros C, Pederson H, Peterson RO, Liberg O. (2012). Assessing the influence of prey-predator ratio, prey age structure and pack size on wolf kill rates. *Oikos* 121, 1454-1463.
8. Frelich LE, Peterson RO, Dovčiak M, Reich PB, Vucetich JA, Eisenhauer N (2012). Trophic cascades, invasive species and body-size hierarchies interactively modulate climate change responses of ecotonal temperate-boreal forest. *Phil Trans R Soc B* 367:2955-2961.
9. Vucetich, JA & RO Peterson (2004). The influence of prey consumption & demographic stochasticity on population growth rate of Isle Royale wolves (*Canis lupus*). *Oikos* 107, 309-320.
10. Peterson, RO; Thomas, NJ; Thurber, JM; Vucetich, JA; Waite, TA (1998). Population limitation and the wolves of Isle Royale. *Journal of Mammalogy* 79, 828-841.
11. Metz M, Smith D, Vucetich J, Stahler D, Peterson R (2012). Seasonal patterns of predation for gray wolves in the multi-prey system of Yellowstone National Park. *Journal of Animal Ecology* 81, 553-563.
12. Jost, C, G Devulder, JA Vucetich, R Peterson, & R Arditi (2005). The wolves of Isle Royale display scale-invariant satiation & density dependent predation on moose. *Journal of Animal Ecology* 74, 809-816.
13. Post, E; NC Stenseth, RO Peterson, JA Vucetich, AM Ellis (2002). Phase dependence and population cycles in a large mammal predator-prey system. *Ecology* 83, 2997-3002.

14. Metz, MC, JA Vucetich, DW Smith, DR Stahler, RO Peterson (2011). Effect of Sociality and Season on Gray Wolf (*Canis lupus*) Foraging Behavior: Implications for Estimating Summer Kill Rate. *PLoS ONE* 6(3)e17332.
15. Vucetich JA, Huntzinger BA, Peterson RO, Vucetich LM, Hammill JH, Beyer DE (2012). Intra-seasonal variation in wolf *Canis lupus* kill rates. *Wildlife Biology* 18,1-12.
16. Peterson, RO, JA Vucetich, RE Page, & A Chouinard (2003). Temporal and spatial aspects of predator-prey dynamics. *Alces* 39, 215-232.
17. Thurber, JM, RO Peterson, JD Woolington, JA Vucetich. 1992. Coyote coexistence with wolves on the Kenai Peninsula, Alaska. *Can. J. Zool.* 70, 2494-2498.
18. Metz, M., D. Smith, D Stahler, J. Vucetich, & R. Peterson. 2016. Temporal Variation in Wolf Predation Dynamics in Yellowstone. Pp 55-60 in *Yellowstone Science, Celebrating 20 Years of Wolves*
19. Beyer, DE, RO Peterson, JA Vucetich, & JH Hammill. 2009. Wolf Population Changes in Michigan. In: Wydeven, A.P., VanDeelen, T. R., and Heske, E.J. (eds.) *Recovery of Gray wolves in the Great Lakes Region of the United States: An Endangered Species Success Story*. Springer Press, New York, NY.
20. Vucetich JA and RO Peterson. 2009. Dynamics of wolf and moose on Isle Royale In: Wydeven, A.P., VanDeelen, T. R., and Heske, E.J. (eds.) *Recovery of Gray wolves in the Great Lakes Region of the United States: An Endangered Species Success Story*. Springer Press, New York, NY.
21. Vucetich, JA & RO Peterson. 2004. Long-term population & predation dynamics of wolves on Isle Royale. Pages 281-292 in *Biology & Conservation of Wild Canids* (edited by D. Macdonald & C. Sillero-Zubiri), Oxford University Press.
22. Hebblewhite, M., Vucetich, J., Smith, D., & Peterson, R. O. (2016). Predicting Prey Population Dynamics from Kill Rate, Predation Rate and Predator-Prey Ratios in three Wolf-Ungulate Systems. *Intermountain Journal of Sciences*, 18(1-4), 64.

