

From: [Johnson, Dawn](#)
To: [Nelson, Marjorie](#)
Cc: [Sarah Backsen](#)
Subject: Peer review of GYE grizzly bears
Date: Thursday, June 09, 2016 8:25:10 PM
Attachments: [AmecFW Letter Report - USFWS Grizzly Bear Peer 6-9-2016.pdf](#)
[Compiled Resumes GYE Grizzly Bear reviewers May 2016.pdf](#)
[Compiled Reviews GYE Grizzly Bear June 2016.pdf](#)

Marjorie and Sarah-

Attached please find a cover letter, the five reviews, and the five resumes. Let me know if you find any errors, need more information in the cover letter, or generally have any questions. I'll provide a complete admin record after completion of the Q&A period.

Sincerely,

Dawn Johnson PhD

Senior Biologist, Amec Foster Wheeler
Austin/Santa Barbara

D/M 805 252 4370

dawn.johnson@amecfw.com amecfw.com

From: Nelson, Marjorie [mailto:marjorie_nelson@fws.gov]

Sent: Tuesday, May 24, 2016 5:24 PM

To: Johnson, Dawn <dawn.johnson@amec.com>

Cc: Sarah Backsen <sarah_backsen@fws.gov>

Subject: Re: cover letter for grizzly reviews

Hi Dawn,

The address is 134 Union Blvd. Lakewood, Colorado 80228

You may make the electronic submission of the reviews, resumes, and letter as PDFs and you can send them to myself and Sarah Backsen, who is coordinating review of comments. For our administrative record, we will also need any relevant material that would go into the record such as emails between you and the peer reviewers giving direction on questions, emails between them and Steve Gess on issues. That can be completed after the 5th review is in. Please feel free to contact Sarah if you have any questions on the administrative record.

thanks so much!

Marj

Marjorie Nelson

Chief, Division of Ecological Services

Mountain-Prairie Region

U.S. Fish and Wildlife Service

303-236-4258

Check out the SSA Framework - Google site for staff at : <https://sites.google.com/a/fws.gov/ssa/>

On Tue, May 24, 2016 at 9:05 AM, Johnson, Dawn <dawn.johnson@amecfw.com> wrote:

Marjorie-

I've received 4 of the 5 reviews and am working on the transmittal letter, while waiting on the 5th review. The SOW indicates the transmittal letter should go to Noreen Walsh. I am planning on submitting everything electronically, but I should probably use her correct mailing address. Can you verify that address? I am also assuming I just submit to you, unless there are other people that I should include on the transmittal email?

I was just going to summarize the documents reviewed, the process, and who the reviewers are/were, then include the 5 reviews and 5 resumes. I'm assuming you want the letter, reviews and resumes each as separate pdfs (so that would be 3 pdfs total). Can you confirm that as well?

Is there anything else you want in the transmittal letter?

Sincerely,

Dawn Johnson PhD

Senior Biologist, Amec Foster Wheeler

Austin/Santa Barbara

D/M 805 252 4370

dawn.johnson@amecfw.com

amecfw.com



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June 9, 2016



Ms. Noreen Walsh

Regional Director
US Fish & Wildlife Service
Mountain-Prairie Region
134 Union Boulevard
Lakewood, CO 80228

SUBJECT: Project: Scientific Peer Review for Greater Yellowstone Grizzly Bears

Dear Ms. Walsh,

In accordance with the Statement of Work dated March 28, 2016, Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) is pleased to submit the completed *Peer Review (without attribution) of the Scientific Findings in U.S. Fish and Wildlife Service's Proposed Rule Removing the Greater Yellowstone Ecosystem Population of Grizzly Bears From the Federal List of Endangered and Threatened Wildlife; Availability of Draft Recovery Plan Supplement: Revised Demographic Criteria and a Draft 2016 Conservation Strategy for this Population.*

The three documents (Proposed Rule, Revised Demographic Criteria, and Draft 2016 Conservation Strategy) were provided to five reviewers on April 14, 2016. Each reviewer independently evaluated the documents and prepared their individual responses to the questions included in the Statement of Work. After receipt of each individual review, I assigned a random number to each review, proofread them, ensured all reviews were in the same format, and coordinated with the reviewer for any clarifications and approval of typographical edits. Individual reviews were received between May 19, 2016 and June 9, 2016.

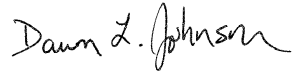
The five reviewers, all of whom are bear biologists, included:

- Jerrold (Jerry) Belant, PhD, from Mississippi State University
- Mark Boyce, PhD, from the University of Alberta
- John Cox, PhD, from the University of Kentucky
- Andrew Derocher, PhD, from the University of Alberta
- Dwayne Etter, PhD, from Michigan Department of Natural Resources

Continued...

Enclosed with this letter are the five reviews with randomly assigned numbers, along with the resume for each reviewer. The administrative record will be provided after completion of the question and answer (Q&A) period. Please contact Dawn Johnson at (805) 252-4370 if you have any questions or need clarification on the process or for any of the reviews.

Yours sincerely,

A handwritten signature in black ink that reads "Dawn L. Johnson". The signature is written in a cursive, flowing style.

Dawn L. Johnson, PhD
Project Manager, Senior Biologist

Enclosures: Individual Reviews and Resumes

Jerrold L. Belant

Professor, Wildlife Ecology and Management

Phone: 662-325-2996

Email: j.belant@msstate.edu

Mississippi State University
Thompson Hall, Rm 251
Department of Wildlife, Fisheries and Aquaculture
Box 9690
Mississippi State, MS 39762-9690

Education:

- [University of Alaska Fairbanks](#) PhD, Wildlife Biology, 2007
- [University of Wisconsin-Stevens Point](#) M.S., Natural Resources, 1991
- [University of Wisconsin-Stevens Point](#) B.S., Wildlife Biology, 1985

Research Interests:

- Carnivore ecology and conservation
- Resource selection
- Human-wildlife conflict management

Extension Interests:

- [Carnivore Ecology and Conservation](#)
- [Carnivore Ecology Lab Facebook Page](#)
- [Mississippi Black Bear Project](#)
- [Missouri Black Bear Project](#)
- [Michigan Predator Prey](#)
- [Michigan Predator-Prey Project Facebook Page](#)

Publications (2008-2016)

2016

Gantchoff, M.G., J.L. Belant. 2016. Patterns of coexistence between two mesocarnivores in northern Patagonia in the presence of invasive hares and anthropogenic disturbance. *Austral Ecology* 41:97-105. [Download](#)

2016

Gonzalez-Maya, J., L. Viquez-R, A. Arias-Alzate, J.L. Belant, G. Ceballos. 2016. Spatial patterns of species richness and functional diversity in Costa Rican terrestrial mammals: implications for conservation. *Diversity and Distributions* 22:43-56. [Download](#)

2016

Michel, E.S., S. Demarais, B.K. Strickland, J.L. Belant, J.J. Millspaugh. 2016. Quantifying dominance of adult female white-tailed deer in the presence of abundant food. *Behaviour* 153:49-67. [Download](#)

2016

Wilton, C.M., J. Beringer, E.E. Puckett, L.S. Eggert, J.L. Belant. 2016. Spatiotemporal factors affecting detection of black bears during noninvasive capture-recapture surveys. *Journal of Mammalogy* 97:266-273. [Download](#)

2015

Bled, F., S. Summers, D. Martell, T.R. Petroelje, D.E. Beyer, Jr., J.L. Belant. 2015. Effects of prey presence and scale on bobcat resource selection during winter. Plos One 10:e0143347. [Download](#)

2015

Bowman, B., J.L. Belant, D.E. Beyer, Jr., D. Martell. 2015. Characterizing non-target species use at bait sites for white-tailed deer. Human-Wildlife Interactions 9:110-118. [Download](#)

2015

Conkling, T.J., J.L. Belant, T.L. DeVault, G. Wang, J.A. Martin. 2015. Assessment of variation of nest survival for grassland birds due to method of nest discovery. Bird Study 62:223-231. [Download](#)

2015

Crain, A.R., J.L. Belant, and T.L. DeVault. 2015. Carnivore incidents with U.S. civil aircraft. Transportation Research Part D: Transport and Environment 36:160-166. [Download](#)

2015

Cruz-Rodríguez, C., J.F. González-Maya, A. Rodríguez-Bolaños, A. Cepeda, J.L. Belant. 2015. Ocelot *Leopardus pardalis* (Carnivora: Felidae) spatial ecology in a fragmented landscape of Colombia. Revista Mexicana de Mastozoología Nueva época 5:1-8. [Download](#)

2015

Duquette, J.F., J.L. Belant, N.J. Svoboda, D.E. Beyer, Jr., P.E. Lederle. 2015. Scale dependence of female ungulate reproductive success in relation to nutritional condition, resource selection and multi-predator avoidance. PLoS One 10:e0140433. [Download](#)

2015

Gantchoff, M.G., J.L. Belant. 2015. Anthropogenic and environmental effects on invasive mammal distribution in northern Patagonia, Argentina. Mammalian Biology 80:54-58. [Download](#)

2015

Gompper, M.E., J.L. Belant, R. Kays. 2015. Carnivore coexistence: America's recovery. Science 347:382-383. [Download](#)

2015

González-Maya, J.F., Víquez-R, J. L. Belant, G. Ceballos. 2015. Effectiveness of protected areas for representing species and populations of terrestrial mammals in Costa Rica. PLoS One 10:e0124480. [Download](#)

2015

Hiller, T.L., J. Beringer, and J.J. Tyre, J.L. Belant. 2015. Resource selection by recolonizing American black bears in a fragmented forest landscape. Ursus 26:116-128. [Download](#)

2015

Hiller, T.L., J.E. McFadden-Hiller, S.R. Jenkins, J.L. Belant, A.J. Tyre. 2015. Demography, prey abundance, and management affect number of cougar mortalities associated with livestock conflicts. Journal of Wildlife Management 79(6):978-988. [Download](#)

2015

Hiller, T.L., J.L. Belant, J. Beringer. 2015. Sexual-size dimorphism mediates effects of resource dispersion on American black bear space use. *Journal of Zoology* 296(3):200-207. [Download](#)

2015

Lafferty, D.J.R., J.L. Belant, D.L. Phillips. 2015. Testing the niche variation hypothesis with a measure of body condition. *Oikos* 124(6):732-740. [Download](#)

2015

LaPoint, S.D., J.L. Belant, R.W. Kays. 2015. Mesopredator release facilitates range expansion in fisher. *Animal Conservation* 18:50-61. [Download](#)

2015

Michel, E.S., S. Demarais, B.K. Strickland, and J.L. Belant. 2015. Contrasting the effects of maternal and behavioral characteristics on fawn birth mass in white-tailed deer. *PLoS One* 10(8):e0136034. [Download](#)

2015

Simek, S.L., J.L. Belant, Z. Fan, B.W. Young, B.D. Leopold, J. Fleming, B. Waller. 2015. Source populations and roads affect American black bear recolonization. *European Journal of Wildlife Research* 61(4):583-590. [Download](#)

2015

Stillfried, M., J.L. Belant, N.J. Svoboda, D.E. Beyer, S. Kramer-Schadt. 2015. When top predators become prey: Black bears alter movement behavior in response to hunting pressure. *Behavioural Processes* 120:30-39. [Download](#)

2015

Struebig, M.J., A. Wilting, D. Gaveau, E. Meijaard, R.J. Smith, The Borneo Mammal Distribution Consortium, M. Fischer, K. Metcalfe, and S. Kramer-Schadt. 2015. Targeted conservation safeguards a biodiversity hotspot from climate and land-cover change. *Current Biology* 25:372-378. [Download](#)

2015

White, P.A., and J.L. Belant. 2015. Provisioning of game meat to rural communities as a benefit of safari hunting in Zambia. *PLoS One* 10:0117237. [Download](#)

2015

Wilton, C.M., J.L. Belant, J.F. Van Stappen, D. Paetkau. 2015. American black bear population abundance and genetic structure on an island archipelago. *Ursus* 26:53-66. [Download](#)

2014

Ayers, C.R., J.L. Belant, D.A. Eads, D.S. Jachowski, J.J. Millspaugh. 2014. Effect of black-footed ferret resource use on litter size. *Western North American Naturalist* 74:108-115. [Download](#)

2014

Belant, J.L., C.R. Ayers. 2014. Habitat management to deter wildlife at airports. *National Academies, Transportation Research Board, ACRP Synthesis* 52, Washington, D.C. 83pp. [Download](#)

2014

Biondi, K.M., J.L. Belant, T.L. DeVault, J.A. Martin, G. Wang. 2014. Integrating mammalian hazards with management at U.S. civil airports: a case study. *Human-Wildlife Interactions* 8:31-38. [Download](#)

2014

DeVault, T.L., P.M. Schmidt, F.E. Pogmore, J. Gobeille, J.L. Belant, T.W. Seamans. 2014. Influence of egg oiling on colony fidelity of ring-billed gulls. *Human-Wildlife Interactions* 8:22-30. [Download](#)

2014

DeVault, T.L., T.W. Seamans, J.A. Schmidt, J.L. Belant, B.F. Blackwell, N. Mooers, L.A. Tyson, L. Van Pelt. 2014. Bird use of solar photovoltaic installations at US airports: Implications for aviation safety. *Landscape and Urban Planning* 122:122-128. [Download](#)

2014

Drey, K.M., J.A. Martin, J.L. Belant, T.L. DeVault, B.F. Blackwell. 2014. Interactions between wildlife and civil aircraft in Mississippi. *Southeastern Naturalist* 13:156-165. [Download](#)

2014

Duquette, J.F., J.L. Belant, N.J. Svoboda, D.E. Beyer, Jr., C.A. Albright. 2014. Comparison of occupancy modeling and radiotelemetry to estimate ungulate population dynamics. *Population Ecology* 56:481-492. [Download](#)

2014

Duquette, J.F., J.L. Belant, N.J. Svoboda, D.E. Beyer, Jr., P.E. Lederle. 2014. Effects of maternal nutrition, resource use and multi-predator risk on neonatal white-tailed deer survival. *Plos One* 9:e100841. [Download](#)

2014

Gantchoff, M.G., J.L. Belant, D.A. Masson. 2014. Land use affects mammal community structure in a multiple-use protected area, east-central Argentina. *Latin American Journal of Conservation* 4:18-24.

2014

Lafferty, D.J.R., J.L. Belant, J.N. Womble, K.S. White, A.T. Morzillo. 2014. Linking wolf diet to changes in marine and terrestrial prey abundance. *Arctic* 67:143-148. [Download](#)

2014

Little, A.R., S. Demarais, K.L. Gee, S.L. Webb, S.K. Riffell, J.A. Gaskamp, J.L. Belant. 2014. Does human predation risk affect harvest susceptibility of white-tailed deer during hunting season? *Wildlife Society Bulletin* 38:797-805. [Download](#)

2014

Martin, J.A., C. Marshall, J.L. Belant, S. Cagle, B.C. West. 2014. Conspecific scent improves capture rates for nine-banded armadillos. *Wildlife Biology in Practice* 10:149-154. [Download](#)

2014

McKinley, B.K., J.L. Belant, D.R. Etter. 2014. American black bear-apiary conflicts in Michigan. *Human-Wildlife Interactions* 8:228-234. [Download](#)

2014

Petroelje, T., J.L. Belant, D.E. Beyer, G. Wang, B.D. Leopold. 2014. Population-level response of coyotes to a pulsed resource event. *Population Ecology* 56:349-358. [Download](#)

2014

Puckett, E.E., T.V. Kristensen, C.M. Wilton, S.B. Lyda, K. Noyce, P.M. Holahan, D.M. Leslie Jr., J. Beringer, J.L. Belant, D. White Jr., L.S. Eggert. 2014. The influence of a bottleneck followed by admixture on population structure of American black bears (*Ursus americanus*) in the Central Interior Highlands, USA. *Molecular Ecology* 23:2414-2427. [Download](#)

2014

Schwarz, K.M., J.L. Belant, J.A. Martin, T.L. DeVault, G. Wang. 2014. Behavioral traits and airport type affect mammal incidents with U.S. civil aircraft. *Environmental Management* 54:908-918. [Download](#)

2014

Sharma, H.P., J. Swenson, J.L. Belant. 2014. Seasonal food habits of the red panda (*Ailurus fulgens*) in Rara National Park, Nepal. *Italian Journal of Mammalogy* 25:25:47-50. [Download](#)

2014

Sharma, H.P., J.L. Belant, J. Swenson. 2014. Effects of livestock grazing on red panda habitat use. *Oryx* 48:228-231. [Download](#)

2014

Waller, B.W., J.L. Belant, B.D. Leopold, B.W. Young, S.L. Simek, D.L. Evans. 2014. Influence of landscape attributes on American black bear den-site selection in Mississippi. *Mammal Study* 39:115-119. [Download](#)

2014

Wegan, M.T., D.R. Etter, J.L. Belant, D.E. Beyer Jr., N.J. Svoboda, T.R. Petroelje. 2014. A cable neck-restraint to live-capture coyotes. *Wildlife Society Bulletin* 37:160-164. [Download](#)

2014

Wilton, C.M., J. Beringer, B. Gardner, E.E. Puckett, L.S. Eggert, J.L. Belant. 2014. Trap array configuration influences estimates and precision of black bear density and abundance. *PLoS One* 9:e111257. [Download](#)

2014

Wilton, C.M., J.L. Belant, J. Beringer. 2014. Distribution of American black bear occurrences and human-bear conflicts in Missouri. *Ursus* 25:53-60. [Download](#)

2013

Ayers, C.R., J.L. Belant, J.J. Millspaugh. 2013. Directness of resource use metrics affects predictions of bear body fat gain. *Polar Biology* 36:169-176. [Download](#)

2013

Ayers, C.R., J.L. Belant, C.M. Bodinoff, J.T. Briggler, and J.J. Millspaugh. 2013. Relating resource use to body condition and survival of Ozark hellbenders *Cryptobranchus alleganiensis* bishop. *Endangered Species Research* 21:205-213. [Download](#)

2013

Belant, J.L., A. Wilting. 2013. Methods for detecting and surveying tropical carnivores. *Raffles Bulletin of Zoology* 28:i-iii.

2013

Belant, J.L., B.E. Washburn, T.L. DeVault. 2013. Understanding animal movements at and near airports. Pages 129-138 in DeVault, T.L., B.F. Blackwell, and J.L. Belant, editors. *Wildlife in airport environments*. Johns Hopkins University Press, Baltimore, Maryland, USA.

2013

Belant, J.L., H. Hofer, A. Wilting. 2013. Comparison of methods for detecting and monitoring tropical carnivores. *Raffles Bulletin of Zoology* 28:109-113.

2013

Belant, J.L., T.L. DeVault, B.F. Blackwell. 2013. Conclusions and future directions. Pages 167-170 in DeVault, T.L., B.F. Blackwell, and J.L. Belant, editors. *Wildlife in airport environments*. Johns Hopkins University Press, Baltimore, Maryland, USA.

2013

Biondi, K.M., J.L. Belant, T.L. DeVault, J.A. Martin, G. Wang. 2013. Bat incidents with U.S. civil aircraft. *Acta Chiropterologica*. 15:185-192. [Download](#)

2013

Blackwell, B.F., T.W. Seamans, P.M. Schmidt, T.L. DeVault, J.L. Belant, M.J. Whittingham, J.A. Martin, and E. Fernandez. 2013. A framework for airport grasslands and birds amidst conflicting priorities. *Ibis* 155:189-193. [Download](#)

2013

DeVault, T.L., B.F. Blackwell, J.L. Belant, editors. 2013. *Wildlife in airport environments: preventing animal-aircraft collisions through science-based management*. Johns Hopkins University Press, Baltimore, Maryland, USA.

2013

DeVault, T.L., B.F. Blackwell, J.L. Belant. 2013. Preface-managing wildlife hazards in airport environments. Pages ix-xi in DeVault, T.L., B.F. Blackwell, and J.L. Belant, editors. *Wildlife in airport environments*. Johns Hopkins University Press, Baltimore, Maryland, USA.

2013

DeVault, T.L., M.J. Begier, J.L. Belant, B.F. Blackwell, R.A. Dolbeer, J.A. Martin, T.W. Seamans, B.E. Washburn, J.R. Weller. 2013. Rethinking airport land-cover paradigms: agriculture, grass, and wildlife hazards. *Human-Wildlife Interactions* 7:10-15. [Download](#)

2013

Do Linh San, E., A.W. Ferguson, J.L. Belant, J. Schipper, M. Hoffmann, P. Gaubert, F.M. Angelici, M.J. Somers. 2013. Conservation status, distribution and species richness of small carnivores in Africa. *Small Carnivore Conservation* 48:4-18. [Download](#)

2013

Duquette, J.F., J.L. Belant, D.E. Beyer, Jr., N.J. Svoboda. 2013. Body condition and dosage effects on ketamine-xylazine immobilization of female white-tailed deer. *Wildlife Society Bulletin* 37:162-167. [Download](#)

2013

Fleming, H.L., J.C. Jones, J.L. Belant, D. Richardson. 2013. Multi-scale roost site selection by Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) and southeastern myotis (*Myotis austroriparius*) in Mississippi. *American Midland Naturalist* 169:43-55. [Download](#)

2013

Fleming, H.L., J.C. Jones, J.L. Belant, D. Richardson. 2013. Probability of detection and visual count error for Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) and southeastern myotis (*Myotis austroriparius*) in tree cavities. *American Midland Naturalist* 169:56-65. [Download](#)

2013

Gitzen, R.A., J.L. Belant, J.J. Millspaugh, S.T. Wong, A. Hearn, J. Ross. 2013. Radiotelemetry and remote monitoring of tropical carnivores. *Raffles Bulletin of Zoology* 28:67-83.

2013

González-Maya, J.F., J.L. Belant, S.A. Wyatt, J. Schipper, I. Cruz-Lizano, M. Calvo, J. Cardenal, D. Corrales, A. Hoepker, A. H. Excobedo-Galvan, F. Castaneda, A. Fisher. 2013. Returning hope: The rediscovery of *Atelopus varius* in Costa Rica. *Amphibia-Reptilia* 34:573-578.

2013

Kramer-Schadt, S., J. Niedballa, J.D. Pilgrim, B. Schroder, J. Lindenborn, C. Reinfelder, M. Stillfried, I. Heckmann, A.K. Scharf, D.M. Auger, S.M. Cheyne, A.J. Hearn, J. Ross, D.W. Macdonald, J. Mathai, J. Eaton, A.J. Marshall, G. Semiadi, R. Rustam, H. Bernard, R. Alfred. H. Samejima, J.W. Duckworth, C. Breitenmoser-Wuersten, J.L. Belant, H. Hofer, A. Wilting. 2013. The importance of correcting for sampling bias in MaxEnt species distribution models. *Diversity and Distributions* 19(11):1366-1379. [Download](#)

2013

Martin, J.A., J.L. Belant, T.L. DeVault. 2013. Bird harassment, repellent, and deterrent techniques for use on and near airports. *Human-Wildlife Conflicts Monograph* 2:1-48.

2013

Martin, J.A., T.J. Conkling, J.L. Belant, K.M. Biondi, B.F. Blackwell, T.L. DeVault, E. Fernández-Juricic, P.M. Schmidt, T.W. Seamans. 2013. Wildlife conservation and alternate land uses at airports. Pages 117-125 in DeVault, T.L., B.F. Blackwell, and J.L. Belant, editors. *Wildlife in airport environments*. Johns Hopkins University Press, Baltimore, Maryland, USA.

2013

McCarthy, J.L., J.L. Belant, A.J. Hearn, J. Ross, C. Breitenmoser-Wursten. 2013. Live trapping carnivores in tropical forests - tools and techniques to maximise efficacy. *Raffles Bulletin of Zoology* 28:55-66.

2013

Mohammed-Azlan, J., J.L. Belant, E. Meijaard. 2013. Secondary information as a tool to study carnivores in tropical forests. *Raffles Bulletin of Zoology* 28:1-8.

2013

Moraru, G.M., J. Goddard, A. Murphy, D. Link, J.L. Belant, A. Varela-Stokes. 2013. Evidence of

antibodies to spotted fever group rickettsiae in small mammals and quail from Mississippi. *Vector-borne and Zoonotic Diseases*. 13:1-5. [Download](#)

2013

Petroelje, T.R., J.L. Belant, D.E. Beyer Jr. 2013. Factors affecting the elicitation of vocal responses from coyotes. *Wildlife Biology* 19:41-47. [Download](#)

2013

Seamans, T.W., J.A. Martin, J.L. Belant. 2013. Tactile and auditory repellents to reduce wildlife hazards to aircraft. Pages 37-46 in DeVault, T.L., B.F. Blackwell, and J.L. Belant, editors. *Wildlife in airport environments*. Johns Hopkins University Press, Baltimore, Maryland, USA.

2013

Severud, B., J.L. Belant, S. Windels, J. Bruggink. 2013. Seasonal variation in assimilated diets of American beavers. *American Midland Naturalist* 169:30-42. [Download](#)

2013

Severud, W.J., S.K. Windels, J.L. Belant, J.G. Bruggink. 2013. The role of forage availability on diet choice and body condition in American beavers (*Castor canadensis*). *Mammalian Biology* 23:87-93. [Download](#)

2013

Svoboda, N.J., J.L. Belant, D.E. Beyer Jr., J.F. Duquette, J.A. Martin. 2013. Identifying bobcat kill sites using a global positioning system. *Wildlife Biology* 19:78-86. [Download](#)

2013

Waller, B.W., J.L. Belant, B.D. Leopold, D.L. Evans, B.W. Young, S.L. Simek. 2013. Scale-dependent den-site selection by American black bears in Mississippi. *Mammal Study* 38:211-216.

2012

Belant, J.L., J.J. Millspaugh, J.A. Martin, R.A. Gitzen. 2012. Multi-dimensional space use: the final frontier. *Frontiers in Ecology and Environment* 10:11-12. [Download](#)

2012

Blackwell, B.F., T.W. Seamans, L.A. Tyson, J.L. Belant, K.C. VerCauteren. 2012. Exploiting antipredator behavior in white-tailed deer for resource protection. *Wildlife Society Bulletin* 36:546-553. [Download](#)

2012

DeVault, T.L., J.L. Belant, B.F. Blackwell, J.A. Martin, J.A. Schmidt, L.W. Burger Jr. 2012. Airports offer unrealized potential for alternative energy production. *Environmental Management* 49:517-522. [Download](#)

2012

Duckworth, J.W., G. Batters, J.L. Belant, J. Brunner, J. Burton, D. Challender, V. Cowling, N. Duplaix, J.D. Harris, S. Hedges, B. Long, S.P. Mahood, P.J.K. McGowan, W.J. McShea, S. Perkin, B.M. Rawson, C.R. Shepherd, S.N. Stuart, B.K. Talukdar, P.P. van Dijk, A.J. Whitten and R. Wirth. 2012. Why South-east Asia is the world's priority for averting imminent species extinctions, and a call to join a developing cross-institutional programme to tackle this urgent issue. *Sapiens* 5:77-95.

2012

Duquette, J.F., J.L. Belant, D.E. Beyer Jr., N.J. Svoboda. 2012. Comparison of pregnancy detection methods in live-white-tailed deer. *Wildlife Society Bulletin* 36:115-118. [Download](#)

2012

Gonzalez-Maya, J.F., J. Schipper, B. Polidoro, A. Hoepker, D.A. Zarrate-Charry, J.L. Belant. 2012. Baird's tapir density in high elevation forests of Talamanca Region of Costa Rica. *Integrative Zoology* 7:381-388. [Download](#)

2012

Libal, N.S., J.L. Belant, R. Maraj, B.D. Leopold, G. Wang, S. Marshall. 2012. Microscale den-site selection of grizzly bears in southwestern Yukon. *Ursus* 23:226-230. [Download](#)

2012

Malick, S., J.L. Belant, J. Bruggink. 2012. Influence of spotted knapweed on diversity and abundance of small mammals in Grand Sable Dunes, Michigan, USA. *Natural Areas Journal* 32:398-402. [Download](#)

2012

Malick, S.L., J.G. Bruggink, J.L. Belant. 2012. Effects of forest patch characteristics on small mammal species composition, Grand Sable Dunes, Michigan. *Natural Areas Journal* 32:293-299.

2012

Marable, M.K., J.L. Belant, D. Godwin, G. Wang. 2012. Effects of resource dispersion and site familiarity on movements of translocated wild turkeys on fragmented landscapes. *Behavioral Processes* 91: 119-124. [Download](#)

2012

Martin, J.A., J.L. Belant, T. DeVault. 2012. Bird harassment, repellent, and deterrent techniques for use on and near airports. *Human-Wildlife Conflicts Monograph* 2.

2012

Millspaugh, J.J., D.C. Kesler, R.A. Gitzen, R. Kays, J.H. Schultz, C.T. Rota, B.J. Keller, J.L. Belant, C.M. Bodinof. 2012. Preliminary considerations and equipment for wildlife radiotelemetry and remote monitoring. Pages 258-283 in N. Silvy, editor. *Research and management techniques for wildlife and habitats*. John Hopkins University Press, Baltimore, Maryland, USA.

2012

Millspaugh, J.J., D.C. Kesler, R.A. Gitzen, R. Kays, J.H. Schulz, J.L. Belant, C.T. Rota, B.J. Keller, C.M. Bodinof. 2012. A review of wildlife radiotelemetry. *Envis Bulletin* 13:20-30.

2012

Millspaugh, J.J., R.A. Gitzen, J.L. Belant, R. Kays, B.J. Keller, D.C. Kesler, C.T. Rota, J.H. Schultz, C.M. Bodinof. 2012. Analysis of wildlife telemetry data. Pages 408-501 in N. Silvy, editor. *Research and management techniques for wildlife and habitats*. John Hopkins University Press, Baltimore, Maryland, USA.

2012

Simek, S., J.L. Belant, B.W. Young, C. Shropshire, B.D. Leopold. 2012. History and status of the American black bear in Mississippi. *Ursus* 23:159-167. [Download](#)

2012

Sollmann, R., B. Gardner, J.L. Belant. 2012. How does spatial study design influence density estimates from spatial capture-recapture models? *PLoS One*. 7:e34575. [Download](#)

2012

Stricker, H.K., J.L. Belant, D.E. Beyer, Jr., J. Kanefsky, K.T. Scribner, D.R. Etter, J. Fierke. 2012. Use of modified hair snares to estimate bobcat abundance. *Wildlife Society Bulletin* 36:257-263. [Download](#)

2012

Svoboda, N.J., J.L. Belant, S.D. Fitzgerald, D.E. Beyer Jr., J.F. Duquette, T. Cooley. 2012. Aspiration pneumonia in an American black bear. *Ursus* 23:1-5. [Download](#)

2012

Van Daele, L.J., V.G. Barnes, J.L. Belant. 2012. Ecological flexibility of brown bears on Kodiak Island, Alaska. *Ursus* 23:21-29. [Download](#)

2012

Waller, B.W., J.L. Belant, B.W. Young, B.D. Leopold, S.L. Simek. 2012. Denning chronology and den characteristics of American black bears in Mississippi. *Ursus* 23:6-11. [Download](#)

2011

Beever, E.A., J.L. Belant, editors. 2011. Ecological consequences of climate change: mechanisms, conservation, and management. Taylor and Francis, Boca Raton, Florida, USA.

2011

Beever, E.A., J.L. Belant. 2011. Ecological consequences of climate change: conclusions and future directions. Pages 285-294 in E.A. Beever, and J.L. Belant, editors. Ecological consequences of climate change: mechanisms, conservation, and management. Taylor and Francis, Boca Raton, Florida, USA.

2011

Belant, J.L., D.R. Etter, P. Friedrich, B. Williams, K. Scribner. 2011. Comparison of techniques for sex determination of American martens. *Journal of Wildlife Management* 75:256-260. [Download](#)

2011

Belant, J.L., D.R. Etter, S.L. Mayhew, L.G. Visser, P. Friedrich. 2011. Improving large scale mark-recapture estimates for American black bear populations. *Ursus* 22:9-23. [Download](#)

2011

Belant, J.L., S.L. Simek, B.C. West. 2011. Managing black bear-human conflicts. *Human-Wildlife Conflicts Monograph* 1:1-77.

2011

Biondi, K.M., J.L. Belant, J.A. Martin, T.L. DeVault, G. Wang. 2011. White-tailed deer incidents with U.S. civil aircraft. *Wildlife Society Bulletin* 35:303-309.

2011

DeVault, T.L., J.L. Belant, B.F. Blackwell, T. W. Seamans. 2011. Interspecific variation in wildlife hazards to aircraft: implications for airport management. *Wildlife Society Bulletin* 35:394-402.

2011

Duquette, J.F., J.L. Belant, D.E., Beyer, N.J. Svoboda, C.A. Albright. 2011. Bald Eagle predation of a white-tailed deer fawn. *Northeastern Naturalist* 18:87-94.

2011

Edge, J.L., D.E. Beyer, J.L. Belant, M.J. Jordan, B. Roell. 2011. Livestock and domestic dog predations by wolves in Michigan. *Human Wildlife Interactions* 5:66-78. [Download](#)

2011

Edge, J.L., D.E. Beyer, J.L. Belant, M.J. Jordan, B. Roell. 2011. Validation and refinement of a predictive spatial model for wolf predations on livestock. *Wildlife Biology* 17:1-10.

2011

Etter, D.R., J.L. Belant. 2011. Comparison of 2 cable neck-restraints with stops to capture coyotes. *Wildlife Society Bulletin* 35:403-408.

2011

González-Maya, J.F., de la Torre, A., Chávez, C., Monroy-Vilchis, O., J.L. Belant. 2011. I simposio ecología conservación de pequeños carnívoros (Felidae, Mustelidae, Procyonidae and Mephitidae) in Mesoamérica. *Mastozología Neotropical* 18:331-338.

2011

Gonzalez-Maya, J.F., A.A. Cepeda, J.L. Belant, D.A. Zarrate-Charry, S.A. Balaguera-Reina, A. Rodriguez-Bolanos. 2011. Research priorities for small carnivores of Colombia. *Small Carnivore Conservation* 44:7-13.

2011

Hiller, T.L., D.R. Etter, J.L. Belant, A.J. Tyre. 2011. Factors affecting harvests of fishers and American martens in northern Michigan. *Journal of Wildlife Management* 75:1399-1405. [Download](#)

2011

Hoffmann, M., J.L. Belant, J.S. Chanson, N.A. Cox, J. Lamoreux, A.S.L. Rodrigues, J. Schipper, S.N. Stuart. 2011. The changing fates of the world's mammals. *Philosophical Transactions of the Royal Society B* 366:2598-2610. [Download](#)

2011

Libal, N.S., J.L. Belant, B.D. Leopold, G. Wang, P.A. Owen. 2011. Despotism and risk of infanticide influence grizzly bear den site selection. *PLoS ONE* 6:e24133. [Download](#)

2011

Martin, J.A., J.L. Belant, T.L. DeVault, L.W. Burger, Jr., B.F. Blackwell, S.K. Riffell, G. Wang. 2011. Wildlife risk to aviation: a multi-scale issue requires a multi-scale solution. *Human-Wildlife Interactions* 5:198-203. [Download](#)

2011

Severud, W.J., J.L. Belant, J.G. Bruggink, S.K. Windels. 2011. Predator cues reduce American beaver use of foraging trails. *Human-Wildlife Interactions* 5:240-249.

2011

Shepherd, C.R., J.L. Belant, C. Breitenmoser-Würsten, N. Duplaix, L.N. Ambu, A. Wilting. 2011. Conservation challenges and opportunities for Borneo's carnivores. *TRAFFIC Bulletin* 23:89-91.

2011

Skalski, J.R., J.J. Millsaugh, M.V. Clawson, J.L. Belant, D.R. Etter, B.J. Frawley, P.D. Friedrich. 2011. Abundance trends of American martens in Michigan based on statistical population reconstruction. *Journal of Wildlife Management* 75:1767-1773. [Download](#)

2011

Svoboda, N.S., J.L. Belant, D.E., Beyer, J.F. Duquette, H.K. Stricker, C.A. Albright. 2011. American black bear predation of an adult white-tailed deer. *Ursus* 22:91-94. [Download](#)

2011

Veine-Smith, A.M., J. Bird, J.L. Belant. 2011. Patterns of endoparasite infections in American martens (*Martes Americana*) of the Upper Peninsula of Michigan. *Comparative Parasitology* 78:225-232. [Download](#)

2010

Belant, J.L., A. Deese. 2010. Importance of wildlife disease surveillance. *Human Wildlife Interactions* 4:14-19. [Download](#)

2010

Belant, J.L., B. Griffith, Y. Zhang, E. Follmann, L. Adams. 2010. Population-level resource selection by sympatric brown and American black bears in Alaska. *Polar Biology* 33:31-40. [Download](#)

2010

Belant, J.L., E.A. Beever, J.E. Gross, J.J. Lawler. 2010. Ecological responses to contemporary climate change within species, communities, and ecosystems. *Conservation Biology* 24:7-9. [Download](#)

2010

Belant, J.L., L. Adams. 2010. Wolves will not provide small-scale ecological restoration. *Bioscience* 60:485. [Download](#)

2010

Belant, J.L., P.J. Allen, B.D. Leopold, D.C. Jackson. 2010. First joint TWS-AFS Symposium: Societies address introductions and reintroductions. *Fisheries* 35(10):496-497.