C. Population Genetics

1. Vucetich, JA, Waite, TA (2003). Spatial patterns of demography and genetic processes across the species' range: Null hypotheses for landscape conservation genetics. *Conservation Genetics* 4, 639-645.
2. Vucetich, JA, Waite, TA, Nunney, L (1997). Fluctuating population size and the ratio of effective to census population size (N_e/N). *Evolution* 51, 2017-2021.
3. Vucetich, JA, & TA Waite (1999). Erosion of heterozygosity in fluctuating populations. *Conservation Biology* 13, 860-868.
4. Adams JR, LM Vucetich, PW Hedrick, RO Peterson, JA Vucetich (2011). Genomic sweep and potential genetic rescue during limiting environmental conditions in an isolated wolf population. *Proceedings Royal Soc B* 278, 3336-3344.
5. Hedrick P, J Adams, JA Vucetich (2011). Genetic Rescue: Re-evaluating and Broadening the Definition. *Conservation Biology* 25, 1069-1070.
6. Geffen E, Kam M, Hefner R, Vucetich JA et al. (2011). Kin encounter rate and inbreeding avoidance in canids. *Molecular Ecology* 20, 5348-5358.
7. Hedrick, PW, RO Peterson, LM Vucetich, JR Adams, JA Vucetich (2014). Genetic rescue in Isle Royale wolves: genetic analysis and the collapse of the population. *Conservation Genetics* 15, 1111-1121.
8. Waite, TA, JA Vucetich, T. Saurer, M Kroninger, E Vaughn, K Field, & S Ibarguen (2005). Minimizing extinction risk through genetic rescue. *Animal Biodiversity & Conservation* 28, 121-130.
9. Vucetich, LM, JA Vucetich, CP Joshi, TA Waite, RO Peterson. 2001. Genetic (RAPD) diversity in *Peromyscus maniculatus* in a naturally fragmentation landscape. *Molecular Ecology* 10, 35-40.
10. Vucetich, JA & TA Waite (2001). Migration and inbreeding: the importance of recipient population size for genetic management. *Conservation Genetics* 2, 167-171.
11. Vucetich, JA; Waite, TA (2000). Is one migrant per generation sufficient for the genetic management of fluctuating populations? *Animal Conservation* 3, 261-266, Part 3.
12. Vucetich, JA, & TA Waite (1998). The number of censuses required for demographic estimation of the effective population size. *Conservation Biology* 12, 1023-1030.

13. Marucco F, Vucetich LM, Peterson RO, Adams JR, Vucetich JA (2012). Evaluating the efficacy of non-invasive genetic methods and estimating wolf survival during a ten-year period. *Conservation Genetics* 13,1611-1622.
14. Schwartz, M, JA Vucetich (2009). Molecules and Beyond: Assessing the Distinctness of the Great Lakes Wolf. *Molecular Ecology* 18, 2307-2309.
15. Räikkönen J, Vucetich JA, Peterson RO, Nelson MP, Vucetich LM (2013). What the inbred Scandinavian wolf population tells us about the nature of conservation. *PLOS ONE* 8(6): e67218. doi:10.1371/journal.pone.0067218.

D. Population Viability

1. Vucetich, JA, TA Waite L Qvarnemark, S Ibarguen (2000). Population variability and extinction risk. *Conservation Biology* 14, 1704-1714.
2. Vucetich, JA, & TA Waite (1998). On the interpretation and application of mean times to extinction. *Biodiversity & Conservation* 7, 1539-1547.
3. Vucetich JA, & S Creel (1999). Ecological interactions, social organization, and extinction risk in African wild dogs. *Conservation Biology* 13, 1172-1182.
4. Vucetich, JA, Peterson, RO, Waite, TA (1997). Effects of social structure and prey dynamics on extinction risk in gray wolves. *Conservation Biology* 11, 957-965.
5. Vucetich, JA, MP Nelson, J Räikkönen, RO Peterson (2009). The Logic of Persistence. *Biological Conservation* 143, 533-534.
6. Lotts, KC, TA Waite, & JA Vucetich (2004). Reliability of absolute & relative predictions of population persistence based on time series. *Conservation Biology* 18, 1224-1232.

E. Habitat Ecology

1. Uboni, A., Vucetich, J. A., Stahler, D. R., & Smith, D. W. (2015). Interannual variability: a crucial component of space use at the territory level. *Ecology* 96, 62-70.
2. Montgomery RA, JA Vucetich, RO Peterson, GJ Roloff, KF Millenbach (2013). The influence of winter severity, predation and senescence on moose habitat use. *Journal of Animal Ecology* 82, 301-309.
3. Uboni A, DW Smith, JS Mao, DR Stahler, JA Vucetich (2015). Long-and short-term temporal variability in habitat selection of a top predator. *Ecosphere* 6, 1-16.
4. Witt JC, Webster CR, Froese RE, Drummer TD, and Vucetich, JA (2012). Scale-dependent drivers of ungulate patch use along a temporal and spatial gradient of snow depth. *Canadian Journal of Zoology* 90, 972-983.
5. Potvin, MJ, TD Drummer, JA Vucetich, BE Beyer, RO Peterson, JH Hammill. 2005. Monitoring and habitat analysis for wolves in Upper Michigan. *Journal of Wildlife Management* 69, 1660-1669.

F. Behavior

1. Vucetich, JA, RO Peterson, & TA Waite (2004). Raven scavenging favours group foraging in wolves. *Animal Behaviour* 67, 1117-1126.
2. Vucetich JA, Vucetich LM, Peterson, RO (2012). The causes and consequences of partial prey consumption by wolves preying on moose. *Behavioral Ecology and Sociobiology* 66, 295-303.
3. MacNulty D, D Smith, D Mech, JA Vucetich, C Packer (2011). Nonlinear effects of group size on the success of wolves hunting elk. *Behavioral Ecology*
4. Potvin, MJ, RO Peterson, & JA Vucetich (2004). Wolf Homesite Attendance Patterns. *Can. J. Zool.* 82, 1512-1518.

G. Herbivory

1. Parikh GL, Forbey JS, Robb B, Peterson RO, Vucetich LM, Vucetich JA (2016). The influence of plant defensive chemicals, diet composition, and winter severity on the nutritional condition of a free-ranging, generalist herbivore. *Oikos*.
2. Brodeur-Campbell, SE, JA Vucetich, DL Richter, TA Waite, JN Rosemier, C.-J. Tsai (2006). Insect herbivory on low-lignin transgenic aspen. *Environmental Entomology* 35, 1696-1701.
3. Henderson, J.J. & J. A. Vucetich. 2016. Microhistology of plant fragments. *The Microscope* 64, 61-68.

H. Ecosystem Ecology

1. Bump JK, RO Peterson, JA Vucetich (2009). Wolves modulate soil nutrient heterogeneity and foliar nitrogen by configuring the distribution of ungulate carcasses. *Ecology* 90, 3159–3167.
2. Bump, JK, K Tischler, A Schrank, R Peterson, JA Vucetich. 2009. Large herbivores & aquatic-terrestrial links in southern boreal forests. *Journal of Animal Ecology* 78, 338-45.
3. Bump J, C Webster, J Vucetich, R Peterson, J Shields, M Powers. 2009. Ungulate carcasses perforate ecological filters & create biogeochemical hotspots in forest herbaceous layers allowing trees a competitive advantage. *Ecosystems* 12, 996-1007.
4. Bump, JK, K. Fox-Dobbs, JL. Bada, PL. Koch, RO Peterson & J.A. Vucetich. 2007. Stable isotopes, ecological integration & environmental change, wolves record atmospheric carbon isotope trend better than tree rings. *Proc R. Soc, Lond B*, 274: 2471–2480.
5. Vucetich, JA; Reed, DD; Breymeyer, A, et al. (2000). Carbon pools and ecosystem properties along a latitudinal gradient in high latitude Scots pine (*Pinus sylvestris*) forests. *Forest Ecology & Management* 136(1-3): 135-145.
6. Nagel, LM, JA Vucetich, DD Reed, GD Mroz, H Parn (2003). Woody biomass and annual production across a latitudinal gradient in northern Scots pine (*Pinus sylvestris*) forests. *Pol. J. Ecol.* 51(4): 471-479.

I. Life History Theory

1. Peterson, RO, JA Vucetich, G Fenton, TD Drummer, CS Larsen (2010). The ecology of arthritis. *Ecology Letters* 13, 1124-1128.
2. MacNulty, DR, DW Smith, JA Vucetich, LD Mech, DR Stahler, C Packer (2009). Predatory senescence in aging wolves. *Ecology Letters* 12, 1-10.
3. Montgomery RA, Vucetich JA, Roloff GJ, Bump JK, Peterson RO (2014). Where Wolves Kill Moose: The Influence of Prey Life History Dynamics on the Landscape Ecology of Predation. *PLoS ONE* 9(3): e91414. doi:10.1371/journal.pone.0091414
4. Peterson RO, Vucetich JA, Beyer D, Schrage M, Räikkönen J (2011). Phenotypic Variation in Moose: The island rule and the moose of Isle Royale. *Alces* 47,125-133.

J. Anatomy

1. Peterson RO, JA Vucetich and LM Vucetich. 2013. Osteoarthritis in nature: osteoarthritis phenotypes are sexually dimorphic in moose (*Alces alces*). *Osteoarthritis and Cartilage* 21:S69.
2. Räikkönen, J., Vucetich, J.A., Peterson, R.O., Nelson, M.P., 2009. Congenital bone deformities and the inbred wolves (*Canis lupus*) of Isle Royale. *Biological Conservation* 142, 1027-1033.
3. Silvia, WJ, RO Peterson, WF Silvia, JA Vucetich, AW Silvia. 2011. The occurrence and morphology of a lateral metatarsal splint bone in moose (*Alces alces*). *The Anatomical Record* 294(2):231-235.

K. Ecotoxicology

1. Vucetich JA, PM Outridge, RO Peterson, R Eide, & R Isrennd (2009). Mercury, lead and lead isotope ratios in the teeth of moose (*Alces alces*) from Isle Royale, U.S. Upper Midwest, from 1952 to 2002. *Journal of Environmental Monitoring* 11, 1352 – 1359.
2. Vucetich, LM, Vucetich, JA, Cleckner, LB, Gorski, PR, & RO Peterson (2001). Mercury concentrations in deer mouse (*Peromyscus maniculatus*) tissues from Isle Royale National Park. *Environmental Pollution* 14, 113-118.