2010

Gonzalez-Maya, J.F., A.A. Cepeda, D.A. Zarrate-Charry, S.A. Balaguera-Reina, A. Escobedo-Galvan, S. Wyatt, V.B. Arroyo-Pena, J. Schipper, J.L. Belant, M. Gonzalez, B. Polidoro. 2010. Scientific journals for conservation in Latin America: a need and opportunity for the region. *Latin American Journal of Conservation* 1:5-8. [Download](#)

2010

Gonzalez-Maya, J.F., J.L. Belant. 2010. Range extension and sociality of Bushy-tailed Olingo *Bassaricyon gabbii* in Costa Rica. *Small Carnivore Conservation* 43:37-39.

2010

King, D.T., B.F. Blackwell, B. Dorr, J.L. Belant. 2010. Effects of aquaculture on migration and movement patterns of double-crested cormorants. *Human Wildlife Interactions* 4:77-86.

[Download](#)

2010

King, D.T., B.K. Strickland, J.L. Belant. 2010. Sex and age bias in American White Pelican captured and collected on wintering grounds. *Waterbirds* 33:546-549. [Download](#)

2010

King, D.T., J.L. Belant, J.B. Harrel, J.F. Glahn. 2010. Superabundant food at catfish aquaculture facilities improves body condition in American white pelicans. *Waterbirds* 33:221-227. [Download](#)

2010

Sharma, H.P., J.L. Belant. 2010. Threats and conservation of red pandas in Dhorpatan Hunting Reserve, Nepal. *Human Dimensions of Wildlife* 15:299-300. [Download](#)

2010

Wang, G., R.B. Minnis, J.L. Belant, C.L. Wax. 2010. Dry weather induces outbreaks of human West Nile virus infections. *BMC Infectious Diseases* 10:38. [Download](#)

2009

Belant, J.L. 2009. Effects of antenna orientation and vegetation on global positioning system telemetry collar performance. *Northeastern Naturalist* 16:577-584.

2009

Belant, J.L., J. Schipper, J. Conroy. 2009. Conservation status of small carnivores in the Americas. *Small Carnivore Conservation* 41:3-8.

2009

Hales, A., J.L. Belant, J. Bird. 2009. Effects of sex and age on early-winter diet in the American Marten. *Ohio Journal of Science* 108:60-64.

2009

Schipper, J., K.M. Helgen, J.L. Belant, J. Gonzalez-Maya, E. Eizirik, M. Tsuchiya-Jerep. 2009. Small carnivores in the Americas: reflections, future research and conservation priorities. *Small Carnivore Conservation* 41:1-2.

2009

Sharma, H.P., J.L. Belant. 2009. Distribution and observations of red pandas (*Ailurus fulgens fulgens*) in Dhorpatan Hunting Reserve, Nepal. *Small Carnivore Conservation* 40:33-35.

2008

Abramov, A., J. Belant, C. Wozencraft. 2008. *Gulo gulo*. IUCN Red List of Threatened Species. Gland, Switzerland. [Download](#)

2008

Belant, J.L., P. Gober, D. Biggins. 2008. *Mustela nigripes*. IUCN Red List of Threatened Species, Gland, Switzerland. [Download](#)

2008

Islam, M.A., C.W. Chowdhury, J.L. Belant. 2008. First record of the large-toothed ferret badger *Melogale personata* in Bangladesh. *Small Carnivore Conservation* 39:41-42.

2008

Lindsay, A.R., J.L. Belant. 2008. A new PCR-based technique for identifying the sex of white-tailed deer (*Odocoileus virginianus*). *Conservation Genetics* 9(2):443-447. [Download](#)

2008

Romanski, M.C., J.L. Belant. 2008. History and status of American marten on Isle Royale National Park, USA. *Small Carnivore Conservation* 39:11-18.

2008

Schipper, J., W. Duckworth, J.L. Belant. 2008. Small carnivores, red listing, and *Small Carnivore Conservation*. *Small Carnivore Conservation* 38:1.

NAME Mark S. Boyce

ADDRESS

Department of Biological Sciences
University of Alberta
Edmonton, AB T6G 2E9
Canada

PHONE

Office: (780)492-0081
Home: b(6)
Fax: (780)492-9234
Cell: b(6)

e-mail: boyce@ualberta.ca

EDUCATION

1977	Ph.D., Yale University, New Haven, Connecticut.
1975	M.Phil., Yale University, New Haven, Connecticut.
1974	M.S., University of Alaska, Fairbanks.
1972	B.S., Iowa State University, Ames.

ACADEMIC POSITIONS

Professor of Ecology, and Alberta Conservation Association Chair in Fisheries and Wildlife, 1999-present (Endowed Chair renewed 2012 July 1), Department of Biological Sciences, University of Alberta, Edmonton.

Vallier Chair of Ecology, and Wisconsin Distinguished Professor (UW-System), 1993-1999, College of Natural Resources, University of Wisconsin, Stevens Point.

Professor, 1987-1993, Department of Zoology and Physiology, University of Wyoming, Laramie.

Associate Professor, 1981-1987, Department of Zoology and Physiology, University of Wyoming, Laramie.

Visiting Professor, 1984-1985, Department of Mathematics, University of Wyoming, Laramie.

Postdoctoral Research Fellow, 1982-1983, Animal Ecology Research Group, Department of Zoology, University of Oxford.

Assistant Professor, 1977-1981, Department of Zoology and Physiology, University of Wyoming, Laramie.

Instructor, 1976-77, Department of Zoology and Physiology, University of Wyoming, Laramie.

HONORS AND AWARDS

ASTech Award, Outstanding Leadership in Alberta Science, 2014, Alberta Science and Technology Leadership Foundation, October.
Fellow, Royal Society of Canada, Notified 2014 June; inducted 2014 November.
President's Award, 2014, Safari Club International, April.
Emerald Award, 2013, Montane Research Program, Province of Alberta, June.
Publication of the Year Award, 2013, Alberta Chapter of The Wildlife Society, March.
TWS Fellow, life-time award, 2012, The Wildlife Society, Bethesda, Maryland, USA, October.
Best Wildlife Publication Award "Popular Category," 2012, Alberta Chapter of The Wildlife Society, March.
Killam Annual Professorship, 2011-12, University of Alberta.
Publication of the Year Award, 2011, Alberta Chapter of The Wildlife Society.
Award of Merit, 2010, Alberta Trappers Association.
William Rowan Distinguished Service Award, 2008, The Wildlife Society.
International Conservationist of the Year, 2007, Safari Club International Foundation, Washington, D.C.
Erskine Fellowship, 1999, Canterbury University, Christchurch, New Zealand.
Phi Kappa Phi, 1998, University of Wisconsin-Stevens Point.
University Scholar Award, 1996, University of Wisconsin-Stevens Point.
Chancellor's Merit Award, 1996, University of Wisconsin-Stevens Point.
Faculty Scholar Award, 1994, Sigma Xi-University of Wisconsin-Stevens Point Chapter.
Distinguished Professorship, 1993, 1999 University of Wisconsin System, Madison.
Vallier Chair of Ecology, 1993, University of Wisconsin-Stevens Point.
Outstanding Research Merit Award, 1993, College of Arts and Sciences, Univ. Wyoming.
Fulbright Scholar to India, 1992, U.S. Educational Foundation in India, Bangalore.
Senior Research Fellow, 1991-92, American Institute of Indian Studies, Bangalore.
Kuehn Professorship Award, 1984-85, College of Arts and Sciences, University of Wyoming.
N.A.T.O. Postdoctoral Fellowship, 1982-83, National Science Foundation, Univ. Oxford, UK.
Academy Exchange to Poland, 1982, National Academy of Sciences, Jagiellonian University.
Outstanding Achievement Award, 1974, University of Alaska, Fairbanks.

SABBATICALS

2010-11, University of Queensland, Brisbane, AUSTRALIA;
Imperial College London, Silwood Park, U.K.

2003-04, University of British Columbia, Vancouver, CANADA.

1991-92, Fulbright Fellow/American Institute of Indian Studies, Centre for Ecological Sciences and Centre for Theoretical Studies, Indian Institute of Science, Bangalore, INDIA.

1982-83, NATO Postdoctoral Fellowship, Department of Zoology, University of Oxford, U.K.

OTHER POSITIONS

1989-1993, Director, UW-National Park Service Research Center, University of Wyoming.

PUBLICATIONS

Books:

- Boyce, M. S., and A. Haney. 1997. *Ecosystem Management: Applications for Sustainable Forest and Wildlife Resources*. Yale University Press, New Haven, Conn. 361pp.
- Thorne, E. T., M. S. Boyce, P. Nicoletti, and T. J. Kreeger (eds.). 1997. *Brucellosis, Bison, elk, and Cattle in the Greater Yellowstone Area: Defining the Problem, Exploring the Solutions*. Wyoming Game and Fish Department, Cheyenne, Wyo. 219pp.
- Keiter, R. B., and M. S. Boyce. 1991. *The Greater Yellowstone Ecosystem: Redefining America's Wilderness Heritage*. Yale University Press, New Haven, Conn. 425pp.
- Boyce, M. S. 1989. *The Jackson Elk Herd: Intensive Wildlife Management in North America*. Cambridge University Press, Cambridge, U.K., 305 pp.
- Boyce, M. S., ed. 1988. *Evolution of Life Histories of Mammals*. Yale Univ. Press, New Haven, Conn., 373 pp.
- Boyce, M. S., and L. D. Hayden-Wing. 1979. *North American Elk: Ecology, Behavior and Management*. Univ. Wyoming, Laramie, 294pp.

Scientific Articles:

- Avgar, T., and M. S. Boyce. 2016. Relative Selection Strength: quantifying effect size in resource- and step-selection inference. *Meth. Ecol. Evol.* (submitted).
- Ladle, A., T. Avgar, M. Wheatley, and M. S. Boyce. 2016. Predictive modeling of ecological patterns along linear-feature networks. *Meth. Ecol. Evol.* (submitted).
- Boyce, M. S., and R. Corrigan. 2016. Moose survey app for population monitoring. *Wildl. Soc. Bull.* (submitted).
- Boyce, M. S., and P. Krausman. 2016. Management of mountain sheep in North America. *J. Wildl. Manage.* (Invited Special Feature).
- Boyce, M. S. 2016. Global conservation for ungulates. *J. Mammal.* (invited).
- Thurfjell, H., S. Ciuti, and M. S. Boyce. 2016. Learning from the mistakes of others: group living female elk (*Cervus elaphus*) adjusting their behaviour with age to avoid hunters. *PLoS One* (submitted).
- Christie, K., W. Jensen, and M. S. Boyce. 2016. Linking habitat selection, reproduction, and density in a Great Plains herbivore. *J. Wildl. Manage.* (submitted).
- Krawchuk, K. E., K. H. Knopff, N. F. Webb, P. J. Jones, M. S. Boyce, and E. H. Merrill. 2016. Is niche separation between wolves (*Canis lupus*) and cougars (*Puma concolor*) realized in the Rocky Mountains of Canada? *Can. J. Zool.* (under revision).
- Morehouse, A., T. Graves, and M. S. Boyce. 2016. Nature vs. Nurture: Evidence for social learning of conflict behaviour in grizzly bears. *PLoS One* (submitted).
- Morehouse, A., and M. S. Boyce. 2016. Omnivores are troublemakers: conflicts with humans in a diverse assemblage of large carnivores. *Anim. Conserv.* (revision submitted).

- Morehouse, A., and M. S. Boyce. 2016. Male dominance interferes with intercept feeding of grizzly bears. *Wildl. Biol.* (submitted).
- Cristescu, B., G. B. Stenhouse, M. Symbaluk, S. E. Nielsen, and M. S. Boyce. 2016. Wildlife habitat selection in relation to landscape disturbance through open-pit mining. *Environ. Conserv.* (revision submitted).
- Benz, R., M. S. Boyce, H. Thurfjell, D. G. Paton, M. Musiani, C. Dormann, and S. Ciuti. 2016. Dispersal ecology of young male ungulates (*Cervus elaphus*) for designing large-scale wildlife corridors. *PLoS One* (submitted).
- Morehouse, A., and M. S. Boyce. 2016. Grizzly bears without borders: spatially explicit capture recapture in southwestern Alberta. *J. Wildl. Manage.* (in press).
- Salari, A., M. Zakaria, and M. S. Boyce. 2016. Habitat use by two tropical waterfowl in central Malaysia. *Wildfowl* (in press).
- Cristescu, B., G. B. Stenhouse, B. Goski, and M. S. Boyce. 2016. Grizzly bear space use and fitness in relation to human habitation and access. *Human Wildl. Interact.* (in press).
- Boyce, M. S., A. Derocher, and D. L. Garshelis. 2016. *Scientific review of grizzly bear harvest management system in British Columbia*. British Columbia Ministry of Forests, Lands and Natural Resource Operations, Victoria. 56 pp.
- Bacon, M. M., and M. S. Boyce. 2016. Landscape of fear for naïve prey: ungulates flee protected area to avoid a re-established predator. *Can. Wildl. Biol. Manage.* (in press).
- Gilbert, S. L., K. J. Hundertmark, D. K. Person, M. S. Lindberg, and M. S. Boyce. 2016. Behavioral plasticity in a variable environment: snow depth and habitat interactions drive deer movement in winter. *J. Mammal.* (in press).
- Cristescu, B., G. B. Stenhouse, and M. S. Boyce. 2016. Large omnivore movements in response to surface mining and mine reclamation. *Scientific Reports* 6:19177, doi: 10.1038/srep19177.
- Avgar, T., J. R. Potts, M. A. Lewis, and M. S. Boyce. 2016. Integrated step selection analysis: bridging the gap between resource selection and animal movement. *Methods Ecol. Evol.* doi: 10.1111/2041-210X.12528.
- Boyce, M. S., C. J. Johnson, E. H. Merrill, S. E. Nielsen, E. J. Solberg, and B. Van Moorter. 2016. Can habitat selection predict abundance? *J. Anim. Ecol.* **85**:11-20.
- Seidel, D., and M. S. Boyce. 2016. Varied tastes: home range implications of foraging patch selection. *Oikos* **125**:39–49.
- Christie, K., W. F. Jensen, J. H. Schmidt, and M. S. Boyce. 2015. Long-term changes in pronghorn abundance linked to climate and oil development in North Dakota. *Biol. Conserv.* **192**:445–453.
- Ciuti, S., W. Jensen, S. E. Nielsen, and M. S. Boyce. 2015. Predicting mule deer recruitment from climate oscillations for harvest management on the northern Great Plains. *J. Wildl. Manage.* **79**(8):1226–1238.
- Morrison, C. D., M. S. Boyce, and S. E. Nielsen. 2015. Space-use, movement and dispersal of sub-adult cougars in a geographically isolated population. *PeerJ* **3**:e1118; doi: 10.7717/peerj.1118.
- Cristescu, B., G. B. Stenhouse, and M. S. Boyce. 2015. Grizzly bear diet shifting on reclaimed lands. *Global Ecol. & Conserv.* **4**: 207-220.
- Seidel, D., and M. S. Boyce. 2015. Patch-use dynamics by a large herbivore. *Movement Ecol.* **3**:7 doi: 10.1186/s40462-015-0035-8.

- Proctor, M. F., S. E. Nielsen, W. F. Kasworm, C. Servheen, T. G. Radandt, A. G. MacHutchon, and M. S. Boyce. 2015. Grizzly bear connectivity mapping in the Canada-US trans-border region. *J. Wildl. Manage.* **79**:544-558. doi: 10.1002/jwmg.862. Featured paper.
- Cristescu, B., G. B. Stenhouse, and M. S. Boyce. 2015. Predicting multiple behaviors from GPS radiocollar cluster data. *Behav. Ecol.* **26**(2): 452–464. Cover feature.
- Morrison, C., M. S. Boyce, S. E. Nielsen, and M. M. Bacon. 2014. Habitat selection of a re-colonized cougar population in response to seasonal fluctuations of human activity. *J. Wildl. Manage.* **78**(8):1394-1403.
- Knopff, A. A., K. H. Knopff, M. S. Boyce, and C. C. St. Clair. 2014. Flexible habitat selection by cougars in response to anthropogenic development. *Biol. Conserv.* **178**:136–145.
- Ensing, E. P., S. Ciuti, F. A. L. M. de Wijs, D. H. Lentferink, A. ten Hoedt, M. S. Boyce, and R. A. Hut. 2014. GPS based daily activity patterns in European red deer and North American elk (*Cervus elaphus*): indication for a weak circadian clock in ungulates. *PLoS One* **9**(9):e106997.
- Privot, M., D. Seidel, S. Kutz, M. Musiani, A. Massolo, M. S. Boyce, and K. Orsel. 2014. What attracts elk onto cattle pasture? Implications for inter-species disease transmission. *Prev. Vet. Med.* **117**(2):326-339.
- Erickson, M. E., C. Found-Jackson, and M. S. Boyce. 2014. Using latent selection difference to model persistence in a declining population. *PLoS One* **9**(5): e98126. doi:10.1371/journal.pone.0098126.
- Killeen, J., H. Thurfjell, S. Ciuti, D. Paton, M. Musiani, and M. S. Boyce. 2014. Habitat selection during ungulate dispersal at broad and fine scale with implications for conservation management. *Movement Ecol.* **2**:15 (doi:10.1186/s40462-014-0015-4).
- Salari, A., M. Zakaria, C. C. Nielsen, and M. S. Boyce. 2014. Quantifying tropical wetlands using field surveys, spatial statistics and remote sensing. *Wetlands* **34**:565–574 (doi: 10.1007/s13157-014-0524-3).
- Cristescu, B., G. B. Stenhouse, and M. S. Boyce. 2014. Grizzly bear ungulate consumption and the relevance of prey size to caching and meat sharing. *Anim. Behav.* **92**: 133–142.
- Cristescu, B., G. B. Stenhouse, and M. S. Boyce. 2013. Perception of human-derived risk influences choice at top of the food chain. *PLoS ONE* **8**(12): e82738.
- Knopff, K. H., N. Webb, and M. S. Boyce. 2014. Cougar population status and range expansion in Alberta during 1991-2010. *Wildl. Soc. Bull.* **38**:116–121.
- Thurfjell, H., S. Ciuti, and M. S. Boyce. 2014. Applications of step-selection functions in ecology and conservation. *Movement Ecol.* **2**:4, pp. 1–12 (doi:10.1186/2051-3933-2-4).
- Lele, S. R., E. H. Merrill, J. Keim, and M. S. Boyce. 2013. Selection, choice, use, and occurrence: clarifying concepts in resource selection studies. *J. Anim. Ecol.* **82**:1183–1191.
- Cristescu, B., and M. S. Boyce. 2013. Focusing ecological research for conservation. *Ambio* **42**:805–815.
- Morehouse, A. T., and M. S. Boyce. 2013. Deviance from truth: telemetry location errors erode both precision and accuracy of habitat-selection models. *Wildl. Soc. Bull.* **37**:596–602 (doi: 10.1002/wsb.292).
- Latham, A. D. M., M. C. Latham, M. S. Boyce, and S. Boutin. 2013. Spatial relationships of sympatric wolves (*Canis lupus*) and coyotes (*C. latrans*) with woodland caribou (*Rangifer tarandus caribou*) during the calving season in a human-modified boreal landscape. *Wildl. Res.* **40**:250–260.

- Muhly, T., M. Hebblewhite, M. S. Boyce, D. Paton, J. A. Pitt, and M. Musiani. 2013. Humans strengthen bottom-up effects and weaken trophic cascades in a terrestrial food web. *PLoS ONE* **8**(5): e64311. doi:10.1371/journal.pone.0064311.
- Nielsen, S., A. Shafer, M. S. Boyce, and G. B. Stenhouse. 2013. Does learning or instinct shape habitat selection? *PLoS ONE* **8**(1): e53721. doi:10.1371/journal.pone.0053721.
- Bird, K. L., C. L. Aldridge, J. E. Carpenter, C. A. Paszkowski, M. S. Boyce, and D. W. Coltman. 2013. The secret sex lives of sage-grouse: multiple paternity and intraspecific nest parasitism revealed through genetic analysis. *Behav. Ecol.* **24**:29-38.
- Boyce, M. S., P. Baxter, and H. Possingham. 2012. Managing moose harvests by the seat of your pants. *Theor. Popul. Biol.* **82**:340–347 (doi: 10.1016/j.tpb.2012.03.002).
- McDonald, L. L., W. P. Erickson, M. S. Boyce, and J. R. Alldredge. 2012. Modelling vertebrate use of terrestrial resources. Chapter 17, Pages 410-428 in N. J. Silvy, editor. *The Wildlife Techniques Manual: Volume 1: Research*, 7th edition. Johns Hopkins University Press, Baltimore, Maryland, USA.
- Ciuti, S., J. M. Northrup, T. B. Muhly, S. Simi, M. Musiani, J. A. Pitt, and M. S. Boyce. 2012. Effects of humans on behaviour of wildlife exceed those of natural predators in a landscape of fear. *PLoS ONE* **7**(11): e50611 (doi:10.1371/journal.pone.0050611).
- Ciuti, S., T. B. Muhly, D. G. Paton, A. D. McDevitt, M. Musiani, and M. S. Boyce. 2012. Human selection of elk behavioural traits in a landscape of fear. *Proc. R. Soc. B* **279**: 4407–4416. (doi:10.1098/rspb.2012.1483).
- Yates, G., and M. S. Boyce. 2012. Animal dispersal. Pages 188-192 in A. Hastings and L. J. Gross, eds., *Encyclopedia of Theoretical Ecology*. University of California Press, Berkeley.
- Northrup, J. M., J. Pitt, T. B. Muhly, G. B. Stenhouse, M. Musiani, and M. S. Boyce. 2012. Vehicle traffic shapes grizzly bear behaviour on a multiple-use landscape. *J. Appl. Ecol.* **49**: 1159–1167 (doi: 10.1111/j.1365-2664.2012.02180.x).
- Shafer, A. B. A., J. M. Northrup, K. S. White, M. S. Boyce, S. D. Côté, and D. W. Coltman. 2012. Habitat selection predicts genetic relatedness in an alpine ungulate. *Ecology* **93**(6): 1317–1329.
- Boyce, M. S., K. H. Knopff, J. Northrup, J. Pitt, and L. S. Vors. 2012. Harvest models and climate change. Pages 293–306 In *Conserving wildlife populations in a changing climate*. Editors: J. Brodie, E. Post, and D. Doak. University of Chicago Press, Chicago, Ill.
- Northrup, J. M., and M. S. Boyce. 2012. Mad cow policy and management of grizzly bear incidents. *Wildl. Soc. Bull.* **36**(3):499–505 (doi: 10.1002/wsb.167).
- Boyce, M. S. 2012. Book Review: Dynamics of large herbivore populations in changing environments. *J. Wildl. Manage.* **76**(7):1523(doi: 10.1002/jwmg.431).
- Northrup, J. M., G. B. Stenhouse, and M. S. Boyce. 2012. Agricultural lands as ecological traps for grizzly bears. *Anim. Conserv.* **15**: 369–377 (doi:10.1111/j.1469-1795.2012.00525.x).
- Boutin, S., M. S. Boyce, D. Seip, D. Latham, J. Nagy, and D. Hervieux. 2012. Why are caribou declining in the Oil Sands? *Frontiers Ecol. Environ.* **10**:65–67.
- Boyce, M. S. 2012. Wildlife ecology. *Oxford Bibliographies in Ecology*. Ed. D. Gibson. Oxford University Press, New York. (www.oxfordbibliographies.com/view/document/obo-9780199830060/obo-9780199830060-0002.xml)
- Proctor, M., D. Paetkau, B. McLellan, G. Stenhouse, K. Kendall, R. Mace, W. Kasworm, C. Servheen, C. Lausen, M. Gibeau, W. Wakkinen, M. Haroldson, G. Mowat, C. Apps, L. Ciarniello, R. Barclay, M. S. Boyce, C. C. Schwartz, and C. Strobeck. 2012. Population

- fragmentation and inter-ecosystem movements of grizzly bears in western Canada and the northern USA. *Wildl. Monogr.* **180**.
- Cristescu, B., G. Stenhouse, M. Symbaluk, and M. S. Boyce. 2012. Ecological effects of mine reclamation on grizzly bears. Proceedings of the 36th annual British Columbia mine reclamation symposium, Kamloops BC, September 17-20, 2012. British Columbia Technical and Research Committee on Reclamation. Bitech Publishers Ltd., Richmond, BC.
- Gates, C. C., P. Jones, M. Sutor, A. Jakes, M. S. Boyce, and K. Kunkel. 2012. The influence of land use and fences on habitat effectiveness, movements and distribution of pronghorn in grasslands of North America. Pages 277–294 in M. J. Somers and M. W. Hayward, editors. *Fencing for conservation: restriction of evolutionary potential or a riposte to threatening processes?* Springer, New York, 320pp.
- Bacon, M. M., G. M. Becic, M. T. Epp, and M. S. Boyce. 2011. Do GPS clusters really work? Carnivore diet from scat analysis and GPS telemetry methods. *Wildl. Soc. Bull.* **35**:409–415.
- Latham, A. D. M., M. C. Latham, M. S. Boyce, and S. A. Boutin. 2011. Movement responses by wolves to industrial linear features and its effect on woodland caribou in northeastern Alberta. *Ecol. Appl.* **21**: 2854–2865.
- Cristescu, B., G. B. Stenhouse, M. Symbaluk, and M. S. Boyce. 2011. Land-use planning following resource extraction—lessons from grizzly bears at reclaimed and active open pit mines. Pages 207–217 in A. B. Fourie, M. Tibbett and A. Beersing (eds.). *Mine Closure 2011*. Australian Centre for Geomechanics, Perth.
- Morehouse, A. T., and M. S. Boyce. 2011. From venison to beef: seasonal changes in wolf diet composition in a livestock grazing landscape. *Frontiers Ecol. Environ.* **9**:440–445.
- Romme, W. H., M. S. Boyce, B. Gresswell, E. H. Merrill, W. Minshall, C. Whitlock, and M. G. Turner. 2011. Twenty years after the 1988 Yellowstone fires: Lessons about disturbance and ecosystems. *Ecosystems* **14**:1196–1215 (doi: 10.1007/s10021-011-9470-6).
- Estay, S. A., A. A. Albornoz, M. Lima, M. S. Boyce, and N. C. Stenseth. 2011. A simultaneous test of synchrony causal factors in muskrat and mink fur returns at different scales across Canada. *PLoS One* **6**(11): e27766. (doi:10.1371/journal.pone.0027766).
- Found, R., and M. S. Boyce. 2011. Warning signs mitigate deer-vehicle collisions in an urban area. *Wildl. Soc. Bull.* **35**:291–295.
- Found, R., and M. S. Boyce. 2011. Predicting deer-vehicle collisions in an urban area. *J. Environ. Manage.* **92**: 2486–2493.
- Latham, A. D. M., M. C. Latham, and M. S. Boyce. 2011. Habitat selection and spatial relationships of black bears (*Ursus americanus*) with woodland caribou (*Rangifer tarandus caribou*) in northeastern Alberta. *Can. J. Zool.* **89**: 267–277.
- Cristescu, B., and M. S. Boyce. 2011. Can grizzly bears persist on a landscape shared with mining? *BIOS* **26**(2):7.
- Bush, K. L., C. K. Dyte, B. J. Moynahan, C. L. Aldridge, H. S. Sauls, A. M. Battazzo, B. L. Walker, K. E. Doherty, J. Tack, J. Carlson, D. Eslinger, J. Nicholson, M. S. Boyce, D. E. Naugle, C. A. Paszkowski, D. W. Coltman. 2010. Population structure and genetic diversity of greater sage-grouse (*Centrocercus urophasianus*) in fragmented landscapes at the northern edge of their range. *Conserv. Genet.* **12**:527–542.

- Bacon, M. M., and M. S. Boyce. 2010. Scavenging of an elk, *Cervus elaphus*, carcass by multiple cougars, *Puma concolor*, in Southeastern Alberta. *Can. Field-Natur.* **124**(3): 242–245.
- Carpenter, J., C. L. Aldridge, and M. S. Boyce. 2010. Sage-grouse habitat selection during winter in Alberta. *J. Wildl. Manage.* **74**(8):1806–1814.
- Boyce, M. S. 2010. Presence-only data, pseudo-absences, and other lies about habitat selection. *Ideas in Ecol. & Evol.* **3**:26–27.
- Cristescu, B., and M. S. Boyce. 2010. Grizzly bears and mining: rationale and objectives of a study on the effects of industry on bears. *Intern. Bear News* **19**(2):20–22.
- Roever, C., M. S. Boyce, and G. B. Stenhouse. 2010. Grizzly bear movements relative to roads: application of step selection functions. *Ecography* **33**: 1113–1122 (doi: 10.1111/j.1600-0587.2010.06077.x).
- Cagnacci, F., L. Boitani, R. A. Powell, and M. S. Boyce. 2010. Animal ecology meets GPS-based radiotelemetry: a perfect storm of opportunities and challenges. *Phil. Trans. R. Soc. B* **365**(1550): 2157–2162.
- Fieberg, J., J. Matthiopoulos, M. Hebblewhite, M. S. Boyce, and J. L. Frair. 2010. Correlation and studies of habitat selection: problem, red herring, or opportunity? *Phil. Trans. R. Soc. B* **365**(1550): 2233–2244.
- Boyce, M. S., J. A. Pitt, J. M. Northrup, A. Morehouse, K. H. Knopff, B. Cristescu, and G. B. Stenhouse. 2010. Temporal autocorrelation functions for movement rates from global positioning system radiotelemetry data. *Phil. Trans. R. Soc. B* **365**(1550):2213–2219.
- Knopff, K. H., A. A. Knopff, and M. S. Boyce. 2010. Cougar kill rate and prey composition in a multi-prey system. *J. Wildl. Manage.* **74**: 1435–1447 (doi: 10.2193/2009-314).
- Avila-Flores, R., S. Boutin, and M. S. Boyce. 2010. Habitat selection by black-tailed prairie dogs in a disturbed landscape at the edge of their geographic range. *J. Wildl. Manage.* **74**(5):945–953 (doi: 10.2193/2008-503).
- Nielsen, S. E., G. McDermid, G. B. Stenhouse, and M. S. Boyce. 2010. Dynamic wildlife habitat models: seasonal foods and mortality risk predict occupancy-abundance and habitat selection in grizzly bears. *Biol. Conserv.* **143**:1623–1634.
- Knopff, K. H., A. A. Knopff, and M. S. Boyce. 2010. Scavenging makes cougars susceptible to snaring at wolf bait stations. *J. Wildl. Manage.* **74**:644–653.
- Merrill, E. H., and M. S. Boyce. 2010. Tri-trophic interactions: Is the northern range elk less variable with wolves and fire? In *The Yellowstone Fires and Beyond. Tall Timbers Research Misc. Publications*. **2010**:154.
- Robichaud, C. B., and M. S. Boyce. 2010. Spatial and temporal patterns of wolf harvest on registered traplines in Alberta, Canada. *J. Wildl. Manage.* **74**:635–643.
- Bush, K. L., C. L. Aldridge, J. E. Carpenter, C. A. Paszkowski, M. S. Boyce, and D. W. Coltman. 2010. Birds of a feather do not always lek together: genetic diversity and kinship structure of Greater Sage-Grouse (*Centrocercus urophasianus*) in Alberta. *Auk* **127**:343–353.
- Muhly, T. B., M. Alexander, M. S. Boyce, R. Creasey, M. Hebblewhite, D. Paton, J. A. Pitt, and M. Musiani. 2010. Differential risk effects of wolves on wild versus domestic prey have consequences for conservation. *Oikos* **119**:1243–1254 (doi: 10.1111/j.1600-0706.2009.18350.x)
- Anderson, C. R., Jr., F. Lindzey, K. H. Knopff, M. G. Jalkotzy, and M. S. Boyce. 2010. Cougar management in North America. Pages 41-54 In M. Hornocker, S. Negri and A.

- Rabinowitz (eds.) *Cougar: ecology and conservation*. University of Chicago Press, Chicago, Ill.
- Boyce, M. S. 2010. Carnivore conservation. Page 45–72 In N. S. Sodhi and P. R. Ehrlich (eds.) *Conservation biology for all*. Oxford University Press, Oxford, UK.
- Xu, C. L., and M. S. Boyce. 2010. Optimal harvesting of moose in Alberta. *Alces* **46**: 15–35.
- Schwab, C., B. Cristescu, M. S. Boyce, G. Stenhouse, and M. Gänzle. 2009. Bacterial populations and metabolites in the scat of free roaming and captive grizzly bears. *Can. J. Microbiol.* **55**:1335–1346.
- Ciarniello, L., M. S. Boyce, D. R. Seip, and D. C. Heard. 2009. Comparison of grizzly bear *Ursus arctos* demographics in wilderness mountains versus a plateau with resource development. *Wildl. Biol.* **15**:247–265.
- Vors, L. S., and M. S. Boyce. 2009. Global declines of caribou and reindeer. *Global Change Biol.* **15**:2626–2633.
- Chetkiewicz, C.-L. B., and M. S. Boyce. 2009. Use of resource selection functions to identify conservation corridors. *J. Appl. Ecol.* **46**:1036–1047.
- Boyce, M. S., E. H. Merrill, and A. R. E. Sinclair. 2009. Managing the biosphere: Wildlife management. Pages 695–700 In: *The Princeton Guide to Ecology*. Edited by S. A. Levin. Princeton University Press, Princeton, New Jersey, USA.
- Shier, C., and M. S. Boyce. 2009. Mink prey diversity correlates with mink-muskrat dynamics. *J. Mammal.* **90**:897–905.
- Webb, S. M., and M. S. Boyce. 2009. Marten fur harvests and landscape change in west-central Alberta. *J. Wildl. Manage.* **73**:894–903.
- Van Moorter, B., D. Visscher, S. Benhamou, L. Börger, M. S. Boyce, and J. M. Gaillard. 2009. Memory keeps you at home: a mechanistic model for home range emergence. *Oikos* **118**: 641–652.
- Boyce, M. S. 2009. Managing bison in Yellowstone: Preserving the final remnant of the Great Plains herds. Pages 762–763 in D. W. Macdonald, ed. *The Princeton Encyclopedia of Mammals*. Princeton University Press, Princeton, NJ.
- Holmengen, N., K. L. Seip, M. S. Boyce, and N. Chr. Stenseth. 2009. Predator-prey coupling: interaction between mink *Mustela vison* and muskrat *Ondatra zibethicus* across Canada. *Oikos* **118**: 440–448.
- Knopff, K. H., A. A. Knopff, M. B. Warren, and M. S. Boyce. 2009. Evaluating Global Positioning System telemetry techniques for estimating cougar predation parameters. *J. Wildl. Manage.* **73**:586–597.
- Millsaugh, J. J., J. R. Skalski, R. L. Townsend, D. R. Diefenbach, M. S. Boyce, L. P. Hansen, and K. Kammermeyer. 2009. An evaluation of sex-age-kill (SAK) model performance. *J. Wildl. Manage.* **73**: 442–451.
- St. Clair, C. C., and M. S. Boyce. 2009. Icy insights from emperor penguins. *Proc. Natl. Acad. Sci.* **106**:1691–1692.
- Van Moorter, B., J. M. Gaillard, P. McLoughlin, D. Delorme, F. Klein, and M. S. Boyce. 2009. Maternal and individual effects in selection of bed sites on fawn survival. *Oecologia* **159**:669–678.
- Xu, C., and M. S. Boyce. 2009. Oil sardine (*Sardinella longiceps*) off the Malabar Coast: density dependence and environmental effects. *Fish. Oceanogr.* **18**:359–370.
- Aldridge, C. L., and M. S. Boyce. 2008. Assessing occurrence and fitness for persistence: a case study of greater sage-grouse brood habitat. *Israel J. Ecol. Evol.* **54**: 389–419.