L. Biodiversity

1. Bach LA, Pertoldi C, Vucetich JA, Loeschcke V, Lundberg P (2012). Diminishing return of investment in genetic diversity. *Evolutionary Ecology Research* 14,793-801.
2. Krzys, G; TA Waite, M Stapanian, JA Vucetich (2002). Assessing avian richness in remnant wetlands: towards an improved methodology. *Wetlands* 22, 186-190.

VI. POPULAR WRITINGS

1. *The New York Times*:
- Vucetich JA & MP Nelson. *Conservation, or curation?* 20 Aug 2014.

- Vucetich JA, RO Peterson, MP Nelson. *Predator and prey, a delicate balance*. 8 May 2013.
 - Vucetich JA. *Scientist at Work*. Regular entries between Jan and Mar 2012.
2. *Natural History*:
 - Vucetich, J (2016) Should humans intervene when climate change threatens an island's ecology? *124(7)*, 20-23.
 3. *Huffington Post*:
 - Vucetich JA, MP Nelson. Should we conserve nature for nature's sake or our own?. 20 Feb 2015.
 - Nelson, MP & JA Vucetich. The Future of conservation and the tragedy of triage. 23 Sept 2014.
 4. *The Ecologist*:
 - Nelson, MP & Vucetich, JA. True sustainability needs an ethical revolution. Dec 31, 2009.
 - Nelson MP & Vucetich JA. Abandon Hope. 2009
 5. *The Conversation*:
 - Bruskotter, J, JA Vucetich, R Wilson. Of bears and biases: scientific judgment and the fate of Yellowstone's grizzlies. June 21st, 2016
 - Nelson MP, JT Bruskotter, JA Vucetich. 2015. Does nature have value beyond what it provides humans? *The Conversation*. 2015.
 6. *Chronicle of Higher Education*:
 - Vucetich JA and MP Nelson. 2010. The Moral Obligations of Scientists.
 7. Published annually, 2007-2015:
 - Vucetich JA & RO Peterson. *The wolves of Isle Royale, Annual Report*. Michigan Tech University. Houghton, MI.
 8. Published annually, 2008-2015:
 - Winter Study: Notes from the Field. Notes*, presented in journal format, details the work and observations of each annual winter field season from the Isle Royale wolf-moose project. *Notes* shares with the general public how observations are transformed into discoveries, and describes how I this research *on* nature with his broader relationship *to* nature. The *Notes* are first presented as a daily blog (www.isleroyalewolf.org) and later in the year in hardcopy.
 9. RO Peterson, JA Vucetich. The wolves of Isle Royale, Annual Report. Michigan Tech University. Houghton, MI. *Published each year from 2016 to 2017*
 10. Vucetich, JA. 2014. How and why I am concerned about wolves in National Geographic Kids Books on conserving endangered species edited by Jazynka K, MacNulty D, Raven-Ellison D.
 11. Vucetich JA and MP Nelson. 2010. The Moral Obligations of Scientists. *Minding Nature* (a journal of the Center for Humans and Nature). August 2010. 3(2):48-49.
 12. Vucetich JA. 2008. What Have We Learned from Isle Royale Wolf-Moose Research? *International Wolf* 18(2) Summer 2008.
 13. Vucetich, JA. 2002. The limits and proper role of science in conserving wolves of Algonquin Park. Published in *Howlings*, official publication of the Central Rockies wolf project.

VII. Significant Impacts

A. *Conservation Ethics Workshops* – I lead 3-day workshops for academics and professionals on conservation ethics. I have led 10 workshops at venues including WildCRU of Oxford University, Oregon State University, University of Montana, and University of Puerto Rico.

B. *What is an endangered species?* – We readily recognize that pandas are endangered and robins are not. Moreover, excellent classification schemes serve to rank the severity of species endangerment. But, consider that the human enterprise has reduced the geographic range of most species of mammal by more than 66%. If that is unacceptable, then what degree of range reduction is acceptable? In other words, at what point in the retrenchment of a species do we begin to owe it special protections?

The United States Endangered Species Act provides powerful legal protection for species meeting the legal definition of endangered species. The normative vagueness of that legal definition highlights our inability to answer the question, What is an endangered species?. I have been a leading voice in addressing this topic. See especially my piece in *Conservation Biology* (2006, #5 on p.2), which was reprinted in a special edition of that journal in 2010, recognizing the 14 most important papers in conservation social science. The ideas in this paper have influenced the outcome of several important legal cases in the United States. For popular accounts, see my essays in *The New York Times* (2014) and *The Huffington Post* (2014).

C. *Climate change in protected areas.* – In 2011 wolves in Isle Royale National Park ceased performing their ecosystem function (regulating moose abundance) as an indirect result of climate warming. Through my efforts the circumstance came to represent the broader threat of climate change to the century old mission of the U.S. National Park Service to “preserve unimpaired the natural and cultural resources and values of the national park system...” My scholarship – a synthesis of ecology and ethics – has become an influential perspective on policies pertaining to the juxtaposition of climate change, ecosystem health, and wilderness. See especially my pieces in *George Wright Forum* (2012, #13 on p.2), *Natural History* (2016), and *After Preservation* (#25 on p. 2).

D. *Wolf hunting.* – In the coterminous United States, wolf hunting had been prohibited for many decades as wolves recovered. By 2011, wolf hunting had been legalized (at least for some time) in six states. My scholarship – a synthesis of ecology and ethics – has been an influential perspective on the appropriateness of wolf hunting and an opportunity to reflected more broadly on the interrelationship between ecology, ethics, and governance as it pertains to the management of natural resources. See especially, my piece in *Journal of Mammalogy* (2016, #8 on p.2).

E. *Anthropocentrism?* – Should we conserve nature only to the extent that doing so serves human needs? Conservation professionals appear to be divided over the appropriateness of anthropocentrism – the notion that only humans possess intrinsic value. I have been a leading voice for explaining the adverse consequences of that position and for explaining the rationale of the counterveiling perspective, i.e., non-anthropocentrism which acknowledges that humans and at least some portion of the non-human world possesses intrinsic value. See especially my pieces in *Bioscience* (2010, #3 on p.1), *Conservation Biology* (2015, #4 on p.1), and *The Huffington Post* (2015).

F. *Advocacy* – Environmental scientists suffer from a perennial rift over whether scientists should be advocates on issues pertaining to public policy. I have been a leading voice in explaining the importance of scientists’ engagement in advocacy. The essence of the reasoning is that scientists are also citizens; and citizens are obligated to advocate for that which they believe is good and against that which they believe is wrong. The obligations of citizenship supercede those of science. Moreover, there are means of advocating which do not dishonor the principles of science. See especially my pieces in *The Chronicle for Higher Education* (2015) and *Conservation Biology* (2009, #6 on p.2), which is considered required reading for discussions pertaining to the topic.

VIII. Accolades & Distinctions

- Witness before the United States House of Representatives, written and oral testimony on wolf management (October 2016).
- U.S. Congressional Record, Senator Carl Levin, formal statement of gratitude for my contributions to the Isle Royale wolf-moose project, 21 July 2008
- Subject Editor for *Oikos*, handling 91 papers (August 2006 - Sept 2010).
- According to the ISI Web of Science, I am the third most productive and cited scholar in the world with respect to the ecology of wolves for the period 1997-present (the period of time covering my professional career).
- Vucetich and Waite (2003; *Cons Genetics*) has been cited (according to ISI Science Citation Index, accessed 4 April 2014) >100 times and ranks in the top 3rd percentile for citations among the 1701 papers associated with the keyword “landscape genetics.”
- Phi Kappa Phi Excellence Award in Interdisciplinary Scholarship (Michigan State University) for my contributions to conservation ethics, April 2011.
- The Isle Royale wolf-moose project, which I have led since 2000, was inducted into the Michigan Environmental Hall of Fame in April 2014.
- I was fictionalized as the main character in *Winter Study* (Putnam, 2008), a novel by Nevada Barr on the winter field season that I lead. Barr spent a week in the field at winter study to research her book. In April 2008, *Winter Study* made the New York Best-Sellers list at #10 for hard-cover fiction.
- Vucetich and Nelson (2010; *The Ecologist*) – an article on the demoralizing effect that hope can have on environmentalists – was reviewed by numerous websites including the *Utne Reader*, *Science Daily*, the National Association of Scholars, and the National Science Foundation website. GreenPlanet.com referenced that paper “Abandon Hope” as the basis for one of their top 5 Simple Suggestions for Earth Day 2010: “Remember, Action is Always Better Than Hope.” In January 2010, CommonDreams.com reprinted the same essay. CommonDreams.com reprints “the latest ideas and opinions of some of the world's best progressive writers and activists.” For example, that same week CommonDreams reprinted essays by Michael Polin, Paul Krugman, and Jesse Jackson.

IX. COMMITTEES, PANELS, ADVISEMENT, REVIEWING

- Scientific advisor to:
 - Humane Society of the United States (2015-present),
 - Project Coyote (2014- present),
 - Tribal Government of the Little River Band of Ottawa Indians (2012-2015),
 - H. J. Andrews Long-term Ecological Research Station (2013- present),
 - Common Coast Research and Conservation (2008- present).
- Developed, with MP Nelson, *Oikos'* first policy for professional and conservation ethics, 2008
- Member of Canid Specialist Group of the Species Survival Commission of IUCN (2014 – present).
- Member of the Mexican wolf recovery team (USFWS) since 2001.
- Served as Opponent for the PhD Defenses of:
 - Malin Aronsson (advisor: H. Andren), *Swedish University of Agricultural Sciences*, 2017.
 - Erlend Nilson (advisors: N. C. Stenseth, A. Mysterud), *University of Oslo*, 2006.
 - Anders Jarnemo (advisor: O. Liberg), *Swedish University of Agricultural Sciences*, 2004.
- Called upon, with some regularity, as an expert witness for legal cases involving natural resource management.
- Served as a scientific peer-reviewer at the request of the USFWS for *The Wyoming Wolf Management Plan* and the USFWS *Proposed Rule To Delist The Wolf In Wyoming*, September 2011 - April 2012. On 23 Sept 2014, the Washington, D.C. Federal District Court judged that the USFWS had acted arbitrarily and capriciously in their decision to remove Wyoming wolves from the list of US Endangered Species. The basis for that decision was my peer-review of Wyoming's plan.
- Invited to be a scientific peer-reviewer for the USFWS plan to delist wolves in August 2013. I