- Aldridge, C. L., S. E. Nielsen, H. L. Beyer, M. S. Boyce, J. W. Connelly, S. T. Knick, and M. A. Schroeder. 2008. Range-wide patterns of greater sage-grouse persistence. *Div. & Distr.* **19**:983–994.
- Allen, J. R., L. McInenly, E. H. Merrill, and M. S. Boyce. 2008. Using resource selection functions to improve estimation of elk population numbers. *J. Wildl. Manage.* **72**:1798–1804.
- Found, C., S. M. Webb, and M. S. Boyce. 2008. Selection of lake habitats by waterbirds in the boreal transition zone of northeastern Alberta. *Can. J. Zool.* **86**:277–286.
- Lingle, S., A. Feldman, M. S. Boyce, and W. F. Wilson. 2008. Prey behavior, age-dependent vulnerability and predation rates. *Am. Nat.* **172**: 712–725.
- Morris, D. W., R. Clark, and M. S. Boyce. 2008. Habitat and habitat selection: theory, tests, and implications. *Israel J. Ecol. Evol.* **54**: 287–294.
- Morris, W. F., C. A. Pfister, S. D. Tuljapurkar, C. V. Haridas, C. Boggs, M. S. Boyce, E. Bruna, D. R. Church, T. Coulson, D. F. Doak, S. Forsyth, J.-M. Gaillard, C. Horvitz, S. Kalisz, B. Kendall, T. Knight, C. Lee, and E. Menges. 2008. Longevity can buffer plant and animal populations against changing climatic variability. *Ecology* **89**:19–25.
- Nielsen, S. E., G. B. Stenhouse, H. L. Beyer, F. Huettmann, and M. S. Boyce. 2008. Can natural disturbance-based forestry rescue a declining population of grizzly bears? *Biol. Conserv.* **141**:2193–2207.
- Roever, C., M. S. Boyce, and G. B. Stenhouse. 2008. Grizzly bears and forestry I: Road vegetation and placement as an attractant to grizzly bears. *For. Ecol. Manage.* **256**:1253–1261.
- Roever, C., M. S. Boyce, and G. B. Stenhouse. 2008. Grizzly bears and forestry II: Grizzly bear habitat selection and conflicts with road placement. *For. Ecol. Manage.* **256**:1262–1269.
- Webb, S. M., D. J. Davidson, and M. S. Boyce. 2008. Trapper attitudes and industrial development on registered traplines in west-central Alberta. *Human Dimen. Wildl.* **13**:115–126.
- Wiens, T., B. Dale, M. S. Boyce, and P. Kershaw. 2008. Three way *k*-fold cross-validation of logistic regression models. *Ecol. Modelling* **212**:244–255.
- Beyer, H. L., E. H. Merrill, N. Varley, and M. S. Boyce. 2007. Willow on Yellowstone's northern range: evidence for a trophic cascade? *Ecol. Appl.* **17**: 1563–1571.
- Boyce, M. S., S. P. Rushton, and T. Lynam. 2007. Does modelling have a role in conservation? Pages 134-144 in D. W. Macdonald and K. Service (editors), *Key Topics in Conservation Biology*. Oxford University Press, Oxford, U.K.
- Ciarniello, L., M. S. Boyce, D. R. Seip, and D. C. Heard. 2007. Grizzly-bear habitat selection is scale dependent. *Ecol. Appl.* **17**:1424–1440.
- Ciarniello, L., M. S. Boyce, D. Heard, and D. Seip. 2007. Components of grizzly bear habitat selection: density, habitats, roads, and mortality risk. *J. Wildl. Manage.* **71**:1446–1457.
- Czetwertynski, S. M., M. S. Boyce, and F. Schmiegelow. 2007. Effects of hunting on demographic parameters of American black bears. *Ursus* **18**:1–18.
- Forester, J. D., A. R. Ives, M. G. Turner, D. P. Anderson, D. Fortin, H.L. Beyer, D. W. Smith, and M. S. Boyce. 2007. State-space models link elk movement to landscape characteristics in Yellowstone National Park. *Ecol. Monogr.* **77**:285–299.
- Frair, J. L., E. H. Merrill, J. R. Allen, and M. S. Boyce. 2007. Know thy enemy: experience affects translocation success in risky landscapes. *J. Wildl. Manage.* **71**:541–554.

- Kauffman, M. J., N. Varley, D. W. Smith, D. R. Stahler, D. R. MacNulty, and M. S. Boyce. 2007. Landscape heterogeneity shapes predation in a newly restored predator–prey system. *Ecol. Lett.* **10**:690–700.
- Knopff, K., and M. S. Boyce. 2007. Prey specialization by individual cougars (*Puma concolor*) in multi-prey systems. *Trans. N. Amer. Wildl. Nat. Resour. Conf.* **72**:194–210.
- McLoughlin, P.D., J.-M. Gaillard, M. S. Boyce, C. Bonenfant, F. Messier, P. Duncan, D. Delorme, B. Van Moorter, S. Saïd, and F. Klein. 2007. Lifetime reproductive success and composition of the home range in a large herbivore. *Ecology* **88**: 3192–3201.
- Aldridge, C. L., and M. S. Boyce. 2007. Linking occurrence and fitness to persistence: a habitat-based approach for endangered greater sage-grouse. *Ecol. Appl.* **17**:508–526.
- Boyce, M. S. 2006. Scale and resource selection functions. *Div. & Distr.* **12**:269–276.
- Boyce, M. S., C. V. Haridas, and C. Lee. 2006. Demography in an increasingly variable world. *Trends Ecol. Evol.* **21**:141–148.
- Chetkiewicz, C.-L., C. C. St. Clair, and M. S. Boyce. 2006. Corridors for conservation: structure versus function. *Ann. Rev. Ecol. Evol. Syst.* **37**:317–42.
- Johnson, C. J., S. E. Nielsen, E. H. Merrill, T. L. McDonald, and M. S. Boyce. 2006. Resource selection functions based on use-availability data: theoretical motivation and evaluation methods. *J. Wildl. Manage.* **70**:347–357.
- Munro, R. H. M., S. E. Nielsen, M. H. Price, G. B. Stenhouse, and M. S. Boyce. 2006. Seasonal and diel patterns of grizzly bear diet and activity in west-central Alberta. *J. Mammal.* **87**:1112–1121.
- Pearce, J. L., and M. S. Boyce. 2006. Modelling distribution and abundance with presence-only data. *J. Appl. Ecol.* **43**:405–412.
- McLoughlin, P., M. S. Boyce, T. Coulson, and T. Clutton-Brock. 2006. Lifetime reproductive success and density-dependent, multi-variable resource selection. *Proc. Royal Soc. B* **273**:1449–1454.
- Nielsen, S. E., M. S. Boyce, and G. Stenhouse. 2006. A habitat-based framework for grizzly bear conservation in Alberta. *Biol. Conserv.* **130**:217–229.
- Varley, N., and M. S. Boyce. 2006. Adaptive management for reintroductions: updating a wolf recovery model for Yellowstone National Park. *Ecol. Modelling* **193**:315–339.
- Boyce, M. S. 2005. Wolves are consummate predators. *Q. Rev. Biol.* **80**:87–92.
- Boyce, M. S., S. Lele, and B. W. Johns. 2005. Whooping crane recruitment enhanced by egg removal. *Biol. Conserv.* **126**:395–401.
- Boyce, M. S., L. L. Irwin, and R. Barker. 2005. Demographic meta-analysis: synthesizing vital rates for spotted owls. *J. Appl. Ecol.* **42**: 38–49.
- Mao, J. S., M. S. Boyce, D. W. Smith, F. J. Singer, D. J. Vales, J. M. Vore, and E. H. Merrill. 2005. Habitat selection by elk before and after wolf reintroduction in Yellowstone National Park. *J. Wildl. Manage.* **69**:1691–1707.
- Johnson, C. J., M. S. Boyce, R. L. Case, H. D. Cluff, R. J. Gau, A. Gunn, and R. Mulders. 2005. Cumulative effects of human developments on Arctic wildlife. *Wildl. Monogr.* **160**:1–36.
- Ripley, T., G. Scrimgeour, and M. S. Boyce. 2005. Bull trout (*Salvelinus confluentus*) distribution and abundance influenced by cumulative industrial developments in a Canadian boreal forest watershed. *Can. J. Fish. Aquat. Sci.* **62**:2431–2442.
- Fortin, D., J. M. Morales, and M. S. Boyce. 2005. Elk winter foraging at fine scales in Yellowstone National Park. *Oecologia* **145**:335–343.

- Naugle, D. E., C. L. Aldridge, B. L. Walker, K. E. Doherty, M. R. Matchett, J. McIntosh, T. E. Cornish, and M. S. Boyce. 2005. West Nile virus and sage-grouse: What more have we learned? *Wildl. Soc. Bull.* **33**:616–623.
- McDonald, L. L., J. R. Alldredge, M. S. Boyce, and W. P. Erickson. 2005. Measuring availability and vertebrate use of terrestrial habitats and foods. Pages 465–488 in C. Braun, editor. *Techniques for Wildlife Investigations and Management*, 6th edition. The Wildlife Society, Washington, D.C.
- Xu, C., M. S. Boyce, and D. J. Daley. 2005. Harvesting in seasonal environments. *J. Math. Biol.* **50**: 663–682.
- Anderson, D. P., J. D. Forester, M. G. Turner, J. L. Frair, E. H. Merrill, D. Fortin, J. S. Mao, and M. S. Boyce. 2005. Factors influencing seasonal home-range sizes in elk (*Cervus elaphus*) in North American landscapes. *Landsc. Ecol.* **20**:257–271.
- Anderson, D. P., M. G. Turner, J. D. Forester, J. Zhu, M. S. Boyce, H. Beyer, and L. Stowell. 2005. Scale-dependent summer resource selection by reintroduced elk in Wisconsin, USA. *J. Wildl. Manage.* **69**:298–310.
- Ciarniello, L., M. S. Boyce, D. Seip, and D. C. Heard. 2005. Denning behaviour and den site selection of grizzly bears along the Parsnip River, British Columbia, Canada. *Ursus* **16**:47–58.
- Johnson, C. J., and M. S. Boyce. 2005. A quantitative approach for regional environmental assessment: application of a habitat-based population viability analysis to wildlife of the Canadian central Arctic. *Can. Envir. Assess. Agency, Res. & Develop. Monogr. Ser.* Electronic publication: http://www.ceaa-acee.gc.ca/015/001/028/index_e.htm
- Fortin, D., H. Beyer, M. S. Boyce, D. W. Smith, and J. S. Mao. 2005. Wolves influence elk movements: behavior shapes a trophic cascade in Yellowstone National Park. *Ecology* **86**:1320–1330.
- Nielsen, S. E., C. J. Johnson, D. C. Heard, and M. S. Boyce. 2005. Can models of presence-absence be used to scale abundance? Two case studies considering extremes in life history. *Ecography* **28**:197–208.
- Xu, C., M. S. Boyce, M. Gadgil, and V. Nanjundiah. 2005. Forecasting spatially structured populations: the role of dispersal and scale. *J. Theor. Biol.* **233**:177–189.
- Xu, C., and M. S. Boyce. 2005. Dynamic complexities in a mutual interference host-parasitoid model. *Chaos, Solitons & Fractals* **24**:175–182.
- Johnson, C. J., M. S. Boyce, C. C. Schwartz, and M. A. Haroldson. 2004. Modeling survival: application of the multiplicative hazards model to Yellowstone grizzly bear. *J. Wildl. Manage.* **68**:966–978.
- Johnson, C. J., M. S. Boyce, R. Mulders, A. Gunn, R. J. Gau, H. D. Cluff, and R. L. Case. 2004. Quantifying patch distribution at multiple spatial scales: applications to habitat models. *Landsc. Ecol.* **19**:869–882.
- Nielsen, S. E., M. S. Boyce, and G. B. Stenhouse. 2004. Grizzly bears and forestry I.: Selection of clearcuts by grizzly bears in west-central Alberta, Canada. *Forest Ecol. and Manage.* **199**:51–65.
- Nielsen, S. E., R. H. M. Munro, E. Bainbridge, M. S. Boyce, and G. B. Stenhouse. 2004. Grizzly bears and forestry II: Distribution of grizzly bear foods in clearcuts in west-central Alberta, Canada. *Forest Ecol. and Manage.* **199**:67–82.
- Fortin, D., M. S. Boyce, E. H. Merrill, and J. Fryxell. 2004. Foraging costs of vigilance in large mammalian herbivores. *Oikos* **107**:172–180.

- Nielsen, S. E., S. Herrero, M. S. Boyce, B. Benn, R. D. Mace, M. L. Gibeau, and S. Jevons. 2004. Modelling the spatial distribution of human-caused grizzly bear mortalities in the Central Rockies Ecosystem of Canada. *Biol. Conserv.* **120**:101–113.
- Niemuth, N., and M. S. Boyce. 2004. Influence of landscape composition on sharp-tailed grouse lek location and attendance in Wisconsin pine barrens. *Écoscience* **11**:209–217.
- Naugle, D. E., C. L. Aldridge, B. L. Walker, T. E. Cornish, B. J. Moynahan, M. J. Holloran, K. Brown, G. D. Johnson, E. T. Schmidtman, R. T. Mayer, C. Y. Kato, M. R. Matchett, T. J. Christiansen, W. E. Cook, T. Creekmore, R. D. Falise, E. T. Rinkes, and M. S. Boyce. 2004. West Nile virus: pending crisis for Greater Sage-Grouse. *Ecol. Lett.* **7**:704–713.
- Fortin, D., M. S. Boyce, and E. H. Merrill. 2004. Multi-tasking by mammalian herbivores: overlapping processes during foraging. *Ecology* **85**:2312–2322.
- Frair, J. L., S. E. Nielsen, E. H. Merrill, S. Lele, M. S. Boyce, R. H.M. Munro, G. B. Stenhouse, and H. L. Beyer. 2004. Removing habitat-induced, GPS-collar bias from inferences of habitat selection. *J. Appl. Ecol.* **41**:201–212.
- Johnson, C. J., D. R. Seip, and M. S. Boyce. 2004. A quantitative approach to conservation planning: Using resource selection functions to map the distribution of mountain caribou at multiple spatial scales. *J. Appl. Ecol.* **41**:238–251.
- Radeloff, V. C., D. J. Mladenoff, R. P. Guries, and M. S. Boyce. 2004. Spatial patterns of cone serotiny in *Pinus banksianain* relation to fire disturbance. *For. Ecol. & Manage.* **189**:133–141.
- Aldridge, C. L., M. S. Boyce, and R. K. Baydack. 2004. Adaptive management of prairie grouse: how do we get there? *Wildl. Soc. Bull.* **32**: 92–103.
- Boyce, M. S., J. S. Mao, E. H. Merrill, D. Fortin, M. G. Turner, J. Fryxell, and P. Turchin. 2003. Scale and heterogeneity in habitat selection by elk in Yellowstone National Park. *Écoscience* **10**: 421–431.
- Boyce, M. S., and J. S. Waller. 2003. Grizzly bears for the Bitterroots: predicting potential abundance and distribution. *Wildl. Soc. Bull.* **31**:670–683.
- Nielsen, S. E., M. S. Boyce, G. B. Stenhouse, and R. H. M. Munro. 2003. Development and testing of phenologically driven grizzly bear habitat models. *Écoscience* **10**:1–10.
- Xu, C., and M. S. Boyce. 2003. Predator-prey dynamics: periodic forcing in functional response vs. intrinsic growth of prey. *Indian Institute of Technology, Kharagpur* 721302. Pp. 1-4.
- Nielsen, S. E., M. S. Boyce, G. B. Stenhouse, and R. H. M. Munro. 2002. Modeling grizzly bear habitats in the Yellowhead ecosystem of Alberta: taking autocorrelation seriously. *Ursus* **13**:45–56.
- Boyce, M. S., P. R. Vernier, S. E. Nielsen, and F. K. A. Schmiegelow. 2002. Evaluating resource selection functions. *Ecol. Modelling* **157**:281–300.
- Boyce, M. S. 2002. Wolves and human communities (book review). *Q. Rev. Biol.* **77**:216.
- Boyce, M. S., E. M. Kirsch, and C. Servheen. 2002. Bet-hedging applications for conservation. *J. Biosci.* **27**:385–392.
- Boyce, M. S. 2002. Population cycles in ecosystem context (book review). *Ecology* **83**:2064–2065.
- Boyce, M. S. 2002. Reconciling the small population and declining population paradigms. Pages 41-49 In: *Population Viability Analysis*, (S. Beissinger and D. R. McCullough, eds.). University of Chicago Press, Chicago.
- Boyce, M. S. 2002. Statistics as viewed by biologists. *J. Agr. Biol. Environ. Stat.* **7**:306–312.

- Brown, J. A., and M. S. Boyce. 2001. A survey design for monitoring butterflies. *Statistica* **61**:291–299.
- Haydon, D.T., N. C. Stenseth, M. S. Boyce, and P. C. Greenwood. 2001. Phase coupling and synchrony in the spatio-temporal dynamics of muskrat and mink populations across Canada. *Proc. National Academy of Sciences, USA* **98**(23):13149–13154.
- Viljugrein, H., O. Chr. Lingjærde, N. Chr. Stenseth, and M. S. Boyce. 2001. Spatio-temporal patterns of mink and muskrat in Canada during a quarter century. *J. Anim. Ecol.* **70**:671–682.
- Erb, J. D., M. S. Boyce, and N. Chr. Stenseth. 2001. Spatial variation in mink and muskrat interactions in Canada. *Oikos* **93**:365–375.
- MacKenzie, D. I., and M. S. Boyce. 2001. Estimating closed population size using negative binomial models. *Western Black Bear Workshop* **7**:21–23.
- Boyce, M. S., D. I. MacKenzie, B. F. J. Manly, M. Haroldson, and D. Moody. 2001. Negative binomial models for abundance estimation of multiple closed populations. *J. Wildl. Manage.* **65**:498–509.
- Erb, J. D., M. S. Boyce, and N. Chr. Stenseth. 2001. Population dynamics of large and small mammals. *Oikos* **92**:3–12.
- Boyce, M. S. 2001. Greater Yellowstone predators: a summary. Pages 37–40 In: *Greater Yellowstone Predators: Ecology and Conservation in a Changing Landscape*, (A. P. Curlee, A. M. Gillesberg, and D. Casey, eds.). Northern Rockies Conservation Cooperative, Jackson, Wyoming.
- Boyce, M. S. 2001. Population viability analysis: development, interpretation, and application. Pages 123–136 In: *Modeling in natural resource management: development, interpretation and application*, (T. M. Shenk and A. B. Franklin, eds.). Island Press, Washington, D. C.
- Boyce, M. S., B. M. Blanchard, R. R. Knight, and C. Servheen. 2001. Population viability for grizzly bears: a critical review. *Internat. Assoc. for Bear Res. and Manage., Monogr. Ser.* No. 4.
- Niemuth, N. D., and M. S. Boyce. 2000. Enhanced avian diversity in Wisconsin pine barrens through aggregated timber harvest. *Trans. N. Am. Wildl. Nat. Resour. Conf.* **65**:184–199.
- Radeloff, V. C., D. J. Mladenoff, and M. S. Boyce. 2000. The changing relation of landscape pattern to jack pine budworm populations during an outbreak. *Oikos* **90**:417–430.
- Radeloff, V. C., D. J. Mladenoff, and M. S. Boyce. 2000. A historical perspective and future outlook on landscape scale restoration in the northwest Wisconsin pine barrens. *Restoration Ecol.* **8**:119–126.
- Boyce, M. S. 2000. Whaling models for conservation. Pages 109–126 In: *Quantitative Methods for Conservation Biology*, ch. 8 (S. Ferson and M. Burgman, eds.). Springer-Verlag, New York.
- Boyce, M. S. 2000. Modeling predator-prey dynamics. Pages 253–287 In: *Research Techniques in Animal Ecology: Controversies and Consequences*. (L. Boitani and T. K. Fuller, eds.). Columbia Univ. Press, New York, N.Y.
- Radeloff, V. C., D. J. Mladenoff, and M. S. Boyce. 2000. Effects of interacting disturbances on landscape patterns: budworm defoliation and salvage logging. *Ecol. Appl.* **10**:233–247.
- Erb, J. D., M. S. Boyce, and N. C. Stenseth. 2000. Geographic variation in the dynamics of muskrat populations in Canada. *Can. J. Zool.* **78**:1009–1016.

- Boyce, M. S., A. R. E Sinclair, and G. C. White. 1999. Seasonal compensation of predation and harvesting. *Oikos* **87**:419–426.
- Boyce, M. S., and E. M. Anderson. 1999. Evaluating the role of carnivores in the Greater Yellowstone Ecosystem. Pages 265–283 In: *Carnivores in Ecosystems*, (T. W. Clark, C. P. Curlee, S. C. Minta, and P. M. Kareiva, eds.). Yale Univ. Press, New Haven, Conn.
- Radeloff, V. C., D. J. Mladenoff, H. S. He, and M. S. Boyce. 1999. Forest landscape change: The northwest Wisconsin Pine Barrens before European settlement and today. *Can. J. For. Res.* **29**:1649–1659.
- Noon, B. R., R. H. Lamberson, M. S. Boyce, and L. L. Irwin. 1999. Population viability analysis: a primer on its principal technical concepts. Pages 87–134 in N. C. Johnson, A. J. Malk, W. T. Sexton, and R. C. Szaro, eds. *Ecological Stewardship: A Common Reference for Ecosystem Management*. Vol. 2. Elsevier Science, New York.
- Boyce, M. S., and L. L. McDonald. 1999. Relating populations to habitats using resource selection functions. *Trends Ecol. Evol.* **14**:268–272.
- Radeloff, V. C., D. J. Mladenoff, and M. S. Boyce. 1999. Detecting jack pine budworm defoliation using spectral mixture analysis: separating effects from determinants. *Remote Sensing of Environment* **69**:156–169.
- Erb, J. D., and M. S. Boyce. 1999. Distribution of population declines in large mammals. *Conserv. Biol.* **13**:199–201.
- Niemuth, N. D., and M. S. Boyce. 1998. Disturbance in Wisconsin pine barrens: implications for management. *Trans. Wisc. Acad. Sci. Arts & Letters* **86**:167–176.
- Boyce, M. S. 1998. Ecological-process management and ungulates: Yellowstone’s conservation paradigm. *Wildl. Soc. Bull.* **26**:391–398.
- Meyer, J. S., L. L. Irwin, and M. S. Boyce. 1998. Influence of habitat abundance and fragmentation on spotted owls in western Oregon. *Wildl. Monogr.* No. 139.
- Brown, J. A., and M. S. Boyce. 1998. Line transect sampling of Karner blue butterflies. *Environ. Ecol. Statistics* **5**(1):81–91.
- Niemuth, N., and M. S. Boyce. 1997. Edge-related nest losses in Wisconsin pine barrens. *J. Wildl. Manage.* **61**:1234–1238.
- Nations, C., and M. S. Boyce. 1997. Stochastic demography for conservation biology. Pages 451–469 In: *Structured Population Models in Marine, Terrestrial, and Freshwater Systems*, (S. Tuljupurkar and H. Caswell, eds.), Chapman and Hall, New York, N.Y.
- Niemuth, N., and M. S. Boyce. 1995. Spatial and temporal patterns of predation of simulated sage grouse nests at high and low nest densities: An experimental study. *Can. J. Zool.* **73**:819–825.
- Boyce, M. S. 1995. Anticipating consequences of wolves in Yellowstone: Model validation. Pages 199–209 In: *Ecology and Conservation of Wolves in a Changing World*, (L. Carbyn, S. Fritts, and D. Seip, eds.). Canadian Circumpolar Institute, Edmonton, Alberta, Canada.
- Spurrier, M. S., M. S. Boyce, and B. F. J. Manly. 1994. Lekking behavior in captive Sage Grouse *Centrocercus urophasianus*. *Anim. Behav.* **47**:303–310.
- Boyce, M. S. 1994. Brucellosis and the future of Greater Yellowstone. *Yellowstone Science* **3**(1):15–16.
- Meyer, J. S., and M. S. Boyce. 1994. Life historical consequences of pesticides and other insults to vital rates. Pages 349–363 In: *Wildlife Toxicology and Population Modeling*:

- Integrated Studies of Agroecosystems*. (R. J. Kendall and T. E. Lacher, eds.) Lewis Publishers, Washington, D.C.
- Boyce, M. S. 1994. Biodiversity at risk: Deforestation. Pages 151–161 In: *Biological Diversity: Problems and Challenges* (S. K. Majumdar, F. J. Brenner, J. E. Lovich, J. F. Schalles, and E. W. Miller, eds.), Ch.13. Pennsylvania Academy of Science, Easton, Penn.
- Boyce, M. S. 1994. Population viability analysis exemplified by models for the northern spotted owl. Pages 3–18 In: *Statistics in Ecology and Environmental Monitoring*, (D. J. Fletcher and B. F. J. Manly, eds.). Otago Conference Series No. 2, Univ. Otago Press, Dunedin, New Zealand.
- Boyce, M. S., J. S. Meyer, and L. L. Irwin. 1994. Habitat-based PVA for the northern spotted owl. Pages 63–85 In: *Statistics in Ecology and Environmental Monitoring*, (D. J. Fletcher and B. F. J. Manly, eds.). Otago Conference Series No. 2, Univ. Otago Press, Dunedin, New Zealand.
- Liou, L., T. Price, M. S. Boyce, and C. M. Perrins. 1993. Fluctuating environments and clutch size evolution in Great Tits. *Am. Nat.* **141**:507–516.
- Boyce, M. S. 1993. Population viability analysis: Adaptive management for threatened and endangered species. *Trans. N. Am. Wildl. Nat. Res. Conf.* **58**:520–527.
- Boyce, M. S. 1993. Predicting the consequences of wolf recovery to ungulates in Yellowstone National Park. Pages 234–269 In: *Ecological Issues on Reintroducing Wolves into Yellowstone National Park*, (R. S. Cook, ed.). Scientific Monograph NPS/NRYELL/NRSM-93/22, U.S. Department of the Interior, National Park Service, U.S. Government Printing Office.
- Menkens, G. E., Jr., and M. S. Boyce. 1993. Comments on the use of time-specific and cohort life tables. *Ecology* **74**:2164–2168.
- Merrill, E. H., M. K. Bramble-Brodahl, R. W. Marris, and M. S. Boyce. 1993. Estimation of green herbaceous phytomass from Landsat MSS data in Yellowstone National Park. *J. Range Manage.* **46**:151–156.
- Boyce, M. S. 1992. Population viability analysis. *Ann. Rev. Ecol. Syst.* **23**:481–506.
- Boyce, M. S., L. H. Metzgar, and J. T. Peters. 1992. Bighorn sheep and horses on the Bighorn Canyon National Recreation Area: Wilderness or pasture? Pages 51–67 In: *Wilderness Issues in the Arid Lands of the Western United States*, (S. I. Zeveloff, and C. M. McKell, eds.) Univ. New Mexico Press, Albuquerque, 145pp.
- Boyce, M. S. 1991. Migratory behavior and management of elk (*Cervus elaphus*). *Appl. Anim. Behav. Sci.* **29**:239–250.
- Boyce, M. S., and E. H. Merrill. 1991. Effects of the 1988 fires on ungulates in Yellowstone National Park. *Proc. Tall Timbers Fire Ecol. Conf.* **17**:121–132.
- Johnson, G. D., and M. S. Boyce. 1991. Survival, growth, and reproduction of captive-reared Sage Grouse. *Wildl. Soc. Bull.* **19**:88–93.
- Johnson, L. L., and M. S. Boyce. 1991. Female choice of males with low parasite loads in Sage Grouse. Pages 377–388 In: *Bird-Parasite Interactions: Ecology, Evolution and Behavior*, (J. E. Loye and M. Zuk, eds.), Oxford University Press, Oxford, U.K.
- Spurrier, M. F., M. S. Boyce, and B. F. J. Manly. 1991. Effects of parasites on mate choice by captive Sage Grouse, *Centrocercus urophasianus*. Pages 389–398 In: *Bird-Parasite Interactions: Ecology, Evolution and Behavior*, (J. E. Loye, and M. Zuk, eds.), Oxford University Press, Oxford, U.K.
- Boyce, M. S. 1990. The Red Queen visits sage grouse leks. *Amer. Zool.* **30**:263–270.

- Johnson, G. D., and M. S. Boyce. 1990. Feeding trials with insects in the diet of Sage Grouse chicks. *J. Wildl. Manage.* **54**:89–91.
- Boyce, M. S. 1989. Bet hedging of avian life histories. *Acta Congressus Internationalis Ornithologici* **19**(2):2131–2139.
- Boyce, M. S., and C. M. Perrins. 1987. Optimizing Great Tit clutch size in a fluctuating environment. *Ecology* **68**:142–153.
- Boyce, M. S. 1987. Time-series analysis and forecasting of the Aransas/Wood Buffalo Whooping Crane population. *Proc. Int. Crane Workshop* **4**:1–9.
- Meyer, J. S., C. G. Ingersoll, L. L. McDonald, and M. S. Boyce. 1986. Estimating uncertainty in population growth rates: Jackknife vs. bootstrap techniques. *Ecology* **67**:1156–1166.
- Stromberg, M. R., and M. S. Boyce. 1986. Systematics and conservation of the swift fox. *Biol. Conserv.* **35**:97–110.
- Zeveloff, S. I., and M. S. Boyce. 1986. Maternal investment in mammals. *Nature* **321**:537–538.
- Boyce, M. S., and R. S. Miller. 1985. Ten-year periodicity in Whooping Crane census. *Auk* **102**:658–660.
- Lindstedt, S. L., and M. S. Boyce. 1985. Seasonality, fasting endurance and body size in mammals. *Am. Nat.* **125**:873–878.
- Bobek, B., M. S. Boyce, and M. Kosobucka. 1984. Factors affecting red deer (*Cervus elaphus*) population density in Southeastern Poland. *J. Applied Ecol.* **21**:881–890.
- Boyce, M. S. 1984. Restitution of *r*- and *K*-selection as a model of density-dependent natural selection. *Ann. Rev. Ecol. Syst.* **15**:427–47.
- Sauer, J. R., and M. S. Boyce. 1983. Density-dependence and survival of elk in Northwestern Wyoming. *J. Wildl. Manage.* **47**:31–37.
- Zeveloff, S. I., and M. S. Boyce. 1982. Why human neonates are so altricial. *Am. Nat.* **120**:537–542.
- Boyce, M. S., and J. Tate, Jr. 1982. Pronghorn (*Antilocapra americana*) demography and hunting quotas in the Powder River Basin, Wyoming. *Proc. Int. Congr. Game Biol.* **14**:101–106.
- Boyce, M. S. 1981. Beaver life history responses to exploitation. *J. Appl. Ecol.* **18**:749–753.
- Boyce, M. S. 1981. Robust canonical correlation of sage grouse habitat, Pages 152–159 In: *The Use of Multivariate Statistics in Studies of Wildlife Habitat*, (D. Capen, ed.), Rocky Mtn. Forest and Range Exp. Sta., Fort Collins, CO., 249pp.
- Boyce, M. S. 1981. Habitat ecology of an unexploited population of beavers in interior Alaska. Pages 155–186 In: *Worldwide Furbearer Conference Proceedings*, Vol. I, (J. A. Chapman and D. Pursley, eds.), Worldwide Furbearer Conference, Frostburg, Maryland.
- Zeveloff, S. I., and M. S. Boyce. 1980. Parental investment and mating systems in mammals. *Evolution* **34**:973–982.
- Meinke, D. K., K. Padian, J. Kappelman, M. S. Boyce, J. R. Bolt, R. E. DeMar, and P. A. Johnston. 1980. Growth rings in dinosaur teeth. *Nature* **288**:193–195.
- Boyce, M. S., and D. J. Daley. 1980. Population tracking of fluctuating environments and natural selection for tracking ability. *Am. Nat.* **115**:480–491.
- Boyce, M. S. 1979. Seasonality and patterns of natural selection for life histories. *Am. Nat.* **114**:569–583.
- Boyce, M. S. 1978. Climatic variability and body size variation in the muskrats (*Ondatra zibethicus*) of North America. *Oecologia* **36**:1–19.

- Boyce, M. S. 1977. Population growth with stochastic fluctuations in the life table. *Theor. Popul. Biol.* **12**:366–373.
- Boyce, M. S., and J. J. Boyce. 1976. Pleistocene extinctions. *Science* **191**:102.
- Menzel, B., and M. S. Boyce. 1973. First record of the pearl dace, *Semotilus margarita* (Cope), from Iowa. *Iowa State J. Res.* **47**(4):245–248.

CONTRACTS & GRANTS

Funded Projects as PI

Grant Completed	Amount Awarded	Funding Agency
Effects of roads and access management on grizzly bear habitat use		
11/30/2009	\$4,000	SCINAC HHF
03/31/2010	\$18,500	ACA
04/03/2010	\$2,280	2009 Species Conservation Grant WWFC
04/2008 - 03/2009	\$25,000	WWF Canada
Cougar Research in Cypress Hills		
02/28/2010	\$15,000	Alberta Tourism Parks and Recreation
10/2013 - 03/2015	\$8,000	MEC, Environments grant with Saskatchewan CPAWS
Wolf Research in Southwestern Alberta		
02/28/2010	\$10,000	Alberta Tourism Parks and Recreation
03/31/2012	\$2,000	SCINAC HHF
04/30/2010	\$3,000	SCINAC HHF
08/31/2010	\$17,250	ABP
Abundance of the Western Grebe in Alberta		
03/31/2010	\$3,000	ACA
03/31/2010	\$9,350	Ducks Unlimited Canada
Habitat and prey selection of a re-established cougar population		
03/31/2010	\$25,750	ACA
03/31/2010	\$2,000	SCINAC HHF
Lynx cycles and barriers: dispersal versus climate change in flat-lying populations		
03/31/2010	\$20,000	ACA
12/31/2010	\$5,000	SCINAC HHF
03/31/2011	\$27,500	ACA
03/01/2008 - 05/27/2010	\$199,998	NSERC Strategic Grant
04/10/2010 - 03/31/2011	\$20,000	MEC c/o Red Deer Naturalists
08/31/2012 - 04/30/2013	\$10,000	ABMI
Elk Study		
04/01/2009 - 11/08/2010	\$31,858	ACA
07/2013	\$7,425	Federation of Alberta Naturalists
Grizzly bear response to open-pit mining: implications for management and conservation		
03/31/2010	\$5,610	IABRM
03/31/2010	\$14,490	Teck Coal
03/31/2010	\$20,000	ACA
04/30/2010	\$7,500	CWF
05/31/2010	\$1,093	American Society of Mammologists
07/31/2010	\$9,000	TDFEF

12/31/2010	\$4,000	SCINAC HHF
12/31/2010	\$14,490	MSLP
03/31/2011	\$4,700	IABRM
03/31/2011	\$2,500	ASRPWF
03/31/2011	\$31,000	ACA
04/30/2011	\$4,400	CWF
12/02/2011	\$6,000	TDFEF
03/31/2012	\$2,000	SCINAC HHF
ICCB 2010 (24th International Congress for Conservation Biology)		
03/01/2010 - 03/03/2011	\$99,289	ICCB Registration account
01/01/2011 - 12/31/2013	\$90,066	Carbon tax project account
03/01/2010 - 02/03/2011	\$234,335	Cash sponsor support (34 sponsors)
03/01/2010 - 02/03/2011	\$191,079	In-kind sponsor support
Cougar distribution and prey selection SW Alberta		
12/31/2010	\$6,500	SCINAC HHF
03/31/2011	\$32,700	ACA
09/30/2011	\$3,000	ASRPWF
09/30/2012	\$1,500	ASRPWF
Space use of urban deer		
04/30/2011	\$2,134	ASRPWF Wildlife Society
03/31/2012	\$2,000	ACA
Ecology of cougar, human and prey interactions in the Cypress Hills		
12/31/2011	\$3,000	ASRPWF
03/31/2012	\$20,000	SK Environment & Resource Management Fish & Wildlife Division Fund
03/31/2012	\$2,000	SCINAC HHF
05/2011 - 03/2012	\$2,500	Cypress Hills Cottage Assoc Donation
Home range development in elk		
04/22/2013	\$9,500	TDFEF
03/31/2013	\$5,325	SCINAC HHF
03/31/2012	\$21,500	ACA
Human access management in central-western Alberta: implications for grizzly bears		
03/31/2013	\$5,200	SCINAC HHF
03/31/2013	\$2,000	ASRPWF
03/31/2013	\$33,050	ACA
03/31/2013	\$14,000	MSLP
04/22/2013	\$10,200	TDFEF
03/31/2014	\$5,000	SCINAC HHF
03/31/2014	\$35,000	ATPR
03/31/2014	\$3,300	ASRPWF
03/31/2014	\$25,000	ACA
06/04/2014	\$10,600	TDFEF
03/31/2015	\$3,650	SCINAC HHF
03/31/2015	\$30,000	ACA
03/31/2015	\$10,115	IABRM
08/31/2015	\$9,300	AFGA MSLP
Efficacy of intercept feeding in reducing spring grizzly bear-ranching conflicts		
03/31/2013	\$3,480	SCINAC HHF

04/22/2013	\$5,000	TDFEF
03/31/2014	\$7,250	IABRM
03/31/2014	\$3,000	SCINAC HHF
06/30/2014	\$4,500	ASRPWF
03/31/2015	\$6,560	IABRM
03/31/2015	\$4,100	SCINAC HHF
Restoring grizzly bear populations to southern Alberta: Monitoring and conflict resolution		
02/28/2014	\$12,000	EC Science Horizons
11/25/2014	\$12,000	EC Science Horizons
03/31/2013	\$9,020	ACABIO
03/31/2014	\$19,400	ACC MSLP
05/31/2014	\$24,393	IABRM
06/04/2014	\$5,000	TDFEF
03/31/2015	\$12,500	AFGA MSLP
05/31/2015	\$26,788	IABRM
06/30/2015	\$25,240	SCIF
11/01/2014	\$177,000	Waterton Biosphere Reserve Association c/o Alta Innovates
Grizzly Bear Monitoring Project (GBMP)		
06/2013 - 06/201	\$25,000	Disney
04/2013 - 03/2014	\$10,000	Nature Conservancy Canada Donations
2014 - 2015	\$70,000	Royal Dutch Shell Waterton Gas Plant
2012 - 2014	\$12,000	Shell Environment
11/2012	\$10,000	CPAWS Donation
Effects of industry on wolverine ecology in the boreal forest of northern Alberta		
03/31/2014	\$3,985	SCI-NAC HHF
03/31/2014	\$19,500	WCSC GWFFP
03/31/2014	\$4,893	ASRPWF
03/31/2014	\$20,000	ACA
06/04/2014	\$9,845	TDFEF
01/15/2015	\$9,300	WCSC GWFFP
03/31/2015	\$75,000	ACA
07/31/2015	\$5,000	AFGA MSLP
07/31/2015	\$4,000	SCI-NAC HHF
09/01/2013 - 07/31/2015	\$17,575	Wolverine Foundation
10/31/2015	\$11,140	TD Friends of the Environment Fund
12/31/2015	\$10,000	WCSC GWFFP
03/31/2016	\$68,138	ACA
05/31/2016	\$4,000	SCI-NAC HHF
07/2013 - 03/2015	\$55,000	Dene Tha First Nations Donation
2014-2016	\$45,000	Husky Oil Operations Ltd. Donation
03/31/2016	\$12,000	TD Friends of the Environment Fund
Access management for wildlife conservation		
05/05/2008 - 05/04/2014	\$834,306	Shell's Contribution Can/NSERC CRD
05/01/2008 – 05/04/2014	\$699,510	NSERC CRD
An evaluation of historical mule deer fawn recruitment in North Dakota		
06/30/2014	\$38,892	ND Game & Fish Department
Response by elk to vehicle disturbance on winter range		

12/31/2015	\$3,600	AFGA MSLP
12/31/2015	\$3,000	SCI-NAC HHF
Analysis of bighorn sheep data from Alberta Environment and Parks		
12/31/2015	\$4,800	APOS
A retrospective analysis of Pronghorn fawn recruitment and demographic data in North Dakota		
12/31/2015	\$59,092	ND Game & Fish Department
Hunting for sustainability: Using bear rubs to monitor black bear populations in southwestern Alberta		
03/31/2016	\$4,500	SCI-NAC HHF
03/31/2016	\$15,000	AFGA MSLP
03/31/2016	\$25,000	ACA
10/01/2016	\$10,000	WBRA
09/30/2016	\$9,500	Alberta Professional Outfitters Society
Evaluating the efficacy of predator management and nesting structures for duck management in AB		
06/30/2017	\$25,000	Delta Waterfowl Foundation
Ecology, density, and distribution of sitatunga in central Uganda		
03/31/2016	\$2,500	SCI-NAC HHF
07/31/2016	\$24,911	Dallas Safari Club
10/31/2016	\$6,540	SCI-San Diego Chapter
Wildlife in an Increasingly Variable World		
03/31/2016	\$447,600	NSERC
Habitats drive population biology		
03/31/2017	\$26,000	NSERC

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

Memberships in professional societies

American Society of Mammalogists (life member).
Canadian Society for Ecology and Evolution.
Ecological Society of America.
Gamma Sigma Delta (honorary).
Phi Kappa Phi (honorary).
Royal Society of Canada; fellow, 2014.
Sigma Xi (associate member 1975, full member 1978, Univ. Alberta Chapter 2000).
Society for Conservation Biology.
The Wildlife Society (Certified Wildlife Biologist, 2000; Fellow, 2012).
Wild Sheep Foundation (life member, 2003).
Willmore Wilderness Foundation (life member, 2007).

Editor-in-Chief: *Journal of Wildlife Management*, 1995-1997.

Editor: *Ecology and Ecological Monographs*, 2001-2006.

Associate Editor: *I.M.A. Journal of Mathematics Applied in Medicine and Biology*, 1983-1994.

Editorial Board: *Environmental Conservation*, 2007-2010. *Oxford Bibliographies in Ecology*, 2010-present. *Animal Biotelemetry*, 2012-present.

Academic Editor: *PLoS One*, 2010-present.

PROFESSIONAL SERVICES (last 5 yrs)

President, Canadian Section of The Wildlife Society, March 2015-present.
Program Chair, The Wildlife Society Annual Conference, Winnipeg, October 2015.
Organized symposium on “Movement models to resource selection functions” for the Annual Conference of The Wildlife Society, Winnipeg, October 2015.
Organized symposium on “Understanding individuals to conserve populations” for the Annual Conference of the Canadian Society for Ecology and Evolution, 2015 May 24.
Workshop on Resource Selection Functions, Saskatchewan Chapter of The Wildlife Society, Saskatoon, 2015 March 13.
Banting Postdoctoral Fellowships Review Committee, NSERC, 2011-2014.
Board of Directors, North American Section, Society for Conservation Biology, 2009-present.
Director, Northern Alberta Chapter of the Safari Club International, 2007-present.
Society for Conservation Biology, Local Chair, 2010 International Congress for Conservation Biology. March 2008-2010 (ICCB dates: 2010 July 3-7).
SLU University System, Sweden, Chair of Panel Reviewing Ecology and Environmental Sciences Programs. May 2009.
Alberta Conservation Association, Board of Directors, 2002-present.
Chair, Operation Standards Review Committee, Board of Directors, Alberta Conservation Association, 2002-present.

INVITED PRESENTATIONS (last 5yrs)

2016, “Neglected but fundamental: 5 understudied topics in population biology,” Distinguished Ecologist Lecture, Colorado State University, April 22.
2016, “North America’s Energy Policy,” Distinguished Ecologist Lecture, Colorado State University, April 21.
2016, “Compensation and density dependence,” Invited Keynote Presentation. Predator-prey Conference, Columbia Mountains Institute, Revelstoke, BC, April 5.
2016, “Neglected but fundamental: 5 understudied topics in population biology,” Mathematical Biology Seminar, University of Alberta, March 7.
2015, “Spatial ecology meets population biology,” Invited Symposium Presentation, Canadian Society for Ecology and Evolution, Saskatoon, May 22.
2015, “Black bears on the tangled bank,” Invited Symposium Presentation, Canadian Society for Ecology and Evolution, Saskatoon, May 24.
2015, “Optimizing cervid harvests in variable environments,” Plenary address, Western States and Provinces Deer and Elk Conference, Canmore, May 13.
2015, “Canada’s Energy Policy, The Urgent Need for Science,” Plenary address, Alberta Chapter of The Wildlife Society, Edmonton, March 21.
2015, “Estimating resource selection functions in R,” AGM of the Canadian Section of The Wildlife Society, Saskatoon, March 13.
2014, “Canada’s Energy Policy: The Urgent Need for Science,” Royal Society of Canada, Quebec City, November 20.

- 2014, “Selection functions: statistics, interpretations, and applications,” Webinar for the Alberta Conservation Association, May 12.
- 2014, “Trophic cascades in Yellowstone,” Plenary Address, Alaska Chapter of The Wildlife Society, Anchorage, April 1.
- 2014, “Workshop on resource selection functions,” Alaska Chapter of The Wildlife Society, Anchorage, March 31.
- 2014, “Does fear reduce effects of ungulates on vegetation?” Gordon Conference on Predator-Prey Interactions, Ventura, California, January 8.
- 2013, “Moving into the digital age: a moose app for citizen science among hunters,” Canadian Section of The Wildlife Society, Symposium on Citizen Science, Canmore, Alberta, March 9.
- 2013, “Selection functions: statistics, interpretations, and applications,” Webinar for the Canadian Section of The Wildlife Society, January 25.
- 2013, “Selection, occupancy, and persistence,” Morrison Lecture, Stanford University, Jan 16.
- 2012, “Wolf-caused Trophic Cascades in Yellowstone: Torrent or Trickle?” Symposium at The Wildlife Society Annual Conference, Portland, October 19.
- 2012, “Critical habitats for the critically endangered Greater Sage-Grouse,” Plenary Address, CONFOR West, Banff, February 3.
- 2011, “Alberta needs a plan for trashing the boreal,” Plenary Address, Canadian Section of The Wildlife Society Annual Conference, Thunder Bay, Ontario, September 25.
- 2011, “Tony’s vision for parks and natural areas,” Symposium Honouring A. R. E. Sinclair, Green College, University of British Columbia, Vancouver, September 17.
- 2011, “Selection, occupancy and persistence,” Invited seminar, Centre for Conservation Biology, Norwegian University of Science and Technology, Trondheim, Norway, Aug 15.
- 2011, “Resource selection functions,” Invited workshop, Hedmark University, Evenstad, Norway, Aug 9-12.
- 2011, “Wolf recovery in western North America,” Invited Plenary Lecture, Summer School for Ph.D. students in ecology, Hedmark University, Evenstad, Norway, Aug 8.
- 2011, “Selection, occupancy and persistence,” Invited seminar, Haldane Theatre, Silwood Park, Imperial College London, March.
- 2011, “Modelling habitat selection using resource selection functions,” Invited research seminar, Grimsö Wildlife Research Station, SLU System, Grimsö, Sweden.
- 2011, “Wolf management in western North America,” Invited colloquium, Grimsö Wildlife Research Station, SLU System, Grimsö, Sweden.
- 2011, “How wolves are managed in Alberta,” Invited address, Symposium on managing wolves in western North America. Society for Range Management, Billings, Mont., Feb 10.
- 2010, “Resource selection functions: the fundamental equations of ecology,” Invited seminar, Australian Centre for Evolutionary Biology & Biodiversity, Research Institute for Climate Change and Sustainability, University of Adelaide, South Australia, Nov. 26.
- 2010, “Resource selection functions for identifying critical habitat for threatened species,” Invited seminar, CSIRO Ecosystems Laboratory, Brisbane, Queensland, October 12.
- 2010, “Landscapes of death: grizzly bears in Alberta,” Invited seminar, Landcare Research, Lincoln, New Zealand, October 7.
- 2010, “Resource selection functions: the fundamental equations of ecology,” Invited seminar, Spatial Ecology Laboratory, The Ecology Centre, University of Queensland, Brisbane, September 10.

CONTRIBUTED PAPERS (recent)

- 2016, “Nazi science and bighorn management.” Alberta Chapter of The Wildlife Society, Drumheller (March 5).
- 2015, “Canada’s energy policy: the urgent need for science.” Canadian Section of The Wildlife Society, Saskatoon, Saskatchewan (March 14).
- 2014, “Are terrestrial trophic cascades limited to parks and protected areas?” Alberta Chapter of The Wildlife Society, Jasper, Alberta. (March 8).
- 2014, “Conflicting views on trophic cascades in Yellowstone,” Canadian Section of The Wildlife Society, Universite Laval, Quebec City, Quebec (March 29).
- 2012, “Managing Moose Populations by the Seat of Your Pants,” Poster presentation, The Wildlife Society, Portland (Oct 19).
- 2012, “Managing Moose Populations by the Seat of Your Pants,” National Fish and Wildlife Conservation Congress, Ottawa (May 29).
- 2011, “Flat-lining of Alberta lynx populations,” (w/G. Yates), Canadian Society for Ecology and Evolution, Banff (May 14).
- 2011, “Cougars create a landscape of fear for ungulates in Cypress Hills,” (w/ M. Bacon), Canadian Society for Ecology and Evolution, Banff (May 15).
- 2010, “Using autocorrelation functions to interpret behavioural patterns in GPS telemetry data,” International Society for Behavioral Ecology, Perth, Australia (Oct 1).
- 2010, “Carbon and conservation,” Annual Conference of the Alberta Chapter of The Wildlife Society, Edmonton (March).

PUBLIC SERVICE/POPULAR PRESENTATIONS (recent)

- 2016, “Bighorn management in Alberta,” Safari Club International, Edmonton (January).
- 2015, “Licenced hunting and trapping in Canada: funding for management and research,” House of Commons Standing Committee on Environment and Sustainable Development, Ottawa (March 31).
- 2013, “Bighorn genetics and the effects of selective harvest,” Wild Sheep Foundation, Red Deer, Alberta (March)
- 2011, “Why we should support parks,” Fort Saskatchewan Fish and Game Association, Fort Saskatchewan, Alberta (September 21).
- 2011, “Declines of the Greater Sage Grouse in Alberta,” Alberta Wilderness Association, Calgary (September 7).
- 2010, “Grizzly bears in Alberta’s mountains,” Alberta Alpine Club, Edmonton (March).

COMMITTEES (recent)

- 2015-present, Alberta Game Policy Advisory Council, Alberta Environment & Parks.
- 2014-present, Alberta Game Management Advisory Group, Alberta Environment & Parks.
- 2015-2016, Grizzly bear harvest policy review, British Columbia Department of Environment.
- 2013-2014, Search Committee for CAIP Chair, University of Alberta.
- 2012, Chair, Search Committee for Editor-in-Chief, *Conservation Biology*, Society for Conservation Biology.

2011, Chair, Donald Rusch Game Bird Research Scholarship Committee, The Wildlife Society.
2010, Awards Committee, The Wildlife Society, Bethesda, Maryland.
2009, Border Issues for Conservation Committee, The Wildlife Society, Bethesda, Maryland.
2008-2011, Committee on the effects of oil and gas development on wildlife. The Wildlife Society, Washington, D.C.
2007-present, Conservation Committee, Alberta Chapter The Wildlife Society.
2007-2008, Search committee, fisheries biologist, Dept. Biological Sciences, Univ. Alberta.
2004-2010, Wisconsin Distinguished Professor review committee, University of Wisconsin System, Madison.
2004-2008, Meanook Field Station Steering Committee, Department of Biological Sciences, University of Alberta.
2004-2009, CCIS building committee, Faculty of Science, University of Alberta.

John J. Cox

University of Kentucky,
Department of Forestry
102 T.P. Cooper Bldg.
Lexington, KY 40546-0073
Tel (office): (859) 257-9507
Fax: (859) 323-1031
e-mail: jjcox@uky.edu

EMPLOYMENT

Present Position: **Assistant Professor of Wildlife Ecology and Conservation Biology**
(7/2013-present)

Institution: **University of Kentucky Department of Forestry**
Distribution of Effort (DOE) 2015: 60% research, 40% teaching
Distribution of Effort (DOE) 2014: 68.45% research, 31.55% teaching
Distribution of Effort (DOE) 2013: 77% research, 23% teaching

Adjunct Assistant Professor of Wildlife and Conservation Biology
Dates of Appointment: October 2006 – June 30, 2013

Position: **Adjunct Assistant Professor of Wildlife and Conservation Biology**
(10/2006-6/2013); **Research Scientist III** (2009-2013); Research Scientist II (2006-09); Research Scientist I (2004-2006); Research Coordinator and Site Manager, University of Kentucky Griffith Woods Natural Area (2005-09)
Institution: **University of Kentucky Department of Forestry**
Duties: Conduct wildlife/conservation-related research, procure research funding, committee service, mentor undergraduate and graduate students. As overload or volunteer, teach conservation biology and other wildlife and conservation-oriented courses. As research coordinator and site manager of Griffith Woods, coordinate research and other activities, site infrastructure and vehicle maintenance, remove exotic species, reintroduce native species, conduct academic and public outreach.

Position: **Research Assistant-Doctoral Graduate Student** (4/99-12/03)
Institution: **University of Kentucky Department of Forestry**
Duties: Conduct research on radio-collared white-tailed deer, elk, and coyotes

Position: **Wildlife Technician** (8/1998-4/1999)
Organization: **Kentucky Department of Fish and Wildlife Resources**
#1 Sportsman's Lane. Frankfort, KY 40601
Duties: Trapped and translocated ruffed grouse and white-tailed deer in Kentucky. Assisted elk biologist during elk recapture efforts and refitting of radio-collars

Position: **Research Assistant** (7/1997-7/1998)

Institution: University of Cincinnati, Department of Molecular and Cellular Physiology, Cardiovascular Center, Cincinnati, OH
 Duties: Molecular biology research on vitamin D steroid receptor pathways

Position: **Graduate Assistant** (8/1995-5/1997)
 Institution: Morehead State University, Dept. Biological and Environmental Sciences
 Duties: G.A. for Biology 171L, Ecology 461, Limnology 535, Animal Physiology 450L

EDUCATION

Degree: **Ph.D., Animal Sciences**, 12/2003
 Location: **University of Kentucky** (1999-2003)
 Dissertation: Community dynamics among reintroduced elk, white-tailed deer, and coyotes in southeastern Kentucky.

Location: **University of Cincinnati** (7/1997-7/1998), University of Cincinnati Dept. Molecular and Cellular Physiology doctoral program, Cincinnati, OH 45220
 Research: Trans-activation of vitamin D steroid receptors; no degree.

Degree: **M.S., Biology**, 8/1997
 Location: **Morehead State University** (1995-1997)
 Thesis: Detection of hybridization events between the coyote, *Canis latrans*, and the domestic dog, *Canis familiaris*, in Kentucky using two polymorphic microsatellite loci and cranial morphometric analysis.

Degree: **B.S., Major Biology/Minor Chemistry**, 8/1995
 Location: **Morehead State University** (1988, 1990-1995)

Degree: Commonwealth Diploma, 1990
 Location: West Carter High School

CURRENT RESEARCH (Advisor or co-advisor for 13 students at UK; 8 M.S., 5 Ph.D.)

- Ecology of the Martial Eagle in the Masai Mara region of Kenya. Mb(6)
- Survival, cause-specific mortality, and social dynamics of cow elk b(6)
- Resource selection, survival, and cause-specific mortality of bull elk in southeastern Kentucky (b(6))
- Survival and cause-specific mortality of white-tailed deer in southeastern Kentucky b(6)
- Disease profile of a recently reintroduced elk in southeastern Kentucky b(6)

- Characterization of elk body condition and its relationship to capture, handling, and translocation (2011-present); b(6)
- Population ecology of black bears in eastern Kentucky (2008-present); b(6)
- Prevalence of toxoplasmosis in black bears of Kentucky and southcentral Florida (2010-present); b(6)
- Ecology and landscape genetics of pit vipers in central Appalachia b(6)
- Distribution and relative abundance of the common raven in southeastern Kentucky; Recolonization dynamics of ravens in Appalachia (b(6)
- Effects of herbivory, competition, and fire on select trees of the Inner Bluegrass (b(6)
- Effects of timber harvest on breeding bird communities in a mixed-mesophytic forest b(6)
- Evaluation of elk as potential vectors of invasive plant species in eastern Kentucky forests; b(6)

GRANTS

Extramural Grants Awarded (\$1,952,279)

- “Survival, cause-specific mortality, and natality of white-tailed deer in southeast Kentucky.” \$424,500. July 2013-June 2016. Kentucky Dept. Fish and Wildlife Resources.
- “Does logging and surface mining increase the vulnerability of stream-associated salamanders to chytrid fungus infection?” 2013. \$5,000. Kentucky Water Resources Research Institute.
- “Assessing ecological connectivity and genetic structuring of Southcentral Florida black bears.” \$25,000. Disney Worldwide Conservation Fund. 2013.
- “Cow elk survival, cause-specific mortality, natality, and neonate recruitment in southeastern Kentucky” July 2013-June 2015. \$54,000. Rocky Mountain Elk Foundation.
- “Resource selection, survival, and cause-specific mortality of bull elk in southeastern Kentucky. July 2013-June 2014. \$55,000. Kentucky Dept. Fish and Wildlife Resources
- “Population growth and expansion of black bears in Kentucky.” July 2013-June 2014. \$93,000. Kentucky Dept. Fish and Wildlife Resources.
- “Survival and cause-specific mortality of cow elk in southeastern Kentucky.” Nov. 2012-14. \$17,879. Rocky Mountain Elk Foundation.
- “Southcentral Florida black bear conservation.” \$25,000. Disney Worldwide Conservation Fund. Sept 2011.
- “Characterization of disease risk in a recently established elk population in Kentucky: implications for herd management and regional metapopulation dynamics. 2012-13.

- \$63,000. Rocky Mountain Elk Foundation.
- “Population growth and expansion of black bears in Kentucky.” July 2011-June 2013. \$180,000. Kentucky Dept. Fish and Wildlife Resources.
- “Resource selection, survival, and cause-specific mortality of bull elk in southeastern Kentucky.” Sept 2010-Sept 2012. \$29,500. Rocky Mountain Elk Foundation. Note these funds were administered thru KDFWR only.
- “Population dynamics and movement ecology of the black bear in eastern Kentucky.” July 2010-June 2011. \$90,000. Kentucky Dept. Fish and Wildlife Resources.
- “Resource selection, survival, and cause-specific mortality of bull elk in southeastern Kentucky. July 2010-June 2015. \$287,500. Kentucky Dept. Fish and Wildlife Resources (check amounts)
- “Population estimation and genetic diversity of black bear in Highlands and Glades Counties Florida.” \$120,000. Florida Fish and Wildlife Conservation Commission.” May 2010-June 2013.
- “Dispersal and population expansion of the black bear in eastern Kentucky.” July 2009-June 2010. \$107,000. Kentucky Dept. Fish and Wildlife Resources (KDFWR).
- “Calf survival, meningeal worm impacts, dispersal, and population expansion in an eastern Kentucky elk herd.” July 2008-June 2009. \$70,000. KDFWR. Co-Principal Investigator with D. Maehr.
- “Dispersal and population expansion of the black bear in eastern Kentucky.” July 2008-June 2009. \$98,000. KDFWR. Co-Principal Investigator with D. Maehr.
- “The common raven in cliff habitat: detectability and occupancy.” \$60,000. USFWS, KDFWR STWG. July 2007-June 2008. Co-Principal Investigator with M. Dzialak.
- “Bluegrass Invasive Species Partnership Initiative.” \$30,000. NFWF. January 2006-December 2007. Co-Principal Investigator with B. Thomas and J. Campbell.
- “Bluegrass Savanna-Woodland Restoration.” \$41,500. Kentucky Land Heritage Conservation Fund Board. July 2007-June 2008. Co-Principal Investigator with P. Crowley.
- “Evaluation of infrared technologies for estimating black bear and elk populations in Kentucky.” \$39,913. Turner Foundation; \$10,000, Rocky Mountain Elk Foundation. October 2006-September 2009. Co-Principal Investigator with K. Alexy, D. Unger, D. Maehr, and J. Larkin.
- “Effects of elk on soil nutrients and vegetation in southeastern Kentucky.” \$10,500 Rocky Mountain Elk Foundation. July 2003-June 2005. Co-Principal Investigator with D. Maehr, C. Rhoades, and J. Larkin.
- “Elk calf ecology in Kentucky.” \$27,400. Earthwatch Institute May-October 2002-2003; \$8,500, Durfee Foundation (June 2002). Co-Principal Investigator with D. Maehr and J. Larkin

Intramural Grants Awarded (\$245,092)

- Baker, T., M. Contreras, **J. Cox**, J. Lhotka, S. Price, and G. Stainback. 2014. \$5,925. Orientation to early faculty career funding opportunities. Research Activity Award. University of KY Dept. of Agriculture and Food Science. College competitive.
- “Wildlife and Conservation Biology Courses.” \$6,000. Teaching Innovation Incentive Fund. University of KY Dept. of Agriculture and Food Science. 2013-14.

- “Gray fox ecology and monitoring in Kentucky.” \$66,000. USDA CSREES. October 2008-September 2011. Co-Principal Investigator with M. Dzialak.
- “Harnessing cell phone technology to track the black bear in eastern Kentucky. \$59,732. USDA CSREES. October 2008-September 2011. Co-Principal Investigator with S. Fei and D. Maehr.
- “Ecological monitoring initiative at Griffith Woods.” \$66,262. USDA Hatch. October 2007-June 2008. Co-Principal Investigator with C. Barton and M. Lacki.
- “Evaluation of infrared technologies for estimating black bear and elk populations in Kentucky.” \$39,913. USDA CSREES; October 2006-September 2009. Co-Principal Investigator with K. Alexy, D. Unger, D. Maehr, and J. Larkin.
- “Detecting hybridization events in wild Kentucky canids.” \$1,260. Roger W. Barbour Fund for Vertebrate and Field Research, Morehead State University. 1996.

Extramural Grants Submitted Pending

- Cox, J.J., and J. Krupa. 2015. Using landscape genetics to investigate forest fragmentation impacts on the Northern Copperhead. \$30,000. Kentucky Science and Engineering Foundation. State competitive.

Extramural Grants Submitted (Not funded)

- Cox, J.J., and J. Krupa. 2014 (Dec.) Using landscape genetics to investigate forest fragmentation impacts on the Northern Copperhead. \$30,000. Kentucky Science and Engineering Foundation. State competitive.
- Cox, J.J., and B. Slabach. 2014 (Oct). Assessing the potential toxicity of surface mining reservoir water for wild and domestic ungulates \$4,968. Kentucky Water Resources Research Institute. Regionally competitive.
- Bears behaving badly: does toxoplasmosis infection increase neophilic behavior? 1/14. \$30,000, Kentucky Science and Engineering Foundation.

Student Grants and Awards (Under J. Cox advisorship; 12; \$15,145)

- b(6)
- [Redacted text block containing 12 student grants and awards, each represented by a gray bar.]

b(6)
 [REDACTED]
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Student Grants Pending (Under J. Cox advisorship; 1; \$4900)

- b(6)
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Student Grants Submitted, Not Funded (Under J. Cox advisorship; 2; \$28,799)

b(6)
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TEACHING

University of Kentucky (2001-present; *indicates overload or teaching outside official duties)

- 2009 Class, University Academy of Teaching and Learning Scholars
- Forestry 101: (3 hrs) Introduction to Wildlife Conservation (Fall 2014-15)
- Forestry 101*: (3 hrs) Introduction to Wildlife Conservation (Fall 2005-10) correspondence course
- Forestry 230/315*: (3 hrs) Conservation Biology (Spring 2008-10; Fall 2010-15; co-instructor/guest lecturer 2003-07)
- Forestry 356: Principles of Forest Wildlife Management (1 hr) (Spring 2012-14)
- Forestry 599*: (3 hrs) Environmentalism: Survey of a Sociopolitical Movement (Spring 2003, Fall 2004)
- Forestry 599*: (3 hrs) Independent Work in Forestry (Spring 2008-present)
- Forestry 599*: (3 hrs) The Chihuahuan Desert: Ecology, Conservation Policy and Practice (Spring 2011)
- Forestry 599*: (3 hrs) Florida's Ecosystems: Ecology, Conservation Policy and Practice (Spring 2012)
- Forestry 599*: (3 hrs) Greater Yellowstone Ecosystem: Ecology, Conservation Policy and Practice (Spring 2013)
- Forestry 602: (3 hrs) Renewable Natural Resource Issues in a Global Perspective; (Fall 2009; co-instructor; topic: Apex predators: ecological keystones, conservation flagships)
- Forestry 770*: (1 hr) Wild Canid Ecology, Management, and Conservation (Fall 2006, 08, 10, 12, 14)
- Forestry 770*: (1 hr) Wild Felid Ecology, Management, and Conservation (Fall 2011, 15)

- Forestry 770*: (1hr) Ecology and Management of North American Ungulates (Spring 2012)
- Forestry 770*: (1hr) Ecology and Management of Neotropical Migrant Songbirds (Spring 2013)
- Natural Resource Conservation 301*: (3 hrs.) Conservation Research and Management (Spring 2003; co-instructor w/ J. Larkin)
- Natural Resource and Environmental Science 320*: Natural Resources and Environmental Analysis (3 hrs.): Field teaching one day (5/14).
- Natural Resource Conservation 395* (3 hrs.) Independent Study (2012-14)
- Natural Resource Conservation 399*: (3 hrs.) Internship (Spring-Summer 2010-14)
- Biology 395*: Independent Research (3 hrs.) (Spring 2010-12)
- Summer Environmental Writing Program*, summer 2003-04, 06
- Earthwatch Research Program*, 8-weeks each, summers 2001-02
- Durfee Foundation High School Student Challenge Awards Program*, 2-weeks, summer 2002
- Invited lectures in: Advanced Conservation Biology, Natural Resource Conservation, Wildlife Management Techniques, Ecolunch seminar series, Carnivore Conservation and Ecology seminar, Biogeography, Wildlife Habitat Analysis, Ethics in Forestry, Conservation Biology (Indiana University of Pennsylvania 11/07, 11/09; Indiana University 4/09; Alice Lloyd College 4/09)
- Supervised over two dozen undergraduate volunteers in conducting research or invasive species removal
- Field guide for students from historically African-American colleges, Summer 2003

SERVICE

- Adjunct Assistant Professor of Wildlife Biology at Eastern Kentucky University (2010-present)
- Graduate Faculty appointment in UK Animal and Food Sciences (2010-present)
- Invited reviewer, Texas Academy of Science Grant Research Proposals (2014)
- Invited symposium panel member, “Brucellosis Science Workshop”, Yellowstone National Park, (2/25-2/28 2013)
- Invited panel member, “Florida Ecological Greenways Network” review and revision team, University of Florida, (2011-13).
- Invited symposium panel member, “Global Climate Change and the Emergence of Infectious Diseases”, University of Kentucky (12/2012).
- Invited panel member (mammal expert), Big Cypress National Preserve scientific panel on oil exploration impacts (2009-10)
- Board of editors for the journal Southeastern Naturalist (2012-present)
- The Wildlife Society Publication Awards Committee (2009-11)
- Site contact, UK Canoe Creek and Griffith Woods natural areas (2009-12)
- Department of Forestry Strategic Planning Committee (2006-present)
- Department of Forestry Wildlife Extension Faculty Search Committee, Fall 2015.
- Department of Forestry Stream Ecologist Search Committee (2011-12)

- Department of Forestry Undergraduate Program Committee (2010-present)
- Department of Forestry Graduate Student Committee (2010-12)
- Department of Forestry T.P. Cooper Landscape Committee (2011-present)
- Department of Forestry Research Committee (2010-present)
- Department of Forestry Chair Search Committee (2009-10)
- Griffith Woods Management and Advisory Committee (2005-2009)
- College of Agriculture Precision Resource Management Committee (2007-2009)
- Efroymsen Planning Committee, Griffith Woods (2005)
- Invited wildlife presentations and school trips at three KY grade schools
- 39 manuscripts reviewed from the following journals and books: Animal Conservation, Wildlife Society Bulletin, Wildlife Monographs, Wildlife Biology in Practice, Journal of Wildlife Management, Journal of Mammalogy, American Midland Naturalist, Restoration Ecology, PLoS One, Southeastern Naturalist, Journal of Soil Science and Environmental Management, Proceedings of the Central Hardwood Forest Conference, Bats in Forests: Conservation and Management (book), Essentials of Conservation Biology 6th Edition (book).

GRADUATE STUDENT ADVISING AND COMMITTEE SERVICE

- Summary Graduate Student Committees (9/2006-present = 47; *Advisor/Co-advisor = 27): Present advised students at UK(18): M.S. students (11): b(6) [redacted]
[redacted]
[redacted]
[redacted]; Ph.D. students (6): b(6) [redacted]
[redacted] Past advised students at UK(26): M.S. students: b(6) [redacted]
[redacted]
[redacted] Ph.D. students: b(6) [redacted]
[redacted]
[redacted] Past students at Eastern KY University(1): b(6) [redacted];
Past students at Indiana Univ. of PA(2): b(6) [redacted]

Graduate Student Theses, Dissertations, and Non-Thesis Graduate Research Projects (as Advisor or Coadvisor) (15):

- b(6) [redacted]
[redacted]
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b(6)

Graduate Student Awards (as Advisor or Co-advisor)

• b(6)

UNDERGRADUATE ADVISING and MENTORING

• NRES 399 b(6)

• NRES 395 b(6)

MANAGEMENT (as project manager of Griffith Woods natural area, Harrison County, KY)

- Coordinated research and ecological restoration efforts among several agencies, institutions, and local volunteer group
- Created technical documents and reports
- Managed accounts and expenditures
- Supervised an exotic plant species removal crew and resident grad student
- Participated in multi-agency meetings that evaluated research proposals
- Participated in a multi-partner task force that created a site management plan
- Represented the UK College of Agriculture in service on the Griffith Woods Management and Advisory Committee
- Conducted multiple management activities (e.g. mowing, exotic plant removal, biotic inventories)
- Supervised over three dozen technicians, numerous volunteers, and one post-doctoral scholar; 2 local high school students mentored on wildlife internship projects
- Assisted with transition of property management to KDFWR

PUBLICATIONS (50)

Peer-Refereed Journal Articles (35)

Treanor, J.T.,* C. Geremia, M.A. Ballou, D.H. Keisler, P.J. White **J.J. Cox**, and P.H. Crowley. 2015. Maintenance of brucellosis in Yellowstone bison: linking seasonal food resources, host-pathogen interaction, and life-history trade-offs. *Ecology and Evolution* *in press* (IF=2.32)

Murphy, S.M.*, **J.J. Cox**, J.D. Clark, J.T. Hast*, B.C. Augustine*, D. Gibbs, and M. Strunk. 2015. Demographic and genetic characteristics of a reintroduced black bear population in the Central Appalachians. *Journal of Wildlife Management* 79:807-818. (IF=1.5)

Maigret, T.A., **J.J. Cox**, D.R. Schneider, C.D. Barton, S.J. Price, and J.L. Larkin. 2014. Effects of streamside management zone timber harvest on salamander populations in ephemeral streams of southeastern Kentucky. *Forest Ecology and Management* 324:46-51. (IF=2.67)

Maigret, T.A., and **J.J. Cox**. 2014. A review of best management practices and the mitigation of stream-breeding salamanders in the eastern deciduous forest. *Proceedings of the 21st Central Hardwood Forest Conference*. General Technical Report P-142 U.S. Forest Service, Northern Research Station.

Ehlman, S., **J.J. Cox**, and P.H. Crowley. 2013. Evaporative water loss model of white-nose syndrome in the hibernating little brown myotis (*Myotis lucifugus*). *Journal of Mammalogy* 94:572-583.

Unger, D.E., **J.J. Cox**, H. Harris, J.L. Larkin, B. Augustine, S. Dobey, J. Hast, R. Jensen, S. Murphy, J. Plaxico, and D.S. Maehr. 2013. A brief history and current status of the

black bear in Kentucky. *Northeastern Naturalist* 20(2):289-308.

Chambers, D.L., W.A. Ulrey, J.M. Guthrie, O.C.H. Kwok, **J.J. Cox**, D.S. Maehr, and J.P. Dupey. 2012. Seroprevalence of *Toxoplasmosis gondii* in free-ranging black bears in Florida. *Journal of Parasitology* 98:674-675.

Tedder, S., **J.J. Cox**, P.H. Crowley, and D.S. Maehr. 2012. Black bears, palms, and giant palm weevils: an intraguild mutualism. *The Open Ecology Journal* 5:18-24.