was subsequently uninvited after officials came to believe that I might be critical of the plan. The episode led to a Service-wide review of their peer-review policy and eventually a *mea culpa*. The event was reported in [The New York Times](#).

- Member of *Algonquin Wolf Management and Conservation* working group, sponsored by the IUCN's Conservation Breeding Specialist Group, 2000-01. My activities here contributed significantly to the establishment of a buffer zone surrounding Algonquin Provincial Park to effectively protect that park's wolf population. It is the first buffer zone ever established to protect a large carnivore.
- Science advisory member, French Wolf Research Review Panel, at the request of the French Government, December 2008.
- Participant in NSF workshop, *Integrating Ecological Science and Environmental Ethics*, March 2007.
- Instructor for the USDA Forest Service Program of Advanced Studies in Silviculture, May 1998, 2000, 2002.
- Peer reviewer for Denali wolf research program, National Park Service, 1998.
- Served as a member of the working group on Ungulate Ecology, sponsored by the National Center for Ecological Analysis and Synthesis, 2002-2003.
- Working group member for *Southern Rockies Wolf Reintroduction Feasibility Assessment*, sponsored by the IUCN's Conservation Breeding Specialist Group, 2000.
- Member, Michigan Wolf Steward's Roundtable, Michigan Department of Natural Resources, 2006-07.
- Periodic reviewer for Journals including, but not limited to: *Conservation Biology*, *J Animal Ecology*, *Human Ecology - An Interdisciplinary Journal*, *Life: The Excitement of Biology*. Particular instances in 2016 are: *Ecospheres* (March 2016), *Molecular Ecology* (May 2016), *Frontiers in Ecology* (May 2016), *Bioscience* (June 2016), *Wildlife Society Bulletin* (Nov 2016).
- Panelist for National Science Foundation: Ecology Panel, April 2007, April 2014.
- Ad hoc reviewer for five proposals submitted to the National Science Foundation since 2008.
- Founder and President of the Michigan Technological University, Chapter of the Society for Conservation Biology, 1997-1998.

X. Outreach & Education

- *Presentations to general public* – more than 80 presentations to more than 5000 people over the past decade, 2007-2016.
- *The Wolves and Moose of Isle Royale* webpage (www.isleroyalewolf.org) is aimed at a general audience and continues to be visited by >10k people annually. More than 4600 people signed-up to receive occasional research updates via email. I designed and maintain this site.
- *Sonifying the wolves and moose of Isle Royale: transforming data into music*. – In 2016, I led an interdisciplinary team of students and faculty through this web-based application that represents the integration of science and art. The project was covered by the *Detroit Free Press*, *Michigan Radio*, and the *Marquette Mining Journal* and can be found at www.isleroyalewolf.org.
- *Citizen science*. – I organize (with R. Peterson) week-long research expeditions, where members of the general public work with the Isle Royale wolf-moose project. Participants learn about the Isle Royale wolf-moose project and help us collect vital data. In the past five years (2011-2016), 184 people (including teachers and students) have participated in the expeditions.
- *Art Exhibit*. – In 2008, I led the development of an art exhibit, *Thinking like an Island*, featuring 38 still images depicting the Isle Royale wolf-moose project from an artistic perspective. The exhibit has been on display at four different venues (Omphale Gallery [Calumet, MI], Michigan State University, The International Wolf Center, and a portion of this exhibit was also shown at *The Gallery Project* [Ann Arbor, MI, Oct 2008]) and viewed by more than 25,000 people.
- *Art Contest*. – In fall 2007, I used www.isleroyalewolf.org to administer a nation-wide art contest for high school students. The contest theme was to depict, in art, some scientific lesson from our research.
- *Science Museum Exhibit*. – In 2007, I led development of a 1000 ft² exhibit featuring the project's scientific discoveries. The exhibit has been viewed by more than 5000 people during 12

months of display at three different venues (Carnegie Museum, Houghton, MI; Library of Univ. MN, Duluth; Hartley Nature Center, Duluth, MN; International Wolf Center, Ely, MN).