Crowley, P.H., and **J.J. Cox**. 2011. Intraguild mutualism. *Trends in Ecology and Evolution* 12:627-633.

Treanor, J., C. Germentia, P.H. Crowley, **J.J. Cox**, P.J. White, R. Wallen, and D. Blanton. 2011. Estimating probabilities of active brucellosis infection in Yellowstone bison through quantitative serology and tissue culture. *Journal of Applied Ecology* 48:1324-1332.

Augustine, B., P.H. Crowley, and **J.J. Cox**. 2011. A mechanistic model of GPS collar fix acquisition. *Ecological Modeling* 222:3615-3625.

Fei, S., **J.J. Cox**, and A. Whittle. 2011. A perfect storm threatens recovery of the Florida panther. *Frontiers in Ecology and the Environment* 9(6):317-318.

Cox, J.J. 2011. Tales of a repatriated megaherbivore: challenges and opportunities for management of reintroduced elk in Appalachia. *Proceedings of the 17th Central Hardwood Forest Conference*:632-642. General Technical Report P-78. U.S. Forest Service, Northern Research Station.

Treanor, J., J. Johnson, R. Wallen, S. Cilles, P. Crowley, **J.J. Cox**, D.S. Maehr, P.J. White, and G. Plumb. 2010. Vaccination strategies for managing brucellosis in Yellowstone bison. *Vaccine* 28F:F64-72.

Olsson, P.M.O., **J.J. Cox**, J.L. Larkin, P. Widen, and A. Olofsson. 2010. Space and habitat use of non-migrating moose in coastal southwestern Sweden. *European Journal of Wildlife Research*. DOI 10.1007/s10344-010-0418-5

Larkin, J.L., D.S. Maehr, J. J. Krupa, **J.J. Cox**, K.A. Alexy, D. Unger, and C. Barton. 2008. Response of small mammals to 3 post-coal mining reclamation treatments. *Southeastern Naturalist* 7:401-412.

Cox, J.J., and P.S. Crowley. 2007. The Bluegrass restoration program at Griffith Woods. (Invited) *Restoration Ecology* 25:72-73.

Olsson, P.M.O., **J.J. Cox**, J.L. Larkin, D.S. Maehr, P. Widen, M.W. Wichrowski. 2007. Movement and activity patterns of translocated elk (*Cervus elaphus nelson*) on an active coal mine in Kentucky. *Wildlife Biology in Practice* 3:1-8.

Cox, J.J., J.L. Larkin, and D.S. Maehr. 2006. Florida panther habitat use: new approach to an old problem. *Journal of Wildlife Management* 70:1778-1785.

Maehr, D.S., P.S. Crowley, **J.J. Cox**, M.J. Lacki, J.L. Larkin, T.S. Hootor, L.D. Harris, and P.M. Hall. 2006. Of Florida panthers and haruspices: genetic intervention in the Florida panther. *Animal Conservation* 9:127-132.

Dzialak, M.R., M.J. Lacki, K.M. Carter, K. Huie, and **J.J. Cox**. 2006. A critical assessment of hacking as a raptor reintroduction technique. *Wildlife Society Bulletin* 34:542-547.

Schneider, J., D.S. Maehr, K.A. Alexy, **J.J. Cox**, J.L. Larkin, and B.C. Reeder. 2006. Food habits of reintroduced elk in southeastern Kentucky. *Southeastern Naturalist* 5:535-546.

Seward, N.W., D.S. Maehr, J. Gassett, **J.J. Cox**, and J.L. Larkin. 2005. Field searches versus vaginal-implant transmitters for locating elk calves. *Wildlife Society Bulletin* 33:751-756.

Wichrowski, M.W., D.S. Maehr, J.L. Larkin, **J.J. Cox**, and M. Olsson. 2005. Activity and movements of reintroduced elk in southeastern Kentucky. *Southeastern Naturalist* 4:365-374.

Cox, J.J., and D.S. Maehr. 2005. Surface mining and wildlife resources: addition and subtraction on the Cumberland Plateau. *Transactions of the North American Wildlife and Natural Resources Conference* 69:234-250.

Larkin, J.L., **J.J. Cox**, M. W. Wichrowski, M.R. Dzialak, and D.S. Maehr. 2004. Release site fidelity of reintroduced elk in Kentucky. *Restoration Ecology* 12:97-105.

Maehr, D.S., J.L. Larkin, and **J.J. Cox**. 2004. Shopping centers as panther habitat: inferring animal locations from models. *Ecology and Society* 9(2): 9. [online] URL: <http://www.ecologyandsociety.org/vol9/iss2/art9>

Larkin, J.L., D.S. Maehr, **J.J. Cox**, D.C. Bolin, and M.W. Wichrowski. 2003. Demographic characteristics of a reintroduced elk population. *Journal of Wildlife Management* 67:467-476.

Cox, J.J., N.W. Seward, J.L. Larkin, and D.S. Maehr. 2003. Common raven nests in eastern Kentucky. *Southeastern Naturalist* 2:99-104.

Larkin, J.L., K. J. Alexy, D. Bolin, D.S. Maehr, **J.J. Cox**, M.W. Wichrowski, and N.W. Seward. 2003. Incidence of meningeal worm in a reintroduced elk herd in Kentucky. *Journal of Wildlife Diseases* 39:588-592.

Maehr, D.S., J.L. Larkin, K.J. Alexy, R.J. Warren, N.W. Seward, J.W. Day, T. Toman, **J.J. Cox**, and M.A. Orlando. 2002. Graduate education should not count more toward TWS certification. *Wildlife Society Bulletin* 30:979-982.

Larkin, J.L., D.S. Maehr, **J.J. Cox**, and C. Logsdon. 2002. Reproductive performance of yearling male elk (*Cervus elaphus nelsoni*) in a reintroduced population in southeastern Kentucky. *Southeastern Naturalist* 1:279-286.

Cox, J.J., D.S. Maehr, and J.L. Larkin. 2002. The biogeography of faunal place names in the United States. *Conservation Biology* 16:1143-1150.

Larkin, J.L., D.S. Maehr, **J.J. Cox**, M. W. Wichrowski, and R.D. Crank. 2002. Factors affecting reproduction and population growth in a restored elk population. *Wildlife Biology* 8:49-54.

Cox, J.J., L. Meade, D. Yancy, and D.S. Maehr. 2001. Taxonomic status of wild *Canis* in Kentucky. *Proceedings of the Annual Conference of the Southeastern Fish and Wildlife Agencies* 55:408-417.

Non-refereed Journal Articles (5)

Stringer, J., **J.J. Cox**, and B. Thomas. 2008. Invasive species hit list: bush honeysuckle. *Kentucky Woodlands Magazine* 3(3) 13-15.

Cox, J.J. 2007. Black vulture fledges young in historic Griffith Tavern. *Kentucky Warbler* 83:36-37.

Seward, N.W., **J.J. Cox**, J.H. Brown, and J.L. Larkin. 2005. Use of elk hair as nesting material by the eastern phoebe. *Kentucky Warbler* 81:33.

Cox, J.J., and J.L. Larkin. 2004. Monitoring the state-endangered common raven (*Corvus corax*) in southeastern Kentucky. (Invited) *Endangered Species Bulletin* 21:109-112.

Cox, J.J., R.D. Crank, and D.S. Maehr. 2000. Bald eagle scavenges a white-tailed deer carcass at Redbird Wildlife Management Area. *Kentucky Warbler* 76:51-52.

Book (1)

White Jr., D., **J.J. Cox**, and J.L. Larkin (eds.). *In progress*. Ecology and management of elk in eastern North America.

Book Chapters (4)

Maehr, D.S., **J.J. Cox**, and J.L. Larkin. 2006. North American Elk, or Wapiti, *Cervus Elaphus*. Pages 293-314. *In*, M. Trani, W.M. Ford, and B.R. Chapman (eds.). The land manager's guide to mammals of the South. USDA Forest Service, Atlanta, GA and The Nature Conservancy, Durham, NC. 546 pp.

Maehr, D.S., M.A. Orlando, and **J.J. Cox**. 2005. Large carnivores, herbivores, and omnivores in South Florida: An evolutionary approach to conserving landscapes and biodiversity. Pages 293-314. *In*, J. Ray, J. Berger, and K. Redford (eds.), Large carnivores and biodiversity: does saving one conserve the other? Island Press, Washington, D.C.

Maehr, D.S., **J.J. Cox**, and J.L. Larkin. 2002. Landscape history: linking conservation approaches for large mammals. Pages 321-340. *In*, J.A. Bissonette and I. Storch (Eds.). Landscape ecology and resource management: linking theory with practice. Island Press, Washington D.C.

Larkin, J.L., D.S. Maehr, L. Cornicelli, **J.J. Cox**, and R. Grimes. 2001. Returning elk to Appalachia: foiling Murphy's Law. Pages 101-117, *In*, D.S. Maehr, R. Noss, and J.L. Larkin (editors). Large mammal restoration: ecological and sociological challenges in the 21st century. Island Press, Washington D.C.

Book Review (1)

Cox, J.J. 2013. Book review: Reintroduction biology: integrating science and management. *Journal of Wildlife Management* 77(5):1079-1080.

Federal Technical Reports (3)

Aune, K., **J.J. Cox**, V. Ezenwa, A. Jolles, T. Kreeger, M. Miller, P. Nara, and S. Olsen. 2013. Brucellosis science review workshop panelist's report. Yellowstone National Park, Mammoth Hot Springs, WY. 20 pp.

Davis III, S.E., K. Hines, W. Conner, **J.J. Cox**, D. Gawlik, J. Jackson, J. Jones, F.M. Wilhelm, and J. Richards. 2010. Oil and gas impacts in the Big Cypress Ecosystem: an analysis of impacts associated with proposed activities in the Nobles Grade area. The Everglades Foundation. 269 pp.

Larkin, J.L., J. Treanor, **J.J. Cox**, D.S. Maehr, and G. Plumb. 2003. A comprehensive rapid-assessment approach for research agenda: elk (*Cervus elaphus*) at Yellowstone National Park. Technical Report, Yellowstone National Park, Mammoth Hot Springs, Wyoming. 177 pp.

Extension Publications (3)

Cox, J.J. 2015. Kentucky Forests: A World of Wildlife. 2015. Written, directed, and produced. 25 min. Released 8/15. Used at KY Wood Expo and other extension venues.

Cox, J.J. 2014. Ten-thousand or bust: elk research in Kentucky. *Kentucky Woodlands Magazine*. 9(1):10-11.

Cox, J.J. 2014. Black bears in Kentucky. Webinar. 10/21.

Acknowledged Book Chapter Review (2)

Cox, J.J. 2015. Book chapter review: “Valuation of Biodiversity”. Essentials of conservation biology (6th edition). Sinauer Associates. (to publisher and author)

Cox, J.J. 2014. Book chapter review: “Restoration Ecology”. Essentials of conservation biology (6th edition). Sinauer Associates. (to publisher and author)

Short Stories:

To Cross a Fence. Inscape, Fall, 1994

Poems:

Respiration at El Paso. Inscape, Spring, 1995

Peoples Island 513. Inscape, Fall, 1995

i mammal. Inscape, Fall, 1995

Sago Ugalde, Inscape, Spring, 1995

Serengeti. Inscape, Fall, 1996

Photography:

Wildlife, landscape, and graphic art photography; works found in several magazines (e.g. Zoogoer, Harpers, Gun and Garden, KY Woodlands), a few books (e.g. Lost Mountain, Living in the Appalachian Forest), and national graphic arts project

<http://www.stateart.net/States/KY/>.

PUBLISHED ABSTRACTS, CONFERENCE and MEETING PRESENTATIONS

(*indicates award-winning presentations, ^aindicates advised undergraduate student primary author, ^bindicates advised graduate student primary author)

Cox, J.J. 2016. Black bears in Kentucky. Workshop on “The Amazing Natural Resources and Biodiversity of Appalachia.” Osher Lifelong Learning Institute at University of Kentucky. Lexington. Feb. 1.

^bMcDermott, J., C. Haymes, J. Hast, G. Jenkins, W. Bowling, K. Sams, and **J.J. Cox**. 2016. White-tailed deer fawn survival in a southeastern Kentucky population. 39th Annual Southeastern Deer Study Group Meeting. Feb 15-18 Raleigh, NC.

^bHaymes, C., J. McDermott, J. Hast, G. Jenkins, W. Bowling, K. Sams, and **J.J. Cox**. 2016. White-tailed deer fawn survival in a southeastern Kentucky population. 39th Annual Southeastern Deer Study Group Meeting. Feb 15-18 Raleigh, NC.

^bSlabach, B., J. T. Hast, C. Barton, and **J.J. Cox**. 2015. A matter of taste? Geophagic behavior of free-ranging ungulates on a human altered landscape. The Wildlife Society 22nd Annual Conference. Oct.17-20, Winnipeg, Canada.

^bHaymes, C., J. McDermott, J.T. Hast, G. Jenkins, W. Bowling and **J.J. Cox**. 2015. Immobilization of wild white-tailed deer with BAM. The Wildlife Society 22nd Annual

Conference. Oct.17-20, Winnipeg, Canada.

^bMurphy, S.M., **J.J. Cox**, J.T. Hast, B. Augustine, J. Plaxico, and S. Dobey. 2015. Demographic and genetic characteristics of a reintroduced black bear population in the Big South Fork Area of Kentucky and Tennessee. Kentucky Chapter of The Wildlife Society Annual Meeting. Natural Bridge State Park, Slade, KY.

^bHaymes, C., J. McDermott, J.T. Hast, G. Jenkins, W. Bowling and **J.J. Cox**. 2015. Immobilization of wild white-tailed deer with BAM. Kentucky Chapter of The Wildlife Society 22nd Annual Conference. Natural Bridge State Park, Slade, KY.

^bHamilton, S., **J.J. Cox**, A. Drayer, J.M. Richards, and J.J. Treanor. 2015. An investigation of chytrid fungus infection in plethodontid salamander communities of logged, surface mined and intact forests of eastern Kentucky. The Annual Water Resources Symposium, Lexington, KY. March 9.

^bHildreth, A., **J.J. Cox**, J.T. Hast, B. Slabach. 2014. Effects of capture metrics on blood serum profiles of elk in Kentucky. The Wildlife Society 21st Annual Conference. Oct. 25-30, Pittsburg, PA.

^bShaffer, J.D., S.K. Gleeson, **J.J. Cox**, and J.M. Lhotka. 2014. Mammalian herbivory on fourteen experimentally planted native hardwood tree seedlings of the Kentucky Bluegrass savanna-woodland community. The Wildlife Society 21st Annual Conference. Oct. 25-30, Pittsburg, PA.

^bFelch, J., and **J.J. Cox**. 2014. The common raven in cliff habitat of the southern Appalachians: detectability and occupancy. The Wildlife Society 21st Annual Conference. Oct. 25-30, Pittsburg, PA.

^bSlabach, B., J.T. Hast, K. Brunjes, P.H. Crowley, and **J.J. Cox**. 2014. Selective take, group dynamics, and managed species: individual and group level patterns in a gregarious megaherbivore. The Wildlife Society 21st Annual Conference. Oct. 25-30, Pittsburg, PA.

^bHast, J.T., **J.J. Cox**, K. Brunjes, R.D. Crank, W.E. Bowling, and G. Jenkins. 2014. Survival and cause-specific mortality of bull elk in southeastern Kentucky. The Wildlife Society 21st Annual Conference. Oct. 25-30, Pittsburg, PA.

^bHamilton, S., **J.J. Cox**, A. Drayer, J.M. Richards, and J.J. Treanor. 2014. An investigation of chytrid fungus infection in plethodontid salamander communities of logged, surface mined and intact forests of eastern Kentucky. The Wildlife Society 21st Annual Conference. Oct. 25-30, Pittsburg, PA.

^bBetancourt, A., **J.J. Cox**, B. Tom, E. Lyons, and M. Nielsen. 2014. Efficacy of injectable ivermectin on gastrointestinal helminthes in captive wild elk. The Wildlife Society 21st Annual Conference. Oct. 25-30, Pittsburg, PA.

^bSlabach, B.S., J.T. Hast, P.H. Crowley, G. Jenkins, W. Bowling, D. Crank. K. Brunjes, and **J.J. Cox**. 2014. Cause-Specific Mortality, Group Dynamics, and VITs: Three Approaches to Cow Elk Management in Kentucky. 19th Annual Eastern Elk Management Workshop, April 27-30, Breaks Interstate Park, VA.

^{*b}Maigret, T., **J.J. Cox**, D. Schneider, C.D. Barton, S.J. Price, and J.L. Larkin. 2014. Effects of timber harvest within streamside management zones on salamander populations in ephemeral streams of southeastern Kentucky. The Annual Meeting of the Association of Southeastern Biologists, April 3-4, Spartanburg, SC.

^aCunningham, J., and **J.J. Cox**. 2014. Tick species and their potential effects within the elk population of eastern Kentucky. National Conference on Undergraduate Research. April 3-5, Lexington, KY.

^aSchwager, R., A. Betancourt, **J.J. Cox**, E. Lyons, M. Nielsen. 2014. Parasite prevalence in Kentucky elk as determined by fecal egg counts. Feb. 27, Posters-at-the-Capitol, Frankfort, KY

^bMaigret, T., **J.J. Cox**, D. Schneider, C.D. Barton, S.J. Price, and J.L. Larkin. 2014. Effects of timber harvest within streamside management zones on salamander populations in ephemeral streams of southeastern Kentucky. The Wildlife Society, Kentucky Chapter State Conference. Feb 20-21, Barren River State Park, KY.

^bMaigret, T.A., **J.J. Cox**. 2014. A review of best management practices and the mitigation of stream-breeding salamanders in the eastern deciduous forest. 19th Annual Central Hardwoods Conference. March 11, Carbondale, IL, USA.

^bMaigret, T.A., **J.J. Cox**, D.R. Schneider, C.D. Barton, S.J. Price, and J.L. Larkin. 2014. Effects of timber harvest within streamside management zones on salamander populations in ephemeral streams of southeastern Kentucky. Southeast Partners in Amphibian and Reptile Conservation Annual Meeting. Feb 13-14, Lake Cumberland, KY, USA.

^bShaffer, J.D., S.K. Gleeson, **J.J. Cox**, and J.L. Lhotka. 2014. The effects of mammalian herbivory on the growth of native hardwood tree seedlings of the Kentucky Bluegrass blue ash-oak savanna-woodland. The Wildlife Society, Kentucky Chapter State Conference. Feb 20-21. Barren River State Park, KY.

^{*b}Shaffer, J.D., S.K. Gleeson, **J.J. Cox**, and J.L. Lhotka. 2014. The effects of mammalian herbivory on the growth of native hardwood tree seedlings of the Kentucky Bluegrass blue ash-oak savanna-woodland. American Society of Plant Biologists Annual Meeting, March 29-30, Lexington, KY.

^{*b}Hast, J.T., **J.J. Cox**, K. Brunjes, W. Bowling, D. Crank, and G. Jenkins. 2014. Survival and cause-specific mortality of bull elk in southeastern Kentucky. The Wildlife Society,

Kentucky Chapter State Conference. Feb 20-21, Barren River State Park, KY.

^bSlabach, B., **J.J. Cox**, and P.H. Crowley. 2014. Partnering standard wildlife monitoring and traditional behavioral techniques: understanding group dynamics in managed species. The Wildlife Society, Kentucky Chapter State Conference. Feb 20-21, Barren River State Park, KY.

^bBetancourt, A., **J.J. Cox**, B.M. Tom, E.T. Lyons, and M.K. Nielsen. 2014. Efficacy of injectable ivermectin on gastrointestinal helminths in captive wild elk (*Cervus canadensis*). The Wildlife Society, Kentucky Chapter State Conference. Feb 20-21, Barren River State Park, KY.

Cox, J.J. 2013. The road to recovery? A century of elk management and conservation in the eastern United States. The Wildlife Society 20th Annual Conference. Oct. 6-10, Milwaukee, WI.

Hast, J.T. ^b, **J.J. Cox**, K. Brunjes, G. Jenkins, D. Crank, and W. Bowling. 2013. Survival and cause-specific mortality of bull elk in southeastern Kentucky. The Wildlife Society 20th Annual Conference. Oct. 6-10. Milwaukee, WI.

Kristensen, T.V., E.E. Puckett, J.T. Hast^b, C. Carpenter, J.L. Sajecki, J.L. Belant, J. Beringer, M. Means, **J.J. Cox**, R.A. Van Den Bussche, L.S. Eggert, D. White, Jr., and K.G. Smith. 2013. Black bear (*Ursus americanus*) dispersal in expanding populations. Twenty-second Conference of the International Association for Bear Research and Management, Sept 15-20, Provo, UT.

^bShaffer, J.D., S.K. Gleeson, **J.J. Cox**, and J.L. Lhotka. 2013. Factors influencing the establishment and survival of native hardwood tree seedlings of the Kentucky Inner Bluegrass blue ash-oak savanna-woodland. 98th Ecological Society of America Annual Conference. August 4-9, Minneapolis, MN.

^bBetancourt, A., B. Tom, M.K. Nielsen, and **J.J. Cox**. 2013. Efficacy of injectable ivermectin on gastrointestinal helminths in captive wild elk (*Cervus elaphus*). 2013. 58th Annual Meeting The American Association of Veterinary Parasitologists July 20-23, Chicago, IL.

^aHatfield, R.S., and **J.J. Cox**. 2013. Population dynamics of the African lion (*Panthera leo*) within the Maasai Mara region of southern Kenya. The National Conference on Undergraduate Research. April 11-13, LaCrosse, WI.

^aHatfield, R.S., and **J.J. Cox**. 2013. Population dynamics of the African lion (*Panthera leo*) within the Maasai Mara region of southern Kenya. Posters-at-the-Capitol. Feb. 21, Frankfort, KY.

^bMaigret, T.A., **J.J. Cox**, S.J. Price, and C. Barton. 2013. Population ecology and habitat

preferences of timber rattlesnakes in an increasingly fragmented landscape of southeast Kentucky. Southeast Partners in Amphibian and Reptile Conservation Annual Meeting, Feb. 21-24, McCormick, SC.

^bHildreth, A. M., J. T. Hast, B. L. Slabach, A. Betancourt, **J. J. Cox**, K. Brunjes, W. Bowling, D. Crank, and G. Jenkins. 2013. Can body condition and select physiological indicators predict survival of elk post-translocation? April 28-30. 18th Annual Eastern Elk Management Workshop, Cable, WI.

^bTreanor, J.T, C. Germania, P.H. Crowley, **J.J. Cox**, P.J. White, R.L. Wallen, and D.W. Blanton. 2012. Estimating probabilities of active brucellosis infection in Yellowstone bison through quantitative serology and tissue culture. The Wildlife Society 19th Annual Conference. Oct. 13-17. Portland, OR.

^bShaffer, J.D., S.K. Gleeson, **J.J. Cox**, and J.M. Lhotka. 2012. The influence of grass competition and herbivory on native hardwood seedling establishment in the Inner Bluegrass of Kentucky. Ecological Society of America Annual Conference. August 5-10. Portland, OR.

^bHast, J.T., **J.J. Cox**, S. Fei, D. Weisrock, S. Dobey, and J. Plaxico. 2012. Genetic diversity, structure, and recolonization patterns of black bears in eastern Kentucky The Wildlife Society, Kentucky Chapter State Conference. Feb 23-24, Dale Hollow Lake State Park, KY.

*Maigret, T., C. Barton, **J.J. Cox**, J.L. Larkin, and D. Schneider. 2012. Impacts of different silvicultural treatments on salamander communities in Robinson Forest, Breathitt County, Kentucky. Feb 23-24, Dale Hollow Lake State Park, KY.

*Murphy, S.M., **J.J. Cox**, J.T. Hast, and S. Fei. 2012. Using non-invasive hair sampling to estimate the size and density of a reintroduced black bear population in south-central Kentucky. The Wildlife Society, Kentucky Chapter State Conference. Feb 23-24, Dale Hollow Lake State Park, KY.

Betancourt, A., E.T. Lyons, M.K. Neilsen, and **J.J. Cox**. Helminths gone wild: conditional responses leading to harmful parasitization of cervids. The Wildlife Society, Kentucky Chapter State Conference. Feb 23-24, Dale Hollow Lake State Park, KY.

Cox, J.J. 2012. Black bears return to Western Appalachia: challenges and opportunities. Tri-state wildlife and woodland program. Cincinnati, OH. March 24.

^aEhlmann, S., **J.J. Cox**, and P.H. Crowley. 2011. Movement and arousal decisions by healthy and diseased cave-dwelling bats during hibernation. Comparative Decision-Making Conference. May 13-15. Lexington, KY.

Barton, C.D., J.W. Stringer, E.L. Witt, M.A. Cherry, S.A. Grubbs, **J.J. Cox**, D.W.

Bowker, J. Larkin, B. Lee and R.K. Kolka. 2011. Water quality and yield: effect of riparian zone width and disturbance. Southern Forest Research Partnership, Inc.: Forestry Research in the South. August.

Tom, B.M., and **J.J. Cox**. 2011. A comparison of noninvasive genetic survey methods for monitoring mesocarnivore populations in Kentucky. The Wildlife Society 18th Annual Conference. Nov. 5-10. Waikoloa, HI.

Hast, J.T., B.A. Augustine, **J.J. Cox**, S.M. Murphy, S. Dobey, and J. Plaxico. 2011. Reproductive ecology and of a recolonizing black bear population in Kentucky. The Wildlife Society 18th Annual Conference. Nov. 5-10. Waikoloa, HI.

*Murphy, S.M., **J.J. Cox**, J.T. Hast, and S. Fei. 2011. Using non-invasive hair sampling to estimate the size and density of a reintroduced black bear population in south-central Kentucky. The Wildlife Society 18th Annual Conference. Nov. 5-10. Waikoloa, HI.

Guthrie, J.G., **J.J. Cox**, and W.A. Ulrey. 2011. Modeling road-crossing behavior for the southcentral Florida black bear. The Wildlife Society 18th Annual Conference. Nov. 5-10. Waikoloa, HI.

Felch, J., **J.J. Cox**, and M. Dzialak. 2011. The Common Raven in cliff habitat: detectability and occupancy. The Wildlife Society, Kentucky Chapter State Conference. February 24-25. Lake Cumberland State Park, KY.

Murphy, S.M., **J.J. Cox**, J.T. Hast, B. Augustine, and S. Fei. 2011. South-central Kentucky black bear population parameters. The Wildlife Society, Kentucky Chapter State Conference. February 24-25. Lake Cumberland State Park, KY.

Cox, J.J. 2010. Tales of a repatriated megaherbivore: challenges and opportunities for management of reintroduced elk in Appalachia. Proceedings of the 17th Central Hardwood Forest Conference. April 5-7. Lexington, KY.

Hast, J.T., **J.J. Cox**, S. Fei, D. Weisrock, S. Dobey, and J. Plaxico. 2010. Genetic diversity, structure, and recolonization patterns of black bears in eastern Kentucky. Proceedings of the 17th Central Hardwood Forest Conference. April 5-7. Lexington, KY.

Augustine, B.A., P.H. Crowley, **J.J. Cox**, and D.S. Maehr. 2010. Understanding controllable sources of fix proportion bias in GPS telemetry. The Wildlife Society, Kentucky Chapter State Conference. February 18-19. Mammoth Cave, KY.

*Hast, J.T., **J.J. Cox**, S. Fei, D. Weisrock, S. Dobey, and J. Plaxico. 2010. Genetic diversity, structure, and recolonization patterns of black bears in eastern Kentucky. The Wildlife Society, Kentucky Chapter State Conference. February 18-19. Mammoth Cave, KY.

Felch, J., **J.J. Cox**, and M. Dzialak. 2010. The Common Raven in cliff habitat: detectability and occupancy. The Wildlife Society 17th Annual Conference. Oct. 2-6. Snowbird, UT.

Murphy, S.M., **J.J. Cox**, J.T. Hast, B. Augustine, and S. Fei. 2010. Beyond the founders? Using non-invasive hair sampling to estimate the size, density, and genetics of a black bear population in south-central Kentucky. The Wildlife Society 17th Annual Conference. Oct. 2-6. Snowbird, UT.

Cox, J.J., L. Dahl, K. Alexy, D. Unger, W. Bowling, D. Maehr, and J. Larkin. 2009. Irruptive growth of reintroduced elk in Kentucky: looming management and conservation challenges. Society for Conservation Biology 23rd Annual Conference. July 10-16. Beijing, China.

Cox, J.J. 2009. Elk reintroduction in Kentucky: challenges and opportunities in the 21st century. (Invited) Alice Lloyd College, Hindman, KY. Apr.22, 2009.

Cox, J.J. 2009. Donuts and dart rifles, coal mines and cabbage palms: challenges and opportunities in studying the black bear in Kentucky and Florida. American Association of Laboratory Animal Science, Louisville, KY. May 16, 2009.

Cox, J.J. 2009. Elk reintroduction in Kentucky: mission accomplished. Now what? (Invited) Indiana University Southeast. New Albany, IN. Apr. 15, 2009.

Whittle, A., S. Fei, and **J.J. Cox**. 2008. Global climate change and its effects on large carnivore habitat in Florida. The Wildlife Society 15th Annual Conference. Miami, FL.

Dahl, L.M., **J.J. Cox**, K.J. Alexy, J.E. Duchamp, D.S. Maehr, D.E. Unger, W.E. Bowling, J.L. Larkin. 2008. Using FLIR to assess abundance and distribution of elk in eastern Kentucky. The Wildlife Society 15th Annual Conference. Nov. 8-12. Miami, FL.

Bowling, W., D.S. Maehr, **J.J. Cox**, L.M. Dahl, and K. Alexy. 2008. Movements, home range characteristics, and demographics of elk in eastern Kentucky. The Wildlife Society 15th Annual Conference. Nov. 8-12. Miami, FL.

Whittle, A., S. Fei, and **J.J. Cox**. 2008. Black bear and Florida panther habitat and the effects of climate change. In proceedings of OFWIM Annual Meeting and Conference: Using innovative technology to move from planning to implementation. Albuquerque, NM.

Whittle, A., S. Fei, and **J.J. Cox**. 2008. Global climate change and its effects on large carnivore habitat in Florida. In proceedings of Florida's Wildlife: On the Frontline of Climate Change. Orlando, FL.

Cox, J.J. 2007. Wildlife reintroductions: a perturbed state of affairs. (Invited) The

Wildlife Society 14th Annual Conference. Sept. 22-26. Tucson, AZ.

Cox, J.J. 2007. Inconvenient truths? (Invited) Environmental challenges for the 21st century: Appalachian and Minority, Science, Technology, Engineering, & Math Majors, June 11. Lexington, KY.

Cox, J.J., D.S. Maehr, Z. Danks, N.W. Seward, and K. Alexy. 2007. Coyote-elk relations in southeastern Kentucky (Invited). Southeastern Furbearers Workshop, May 9-12. Cadiz, KY.

Maehr, D.S., D.E. Unger, H.B. Harris, W.A. Ulrey, R. Jensen, J.M. Guthrie, V. Frary, J.L. Larkin, A.N. Schuhmann, L.M. Dahl, **J.J. Cox**, and J.H. Harrelson. 2007. University of Kentucky Black Bear Research Summary. Eastern Black Bear Workshop, Sheperdstown, WV. April.

Cox, J.J., D.S. Maehr, Z. Danks, N.W. Seward, and K. Alexy. 2006. Coyote-elk relations in southeastern Kentucky. The Wildlife Society 13th Annual Conference. Sept. 23-27, 2007. Anchorage, Alaska.

Maehr, D.S., **J.J. Cox**, and J.L. Larkin. 2005. Florida panther habitat use: a new approach to a management dilemma. 12th Annual Conference of The Wildlife Society. Madison, WI. September 25-29.

Cox, J.J. 2005. Where do we go from here? The Griffith Woods restoration project. (Invited) Annual Conference of the Kentucky Academy of Science. Nov. 10, 2005. Eastern Kentucky University, Richmond.

Cox, J.J., D.S. Maehr, and J.L. Larkin. 2005. A Euclidean distance-based habitat use analysis of the endangered Florida panther. Society for Conservation Biology 19th Annual Conference. July 15-19. University of Brasilia, Brazil.

Maehr, D.S., **J.J. Cox**, J.L. Larkin, P.H. Crowley, J. Treanor, T.S. Hootor, and J.L. Gittleman. 2005. Do life histories and landscape predict colonization success in large mammals? Ninth International Mammalogical Congress, Sapporo, Japan. August.

Ter Beest, J.M., D.S. Maehr, C.D. Barton, J.L. Larkin, and **J.J. Cox**. 2005. Effects of a restored elk population on soils, vegetation, and water quality in eastern Kentucky. 12th Annual Conference of The Wildlife Society. Madison, WI. September 25-29.

Seward, N.W., D.S. Maehr, **J.J. Cox**, and J.L. Larkin. 2003. Mortality and survival of elk calves in eastern Kentucky. 10th Annual Conference of The Wildlife Society. Burlington, VT. September 6-10.

Larkin, J.L., D.S. Maehr, J. Treanor, **J.J. Cox**, H. Loring, and G. Plumb. 2003. A comprehensive rapid-assessment for research agenda development: a case study for elk in

Yellowstone National Park. 7th Biennial Scientific Conference on the Greater Yellowstone Ecosystem. Mammoth Hot Springs, WY October 6-8.

Maehr, D.S., **J.J. Cox**, and J.L. Larkin. 2003. Landscape history: dictating the conservation approach for large mammals. 9th Annual Conference of The Wildlife Society. Burlington, VT. September 6-10.

Seward, N.W., **J.J. Cox**, J. Gassett, D.S. Maehr, and J.L. Larkin. 2002. Field searches are superior to vaginal-implant transmitters for locating elk calves. 7th Annual Eastern Elk Management Workshop. Killarney, Ontario. May. 4-8.

Cox, J.J., D.S. Maehr, and J.L. Larkin. 2002. Send them to the Redbird: elk reintroduction and perturbation analysis in the Daniel Boone National Forest. The Wildlife Society 9th Annual Conference. Sept. 23-28. Bismarck, ND.

Cox, J.J., D.S. Maehr, and J.L. Larkin. 2002. The biogeography of faunal place names in the United States. Society for Conservation Biology 16th Annual Conference. July 14-July 18. University of Kent, Canterbury, England.

Larkin, J.L., D.S. Maehr, **J.J. Cox**, M.W. Wichrowski, N.W. Seward, D. Crank, and C. Logsdon. 2002. Restored elk in Kentucky: past trends and future threats to long-term viability. 7th Annual Eastern Elk Managers Workshop, Killarney, Ontario. May 4-8.

Cox, J.J., J.L. Larkin, D.S. Maehr, and M.W. Wichrowski. 2001. Colonizing patterns of a restored elk population in eastern Kentucky. Society for Conservation Biology 15th Annual Conference. July 29-Aug. 1. University of Hawaii, Hilo, HI.

Cox, J.J., D.S. Maehr, and J.L. Larkin. 2001. Kentucky mountain elk. Earthwatch Institute Annual Conference. Nov.13-16. Tufts University, Boston, MA

Cox, J.J., D.S. Maehr, and J.L. Larkin. 2001. Distribution, density, and historical range fidelity of select place names in the United States. The Wildlife Society 8th Annual Conference. Sept. 25-29. Reno, NV.

Cox, J.J., L. Meade, D. Yancy, and D.S. Maehr. 2001. Taxonomic status of wild Canis in Kentucky. 55th Annual Conference of the Southeastern Fish and Wildlife Agencies. Oct 13-17. Louisville, KY.

Wichrowski, M., J.L. Larkin, D.S. Maehr, and **J.J. Cox**. 2001. Colonization patterns of a restored elk population in Appalachia. The Wildlife Society 8th Annual Conference. Sept. 25-29. Reno, NV.

Larkin, J.L., D.S. Maehr, **J.J. Cox**, and M.W. Wichrowski. 2001. Demographic characteristics of a restored elk population. The Wildlife Society 8th Annual Conference. Sept. 25-29. Reno, NV.

Larkin, J.L., D.S. Maehr, **J.J. Cox**, R.D. Crank, M.W. Wichrowski, and E.G. Springborn. 2000. Elk restoration in Kentucky: Current findings and future direction. The Wildlife Society 7th Annual Conference, Nashville, TN. September 12-16.