- *Documentary Films* in which I am featured:
 - *Fortunate Wilderness* (2008) is a feature-length film by George Desort that describes the Isle Royale wolf-moose project. Shown at >20 venues throughout the Midwest and Canada (more than 2500 in attendance) and broadcast on >30 different public TV stations, with an estimated, total audience of 10,000.
 - *Alces alces: uncut* (2009) is a short film by George Desort on the natural history of moose. I wrote the script and narrated the film, which has been shown at film festivals, art galleries, and nature centers in Houghton (MI), Ann Arbor (MI), Washburn (WI), and Duluth (MN).
 - *Counting Wolves* (2015) by G. Desort, *41 North Film Festival* (November 2016), Detroit Institute of Art (2015)
 - *The Fight for Isle Royale Wolves* (2016) by B. Kaufman, *41 North Film Festival* (November 2016), Detroit Institute of Art (2015)
- *Internship*. – I direct an intern program for the Isle Royale wolf-moose program. Each year we select four undergraduate students to work on Isle Royale during the summer field season for 4-5 weeks. Students are selected each year from an international pool of applicants. The program began in 2008. Most students report the experience to be transformative.
- Assist authors, instructors, and organizations in their use and interpretation of data and insight from the Isle Royale wolf-moose project. Selected, examples include:
 - The Benessee Group reprinted with permission an essay (Vucetich et al. 2013. New York Times, 13 May 2013) to be used in course materials by Japanese students who are learning English as a second language.
 - ModSim (<http://modelsim.tech.northwestern.edu/info/>) an NSF-funded effort to provide instructional materials for high school students and teachers.
 - Wilson, E. O. 2013. "Predator-prey relationships" in *E.O. Wilson's Life on Earth*.
 - Cover photo for undergraduate textbook, *Ecology: Concepts and Applications*. By Manuel Molles, 2014. This book accounts for about 60% of undergraduate ecology textbook sales.
 - Shuster, M., J. Vigna, & M. Tontono. 2013. *Biology for a Changing World*, 2nd edition; W.H. Freeman and Company/Worth Publishers/Macmillan Higher Education.
 - Johnson-Sheehan, R. 2013. *Technical Communication Strategies for Today*, 1st edition, Pearson Education, Inc.

XI. Press coverage

In the past 5 years, I have been interviewed numerous times about the Isle Royale wolf-moose project. These interviews have resulted in articles appearing in more than 75 national and international print or radio media outlets (e.g., National Public Radio, Canadian Broadcasting Corp, Science, Nature, New York Times, Washington Post, Assoc Press, Audubon, BBC, ABC News, NBC Morning Show, US News & World Report, Aljazeera) and more than 25 regional print or radio media outlets.

Additionally, I have received national and international press coverage for my involvement with these more specific research findings: Vucetich et al., 2012 (*George Wright Forum*), Peterson et al. 2010 (*Ecology Letters*), Vucetich & Nelson 2010 (*Bioscience*), MacNulty et al. 2009 (*Ecology Letters*), Bump et al. 2009 (*Ecology*), Räikkönen et al. 2009 (*Biological Conservation*), Vucetich & Nelson 2009a (*The Ecologist*), Bump et al. 2007 (*Proc R Soc*), Vucetich et al. 2006 (*Cons Biol*), Vucetich et al. 2005 (*Oikos*), and Vucetich et al. 2004 (*Anim Behav*).

ScienceDaily.com, an important clearing house for science disseminated to the general public, has published 11 articles in the past 5 years about work that I've lead or to which I've contributed.

I was also interviewed for a July 2009 article on *ScienceLives*, an occasional series produced cooperatively by the National Science Foundation and LiveScience.

(<http://www.livescience.com/environment/090716-sl-john-vucetich.html>)