Larkin, J.L., D.S. Maehr, **J.J. Cox**, and M.W. Wichrowski. 2001. Demographic characteristics of a restored elk population. Society for Conservation Biology 15th Annual Conference. July 29-Aug. 1. University of Hawaii, Hilo, HI.

Larkin, J.L., D.S. Maehr, and **J.J. Cox**. 2000. Elk restoration in Appalachia: Ecological imperative or sociological vanity? Society for Conservation Biology 14th Annual Meeting, Missoula, MT. June 9-12.

Cox, J.J., D.S. Maehr, and J.L. Larkin. 2000. Eastern elk restoration: do age and Allee effects determine growth rates? The Wildlife Society 7th Annual Conference. Sept. 12-16. Nashville, TN.

Cox, J.J., and David S. Maehr. 2000. Impacts of reintroduced elk on white-tailed deer and coyotes. Kentucky Natural History Society. September. Buckhorn Lake State Park, Chavies, KY.

Cox, J.J., D.S. Maehr, and J.L. Larkin. 2000. Kentucky mountain elk. Earthwatch Institute Annual Conference. Nov.15-18. Harvard University, Cambridge, MA

Cox, J.J., D.S. Maehr, and J.L. Larkin. 2000. Eastern elk restoration: do age and Allee effects determine growth rates? Society for Conservation Biology 14th Annual Conference June 9-12. University of Montana, Missoula, MT.

Wichrowski, M.W., D.S. Maehr, J.L. Larkin, **J.J. Cox**, R.D. Crank, E.G. Springborn, M.S. Smith, M. Olsson, and P. Giardot. 2000. Daily and seasonal activity and movement patterns of translocated elk in eastern Kentucky. The Wildlife Society 7th Annual Conference. Sept. 12-16. Nashville, TN.

Cox, J.J., C. Tuerk, and L. Meade. 1997. Detection of hybridization events between the coyote, *Canis latrans*, and the domestic dog, *Canis familiaris*, in Kentucky using two polymorphic microsatellite loci and cranial morphometric analysis. Midwest Ecology and Evolution Conference. April. University of Louisville, Louisville, KY.

SYMPOSIA ORGANIZED

Cox, J.J., D. White, Jr., and J.L. Larkin. 2013. "Elk ecology, conservation, and management in eastern North America: opportunities and challenges in the 21st century." The Wildlife Society 20th Annual Conference. Milwaukee, WI. 10/2013.

Larkin, J., **J.J. Cox**, and J. Larkin. "Restoration of wildlife and their habitats." The Wildlife Society 9th Annual Conference. Bismarck, ND. 9/2002.

POPULAR MEDIA

Spence, C. Evermore (Common Raven study). 2015. The Magazine: University of Kentucky College of Agriculture. Winter.

<http://www2.ca.uky.edu/agcomm/Magazine/2015/Winter2015/index.html>

America The Wild TV Series. National Geographic Wild Channel. Sept 2013. Episode “Gator Country” Featured 20 minute segment on UK Florida black bear research project.

KY Afield TV Series: June 2013. <http://www.youtube.com/watch?v=xxtJPMRxx2w>

Spence, C. 2013. Friends not foes (timber rattlesnake study). The Magazine: University of Kentucky College of Agriculture. Spring.

http://www.ca.uky.edu/agcomm/magazine/2013/Spring13/friends_not_foes.html

Baker, D. 2012. Elk round-up. Kentucky Afield Magazine. Spring.

KY Afield TV Series: March 2012. Bull elk research project.

<http://www.youtube.com/watch?v=ZF0isXlGha8&feature=plcp>

Spence, C. 2011. The bear facts. The Magazine: University of Kentucky College of Agriculture. Fall. <http://www.ca.uky.edu/agcomm/magazine/2011/FALL-2011/Articles/index.htm>

<http://www.ca.uky.edu/agcomm/magazine/2011/FALL-2011/Articles/index.htm>

White, M. 2011. Bear essentials. Audubon 113:28-32.

Jenkins, M. 2011. The Headwaters. Nature Conservancy. Issue 2:44-53.

Risch, D. 2010. Andrea the elk spotter. Highlights Magazine. November 2010.

KY Afield TV Series: March 2010. Black bear research and denning.

<http://www.youtube.com/watch?v=dzz9LZ554NM>

Spence, C. 2009. Elk return to Kentucky. The Magazine: University of Kentucky College of Agriculture. Spring. <http://www.ca.uky.edu/agcomm/Magazine/2009/SPRING-2009/Articles/ElksReturntoKentucky.html>

<http://www.ca.uky.edu/agcomm/Magazine/2009/SPRING-2009/Articles/ElksReturntoKentucky.html>

CNN: September 2009 http://articles.cnn.com/2009-09-07/tech/florida.tracking.bears_1_bears-researchers-doughnuts?s=PM:TECH

http://articles.cnn.com/2009-09-07/tech/florida.tracking.bears_1_bears-researchers-doughnuts?s=PM:TECH

Spence, C. 2005. Restoring an early landscape. The Magazine: University of Kentucky College of Agriculture 6:23.

SCIENTIFIC MEETINGS ATTENDED

- The Wildlife Society 21st Annual Conference. 10/14. Pittsburg, PA.
- The Wildlife Society 20th Annual Conference. 10/13. Milwaukee, WI

- The Wildlife Society 19th Annual Conference. 10/12. Portland, OR
- The Wildlife Society 17th Annual Conference. 10/10. Snowbird, UT.
- The Wildlife Society 15th Annual Conference. 11/08. Miami, FL.
- The Wildlife Society 14th Annual Conference. 9/07. Tucson, AZ
- The Wildlife Society 13th Annual Conference. 9/06. Anchorage, AK
- The Wildlife Society 12th Annual Conference. 9/05. Madison, WI.
- The Wildlife Society 10th Annual Conference. 9/03. Burlington, VT.
- The Wildlife Society 9th Annual Conference. 9/02. Bismarck, ND.
- The Wildlife Society 8th Annual Conference. 9/01. Reno, NV.
- The Wildlife Society 7th Annual Conference. 9/00. Nashville, TN
- The Wildlife Society 6th Annual Conference. 9/99. Austin, TX.
- The Wildlife Society Annual KY State Chapter Meeting 9/15. Natural Bridge S.P., KY
- The Wildlife Society Annual KY State Chapter Meeting 2/14. Barren Lake, KY
- The Wildlife Society Annual KY State Chapter Meeting 2/12. Dale Hollow Lake, KY
- The Wildlife Society Annual KY State Chapter Meeting 2/11. Lake Cumberland, KY
- The Wildlife Society Annual KY State Chapter Meeting 2/10. Mammoth Cave, KY
- Society for Conservation Biology 23rd Annual Conference. 7/09. Beijing, China.
- Society for Conservation Biology 19th Annual Conference. 7/05. Brasilia, Brazil.
- Society for Conservation Biology 16th Annual Conference. 7/02. Cambridge, England.
- Society for Conservation Biology 15th Annual Conference. 7/01. Hilo, HI.
- Society for Conservation Biology 14th Annual Conference. 6/00. Missoula, MT.
- Society for Conservation Biology 13th Annual Conference. 6/99. College Park, MD.
- Annual Conference of the Kentucky Academy of Science. 11/05. Richmond, KY
- Annual Conference of the Kentucky Academy of Science. 11/98. Louisville, KY.
- Annual Conference of the Kentucky Academy of Science. 11/97. Morehead, KY.
- Cumberland Regional Black Bear Workshop, 4/14
- Cumberland Regional Black Bear Workshop, 11/13
- 9th International Mammalogical Congress. 8/05. Sapporo, Japan.
- Southeastern Furbearers Workshop. 5/07. Cadiz, KY.
- 9th Annual Eastern Elk Workshop. 3/04. Knoxville, TN
- 14th Annual Eastern Elk Workshop. 4/10. Knoxville, TN
- 7th Annual Eastern Elk Workshop. 4/03. Knoxville, TN
- 55th Annual Conference Southeastern Fish & Wildlife Agencies. 10/01. Louisville, KY.
- Earthwatch Institute Annual Conference. 11/01. Maynard, MA.
- Earthwatch Institute Annual Conference. 11/00. Cambridge, MA.
- Midwest Ecology and Evolution Conference. 4/97. Louisville, KY.

MEMBERSHIPS (Scientific, Professional, and Honor Societies)

- Society for Conservation Biology (1999-present)
- The Wildlife Society, National and Kentucky Chapters (1999-present)
- Kentucky Ornithological Society (2004-present)
- Kentucky Society of Natural History (2004-present)

- Kentucky Native Plant Society (2007-present)
- The Audubon Society (1999-present)
- The Wildlife and Environmental Society of Malawi (2009-present)
- The Aldo Leopold Foundation (2012-present)

CERTIFICATION and CONTINUING EDUCATION

- Certified Wildlife Biologist, The Wildlife Society (3/2007-present)
- DEA licensed Class II and lower controlled substances (8/2008-present)
- UK CELT Workshop: Cheating: curbing, catching, and consequences (2/27/14)
- UK CELT Workshop: Enhancing student success (9/3/13)
- Non-invasive techniques in genetics for wildlife conservation; Smithsonian-Mason Global Conservation Studies Program, Front Royal, VA, (5/19-5/25/2012) (3 hr graduate course)
- Statistics for ecology and conservation biology; Smithsonian-Mason Global Conservation Studies Program, Front Royal, VA, (2/7-2/18/2011) (6 hr graduate course)
- Chemical immobilization of animals (2 day course); Safe-capture International, Inc. Fort Campbell, KY (11/22-23/2011)
- Detection and occupancy studies of wildlife; 1 day workshop course (The Wildlife Society Annual Meeting, Miami, FL; 11/8/2008)
- S-130, S-190 Fire training (1/2007)

AWARDS, SCHOLARSHIPS, HONORS,

- University of Kentucky 2002-2003 Gamma Sigma Delta College of Agriculture Outstanding Doctoral Student (3/2003)
- University of Kentucky (2002-2003) Dissertation Fellowship \$16,000/year + tuition
- University of Kentucky (2000-2002) Target of Opportunity Scholarship \$4,000/year
- University of Kentucky (1999-2002) Research Assistantship \$15,000/year
- Morehead State University (1995-1997) Graduate Assistantship \$5000/year
- Morehead State University (1990-1994) Regents Scholarship \$1500/year
- Morehead State University (1990-1994) Alumni Scholarship \$500/year

INTERNATIONAL TRAVEL

- Soviet Union, People to People Youth Science Exchange, Field Biology, July-August 1990
- China, Liahuashan Nature Reserve and Gobi Desert, July 2009
- Kenya, Africa. Naboisho Conservancy, Mara National Park. 2014.
- Malawi, Africa. Mt. Mulanje International Bioreserve, Liwonde National Park, Majete Game Reserve, Nkotakota Game Reserve. June-July 2003, 2009, 2011, 2014.
- Sweden, Karlstad University and Uppsala coastal region. June 2006
- Brazil, Brasilia National Park, July 2005
- Japan, Sapporo, August 2005
- England and Scotland, July 2002

OTHER INTERESTS

- History, psychology, sociology, anthropology, ecofriendly technologies and lifestyles, landscaping with native plants, astronomy, poetry and fiction writing, music (fiddle, guitar, piano), Appalachian culture, hiking, and antiques.

ANDREW EDWARD DEROCHER

Born: b(6)

Canadian Citizen

Work: Department of Biological Sciences
University of Alberta
Edmonton, Alberta
Canada T6G 2E9

Phone: (780) 492-5570 Fax: (780) 492-9234

e-mail: derocher@ualberta.ca / b(6)

Twitter: @aederocher

Citation metrics

Web of Science

ResearcherID h-index: 41 (December 28, 2015)

Sum of the Times Cited: 4616 (December 28, 2015)

Google Scholar

h-index: 49 (December 15, 2015)

Citations: 7764 (December 15, 2015)

PUBLICATIONS (peer reviewed) (*students and postdocs in italics*)

171. *Bechshøft T.O.*, Derocher A.E., Richardson, E., Lunn, N.J., St. Louis, V. In revision. Hair mercury concentrations in polar bear family groups: mother-offspring and sibling pairs. *Environmental Science and Technology*.
170. *Pilfold, N.W.*, Hedman, D., Stirling, I., Derocher, A.E., Lunn, N.J., Richardson, E. In press. Mass loss rates of fasting polar bears. *Physiological and Biochemical Zoology*.
169. *Viengkone, M.*, **Derocher, A.E.**, Richardson, E., Malenfant, R., Miller, J., Obbard, M., Dyck, M., Sahanatien, V., Lunn, N., Davis, C. In revision. Comparing two genetic marker systems for assessing polar bear (*Ursus maritimus*) population structure in the Hudson Bay region. *Ecology and Evolution*.
168. *Sahanatien, V.*, Haas, C. Derocher, A.E., Peacock, E., *Pilfold, N.W.*, McDonald, T. in review. Sea ice structure and polar bear habitat selection using high resolution SAR satellite imagery. *Polar Biology*.
167. *Smereka, C.S.*, Edwards, M.A., *Pongracz, J.*, Branigan, M., *Pilfold, N.*, **Derocher, A.E.** in review. Barren-ground grizzly bear den selection, Mackenzie Delta, Northwest Territories. *Polar Biology*.
166. *Viengkone, M.*, *Robinson, B.G.*, Davis, C.S., Richardson, E., Obbard, M.O. Dyck, M., *Sahanatien, V.*, Lunn, N.J., **Derocher, A.E.** Space-use during the breeding season maintains population structure in polar bears (*Ursus maritimus*). *Biological Conservation*.
165. *Auger-Méthé, M.*, Field, C., Moesgaard Albertsen, C., **Derocher, A.E.**, Lewis, M.A., Jonsen, I.D., Mills Flemming, J. 2016. State-space models' dirty little secrets: even simple linear Gaussian models can have parameter and state estimation problems. *Scientific Reports*. Accepted.
164. *Pilfold, N.W.*, *McCall, A.*, **Derocher, A.E.**, Lunn, N.J., Richardson, E. Accepted. Migratory response of polar bears to sea ice loss: to swim or not to swim spatial

- heterogeneity in the behavioural response of migratory polar bears to climate change. *Ecography*.
163. *Mislan, P., Derocher, A.E., St. Louis, V.L., Richardson, E., Lunn, N.J., Janz, D.* in review. Assessing stress in western Hudson Bay polar bears using hair cortisol concentration as a biomarker. *Ecological Indicators*.
 162. *Bytingsvik J., Bertinussen H.O., Sørmo, E.G., Eggen, G.S., Simon E., Hamers T. Leonards P.E.G., Lamoree M., Lie E., Aars J., Derocher A.E., Wiig Ø., Visser. T.J., Jenssen B.M.* submitted. Has decreased concentrations of thyroid disruptive organohalogenated compounds improved the thyroid hormone status in polar bear cubs? *Environmental Science and Technology*.
 161. *Robinson, B.G., Franke, A., Derocher, A.E.* Weather-mediated prey depletion causes food-limitation in a top avian predator. *Journal of Avian Biology*.
 160. *Robinson, B.G., Franke, A., Derocher, A.E.* Estimating the diet of predators with stable isotopes: using priors in Bayesian mixing models to reduce uncertainty.
 159. *Robinson, B.G., Franke, A., Derocher, A.E.* 2015. Estimating nestling diet with cameras: quantifying uncertainty from unidentifiable food deliveries. *Wildlife Biology* DOI: 10.2981/wlb.00114
 158. *Edwards, M.A., Derocher, A.E.* 2015. Mating-related behaviour of grizzly bears inhabiting marginal habitat at the periphery of their North American range. *Biological Processes* 111:75-83.
 157. *Krawchuk, K., Edwards, M.A., Merrill, E. Derocher, A.E.* in prep. Influence of landscape factors on the movements of Canadian Arctic grizzly bears following den emergence. *Polar Biology*.
 156. *Pongracz, J., Derocher, A.E.* in prep. Summer refugia of polar bears (*Ursus maritimus*) in the southern Beaufort Sea.
 155. *Pongracz, J., Derocher, A.E.* in prep. Seasonal and interannual variation in polar bear (*Ursus maritimus*) distribution in the southern Beaufort Sea.
 154. *McCall, A.G., Pilfold, N.W., Derocher, A.E., Lunn, N.J.* accepted. Seasonal habitat selection by adult female polar bears in western Hudson Bay. *Population Ecology*.
 153. *Pilfold, N.W., Derocher, A.E., Stirling, I., Richardson, E.* 2015. Multi-temporal drivers of spring predation events for polar bears in a changing climate. *Oikos*. 124:1098-1107.
 152. *Auger-Méthé, M., Derocher, A.E., DeMars, C.A., Plank, M.J., Codling, E.A., Lewis, M.A.* in prep. Evaluating random search strategies for three mammals from distinct guilds.
 151. *Cullingham, C., Thiessen, C.D., Derocher, A.E., Paquet, P.C., Miller, J.M., Hamilton, J.A., Coltman, D.W.* 2016. Population structure and dispersal of wolves in the Canadian Rocky Mountains. *Journal of Mammalogy*. In press.
 150. *Lambert Koizumi, C., Derocher, A.E., Callaghan, K.* in prep. Effect of grizzly bear and wolf predation risk on the habitat use and sexual segregation of a northern alpine ungulate.
 149. *Bechshøft T.O., Derocher A.E., Richardson, E., Mislan, P., Lunn, N.J., Sonne, C., Dietz, R., Janz, D., St. Louis, V.* 2015. Cortisol and mercury in western Hudson Bay polar bear hair: is there a link? *Ecotoxicology* 24:1315-1321.
 148. *Cherry, S.G., Derocher, A.E., Lunn, N.J.* in revision. Habitat-mediated timing of migration in polar bears: an individual perspective. *Ecology and Evolution*.
 147. *Sahanatien, V.S., Peacock, E., Derocher, A.E.* 2015. Spatial ecology of polar bears in a seasonal sea ice ecozone. *Ecology and Evolution* doi: 10.1002/ece3.1571. 1-14.
 146. *Auger-Méthé, M., Lewis, M.A., Derocher, A.E.* 2015. Home ranges in moving habitats: polar bears and sea ice. *Ecography* doi: 10.1111/ecog.01260

145. *Hamilton, S.G., Castro de la Guardia, L., Derocher, A.E., Sahanatien, V., Tremblay, B., Huard, D.* 2014. Projected polar bear sea ice habitat in the Canadian Arctic Archipelago. *PLoS One* 9: E113746
144. *McCall, A.G., Derocher, A.E., Lunn, N.J.* 2015. Home range distribution of polar bears in western Hudson Bay. *Polar Biology* 38:343-355.
143. *Barker, O.E., Derocher, A.E., Edwards, M.A.* 2014. Seasonal use of Arctic ground squirrels by brown bears in the Mackenzie Delta region, Northwest Territories. *Polar Biology* DOI 10.1007/s00300-014-1593-8
142. *Nagy, J.A., Larter, N.C., Campbell, M., Johnson, D.H., Croft, B., Derocher, A.E., Dumont, M., Kelly, A., Allaire, D.* submitted December 13, 2013. Synchrony of caribou activity in northern Canada. *Polar Biology*.
141. *Nagy, J.A., Derocher, A.E., Bayne, E., Campbell, M.W., Kelly, A., Croft, B., Cuyler, C., Larter, N.C., Sahanatien, V., Aastrup, P.* in prep. Hierarchical and fuzzy clustering: effects of behaviour and data configuration on their reliability as tools to detect animal subpopulations. *Ecological Applications*.
140. *Robinson, B., Franke, A. Derocher, A.E.* 2014. The influence of weather and lemmings on spatiotemporal in the abundance of multiple avian guilds in the Arctic. *PLoS One* 9:e101495.
139. *Peacock, E., Sonsthagen, A.S., Obbard, M.E., Boltunov, A., Regehr, E.V., Ovsayanikov, N., Aars, J., Atkinson, S., Sage, G.K., Zeyl, E., Bachmann, L., Ehrich, D., Scribner, K.T., Amstrup, S.C., Belikov, S., Born, E., Derocher, A.E., Stirling, I., Taylor, M.K., Wiig, Ø., Paetkau, D., Talbot, S.L.* 2015. Implications of the circumpolar genetic structure of polar bears for their ecology, evolution and conservation biology. *PLoS One* 10: e112021.
138. *Bromaghin, J.F., Amstrup, S.C., McDonald, T.L., Stirling, I., Derocher, A.E., Richardson, E.S., Regehr, E.V., Douglas, D.C., Durner, G.M.* 2014. Polar bear population dynamics in the southern Beaufort Sea during a period of sea ice decline. *Ecological Applications* 25:634-651
137. *Richardson, E.S., Davis, C., Stirling, I., Derocher, A.E., Lunn, N.* Genetic mating system and opportunity for sexual selection in a solitary carnivore, the polar bear (*Ursus maritimus*).
136. *Castro, L., Myers, P., Derocher, A.E., Terwisscha van Scheltinga, A.D., Lunn, N.* In revision. Can polar bear telemetry data help validate sea ice models?
135. *Pilfold, N.W., Derocher, A.E., Stirling, I., Richardson, E.* 2013. Polar bear predatory behaviour reveals seascape distribution of ringed seal lairs. *Population Ecology* 56:129-136.
134. *Pilfold, N.W., Auger-Méthé, M., Derocher, A.E.* in prep. Circumventing unrealistic assumptions of resource selection theory for despotic carnivores. *Biology Letters*.
133. *Nagy, J.A., Larter, N.C., Johnson, D.H., Kelly, A., Derocher, A.E., Bayne, E., Boutin, S., Case, R.L., Heikkilä, J., Allaire, D.* in revision. Demographic and behavioural responses of caribou to energy industry footprints in northwestern Canada: implications for development and conservation. *Journal of Applied Ecology*.
132. *Molnár, P.K., Lewis, M.A., Derocher, A.E.* 2013. Estimating Allee dynamics before they can be observed: polar bears as a case study. *PLoS One*. 9:e85410.
131. *Auger-Méthé, M., Derocher, A.E., Plank, M.J., Codling, E.A., DeMars, C.A., Lewis, M.A.* 2015. Differentiating between the Lévy and the intermittent search strategies. *Methods in Ecology and Evolution*. 6:1179-1189.
130. *Pilfold, N.W., Derocher, A.E., Richardson, E.* 2014. Influence of interference competition on the distribution of a wide-ranging, non-territorial carnivore. *Global Ecology and Biogeography* 23: 425-435.

129. Rode, K.D., Regehr, E.V., Douglas, D., Durner, G., **Derocher, A.E.**, *Thiemann, G.W.*, Budge, S. 2013. Variation in the response of an Arctic top predator experiencing habitat loss: feeding and reproductive ecology of two polar bear populations. *Global Change Biology* 20:76-88.
128. *Castro, L.*, **Derocher, A.E.**, Myers, P. Terwisscha van Scheltinga, A.D., Lunn, N.J. 2013. Future sea ice conditions in western Hudson Bay and consequences for polar bears in the 21st century. *Global Change Biology* 19:2675-2687.
127. Dietz, R., Sonne, C., Basu, N., Braune, B., O'Hara, T., Letcher, R.J., Scheuhammer, T., Andersen, M., Andreassen, C., Andriashek, D., Asmund, G., Aubail, A., Baagøe, H., Born, E.W., Chan, H.M., **Derocher, A.E.**, Grandjean, P., Knott, K., Kirkegaard, M., Krey, A., Lunn, N., Messier, F., Obbard, M., Olsen, M.T., Ostertag, S., Peacock, E., Renzoni, A., Rigét, F.F., Skaare, J.U., Stern, G., Stirling, I., Taylor, M., Wiig, Ø., Wilson, S., and Aars, J. 2013. What are the toxicological effects of mercury in Arctic biota? *Science of the Total Environment* 443:775-790.
126. Bytingsvik, J., Simon, E., Leonards, P.E.G., Lamoree, M., Lie, E., Aars, J., **Derocher, A.E.**, Wiig, Ø., Jenssen, B.M., Hamers, T. 2013. Transthyretin-binding activity of contaminants in blood from polar bear (*Ursus maritimus*) cubs. *Environmental Science and Technology* 47: 4778-4786.
125. *Edwards, M.A.*, **Derocher, A.E.**, Nagy, J.A. 2013. Home range size variation in female Arctic grizzly bears relative to reproductive status and resource availability. *PloS One*. 8: e68130 DOI 10.1371/journal.pone.0068130
124. *Thiemann, G.W.*, **Derocher, A.E.**, *Cherry, S.G.*, Lunn, N.J., Peacock, E., *Sahanatien, V.* 2013. Effects of chemical immobilization on the movement rates of free-ranging polar bears. *Journal of Mammalogy* 94: 386-397.
123. Stirling, I., **Derocher, A.E.** 2012. Effects of climate warming on polar bears: a review of the evidence. *Global Change Biology* 18: 2694-2706.
122. **Derocher, A.E.**, Aars, J., Amstrup, S.C., Cutting, A., Lunn, N.J., *Molnár, P.K.*, Obbard, M.E., Stirling, I., *Thiemann, G.W.*, Vongraven, D., Wiig, Ø., York, G. 2013. Rapid ecosystem change and polar bear management. *Conservation Letters* 6:368-375.
121. *Pilfold, N.W.*, **Derocher, A.E.**, Stirling, I., *Richardson, E.S.*, Andriashek, D.S. 2012. Age and sex composition of seals killed by polar bears in the eastern Beaufort Sea. *PLOS ONE* 7: e41429.
120. Miller, S.D, McLellan, B.N., **Derocher, A.E.** 2013. Large carnivore management in North America. *International Journal of Environmental Science* 70: 383-398.
119. Bytingsvik, J., Leeuwen, S.P.J., Hamers, T., Swart, K., Aars, J., Lie, E., Nilsen, E.M.E., Wiig, Ø., **Derocher, A.E.**, Jenssen, B.M. 2012. Perfluoralkyl substances in polar bear mother-cub pairs: A comparative study based on plasma levels in 1998 and 2008. *Environment International* 49:92-99.
118. *Cherry, S.G.*, **Derocher, A.E.**, *Thiemann, G.W.*, Lunn, N.J. 2013. Polar bear migratory patterns and seasonal fidelity in relation to sea ice dynamics. *Journal of Animal Ecology* 82:912-921.
117. Vongraven, D., Aars, J., Amstrup, S., Atkinson, S.N., Belikov, S., Born, E.W., DeBruyn, T.D., **Derocher, A.E.**, Durner, G., Gill, M., Lunn, N., Obbard, M.E., Omelak, J., Ovsyanikov, N., Peacock, E., *Richardson, E.*, *Sahanatien, V.*, Stirling, I. and Wiig, Ø. 2012. A circumpolar monitoring plan for polar bears. *Ursus Monograph* 5:1-66.
116. *Sahanatien, V.*, **Derocher, A.E.** 2012. Monitoring sea ice habitat fragmentation for polar bear conservation. *Animal Conservation* 15:397-406.
115. Andersen, M., **Derocher, A.E.**, Wiig, Ø., Aars, J. 2012. Polar bear (*Ursus maritimus*) maternity den distribution in Svalbard, Norway. *Polar Biology* 35:499-508.

114. **Derocher, A.E.**, Andersen, M., Wiig, Ø., Aars, J., Hansen, E., Biuw, M. 2011. Sea ice dynamics affects polar bear den ecology at Hopen Island, Svalbard, Norway. *Marine Ecology Progress Series* 441:273-279.
113. *Auger-Méthé, M.*, Cassady St. Clair, C., Lewis, M.A. **Derocher, A.E.** 2011. Sampling rate and misidentification of Lévy and non-Lévy movement paths: comment. *Ecology* 92:1699-1701.
112. St. Louis, V.L., **Derocher, A.E.**, Stirling, I., Graydon, J.A., Lee, C., Jocksch, E., *Richardson, E.*, Ghorpade, S., Kwan, A.K., Kirk, J.L., Lehnherr, I., Swanson, H.K. 2011. Differences in mercury bioaccumulation between polar bears (*Ursus maritimus*) from the Canadian high and sub Arctic. *Environmental Sciences and Technology* 45:5922-5928.
111. **Derocher, A.E.** 2010. The prospect for polar bears. *Nature* 468: 905-906.
110. Bytingsvik J., Lie E., Aars J., Wiig Ø., **Derocher A.E.**, Jenssen B.M. 2012. PCBs and OH-PCBs in polar bear mother-cub pairs: A comparative study based on plasma levels in 1998 and 2008. *Science of the Total Environment* 417-418:117-128.
109. Hedberg, G.E., **Derocher, A.E.**, Andersen, M., Rogers, Q.R., DePeters, E.J., Lönnerdal, B., Mazzaro, L., Chesney, R.W., Hollis, B. 2011. Milk composition in free-ranging polar bears (*Ursus maritimus*) from Svalbard, Norway as a model for captive rearing milk formula. *Zoo Biology* 29:1-16.
108. *Molnár, P.K.*, **Derocher, A.E.**, Klanjscek, T., Lewis, M.A. 2011. Predicting climate change impacts on polar bear litter size. *Nature Communications* 2:186 DOI: 10.1038/ncomms1183.
107. *Nagy, J.A.*, Johnson, D.L., Larter, N.C., Campbell, M.W., **Derocher, A.E.**, *Kelly, A.*, Dumond, M., Allaire, D., Croft, B. 2011. Subpopulation structure of caribou (*Rangifer tarandus* L.) in arctic and sub-arctic Canada. *Ecological Applications* 21:2334-2348.
106. Hoffman, M. et al. 2010. The impact of conservation on the status of the world's vertebrates. *Science* 330:1503-1509.
105. *Barker, O.E.*, **Derocher, A.E.** 2010. Habitat selection by Arctic ground squirrels (*Spermophilus parryii*). *Journal of Mammalogy* 91:1251-1260.
104. Åsbakk, K., Aars, J., **Derocher, A.E.**, Wiig, Ø., Oksanen, A., Born, E.W., Dietz, R. Sonne, C., Tryland, M., Godfroid, J., Kapel, C.M. 2010. Serosurvey for *Trichinella* in polar bears (*Ursus maritimus*) from Svalbard and the Barents Sea. *Veterinary Parasitology* 172:256-263.
103. Peacock, L., **Derocher, A.E.**, Lunn, N., Obbard, M. 2010. Polar bear ecology and management in Hudson Bay in the face of climate change. Page 93-115, In Ferguson, S., Loseto, L., Mallory, M. (eds.) *A little less Arctic: top predators in the world's largest northern inland sea*, Hudson Bay. Springer.
102. Peacock, L., **Derocher, A.E.**, *Thiemann, G.W.*, Stirling, I. 2011. Conservation of Canada's polar bears in a changing world. *Canadian Journal of Zoology* 89:371-384.
101. *Edwards, M.A.*, **Derocher, A.E.**, Hobson, K.A., Branigan, M., *Nagy, J.A.* 2011. Fast carnivores and slow herbivores: differential foraging strategies among grizzly bears in the Canadian Arctic. *Oecologia* 165:877-889.
100. **Derocher, A.E.**, Andersen, M., Wiig, Ø., Aars, J. 2010. Sexual dimorphism and the mating ecology of polar bears (*Ursus maritimus*) at Svalbard. *Behavioural Ecology and Sociobiology* 64:939-946.
99. **Derocher, A.E.**, Wiig, Ø., Van Parijs, S.M. 2010. Nursing vocalisations of a polar bear cub. *Ursus* 21:189-191.
98. *Lambert Koizumi, C.*, **Derocher, A.E.** 2011. Spatial overlap of Dall sheep, grizzly bears and wolves in the Richardson Mountains. *Galemys* 22:31-42.

97. Molnár, P.K., **Derocher, A.E.**, Thiemann, G.W., Lewis, M.A. 2010. Predicting survival, reproduction and abundance of polar bears under climate change. *Biological Conservation* 143:1612-1622.
96. Towns, L., **Derocher, A.E.**, Stirling, I., Lunn, N.J. 2010. Changes in land distribution of polar bears in western Hudson Bay. *Arctic* 63:206-212.
95. Cherry, S.G., **Derocher, A.E.**, Hobson, K.A., Stirling, I., Thiemann, G.W. 2010. Quantifying dietary pathways of proteins and lipids to tissues of polar bears. *Journal of Applied Ecology* 48:373-381.
94. Chesney, R.W., Hedberg, G.E., Rogers, Q.R., Dierenfeld, E.S., Hollis, B.E., **Derocher, A.**, Andersen, M. 2009. Does taurine deficiency cause metabolic bone disease and rickets in polar bear cubs raised in captivity? *Taurine 7, Advances in Experimental Medicine and Biology* 643:325-331.
93. Medill, S., **Derocher, A.E.**, Stirling, I., Lunn, N.J. 2010. Reconstructing reproductive histories of female polar bears (*Ursus maritimus*) using cementum patterns in premolar teeth. *Polar Biology* 33:115-124.
92. Medill, S., **Derocher, A.E.**, Stirling, I., Lunn, N.J., Moses, R. 2009. Estimating cementum annuli width in polar bears: identifying sources variation and error. *Journal of Mammalogy* 90:1256-1264.
91. Towns, L., **Derocher, A.E.**, Stirling, I., Lunn, N.J., Hedman, D. 2009. Spatial and temporal patterns of problem polar bears in Churchill, Manitoba. *Polar Biology* 32:1529-1537.
90. Molnár, P.K., Klanjscek, T., **Derocher, A.E.**, Obbard, M.E., Lewis, M.A. 2009. A body composition model to estimate mammalian energy stores and metabolic rates from body mass and body length, with application to polar bears. *Journal of Experimental Biology* 212:2313-2323.
89. Schipper, J. et al. 2008. The status of the world's land and marine mammals: diversity, threat and knowledge. *Science* 322:225-230.
88. Edwards, M.A., Nagy, J.A., **Derocher, A.E.** 2009. Low site fidelity and home range drift in a wide-ranging large Arctic omnivore. *Animal Behaviour* 77:23-28.
87. Barker, O., **Derocher, A.E.** 2009. Brown bear (*Ursus arctos*) predation of broad whitefish (*Coregonus nasus*) in the Mackenzie Delta Region, Northwest Territories. *Arctic* 62:312-316.
86. Cherry, S.G., Stirling, I., Richardson, E.S., **Derocher, A.E.** 2009. Monitoring the fasting physiology of polar bears in response to environmental change. *Polar Biology* 32:383-391.
85. Oksanen, A., Åsbakk, K., Prestrud, K.W., Aars, J., **Derocher, A.E.**, Tryland, M., Wiig, Ø., Dubey, J.P., Sonne, C., Dietz, R., Andersen, M., Born, E.W. 2009. Prevalence of antibodies against *Toxoplasma gondii* in polar bears (*Ursus maritimus*) from Svalbard and east Greenland. *Journal of Parasitology* 95:89-94.
84. **Derocher, A.E.** 2008. Polar bears in a warming Arctic. In *Sudden and disruptive climate change: exploring the risks and how we can avoid them. Edited by M.C. MacCracken, F. Moore, J.C. Topping, Jr.* Earthscan, London, UK. pp. 193-204.
83. Durner, G.M., Douglas, D.C., Nielson, R. M., Amstrup, S.C., McDonald, T.L., Stirling, I., Mauritzen, M., Born, E.W., Wiig, Ø., DeWeaver, E., Serreze, M.C., Belikov, S.E., Holland, M.M., Maslanik, J., Aars, J., Bailey, D.A., **Derocher, A.E.** 2009. Predicting 21st-century polar bear habitat distribution from global climate models. *Ecological Monographs* 79:25-58.
82. Andersen, M., **Derocher, A.E.**, Wiig, Ø., Aars, J. 2008. Movements of two Svalbard polar bears using geographical positioning system satellite transmitters. *Polar Biology* 31:905-911.

81. *Thiemann, G.W., Derocher, A.E., Stirling, I.* 2008. Polar bear conservation in Canada: an ecological basis for identifying designatable units. *Oryx* 42:504-515.
80. *Edwards, M.A., Nagy, J.A., Derocher, A.E.* 2008. Using subpopulation structure for barren-ground grizzly bear management. *Ursus* 19:91-104.
79. *Stirling, I., Derocher, A.E., Rode, K., Gough, W.A.* 2008. Response to Dyck et al. (2008) on polar bears and climate change in western Hudson Bay. *Ecological Complexity* 5:193-201.
78. *Molnár, P.K., Derocher, A.E., Lewis, M.A., Taylor, M.K.* 2008. Modeling the mating system of polar bears – a mechanistic approach to the Allee effect. *Proceedings of the Royal Society B* 275:217-226.
77. *Stirling, I., Derocher, A.E.* 2007. Melting under pressure: the real scoop on climate warming and polar bears. *The Wildlife Professional Spring*: 23-27, 43.
76. *Stirling, I., Richardson, E., Thiemann, G.W., Derocher, A.E.* 2008. Unusual predation attempts of polar bears on ringed seals in the southern Beaufort Sea: possible significance of changing spring ice conditions. *Arctic* 61:14-22.
75. *Jores, J., Derocher, A.E., Staubach, C., Aschfalk, A.* 2008. Occurrence and prevalence of *Clostridium perfringens* in polar bears from Svalbard, Norway. *Journal of Wildlife Diseases* 44:155-158.
74. *Stone, I.R., Derocher, A.E.* 2007. An incident of polar bear infanticide and cannibalism on Phippsøya, Svalbard. *Polar Record* 43:171-173.
73. *Parks, E.K., Derocher, A.E., Lunn, N.J.* 2006. Movement patterns of polar bears (*Ursus maritimus*) on the sea ice of Hudson Bay. *Canadian Journal of Zoology* 84:1281-1294.
72. *Edwards, M.A., Derocher, A.E., Nagy, J.A.* 2005. Barren-ground grizzly bears of the western Arctic: potential influence of oil and gas development and climate change. Pages 66-87 in *New Northern Lights: Graduate Research on Circumpolar Studies from the University of Alberta. Edited by H.E. Caslteden, R.K. Danby, A.R. Giles, J.P. Pinard.* CCI Press, University of Alberta, Edmonton, Canada.
71. *Muir, D.C.G., Backus, S., Derocher, A.E., Dietz, R., Evans, T., Gabrielsen, G.W., Nagy, J., Norstrom, R.J., Sonne, C., Stirling, I., Taylor, M.K., Letcher, R.J.* 2006. Brominated flame retardants in polar bears (*Ursus maritimus*) from Alaska, the Canadian Arctic, Greenland, and Svalbard. *Environmental Science and Technology* 40:449-455.
70. *Sasaki, M., Endo, H., Wiig, Ø., Derocher, A.E., Tsubota, T., Taru, H., Yamamoto, M., Arashima, K., Hayashi, Y., Kitamura, N., Yamada, J.* 2005. Adaptation of the hindlimbs for climbing in bears. *Annals of Anatomy* 187:153-160.
69. *Derocher, A.E.* 2005. Population ecology of polar bears at Svalbard, Norway. *Population Ecology* 47:267-275.
68. *Grahl-Nielsen, O., Andersen, M., Derocher, A.E., Lydersen, C., Wiig, Ø., Kovacs, K.M.* 2004. Reply to comment on Grahl-Nielsen et al. (2003): sampling, data treatment and predictions in investigations on fatty acids in marine mammals. *Marine Ecology Progress Series* 281:303-306.
67. *Smithwick, M., Mabury, S.A., Solomon, K.R., Sonne, C., Martin, J.W., Born, E.W., Dietz, R., Derocher, A.E., Letcher, R.J., Evans, T., Gabrielsen, G.W., Nagy, J., Stirling, I., Taylor, M.K., Muir, D.C.G.* 2005. A circumpolar study of perfluoroalkyl contaminants in polar bears (*Ursus maritimus*). *Environmental Science and Technology* 39:5517-5523.
66. *Verreault, J., Muir, D.C.G., Norstrom, R.J., Stirling, I., Fisk, A.T., Gabrielsen, G.W., Derocher, A.E., Evans, T.J., Dietz, R., Sonne, C., Sandala, G.M., Gebbink, W., Riget, F.F., Taylor, M.K., Nagy, J., Letcher, R.J.* 2005. Chlorinated hydrocarbon contaminants

- and metabolites in polar bears (*Ursus maritimus*) from Alaska, Canada, East Greenland, and Svalbard: 1996–2002. *The Science of the Total Environment* 351-352:369-390.
65. Tryland, M., Neuvonen, E., Huovilainen, A., Tapiovaara, H., Osterhaus, A., Wiig, Ø., **Derocher, A.E.** 2005. Serologic survey for selected virus infections in polar bears at Svalbard. *Journal of Wildlife Diseases* 41:310-316.
 64. **Derocher, A.E.**, Wiig, Ø., Andersen, M. 2005. Sexual dimorphism of polar bears at Svalbard. *Journal of Mammalogy* 86:895-901.
 63. Pomponi, M., Gavuzzo, E., Bertonati, C., Lydersen, C., Wiig, Ø., **Derocher, A.E.**, Kovacs, K.M. 2004. Hemoglobin, pH and DPG/Chloride shifting. *Biochimie* 86:927-932.
 62. Braathen, M., **Derocher, A.E.**, Wiig, Ø., Sørmo, E.G., Lie, E., Skaare, J.U., Jenssen, B.M. 2004. Thyroid hormone and retinol status in polar bears (*Ursus maritimus*) at Svalbard in relation to plasma concentrations of PCBs. *Environmental Health Perspectives* 112:826-833.
 61. Wolkers, H., van Bavel, B., **Derocher, A.E.**, Wiig, Ø., Kovacs, K.M., Lydersen, C., Lindstrøm, G. 2004. Congener-specific accumulation and food chain transfer of polybrominated diphenyl ethers in two arctic food chains. *Environmental Science and Technology* 38:1667-1674.
 60. Oskam, I.C., Ropstad, E., Lie, E., **Derocher, A.E.**, Wiig, Ø., Dahl, E., Larsen, S., Skaare, J.U. 2004. Organochlorines affect the steroid hormone cortisol in free-ranging polar bears (*Ursus maritimus*) at Svalbard, Norway. *Journal of Toxicology and Environmental Health Part A* 67:959-977.
 59. Grahl-Nielsen, O., Andersen, M., **Derocher, A.E.**, Lydersen, C., Wiig, Ø., Kovacs, K.M. 2004. Fatty acid composition of the adipose tissue of polar bears and their prey: ringed seals, bearded seals and harp seals. *Marine Ecology Progress Series* 265:275-282.
 58. Lie, E., Larsen, H.J.S., Larsen, S., Johansen, G.M., **Derocher, A.E.**, Lunn, N.J., Norstrom, R.J., Wiig, Ø., Skaare, J.U. 2005. Does high organochlorine (OC) exposure impair the resistance to infection in polar bears (*Ursus maritimus*)? Part II: Possible effect of OCs on mitogen- and antigen-induced lymphocyte proliferation. *Journal of Toxicology and Environmental Health Part A* 68:457-484.
 57. Olsen, G.H., Mauritzen, M., **Derocher, A.E.**, Sørmo, E. G., Skaare, J. U., Wiig, Ø., Jenssen, B.M. 2003. Space-use strategy is an important determinant of PBC concentrations in female polar bears in the Barents Sea. *Environmental Science and Technology* 37:4919-4924.
 56. **Derocher, A.E.**, Lunn, N.J., Stirling, I. 2004. Polar bears in a warming climate. *Integrative and Comparative Biology* 44:163-176.
 55. Oskam, I. C., Ropstad, E., Dahl, E., Lie, E., **Derocher, A.E.**, Wiig, Ø., Larsen, S., Wiger, R., Skaare, J.U. 2003. Organochlorines affect the major androgenic hormone, testosterone, in male polar bears (*Ursus maritimus*) at Svalbard. *Journal of Toxicology and Environmental Health Part A* 66:2119-2139.
 54. Urashima, T., Nagata, H., Nakamura, T., Arai, I., Saito, T., Imazu, K., Hayashi, T., **Derocher, A.E.**, Wiig, O. 2003. Differences in oligosaccharide pattern of a sample of polar bear colostrum and mid-lactation milk. *Comparative Biochemistry and Physiology Part B* 136:887-896.
 53. Lie, E., Larsen, H.J.S., Larsen, S., Johansen, G.M., Borgen, T., **Derocher, A.E.**, Lunn, N.J., Norstrom, R.J., Wiig, Ø., Skaare, J.U. 2004. Does high organochlorine (OC) exposure impair the resistance to infection in polar bears (*Ursus maritimus*)? Part I: Effect of OC on the humoral immunity. *Journal of Toxicology and Environmental Health* 67:555-582.

52. *Mauritzen, M., Belikov, S.E., Boltunov, A.N., Derocher, A.E., Hansen, E., Ims, R.A., Wiig, Ø., Yoccoz, N.* 2003. Functional responses in polar bear habitat selection. *Oikos* 100:112-124.
51. *Lie, E., Bernhoft, A., Riget, F., Belikov, S.E., Boltunov, A.N., Derocher, A.E., Garner, G.W., Wiig, Ø., Skaare, J.U.* 2003. Geographical distribution of organochlorine pesticides (OCPs) in polar bears (*Ursus maritimus*) in the Norwegian and Russian Arctic. *The Science of the Total Environment* 306:159-170.
50. *Mauritzen, M., Derocher, A.E., Pavlova, O., Wiig, Ø.* 2003. Polar bears on drift ice - walking the treadmill. *Animal Behaviour* 66:108-113.
49. *Haave, M., Ropstad, E., Derocher, A.E., Lie, E., Dahl, E., Wiig, Ø., Skaare, J.U., Jenssen, B.M.* 2003. PCBs and reproductive hormones in female polar bears at Svalbard. *Environmental Health Perspectives* 111:431-436.
48. *Skaare, J.U., Larsen, H.J., Lie, E., Bernhoft, A., Derocher, A.E., Norstrom, R., Ropstad, E., Lunn, N.F., Wiig, Ø.* 2002. Ecological risk assessment of persistent organic pollutants in the arctic. *Toxicology* 181-182:193-197.
47. *Pomponi, M., Bertonati, C., Patamia, M., Marta, M., Derocher, A.E., Lydersen, C., Kovacs, K.M., Wiig, Ø., Bårdgard, A.J.* 2002. Polar bear haemoglobin and human Hb A₀: same 2,3-diphosphoglycerates binding site but asymmetry of the Binding? *Hemoglobin* 26:363-371.
46. *Derocher, A.E., Wolkers, H., Colborn, T., Schlabach, M., Larsen, T.S., Wiig, Ø.* 2003. Contaminants in Svalbard polar bear samples archived since 1967 and possible population level effects. *The Science of the Total Environment* 301:163-174.
45. *Derocher, A.E., Wiig, Ø., Andersen, M.* 2002. Diet composition of polar bears in Svalbard and the western Barents Sea. *Polar Biology* 25:448-452.
44. *Derocher, A.E., Wiig, Ø.* 2002. Postnatal growth in body length and mass of polar bears (*Ursus maritimus*) at Svalbard. *Journal of Zoology (London)* 256:343-349.
43. *Tryland, M., Derocher, A.E., Brun, E., Kierulf, P., Arnemo, J.A., Wiig, Ø., Ølberg, R. A.* 2002. Plasma chemistry in free-ranging polar bears. *Journal of Wildlife Diseases* 38:566-575.
42. *Mauritzen, M., Derocher, A.E., Wiig, Ø., Belikov, S.E., Boltunov, A., Garner, G.W.* 2002. Using satellite telemetry to define spatial population structure in polar bears in the Norwegian and western Russian Arctic. *Journal of Applied Ecology* 39:79-90.
41. *Henriksen, E.O., Wiig, Ø., Skaare, J.U., Gabrielsen, G.W., Derocher, A.E.* 2001. Monitoring PCBs in polar bears: lessons learned from Svalbard. *Journal of Environmental Monitoring* 3:493-498.
40. *Mauritzen, M., Derocher, A.E., Wiig, Ø.* 2001. Space-use strategies of female polar bears in a dynamic sea ice habitat. *Canadian Journal of Zoology* 79:1704-1713.
39. *Tryland, M., Derocher, A.E., Wiig, Ø., Godfroid, J.* 2001. *Brucella* sp. antibodies in polar bears from Svalbard and the Barents Sea. *Journal of Wildlife Diseases* 37:523-531.
38. *Wiig, Ø., Derocher, A.E.* 2001. Body composition of three polar bear (*Ursus maritimus*) cubs found dead at Svalbard. *Polar Biology* 24:383-385.
37. *Skaare, J.U., Bernhoft, A., Wiig, Ø., Norum, K.R., Eide, D.M., Derocher, A.E.* 2001. Relationships between plasma levels of organochlorines, retinol and thyroid hormones from polar bears (*Ursus maritimus*) at Svalbard. *Journal of Toxicology and Environmental Health* 62:227-241.
36. *Andersen, M., Lie, E., Derocher, A.E., Belikov, S.E., Bernhoft, A., Boltunov, A., Garner, G.W., Skaare, J.U., Wiig, Ø.* 2001. Geographic variation of PCB congeners in polar bears (*Ursus maritimus*) from Svalbard east to the Chukchi Sea. *Polar Biology* 24:231-238.

35. Pomponi, M., Bertonati, C., Fuglei, E., Wiig, Ø., **Derocher, A.E.** 2000. 2,3-DPG-Hb complex: A hypothesis for an asymmetric binding. *Biophysical Chemistry* 84:253-260.
34. Bernhoft, A., Skaare, J.U., Wiig, Ø., **Derocher, A.E.**, Larsen, H.J.S. 2000. Possible immunotoxic effects of organochlorines in polar bears (*Ursus maritimus*) at Svalbard. *Journal of Toxicology and Environmental Health* 59:561-574.
33. Urashima, T., Yamashita, T., Nakamura, T., Arai, I., Saito, T., **Derocher, A. E.**, Wiig, Ø. 2000. Chemical characterization of milk oligosaccharides of the polar bear, *Ursus maritimus*. *Biochimica et Biophysica Acta* 1475: 395-408.
32. **Derocher, A.E.**, Wiig, Ø., Bangjord, G. 2000. Predation of Svalbard reindeer by polar bears. *Polar Biology* 23:675-678.
31. Boulanger, J., Martin, K., Kaiser, G.W., **Derocher, A.E.** 2000. Evaluating uncertainty in estimating population trends for research and conservation of marbled murrelets. *Society of Canadian Ornithologists Special Publication 1. Biology and Conservation of Forest Birds*. pp. 53-63.
30. Skaare, J.U., Bernhoft, A., **Derocher, A.**, Gabrielsen, G.W., Goksøyr, A., Henriksen, E., Larsen, H.J., Lie, E., Wiig, Ø. 2000. Organochlorines in top predators at Svalbard – occurrence, levels and effects. *Toxicology Letters* 112:103-109.
29. Paetkau, D., Amstrup, S.C., Born, E.W., Calvert, W., **Derocher, A.E.**, Garner, G.W., Messier, F., Stirling, I., Taylor, M., Wiig, Ø., Strobeck, C. 1999. Genetic structure of the world's polar bear populations. *Molecular Ecology* 8:1571-1585.
28. **Derocher, A.E.**, Wiig, Ø. 1999. Infanticide and cannibalism of juvenile polar bears in Svalbard. *Arctic* 52:307-310.
27. **Derocher, A.E.**, Wiig, Ø. 1999. Observation of adoption in polar bears (*Ursus maritimus*). *Arctic* 52:413-415.
26. Gjerde, B., **Derocher, A.E.**, Wiig, Ø. 1999. Absence of trypanosomes in polar bears (*Ursus maritimus*) in Svalbard. *Veterinary Record* 145:526-527.
25. **Derocher, A.E.** 1999. Latitudinal variation in litter size: ecology or methodology? *Polar Biology* 22:350-356.
24. Wasteson, Y., Arnemo, J.M., Johansen, B.K., Klungseth Johansen, B., Vold, L., Mathiesen, S.D., Olsen, M.A., Wiig, Ø., **Derocher, A.E.** 1999. Analysis of faecal samples from wild animals for verocytotoxin producing *Escherichia coli* and *E coli* O157. *Veterinary Record* 144:646-647.
23. Wiig, Ø., **Derocher, A.E.** 1999. Application of aerial survey methods to polar bears in the Barents Sea. In *Marine Mammal Survey and Assessment Methods*. Edited by Garner, G.W., Amstrup, S.C., Laake, J.L., Manly, B.F.J., McDonald, L.L., Robertson, D.G., A.A. Bolkema Publishers, Rotterdam. pp. 27-36.
22. Wiig, Ø., **Derocher, A.E.**, Belikov, S.E. 1999. Ringed seals (*Phoca hispida*) breeding in the drifting pack-ice of the Barents Sea. *Marine Mammal Science* 15: 595-598.
21. Wiig, Ø., **Derocher, A.E.**, Cronin, M., Skaare, J.U. 1998. Female pseudohermaphrodite polar bears at Svalbard. *Journal of Wildlife Diseases* 34:792-796.
20. **Derocher, A.E.**, Stirling, I. 1998. Geographic variation in growth of polar bears. *Journal of Zoology (London)* 245:65-72.
19. **Derocher, A.E.**, Stirling, I. 1998. Maternal investment and offspring size in polar bears (*Ursus maritimus*). *Journal of Zoology (London)* 245:253-260.
18. **Derocher, A.E.**, Stirling, I. 1997. Male-biased harvesting of polar bears in western Hudson Bay. *Journal of Wildlife Management* 61:1075-1082.
17. **Derocher, A.E.**, Stirling, I. 1996. Aspects of survival in juvenile polar bears. *Canadian Journal of Zoology* 74:1246-1252.
16. Kaiser, G.W., **Derocher, A.E.**, Crawford, S., Gill, M.J., Manley, I.A. 1995. A capture technique for Marbled Murrelets in coastal inlets. *Journal of Field Ornithology* 66:321-

- 333.
15. **Derocher, A.E.**, Stirling, I. 1995. Temporal variation in reproduction and body mass of polar bears in western Hudson Bay. *Canadian Journal of Zoology* 73:1657-1665.
 14. **Derocher, A.E.**, Stirling, I. 1995. Estimation of polar bear population size and survival in western Hudson Bay. *Journal of Wildlife Management* 59:215-221.
 13. **Derocher, A.E.**, Stirling, I. 1994. Age-specific reproductive performance of female polar bears. *Journal of Zoology, London* 234:527-536.
 12. **Derocher, A.E.**, Taylor, M. 1994. Density-dependent population regulation of polar bears. Taylor, M., Editor. *Density-dependent population regulation of black, brown, and polar bears. International Conference on Bear Research and Management Monograph Series No. 3. Yellowstone National Park, Wyoming: International Association for Bear Research and Management.* pp. 25-30.
 11. **Derocher, A.E.**, Andriashek, D., Stirling, I. 1993. Terrestrial foraging by polar bears during the ice-free period in western Hudson Bay. *Arctic* 46:251-254.
 10. Stirling, I., **Derocher, A.E.** 1993. Possible impacts of climatic warming on polar bears. *Arctic* 46:240-245.
 9. **Derocher, A.E.**, Andriashek, D., Arnould, J.P.Y. 1993. Aspects of milk composition and lactation in polar bears. *Canadian Journal of Zoology* 71:561-567.
 8. **Derocher, A.E.**, Stirling, I., Andriashek, D. 1992. Pregnancy rates and serum progesterone levels of polar bears in western Hudson Bay. *Canadian Journal of Zoology* 70:561-566.
 7. **Derocher, A.E.**, Stirling, I. 1992. The population dynamics of polar bears in western Hudson Bay. McCullough, D.R., Barrett, R.H., Editors. *Wildlife 2001: Populations.* London, U.K.: Elsevier Applied Science. p. 1150-1159.
 6. **Derocher, A.E.**, Stirling, I. 1991. Oil contamination of two polar bears. *Polar Record* 27:56-57.
 5. **Derocher, A.E.**, Stirling, I. 1990. Aggregating behaviour of adult male polar bears. *Canadian Journal of Zoology* 68:1390-1394.
 4. **Derocher, A.E.**, Stirling, I. 1990. Distribution of polar bears (*Ursus maritimus*) during the ice-free period in western Hudson Bay. *Canadian Journal of Zoology* 68:1395-1403.
 3. Stirling, I., **Derocher, A.E.** 1990. Factors affecting the evolution and behavioral ecology of the modern bears. *International Conference on Bear Biology and Management.* 8:189-204.
 2. **Derocher, A.E.** 1990. Supernumerary mammae and nipples in the polar bear. *Journal of Mammalogy* 71:236-237.
 1. **Derocher, A.E.**, Nelson, R.A., Stirling, I., Ramsay, M.A. 1990. Effects of fasting and feeding on serum urea and serum creatinine levels in polar bears. *Marine Mammal Science* 6:196-203.

BOOKS

- Derocher, A.E. 2012. *Polar bears: A complete guide to their biology and behavior.* Johns Hopkins University Press, Baltimore, MD. 249 pp.

PUBLICATIONS (non-refereed publications and reports)

49. Contributing author to Larsen, J.N., O.A. Anisimov, A. Constable, A.B. Hollowed, N. Maynard, P. Prestrud, T.D. Prowse, and J.M.R. Stone, 2014: Polar regions. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S.

- Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1567-1612.
48. Derocher, A.E. 2013. Polar bears in a rapidly changing world. *Bare Essentials* July/August 117-122.
 47. Derocher, A. 2013. Last Ice Area last hope for polar bears. *The Circle* 2013(2): 14-15.
 46. Derocher, A.E. 2013. Heating up conservation. *Conservation Biology*. 27: 638-639.
 45. Derocher, A.E. 2012. Polar bears in Northwest Greenland: An interview survey about the catch and the climate. Born, Heilman, Holm and Laidre. 2011. Copenhagen: Museum Tusculanum Press. 232 p, illustrated, hard cover. ISBN 978-87-635-3168-9. £47.49. *Polar Record*. 49.
 44. Derocher, A.E. 2012. Polar bears. In *Herchel Island*. C.R. Burn (Ed.).
 43. Derocher, A.E. 2008. Watching as the ice goes. *Arctic Bulletin* 8: 14-15.
 42. Derocher, A.E. 2007. Book review: The world of the polar bear. *Arctic* 60: 92-93
 41. Aars, J., Lunn, N.J., Derocher, A.E. (Eds.). 2006. Polar bears: Proceedings of the 14th Working Meeting of the IUCN Polar Bear Specialist Group. IUCN, Gland, Switzerland and Cambridge, U.K.
 40. Aars, J., Derocher, A.E., Andersen, M., Vongraven, D., Ekker, M., Wiig, Ø. 2006. Polar bear management and research in Norway 2001-2005. *In* Polar bears: Proceedings of the 14th Working Meeting of the IUCN Polar Bear Specialist Group. *Edited by* J. Aars, N.J. Lunn, A.E. Derocher. IUCN, Gland, Switzerland and Cambridge, U.K. pp. 145-151.
 38. Richardson, E., Branigan, M., Calvert, W., Cattet, M., Derocher, A.E., Doidge, W., Hedman, D., Lunn, N.J., McLoughlin, P., Obbard, M.E., Stirling, I., Taylor, M. 2006. Research on polar bears in Canada 2001-2004. *In* Polar bears: Proceedings of the 14th Working Meeting of the IUCN Polar Bear Specialist Group. *Edited by* J. Aars, N.J. Lunn, A.E. Derocher. IUCN, Gland, Switzerland and Cambridge, U.K. pp. 117-132.
 38. Nagy, J.A., **Derocher, A.**, Nielsen, S., Wright, W., Heikkila, J. 2006. Modelling Seasonal Habitats of Boreal Woodland Caribou at the Northern Limits of Their Range: a Preliminary Assessment of the Lower Mackenzie River Valley, Northwest Territories, Canada. Department of Environment and Natural Resources, Yellowknife, Northwest Territories.
 37. Falk-Petersen, S., Hop, H., Lewis, P., Hansen, E., Pavlov, V., Derocher, A., Poltermann, M. 2004. The marginal ice zone of the Barents Sea: Temporal and spatial variability of the ice-ocean system of the ice-edge. Norwegian Polar Institute, Kortrapport/Brief Report Series nr. 1
 36. **Derocher, A.E.** 2004. Polar bears. Pp. 156-168. *In* Encyclopedia of the Arctic. *Edited by* M. Nuttall. Rutledge, New York.
 35. **Derocher, A.E.** 2004. Agreement on the conservation of polar bears. Pp. 16-17. *In* Encyclopedia of the Arctic. *Edited by* M. Nuttall. Rutledge, New York.
 34. **Derocher, A.E.** 2004. Bears. Pp. 215-217. *In* Encyclopedia of the Arctic. *Edited by* M. Nuttall. Rutledge, New York.
 33. **Derocher, A.E.** 2004. Marine mammals. Pp. 1248-1250. *In* Encyclopedia of the Arctic. *Edited by* M. Nuttall. Rutledge, New York.
 32. **Derocher, A.E.** 2004. Narwhal. Pp. 1361-1362. *In* Encyclopedia of the Arctic. *Edited by* M. Nuttall. Rutledge, New York.
 31. **Derocher, A.E.**, Lunn, N.J., Stirling, I. 2002. Polar bears in a changing climate. *Integrative and Comparative Biology* 42: 1219-1219.
 30. **Derocher, A.E.** 2003. It's seals on the rocks for polar bears – Reply. *Frontiers in Ecology and the Environment*. 1: 180-180.
 29. **Derocher, A.E.**, Wiig, Ø., Andersen, M., Vongraven, D., Ekker, M. 2002. Polar bear research and management in Norway 1997-2000. pg. 75-84. *In* Polar bears: Proceedings

- of the 13th Working Meeting of the IUCN/SSC Polar Bear Specialist Group; 23-28, June, 2001; Nuuk, Greenland. Gland, Switzerland and Cambridge, U.K.: IUCN.
28. Skaare, J.U., Larsen, H.J., Lie, E., Ropstad, E., Bernhoft, A., **Derocher, A.E.**, Lunn, N.J., Norstrom, R., Wiig, Ø. 2001. Relationships between high loads of organic contaminants and health effects in arctic mammals-Immune response and chlorinated environmental pollutants in polar bear. *Pharmacology and Toxicology* 88, suppl.1, 14.
 27. Oskam, I.C., **Derocher, A.E.**, Lie, E., Skaare, J.U., Wiig, Ø., Larsen, S., Dahl, E., Ropstad, E. 2001. Organochlorines effect the major androgenic hormone, testosterone, in male polar bears (*Ursus maritimus*). *Pharmacology and Toxicology* 88, suppl.1, 23.
 26. Lie, E., Larsen, H.J.S., **Derocher, A.E.**, Lunn, N., Norstrom, R., Wiig, Ø., Skaare, J.U. 2001. Reduced infection resistance in polar bears (*Ursus maritimus*) with high polychlorinated biphenyl (PCB) exposure? SETAC 22nd Annual Meeting Abstract Book, p.107.
 25. Wiig, Ø., Blix, A. S., **Derocher, A. E.**, Kovacs, K. M., Schweder, T. 2001. National priorities for polar bear research in Norway. Report to the Norwegian National Committee on Polar Research, The Research Council of Norway, Oslo, 19pp.
 24. Reid, D.G., Waterhouse, L., Buck, P.E.F., **Derocher, A.E.**, Bettner, R., French, C.D. Inventory of the Queen Charlotte Islands Ermine. In L.M. Darling, editor. 2000. Proceedings of a Conference on the Biology and Management of Species and Habitats at Risk, Kamloops, B.C., 15 - 19 Feb.,1999. Volume One. Pp. 393-406. B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. and University College of the Cariboo, Kamloops, B.C. 490pp.
 23. Lie, E., **Derocher, A.E.**, Wiig, Ø., Skaare, J.U. 2000. Polychlorinated biphenyls in mother/offspring pairs of polar bears (*Ursus maritimus*) at Svalbard. *Organohalogen Compounds* 49: 457-460.
 22. Braathen, M., Haave, M., Olsen, G.H., **Derocher, A.E.**, Skaare, J.U., Ropstad, E., Wiig, Ø, Sormo, E.G., Jenssen, B.M. 2000. PCB contamination in relation to levels of thyroid hormones and progesterone, and migration patterns in polar bears (*Ursus maritimus*). *Organohalogen Compounds* 49: 438-441.
 21. Wiig, Ø., **Derocher, A.E.**, Gjertz, I., Scheie, J.O. 2000. Kunnskapsstatus for isbjørn ved Svalbard, of framtidige behov for kartlegging, overvåkning og forskning. (Status of information on polar bears of Svalbard with requirements for future mapping, monitoring, and research). Norwegian Polar Institute Meddelelser 160:33 pp. (in Norwegian).
 20. **Derocher, A.E.** 2000. Reproductive biology of polar bears (*Ursus maritimus*): potential impacts of environmental pollutants. Centre for Reproductive Biology in Uppsala, Sweden. CRU Report No. 10. 9-22.
 19. Reid, D.G., Waterhouse, L., Buck, P.E.F., **Derocher, A.E.**, Bettner, R., French, C.D., Husband, C. 1999. Status and management of ermine on the Queen Charlotte Islands, British Columbia. Forest Research Extension Note EN-001. British Columbia Forest Service. 4 pp.
 18. **Derocher, A.E.**, Garner, G.W., Lunn, N.J., Wiig, Ø. (Editors) 1998. Polar bears: Proceedings of the 12th Working Meeting of the IUCN/SSC Polar Bear Specialist Group; February 3-7, 1997; Oslo, Norway. Gland, Switzerland and Cambridge, U.K.: IUCN.
 17. Loughheed, L.W., Beauchamp, W.D., Manley, I.A., **Derocher, A.E.**, Kaiser, G.W., Cooke, F. 1998. Demography and ecology of Marbled Murrelets in Desolation Sound, British Columbia (1995). CWS/NSERC Wildlife Ecology Chair Technical Report No. 001. CWS/NSERC Wildlife Ecology Chair, Simon Fraser University, Burnaby, BC. 39 pp.
 16. Øritsland, N.A., **Derocher, A.E.**, Stirling, I. 1998. A view on computer modeling for polar bear population management. In Polar bears: Proceedings of the 12th Working

- Meeting of the IUCN/SSC Polar Bear Specialist Group; February 3-7, 1997; Oslo, Norway. Gland, Switzerland and Cambridge, U.K.: IUCN.
15. **Derocher, A.E.**, Wiig, Ø., Gjertz, I., Bøkseth, K., Sheie, J.O. 1998. Status of polar bears in Norway, 1997. *In* Polar bears: Proceedings of the 12th Working Meeting of the IUCN/SSC Polar Bear Specialist Group; February 3-7, 1997; Oslo, Norway. Gland, Switzerland and Cambridge, U.K.: IUCN.
 14. Norris, S., Pedersen, A.Ø., **Derocher, A.E.** 1998. Isbjørner og varige organiske forurensningsstoffer (Polar bears and persistent organic pollutants). Barents Watch 1998: 40-41.
 13. Wiig, Ø., **Derocher, A.E.**, Belikov, S.E. 1998. Ringed seals (*Phoca hispida*) breeding in the drifting pack-ice of the Barents Sea. The World Marine Mammal Science Conference, Monaco, 20-24 January 1998 Abstracts. pp. 148-149.
 12. **Derocher, A.E.** 1997. Polar bears face a warming world. World Wide Fund for Nature Arctic Bulletin 4.97: 14-15.
 11. **Derocher, A.E.** 1997. Polar bears: living with the white bear. Nikita Ovsyanikov: book review. Polar Record 33: 246-247.
 10. Wiig, Ø., Bernhoft, A., **Derocher, A.E.**, Larsen, H.J., Skaare, J.U. 1997. Organochlorine pollution in polar bears at Svalbard. Pp. 380. *In* International Theriological Conference, abstracts, Acapulco, Mexico.
 9. Skaare, J.U., Bernhoft, A., **Derocher, A.E.**, Larsen, H.J., Wiig, Ø. 1997. Polychlorinated biphenyls (PCBs) in polar bears at Svalbard. Pp. 125-126. *In* The AMAP International Symposium on Environmental Pollution in the Arctic, extended abstracts, Tromsø, Norway, June 1-5, 1997.
 8. **Derocher, A.E.** 1996. Population estimation and monitoring of polar bears in the Svalbard area: problem analysis. Norsk Polar Institute Internal Report :1-26.
 7. **Derocher, A.E.**, Kaiser, G.W., Cooke, F., Manley, I.A., Gill, M.J. 1996. Research on Marbled Murrelets in the Desolation Sound area during the 1994 breeding season. Canadian Wildlife Service Technical Report Series No. 257. 54 pp.
 6. **Derocher, A.E.** 1995. Wildlife diversity and habitat relationships. *in* A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region. *Edited by* R. N. Green. Ministry of Forests, 4595 Canada Way, Burnaby, B.C., Canada.
 5. Stirling, I., Andriashek, D., Spencer, C., **Derocher, A.E.** 1988. Assessment of the polar bear population in the eastern Beaufort Sea. Final report to the Northern Oil and Gas Action Program. Canadian Wildlife Service, 5320 122 Street, Edmonton, Alberta. T6H 3S5. 30 pp.
 4. Adams, A.K., Nelson, R.A., Stirling, I., **Derocher, A.** 1988. Heat loss patterns in the polar bear, *Ursus maritimus*. FASEB 2: A747.
 3. Stirling, I., Andriashek, D., Spencer, C., **Derocher, A.** 1987. Assessment of the polar bear population in the eastern Beaufort Sea. Progress report to the Northern Oil and Gas Action Program. Canadian Wildlife Service, 5320 122 Street, Edmonton, Alberta. T6H 3S5. 30 pp.
 2. **Derocher, A.E.**, Miller, S.J. 1986. Twelve gauge ferret shell tests on polar bears, Cape Churchill, Manitoba, 1984. Northwest Territories Department of Renewable Resources, Yellowknife. File Report No. 54. 40 pp.
 1. **Derocher, A.E.** 1984. Telemetry: comments and suggestions from the coastal grizzly project 1983. British Columbia Ministry of Environment, Wildlife Branch, Wildlife Working Report WR 3.

POPULAR PUBLICATIONS

- Derocher, A.E.** 2010. Polar bears and their disappearing world. The Geographer Autumn: 11.

- Nagy, J., **Derocher, A.E.** 2009. Tracking Canada's caribou. ARGOS Forum. 68: 8-9.
- Derocher, A.E.** 2008. Watching as the ice goes. Arctic Bulletin 1.08: 15-16.
- Derocher, A.E.** 2008. Polar bear. Pg. 616-617. World Book Encyclopedia.
- Derocher, A.E.** 2007. The wanderings of white bears. ARGOS Forum 65: 6-9
- Derocher, A.** 2007. Ask the experts: Are polar bears increasing? Animal Keeper's Forum 34: 304-305.
- Parks, E.K., **Derocher, A.E.** 2005. Where the bears are: movement patterns on the sea ice of Hudson Bay. Polar Bears International 12: 5.
- Derocher, A. E.** 2000. Polar bear research in Norway. International Bear News 9: 8.
- Derocher, A. E.** 2000. Counting bears from above. Polar Bears Alive 7(4): 1, 4.
- Boltunov, A., **Derocher, A. E.** 2000. Norwegian-Russian Environmental Cooperation: Satellites track Barents Sea polar bears. WWF Arctic Bulletin 1: 16.
- Derocher, A. E.** 2000. Die Bären – Ein Überblick über Verhalten und Ökologie (Bears-Behaviour and ecology in overview). *In* Die Bären (The Bears). Filander Press, Furth, Germany. pp. 29-66.
- Derocher, A. E.** 1999. Svalbard: Land of the ice bears (Part II). Polar Bears Alive 6(4): 4-5.
- Derocher, A. E.** 1999. Svalbard: Land of the ice bears (Part I). Polar Bears Alive 6(3): 4-5.
- Stirling, I., **Derocher, A. E.** 1993. Behavior of bears. *In* I. Stirling (ed.). Bears: majestic creatures of the wild. Weldon Owen Publishing, Sydney, Australia. Pages 70-85.
- Derocher, A. E.,** Stirling, I. 1993. Studying bears. *In* I. Stirling (ed.). Bears: majestic creatures of the wild. Weldon Owen Publishing, Sydney, Australia. Pages 206-211.
- Derocher, A. E.** 1993. Coloring of black bears. *In* I. Stirling (ed.). Bears: majestic creatures of the wild. Weldon Owen Publishing, Sydney, Australia. Pages 112-113.
- Derocher, A. E.** 1993. Grizzly Adams. *In* I. Stirling (ed.). Bears: majestic creatures of the wild. Weldon Owen Publishing, Sydney, Australia. Page 220.
- Derocher, A. E.** 1993. Bear milk. *In* I. Stirling (ed.). Bears: majestic creatures of the wild. Weldon Owen Publishing, Sydney, Australia. Page 66.
- Derocher, A. E.** 1993. Why are bears so vulnerable. *In* I. Stirling (ed.). Bears: majestic creatures of the wild. Weldon Owen Publishing, Sydney, Australia. Pages 216-217.
- Derocher, A. E.** 1993. A slouthe of beerys. *In* I. Stirling (ed.). Bears: majestic creatures of the wild. Weldon Owen Publishing, Sydney, Australia. Page 74.