XII. Public Presentations

A. Invited Seminars (32 seminars in past 11 years)

- Oxford University, Dept Zoology, WildCRU, *Wolf hunting in Michigan: the confluence of ecology, governance, and ethics*, March 2017
- Oxford University, Dept Zoology, WildCRU, *The conflict between conservation and social justice*, March 2017
- Oxford University, Dept Zoology, WildCRU, *The wolves and moose of Isle Royale*, 6 May 2016
- Oxford University, Dept Zoology, WildCRU, *The conflict between conservation and animal welfare*, 7 May 2016
- Dept Biological Sciences, Michigan Technological University, *The wolves and moose of Isle Royale*, 2 Dec 2016
- Michigan State University, Dept. of Fisheries & Wildlife, Hanover Seminar Series, *Laws of nature, historical contingency, and the wolves and moose on Isle Royale*, 24 March 2015.
- Western Michigan University, Dept. of Biological Sciences, *The wolves and moose of Isle Royale: lessons from five decades of observation*, 27 March 2015
- Portland State University, *Nature's Intrinsic Value*, 1 June 2015
- University of Georgia, Dept of Genetics, Athens, GA, 5 Nov 2014.
- Oregon State University, Dept of Forest Ecosystems & Society, Corvallis, OR, 29 Oct 2014.
- Grand Valley State University, Allendale, MI, 10 April 2014.
- Oregon State University, Corvallis, OR, 21 Nov 2013.
- University of Wisconsin, Madison, WI, 1 Nov 2013.
- Northland College, Ashland, WI Oct 2013.
- Vucetich, JA. Wolves & Moose of Isle Royale: Lessons from Fifty years of research. Dept. of Forest Ecosystems & Society. Oregon State Univ., Corvallis, OR. 1 April 2013
- Ohio State University, Dept of Evolution, Ecology & Organismal Biology, March 2013.
- Ohio State University, Dept of Natural Resources, March 2013.
- Michigan State University, Dept of Sociology, March 2013.
- Michigan State University, Dept of Fisheries & Wildlife, March 2013.
- Universite de Sherbrooke, CA, Dept de biologie, March 2013.
- Vucetich, JA. Working to Resolve the Conflict between Animal Welfare and Conservation Ethics. Invited talk, The Wildlife Society annual meeting. Portland, OR. 16 Oct 2012.
- Boise State University, Dept of Biological Sciences, Sept. 2012.
- University of Idaho, Moscow, Fish & Wildlife Resources, Sept 2012.
- University of IL, Urbana, Program in Ecology, Evolution & Conservation Biology, March 2012.
- Michigan Technological University, Dept of Biological Sciences, Sept 2011.
- University of Puerto Rico, San Juan, April 2011.
- Humboldt State University, Dept of Biology, Sept 2009.
- Michigan State University, Graduate Student Seminar Series, April 2009.
- SUNY-Syracuse, April 2008 (cancelled at last moment due to unforeseen, unavoidable conflict).
- Central Michigan University, Biology Dept, April 2008.
- Michigan State University, Fisheries & Wildlife, April 2008.
- University of Montana, Forestry Dept, April 2008.
- Western State College, April 2008.
- University of Oslo, Norway, 2006.
- Philosophy Department, University of Idaho, April 2006.
- University of California - Santa Cruz, Department of Applied Math, March 2006.
- Northern Illinois University, Biology Department, 2005.
- Lund University, Sweden, Department of Theoretical Ecology, 2004.
- Uppsala University, Sweden, Department of Conservation Biology, 2004.
- University of Wisconsin - Stevens Point, Department of Philosophy, 2004 of Philosophy, 2004.

B. Other Invited Talks

Detroit Zoo, Detroit, MI, 18 Mar 2017.

“Wolf management in Michigan,” presented at the ISSRM Symposium, Houghton, MI, 22-26 June 2016

Michigan State University, Wolf Hunting in Michigan, Wildlife Problem Solving Course by Professor William Porter, 25 March 2015.

“The conflict between conservation and animal welfare,” presented at the *Take Action for Animals Conference*, Humane Society of the United States, Washington, DC, June 2016.

“The wolves and moose of Isle Royale,” presented at the MTU Alumni Reunion, 4 Aug 2016

“The wolves and moose of Isle Royale,” presented at Lake Superior Day – Copper Harbor, MI, 24 July 2016.

University of Michigan, Medical Scientist Training Program Annual Retreat – *The wolves of Isle Royale*, 1 Aug 2015.

Huron Mountain Club, The wolves of Isle Royale, 4 Aug 2015

Western Michigan University, evening presentation for general public, *The Future of Wolf Hunting in Michigan*, 26 March 2015.

Living Large Conference, Humane Society of the United States, *The conflict between conservation and animal welfare*, Washington, DC, 12-14 Oct 2015.

Detroit Zoo, Detroit, MI, 23 Oct 2014.

Wayne State University, Detroit, MI, 24 Oct 2014.

Grand Valley State University, Grand Rapids, MI, 25 Oct 2014.

Mich Tech Univ, Houghton, MI. MTU Wildlife Society. 19 March 2014.

California Wolf Center, Julian, CA, two talks on 26 Oct 2013.

University of WI, Madison, WI. Conservation Ethics: an overview. Nov 2013.

Oregon State University, Dept. of Forest Ecosystems & Society, Corvallis, OR, April 2013.

Vucetich, JA. Wolves & Moose of Isle Royale: Lessons from Fifty years of research. Stewardship Network webcast. 12 Sept 2012.

Timber Wolf Alliance meeting. Manitowish Waters, WI. Aug 2012.

Sinclair Community College, Dayton, OH, Keynote address at faculty retreat. March 2012.

University of Montana, Missoula, evening presentation. Oct 2011.

Center for Humans and Nature, Chicago, IL, Oct 29, 2010.

International Wolf Center group at MTU. August 2009.

Yellowstone Center for Resources, Yellowstone National Park. June 2009.

Applying conservation biology to endangered species recovery goals: The wolf as a case study, Ladder Ranch, New Mexico, April 2008.

MTU SFRES symposium – Ecosystems and Climate Change, spring 2008.

Senda Darwin Biological Station, Chiloe, Chile. March, 2007.

Yellowstone Center for Resources, Yellowstone National Park. March 2006.

Yellowstone Center for Resources, Yellowstone National Park. March, 2004.