MANUSCRIPTS REVIEWED FOR PROFESSIONAL JOURNALS

Animal Behaviour, Arctic, Behavioural Ecology and Sociobiology, Biological Conservation, Biology Letters, BMC Biology, Canadian Field-Naturalist, Canadian Geographer, Canadian Journal of Zoology, Conservation Biology, Conservation Physiology, Diversity and Distributions, Ecography, Ecohealth, Ecology, Ecology and Evolution, Ecoscience, Ecosphere, Ecotoxicology and Environmental Safety, Environmental Conservation, Forestry Chronicle, Frontiers in Ecology and the Environment, Frontiers in Ecology and Evolution, Global Change Biology, Global Ecology and Conservation, Integrative Zoology, International Journal of Ecology, Journal of Animal Ecology, Journal of Biogeography, Journal of Fish and Wildlife Management, Journal of Mammalogy, Journal of Wildlife Management, Journal of Zoology, Mammal Review, Marine Ecology Progress Series, Marine Mammal Science, Nature, Nature Climate Change, North Atlantic Marine Mammal Commission Scientific Publications, Oecologia, Oikos, PLoS One, Polar Biology, Polar Record, Polar Research, Sarsia, Science, Ursus, Wildlife Biology

EDUCATION

Ph.D., Zoology, University of Alberta. 1991.

Dissertation title: Population dynamics and ecology of polar bears in western Hudson Bay.

M.Sc., Zoology, University of Alberta. 1987.

Thesis title: The distribution and abundance of polar bears (*Ursus maritimus* Phipps) during the ice-free period in Western Hudson Bay.

B.S.F. (Honours), Forest Biology, University of British Columbia. 1983.

Thesis title: A sensitivity analysis of a population model for three species of bears.

EMPLOYMENT

Professor (tenured), Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada T6G 2E9. 2002- present

Senior Research Scientist in Mammalogy and Section Head of the Terrestrial Ecology Program, Norwegian Polar Institute, N9296, Tromsø, Norway. 1996–2002

Research Wildlife Ecologist, Ministry of Forests, 2100 Labieux Road, Nanaimo, British Columbia, V9T 6E9, Canada. 1993-1996

Adjunct Professor, Centre for Applied Conservation Biology, University of British Columbia, 270 2357 Main Mall, Vancouver, British Columbia, V6T 1Z4, Canada. 1993-1996

Biologist, Canadian Wildlife Service, 5320 122 Street, Edmonton, Alberta, T6H 3S5, Canada. 1991-1993

FIELD RESEARCH

Svalbard, Norway

-Hopen Island, Spitsbergen, Edgeøya, Barentsøya, polar bears

Barents Sea, Norway and Russia

-central and eastern Barents Sea, polar bears (1997-98), in co-operation with Russian scientists

Manitoba, Canada

-Cape Churchill Wildlife Management Area, polar bears (1984-1992)

-Cape Churchill, contract to the Northwest Territories Wildlife Branch

Northwest Territories, Canada

-Beaufort Sea and Amundsen Gulf, polar bears (1985-1987, 1992, 2003-2012)

-Viscount Melville Sound, (2013-2014)

-Mackenzie Delta, grizzly bears (2003-2009)

Nunavut, Canada

-Foxe Basin, polar bears (2007)

Antarctic

-Weddell Sea and Scotia Sea, seals and penguins (1988)

Yukon Territory, Canada

-Dempster Highway, Blackstone River, gyrfalcon surveys (1982)

British Columbia, Canada

- Queen Charlotte Islands, Queen Charlotte Islands ermine (1993)
- Sunshine Coast, marbled murrelets (1993, 1994)
- Queen Charlotte Islands, marbled murrelets (1993)
- Kimsquit River Valley (Bella Coola), grizzly bear (1983)
- Northern Rocky Mountains, Stone's sheep (1982)
- University of British Columbia Research Forest, black-tailed deer (1982)
- Queen Charlotte Islands, forestry technician (1981)

PROFESSIONAL ACTIVITIES

- IUCN/SSC Polar Bear Specialist Group, Member (1996-ongoing, Chair 2005-2009)
- Conservation and Science Committee of the Board of Directors of WWF – Canada (2005-2015)
- Federal-Provincial Polar Bear Technical Committee (2002-2010)
- International Association for Bear Research and Management, Council Member (2000-2007, 2 terms)
- Arctic Institute of North America, Member
- Canadian Society of Zoologists, Member
- Society for Conservation Biology, Member
- Marine Mammal Society, Member
- American Society of Mammalogists, Member
- Wild Bear Advisory Committee, Polar Bears International (2004-ongoing)
- Polar Continental Shelf Project, Science Steering Committee, Natural Resources Canada (2003-2007)
- Polar Continental Shelf Project Advisory Committee, Natural Resources Canada (2004-2007)
- Associate Editor, *Ursus*, 2001-2003
- Associate Editor, *Wildlife Biology*, 2005 – 2009

AWARDS

- University of Alberta Alumni Honour Award, 2010
- Capilano University Distinguished Alumni Award, 2012
- National Outdoor Book Award 2012, Honorable Mention for *Polar Bears: A complete guide to their biology and behavior*.
- Faculty of Science Teaching Honor Roll, 2012-13
- Faculty of Science Graduate Mentoring Award, 2015
- Alberta Chapter of the Wildlife Society, The William Rowan Distinguished Service Award, 2016

UNIVERSITY RESPONSIBILITIES

- Assistant Associate Chair of Graduate Studies (Department of Biological Sciences) 2007-08
- Curator of Mammalogy, Zoology Museum, University of Alberta (2003-ongoing)
- Adjunct Committee, Department of Biological Sciences (2012-ongoing)

GRADUATE STUDENTS

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CURRICULUM VITAE

DWAYNE ROBERT ETTER, Ph.D.

OFFICE: b(6)

Phone: b(6)

Email: b(6)

FORMAL EDUCATION:

Ph.D. 2001. Natural Resources and Environmental Sciences, University of Illinois, Urbana-Champaign

Dissertation: Ecology and management of overabundant white-tailed deer from suburban Chicago, Illinois.

M.S. 1994. Biology, Western Illinois University, Macomb, IL

Thesis: Emigration and survival of orphaned female deer in Illinois: A pilot study.

B.S. 1986. Environmental Studies, Stockton University, Pomona, NJ

EMPLOYMENT HISTORY:

Wildlife Research Specialist

Michigan Department of Natural Resources, Wildlife Division, Rose Lake Wildlife Research Station, 8562 East Stoll Road, East Lansing, MI 48823

October 2003 to present

Serve as Michigan's technical expert on black bear, furbearers and invasive feral swine. Design and coordinate research projects relevant to the management of Midwest and Upper Great Lakes wildlife with emphasis on black bear and furbearers. Design and coordinate research projects relevant to eliminating invasive feral swine from Michigan. Recommend strategies and policies for invasive feral swine control, and coordinate statewide removal with USDA-WS State Director. Prepare, review and edit Wildlife Division reports and manuscripts for publication in peer-reviewed scientific journals. Provide information through scientific publications, Division reports, media interviews, and presentations to Department managers, administrators, the Natural Resources Commission, stakeholders, and wildlife professionals. Work with university faculty to develop graduate student research projects that lead to an advanced degree. Guest lectures at universities and colleges. Serve as lead worker for one Wildlife Research Technician. Train Department employees and coordinate Wildlife Division and inter-agency field surveys. Assist

Wildlife Division's management specialist with developing bear and furbearer harvest regulations. Participate on Department's Invasive Species Core Team, and Black Bear and Furbearer Workgroups; the Midwest Association of Fish and Wildlife Agencies, Feral Swine and Furbearer Working Groups; and Michigan Raccoon Rabies Working Group. Serve as Department liaison to Safari Club International – Michigan Involvement Committee. Expert testimony.

Acting Research and Technology Section Supervisor

Michigan Department of Natural Resources, Wildlife Division, P.O. Box 30444, Lansing, MI 48933

February 2008 to April 2008

Supervise eighteen employees in the research and technology section. Approve work plans and bi-weekly timesheets. Oversee section budget. Perform employee reviews. Coordinate grants and contracts with Universities and NGOs. Serve on the Wildlife Division's Management Team.

Interim Bear/Furbearer Management Specialist

Michigan Department of Natural Resources, Wildlife Division, P.O. Box 30444, Lansing, MI 48933

March 2003 to March 2004

Serve as the State's technical expert on bear and furbearer ecology and management. Develop bear and furbearer management regulations and policy directives. Draft and present wildlife conservation orders to administrators and the Natural Resources Commission. Develop annual harvest quota recommendations for bear and furbearers. Serve as MDNR liaison with stakeholder groups. Respond to questions from constituents and special interest groups. Represent the Wildlife Division at public meetings. Serve as Chair of the Bear and Furbearer Working Groups. Provide training to MDNR employees. Media interviews.

Wildlife Research Biologist

Michigan Department of Natural Resources, Wildlife Division, P.O. Box 30444, Lansing, MI 48933

April 2002 to September 2003

Design and coordinate research projects relevant to the management of black bear and furbearers. Prepare research proposals and secure funding through internal and external funding sources. Prepare Wildlife Division reports and manuscripts for publication in scientific journals. Provide information through scientific publications, Division reports, media interviews and presentations to Department managers, administrators, the Natural Resources Commission, stakeholders, and wildlife professionals. Maintain a resource of literature on ecology and management of black bears and furbearers. Analyze bear and furbearer harvest data. Conduct annual surveys to estimate relative abundance of bear and furbearers. Assist Wildlife Division's management specialist with developing annual bear and furbearer harvest regulations. Participate on Wildlife

Division's bear and furbearer workgroups, and the Midwest Association of Fish and Wildlife Agencies Furbearer Working Group. Serve on graduate student committees. Provide training to Department employees.

Temporary Deer Biologist/Instructor

Illinois Natural History Survey/University of Illinois, Urbana-Champaign, 607 East Peabody Drive, Champaign, IL 61820
July 2001 to April 2002

Develop and teach an upper level Wildlife Techniques course in the Department of Natural Resources and Environmental Sciences. Conduct research projects to examine the ecology of deer in urban and agricultural areas of Illinois. Prepare manuscripts for publication in scientific journals. Develop and present workshops and presentations at professional conferences. Maintain a resource of books and literature about ungulate ecology and management. Guest lecture in wildlife ecology courses. Provide technical assistance on deer related issues to researchers and managers nationwide.

Research Assistant

Illinois Natural History Survey, Center for Wildlife Ecology, 607 East Peabody Drive, Champaign, IL 61820
August 1998 to July 2001

Write grant proposals and conduct research projects to examine the ecology of deer in urban and agricultural areas of Illinois. Prepare reports, and manuscripts for publication in scientific journals. Develop an urban deer population model for the Chicago region. Conduct field studies on deer herbivory in Chicago natural areas. Develop and present workshops and presentations at professional conferences. Maintain a resource of books and literature about ungulate ecology and management. Guest lecture for wildlife ecology courses at the University of Illinois, Urbana-Champaign. Provide technical assistance on deer related issues to researchers and managers nationwide.

Animal Ecologist

DuPage County Forest Preserve District, 3 South 580 Naperville Road, Wheaton, IL 60187
January 1996 to July 1998

Network a group effort among county, federal, state and the University of Illinois to facilitate urban white-tailed deer research projects in northeast Illinois. Incorporate research findings into an adaptive framework for natural areas management in the Chicago region. Present research findings to District administrators and at professional conferences. Implement an urban deer management program that annually removed 300-600 deer from 23,000 acres of Forest Preserve lands. Hire, train, test and supervise 10 field technicians and sharpshooters participating in the deer culling program. Qualify and participate as a state certified sharpshooter. Prepare permit applications and reports of research and management programs. Advise on deer management at

Forest Preserve, county board, and public meetings in DuPage County. Assist the District's public affairs department in planning and preparing public information and educational documents about deer ecology and management. Prepare natural resource management plans. Maintain a current resource library of literature about ungulate ecology and management. Advise and provide technical assistance on additional wildlife research projects in the Chicago region. Media interviews.

Wildlife Specialist

DuPage County Forest Preserve District, 3 South 580 Naperville Road, Wheaton, IL 60187
November 1994 to January 1996

Western Illinois Deer Check Coordinator

Illinois Department of Natural Resources, 600 North Grandview Avenue West, Springfield, IL 62706
October 1992 to May 1993

Graduate Research Assistant

Western Illinois University, Department of Biology, Macomb, IL 61455
August 1991 to July 1994

Principal/Environmental Scientist (self employed)

DRE Environmental Consultants, Willingboro, NJ
April 1989 to August 1991

Environmental Scientist

Lord, Anderson, Worrell, and Barnett, Burlington, NJ
January 1990 to April 1991

Environmental Biologist

Environmental Design Group, Brick, NJ
April 1988 to January 1990

Project Manager

Land Resource Recycling Management, Inc., Rancocas, NJ
January 1987 to April 1988

Seasonal Deer Management Technician

New Jersey Division of Fish, Game and Wildlife, Nacote Creek, NJ
November 1986 to January 1987

PEER-REVIEWED PUBLICATIONS:

- Draheim, H.M, J.A. Moore, D. Etter, S.R. Winterstein, and K.T. Scribner. *In press*. Detecting black bear source-sink dynamics using individual-based genetic graphs. *Proceedings of the Royal Society B*.
- Burt, D.M., G.J. Roloff, D.R. Etter, and E. Clark. 2016. Reliably detecting snowshoe hares with winter track counts. *Wildlife Society Bulletin* 40:122-129.
- Draheim, H.M., V. Lopez, D. Etter, S.R. Winterstein, and K.T. Scribner. 2015. Effects of Sampling Scale on American Black Bear Spatial Genetic Structure. *Ursus* 26:143-156.
- Moore, J.A, H.M. Draheim, D. Etter, S. Winterstein, and K.T. Scribner. 2014. Application of Large-Scale Parentage Analysis for Investigating Natal Dispersal in Highly Vagile Vertebrates: A Case Study of American Black Bears (*Ursus americanus*). *PLOS ONE* 9 (3): Article No. e91168.
- Wegan, M.T., D.R. Etter, J.L. Belant, D.E. Beyer, Jr., N.J. Svoboda, and P.R. Petroelje. 2014. A cable neck-restraint to live-capture coyotes. *Wildlife Society Bulletin*. 38:160-164.
- Stricker, H.K., J.L. Belant, D.E. Beyer, Jr., J. Kanefsky, K.T. Scribner, D.R. Etter, and J. Fierke. 2012. Use of modified snares to estimate bobcat abundance. *Wildlife Society Bulletin* 36:257-263.
- Etter, D.R. and J.L. Belant. 2011. Evaluation of 2 cable restraints with minimum loop stops to capture coyotes. *Wildlife Society Bulletin*. 35:403-408.
- Skalski, J.R., J.J. Millspaugh, M. Clawson, J.L. Belant, D.R. Etter, B.J. Frawley, and P.D. Friedrich. 2011. Abundance trends of American martens in Michigan based on statistical population reconstruction. *Journal of Wildlife Management*. 75:1767-1773.
- Rudolph, B., D.R. Etter, and S. Shafer. 2011. CPR for urban deer management objectives: Clarity, practicality, and relevance. *Wildlife Society Bulletin* 35:161-167.
- Hiller, T.H., D.R. Etter, J.L. Belant, and A.J. Tyre. 2011. Extrinsic factors affecting managed harvests of fishers and American martens. *Journal of Wildlife Management* 75:1399-1405.
- Williams, B.W., D.R. Etter, K.T. Scribner and P.D. Friedrich. 2011. Uncertainty in determination of sex from harvested bobcats. *Journal of Wildlife Management* 75:1508-1512.
- Belant J.L., D.R. Etter, Mayhew, S.L., L.G. Visser and P.D. Friedrich. 2011. Improving large

- scale mark-recapture population estimates for American black bears. *Ursus* 22:9-23.
- Belant, J.L., D.R. Etter, P.D. Friedrich, M.K. Cosgrove, B.W. Williams and K.T. Scribner. 2011. Comparison of techniques for sex determination of American martens. *Journal of Wildlife Management* 75:256-260.
- Carter, N.H., D.G. Brown, D.R. Etter, and L.G. Visser. 2010. Predicting black bear habitat suitability in Michigan's Northern Lower Peninsula. *Ursus* 21:57-71.
- Piccolo B., K.M. Hollis, R.E. Warner, T.R. Van Deelen, D.R. Etter, and C.L. Anchor. 2010. Mortality of white-tailed deer neonates in suburban Chicago, Illinois. *Canadian Journal Zoology* 88:1-9.
- Nixon, C.M., P.C. Mankin, D.R. Etter, L.P. Hansen, P.A. Brewer, J.E. Chelsvig, T.L. Esker, and J.B. Sullivan. 2010. Characteristics of dominant and subordinate led social groups of white-tailed deer in Illinois. *American Midland Naturalist* 163:388-399.
- Williams, B.W., D.R. Etter, S.R. Winterstein, D. Linden, K.F. Millenbah, and K.T. Scribner. 2009. Non-invasive hair sampling and genetic tagging of co-distributed fishers and American martens. *Journal of Wildlife Management* 73:26-34.
- Nixon, C.M., P.C. Mankin, D.R. Etter, L.P. Hansen, P.A. Brewer, J.E. Chelsvig, T.L. Esker, and J.B. Sullivan. 2008. Migration behavior among female white-tailed deer in Central and Northern Illinois. *American Midland Naturalist* 160:178-190.
- DeNicola, A.J., D.R. Etter, and T. Almendinger. 2008. Demographics of non-hunted white-tailed deer populations for modeling management strategies. *Human-Wildlife Conflicts* 2:42-49.
- Dreher, B.P., S.R. Winterstein, K.T. Scribner, P.A. Lukacs, D.R. Etter, G.J.M. Rosa, V.A. Lopez, S.V. Libants, and K.R. Filcek. 2007. Non-invasive estimation of black bear abundance incorporating genotyping errors and harvested bear. *Journal of Wildlife Management* 71:2684-2693.
- Nixon, C.M., P.C. Mankin, D.R. Etter, L.P. Hansen, P.A. Brewer, J.E. Chelsvig, T.L. Esker, and J.B. Sullivan. 2007. White-tailed deer dispersal behavior in an agricultural environment. *American Midland Naturalist* 157:212-220.
- Van Deelen, T.R., and D.R. Etter. 2003. Effort and the functional response of deer hunters. *Human Dimensions of Wildlife* 8:97-108.
- Etter, D.R., K.M. Hollis, D.R. Ludwig, J.E. Chelsvig, C.L. Anchor, T.R. Van Deelen, and R.E. Warner. 2002. Survival and movements of white-tailed deer in suburban Chicago, Illinois.

Journal of Wildlife Management 66:500-510.

Nixon, C.M., L.P. Hansen, P.A. Brewer, J.E. Chelsvig, T.L. Esker, D.R. Etter, J.B. Sullivan, R. Koerkenmeier, and P.C. Mankin. 2001. Survival of white-tailed deer in the intensively farmed areas of Illinois. *Canadian Journal Zoology* 79:581-588.

Van Deelen, T.R., K.M. Hollis, C. Anchor, and D.R. Etter. 2000. Sex affects age determination and wear of molariform teeth in white-tailed deer. *Journal of Wildlife Management* 64:1076-1083.

Dubey, J.P., K. Hollis, S. Romand, P. Thulliez, O.C.H. Kwok, L. Hungerford, C. Anchor, and D. Etter. 1999. High prevalence of antibodies to *Neospora caninum* in white-tailed deer (*Odocoileus virginianus*). *International Journal Parasitology* 29:1709-1711.

Etter, D.R., C.M. Nixon, J.B. Sullivan, and J.A. Thomas. 1995. Emigration and survival of orphaned female deer in Illinois. *Canadian Journal Zoology* 73:440-445.

Nixon, C.M. and D.R. Etter. 1995. Maternal age and fawn rearing success for white-tailed deer in Illinois. *American Midland Naturalist* 133:290-297.

PROCEEDINGS, REPORTS AND ARTICLES:

Etter, D.R., and D.E. Beyer. October 2009. What can the age of harvested animals tell us about a population? *Michigan Outdoor News* 10 (21):18-19.

Etter D.R. 2009. Hound Dog Training (Coursing) Pen Issue Paper. Midwest Assoc. of Fish and Wildlife Agencies, Furbearer Working Group.

Etter D.R. 2008. A review of bear management in Michigan. Michigan Dept. Nat. Res. Issue paper.

Etter D.R., and S.L. Mayhew. 2008. 2005 Northern Lower Peninsula bear genetic capture-recapture survey. Michigan Dept. Nat. Res. Wildlife Division Report No. 3490.

Mayhew S.L. and D. R. Etter. 2008. An evaluation of the black bear tetracycline survey for estimating Michigan's Upper Peninsula bear population. Michigan Dept. Nat. Res. Wildlife Division Report No. 3489.

Frawley, B.J., and D. Etter. 2008. 2007 Bobcat hunter and trapper opinion survey. Michigan Dept. Nat. Res., Div. Report No. 3486.

Cooley, T.M., S.M. Schmitt, P.D. Friedrich, D.P. Bostick, and D.R. Etter. 2007. 2006-2007

- Bobcat Registration Report. Michigan Dept. Nat. Res., Div. Report No. 3475.
- Frawley, B.J., and D. Etter. 2007. 2006 Bobcat Hunter and Trapper Harvest in Michigan. Michigan Dept. Nat. Res., Div. Report No. 3474.
- Frawley, B.J., D. Etter, and D. Bostick. 2006. 2005 Bobcat hunter and trapper opinion survey. Michigan Dept. Nat. Res., Div. Report No. 3463.
- Frawley, B.J., D. Etter, and D. Bostick. 2005. 2004-2005 Bobcat hunter and trapper opinion survey. Michigan Dept. Nat. Res., Div. Report No. 3441.
- Frawley, B.J., D. Etter, and D. Bostick. 2005. 2004 Bobcat trapper harvest in the Northern Lower Peninsula. Michigan Dept. Nat. Res., Div. Report No. 3448.
- Frawley, B.J., D. Etter, and D. Bostick. 2005. Fox and coyote trapping survey. Michigan Dept. Nat. Res., Div. Report No. 3430.
- Frawley, B.J., D. Etter, and D. Bostick. 2004. Bobcat hunter and trapper opinion survey. Michigan Dept. Nat. Res., Div. Report No. 3427.
- Earle, R.D., D.R. Etter, S.L. Mayhew, and V.R. Tuovila. 2003. Bobcat population survey methods. Final report. Federal Aid in Wildlife Restoration Project W-127-R-1. Michigan Department of Natural Resources, Lansing, MI. 20 pp.
- Etter, D.R., T.F. Reis, and L.G. Visser. 2003. Michigan Status Report. Pages 41-49 *in* M. Terner, editor, Proceedings of 17th Eastern Black Bear Workshop, Black Bears in the Back Yard. New Jersey Department of Environmental Protection.
- Etter, D.R. 2002. Black bear population management techniques. Final report. Federal Aid in Wildlife Restoration Project W-127-R-20. Michigan Department of Natural Resources, Lansing, MI. 27 pp.
- Etter, D.R., T.R. Van Deelen, D.R. Ludwig, K.M. Hollis, J.E. Chelsvig, and R.E. Warner. 2001. Overabundant deer, better management through research. Pages 198-205 *in* M.C. Brittingham, J. Kays and R. McPeake, editors, Proceedings of the 9th Wildlife Damage Management Conference, University Park, PA.
- Hollis, K. M., C.L. Anchor, J. Chelsvig, D. R. Etter, J. P. Dubey, R. E. Warner, and L. L. Hungerford. 2001. Radio-telemetry and Geographical Information Systems to assess urban deer zoonoses. Pages 273-282 *in* M.C. Brittingham, J. Kays and R. McPeake, editors, Proceedings of the 9th Wildlife Damage Management Conference, University Park, PA.
- Piccolo B., K.M. Hollis, R.E. Warner, T.R. Van Deelen, D.R. Etter, and C.L. Anchor. 2001.

- Variation of white-tailed deer home-ranges in fragmented urban habitats around Chicago, Illinois. Pages 351-356 in M.C. Brittingham, J. Kays and R. McPeake, editors, Proceedings of the 9th Wildlife Damage Management Conference, University Park, PA.
- Etter, D.R., D.R. Ludwig, S.N. Kobal, T.R. Van Deelen, and R.E. Warner. 2000. Management of white-tailed deer in Chicago, Illinois forest preserves. Pages 190-196 in T.P. Salmon and A.C. Crabb, editors, Proceedings of the 19th Vertebrate Pest Conference, University of California, Davis.
- Van Deelen, and D.R. Etter. 2000. Cost and controversy in managing urban deer. *INHS reports* March-April 2000. [Http://www.inhs.uiuc.edu/chf/pub/surveyreports/march-april00/deer.html](http://www.inhs.uiuc.edu/chf/pub/surveyreports/march-april00/deer.html)
- Etter, D.R., and T.R. Van Deelen. July 1999. A model for managing overabundant deer populations in the natural areas of the Chicago Wilderness, Final Report. The Chicago Wilderness. 9 pp.
- Etter, D.R., T.R. Van Deelen and R.H. Diehl. July 1999. An empirical model for predicting suburban deer populations. (online) http://nhsbig.inhs.uiuc.edu/www/deer_model.html.
- Etter D.R., and T.R. Van Deelen. 1999. Deer in the suburbs of Chicago. *INHS reports* May-June 1999. (online) <http://www.inhs.uiuc.edu/chf/pub/surveyreports/may-jun99/deer.html>
- Etter, D.R. 1998. Population dynamics of deer within the forest preserves of DuPage County. Forest Preserve District of DuPage County, Glen Ellyn, IL. 27 pp.
- Etter, D.R., D.R. Ludwig, S. Kobal, and M. Redmer. 1998. Deer Population Control Permit Summary (December 1997 through March 1998) and A Proposal for White-tailed Deer Management Within the Forest Preserve District of DuPage County (December 1998 through March 1999). Forest Preserve District DuPage County, Glen Ellyn, IL. 112 pp.
- Etter, D.R., D.R. Ludwig, and S. Kobal. 1997. Deer Population Control Permit Summary (December 1996 through March 1997) and A Proposal for White-tailed Deer Management Within the Forest Preserve District of DuPage County (December 1997 through March 1998). Forest Preserve District DuPage County, Glen Ellyn, IL. 112 pp.
- Ludwig, D.R., D.R. Etter, and S. Kobal. 1996. Deer Population Control Permit Summary (December 1995 through March 1996) and A Proposal for White-tailed Deer Management Within the Forest Preserve District of DuPage County (December 1996 through March 1997). Forest Preserve District DuPage County, Glen Ellyn, IL. 85 pp.
- Ludwig, D.R., D.R. Etter, and S. Kobal. 1995. Deer Population Control Permit Summary (December 1994 through March 1995) and A Proposal for White-tailed Deer Management Within the Forest Preserve District of DuPage County (December 1995 through March 1996). Forest Preserve District DuPage County, Glen Ellyn, IL. 166 pp.

- Nixon, C.M., J.B. Sullivan, R.G. Koerkenmeier, D. Etter, A. Woolf, J. Roseberry, J. Kube, and E.J. Heske. 1995. Cooperative Forest Wildlife Research, Illinois deer investigations, Final Report. Federal Aid in Wildlife Restoration Project W-87-R-17. Illinois Dept. Nat. Res., Springfield. 24pp.
- Nixon, C.M., L.P. Hansen, P.A. Brewer, J.E. Chelsvig, J.B. Sullivan, T. Esker, R.K. Koerkenmeier, D.R. Etter, J. Cline, and J.A. Thomas. 1994. Behavior, dispersal, and survival of male white-tailed deer in Illinois. Biological Note 139, Illinois Natural History Survey, Urbana. 30pp.
- Nixon, C.M., J.B. Sullivan, R.G. Koerkenmeier, D. Etter, R. Anderson, A. Woolf, J. Roseberry, J. Kube, and J. Buhnerkempe. 1994. Cooperative Forest Wildlife Research, Illinois deer investigations, Annual Report. Federal Aid in Wildlife Restoration Project W-87-R-16. Illinois Dept. Nat. Res., Springfield. 22 pp.
- Nixon, C.M., J.B. Sullivan, R.G. Koerkenmeier, D. Etter, J. Kube, J. Thomas, A. Woolf, and J. Roseberry. 1993. Cooperative Forest Wildlife Research, Illinois deer investigations, Annual Report. Federal Aid in Wildlife Restoration Project W-87-R-15. Illinois Dept. Nat. Res., Springfield. 17 pp.
- Nixon, C.M., J.B. Sullivan, R. Koerkenmeier, D. Etter, J. Kube, T.L. Esker, G. Morgan, and J. Van Es. 1992. Cooperative Forest Wildlife, Illinois deer investigations, Final Report. Federal Aid in Wildlife Restoration Project W-87-R-12,13,14. Illinois Dept. Conser., Springfield. 43 pp.

PROFESSIONAL PRESENTATIONS AND POSTERS:

- 2016 Indiana Chapter of The Wildlife Society, Bloomington, IN, March 1 – 2, 2016. The impact of landscape features on black bear movements in an agricultural region: implications for range expansion in southern Michigan, USA. D.R. Etter, M.T. Wegan and D.M. Williams.
- 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI, January 24-27, 2016. Errors in the interpretation of wildlife sign at survey bait stations. Mayhew, S.L. and D.R. Etter.
- International Urban Wildlife Conference, Chicago, IL, May 17-20, 2015. Environmental conditions correlating with resource selection for suburban deer seropositive for Jamestown Canyon virus. Hollis-Etter, K. M., R. A. Montgomery, D. R. Etter, C. L. Anchor, J. E. Chelsvig, R. E. Warner, G. J. Roloff, P. R., Grimstad, D. D. Lovin, and M. S. Godsey.
- Michigan Chapter of The Wildlife Society, Spring Meeting, Clare, MI, March 26, 2015. Black Bear Movements with Respect to Hair-Snare Stations in the Northern Lower Peninsula of Michigan: Implications for Population Model Assumptions. Dutcher, A.E., D.M. Williams, W.T. Wegan and D.R. Etter.

75th Midwest Fish and Wildlife Conference, Indianapolis, IN, February 7-11, 2015.
Environmental conditions correlating with resource selection for suburban deer seropositive for Jamestown Canyon virus. Hollis-Etter, K. M., R. A. Montgomery, D. R. Etter, C. L. Anchor, J. E. Chelsvig, R. E. Warner, G. J. Roloff, P. R., Grimstad, D. D. Lovin, and M. S. Godsey.

21st Annual Conference of The Wildlife Society, Pittsburgh, PA, October 25-30, 2014. Black Bear Movements with Respect to Hair-Snare Stations in the Northern Lower Peninsula of Michigan: Implications for Population Model Assumptions. Dutcher, A.E., D.M. Williams, W.T. Wegan and D.R. Etter.

21st, Annual Conference of The Wildlife Society, Pittsburgh, PA, October 25-30, 2014.
Improving current population estimation methods for Michigan black bears. Dutcher, A.E., D.M. Williams, M.T. Wegan, and D.R. Etter.

21st, Annual Conference of The Wildlife Society, Pittsburgh, PA, October 25-30, 2014. Spatially explicit capture-recapture estimation of black bear abundance in Michigan's northern lower peninsula. Williams, D.M., D.R. Etter, A.E. Dutcher, and W.F. Porter.

20th Annual Conference of The Wildlife Society, Milwaukee, WI, October 5-10, 2013. The impact of landscape features on black bear movements in an agricultural region: implications for range expansion in southern Michigan, USA. Wegan M.T., D.R. Etter, and D.M. Williams.

20th Annual Conference of The Wildlife Society, Milwaukee, WI, October 5-10, 2013. Climatic factors influencing snowshoe hare occupancy in Michigan. Burt, D., G. J. Roloff, and D. Etter. 2013.

20th Annual Conference of The Wildlife Society, Milwaukee, WI, October 5-10, 2013.
Environmental conditions correlating with resource selection for suburban deer seropositive for Jamestown Canyon virus. Hollis-Etter, K. M., R. A. Montgomery, D. R. Etter, C. L. Anchor, J. E. Chelsvig, R. E. Warner, G. J. Roloff, P. R., Grimstad, D. D. Lovin, and M. S. Godsey.

2013 Midwest Furbearer Workshop, Petersburg, Illinois, March 26-28, 2013. Using principles of sound scientific management in making decisions regarding expansion of bobcat harvest in Michigan's Lower Peninsula. D. Etter, S. Mayhew, A. Bump, T. Gehring, T. Preuss, and N. Svoboda.

19th Annual Conference of The Wildlife Society, Portland, OR, October 13-18, 2012.
Reconciling hunters and managers with science: spatio-temporal dynamics of Michigan black bear harvest. Williams D.M., D.R. Etter, G. Nowak, A. Bump, A.C. Dechen Quinn, and W.F. Porter.

US-International Association for Landscape Ecology, Newport, Rhode Island, April 8-12, 2012
Annual Symposium, Newport, Rhode Island. Leaving home: factors affecting natal dispersal in

American black bears. Moore, J.A., H.M. Draheim, D.R. Etter, S.R. Winterstein, K.T. Scribner. 2012.

US-International Association for Landscape Ecology, Newport, Rhode Island, April 8-12, 2012 Annual Symposium, Newport, Rhode Island. Applications of graphs to black bear source-sink dynamics. Draheim, H.M., J.A. Moore, K.T. Scribner, D.R. Etter, S.R. Winterstein. Evolution, Norman, Oklahoma. June 17-21, 2011. Individual-based analysis of landscape effects on gene flow and connectivity of black bear (*Ursus americanus*) in Michigan's Northern Lower Peninsula. Draheim, H.M., K.T. Scribner, J.A. Moore, S.R. Winterstein, and D.R. Etter.

2011 Midwest Furbearer Workshop, Grantsville, Wisconsin, May 3-5, 2011. Factors affecting harvests of fishers and American martens in Northern Michigan. A. Bump, T. Hiller, D.R. Etter, J.L. Belant, and A.J. Tyre.

20th Eastern Black Bear Workshop, Hendersonville, North Carolina, May 1-4, 2011. Estimating abundance of black bears in Michigan, sifting through the sands of time. D.R. Etter and L. Visser.

US-International Association for Landscape Ecology, Twenty-fifth Anniversary Symposium, Athens, Georgia, April 5-9, 2010. Spatial and temporal scale of sampling affects individual-based measures of spatial genetic structure in Michigan black bear. Draheim, H., K. Scribner, V. Lopez, S. Winterstein, and D. Etter.

2010 Midwest Furbearer Workshop, April 26-29, 2010, Deadwood, SD. Evaluation of two cable neck-restraints with stops to capture coyotes. D.R. Etter and J.L. Belant.

2010 Midwest Furbearer Workshop, April 26-29, 2010, Deadwood, SD. Abundance of American martens and fishers in Michigan using statistical population reconstruction. D.R. Etter, P.D. Friedrich, B.J. Frawley, J.R. Skalski, J.J. Millsaugh, M.V. Clausen, and J.L. Belant.

2006 Midwest Furbearer Workshop, September 10-13, 2006, Sault Ste. Marie, MI. Habitat Use by Reintroduced American Marten In Hardwood Dominated Forest. C. Buchanan, B.J. Swanson, T. Callison, and D. Etter.

2006 Midwest Furbearer Workshop, September 10-13, 2006, Sault Ste. Marie, MI. The Future of Bear Management in Michigan: The Statewide Black Bear Management Plan. D. Bostick, and D. Etter.

2006 Midwest Furbearer Workshop, September 10-13, 2006, Sault Ste. Marie, MI. Improving Midwest Furbearer Distribution Representations. M. Strong, D. Etter, D. Bostick, C. Nelsen, B. Bluett, C. Dwyer, D. Swanson, S. Johnson, B. Plowman, D. Hamilton, R. Andrews, T. Gosselink, W. Clark, and S. Koehler.

2006 Michigan Rabies Conference, April 24, 2006, East Lansing, MI. Rabies vector species: Regulation of rehabilitation and nuisance control. D.J. O'Brien, T.M. Cooley, D.R. Etter, J. Jansen, D.J. Knapp, and K. Signs.

66th Midwest Fish and Wildlife Conference, December 11-14, 2005. Shifts in population dynamics due to intensive culling: considerations for managing overabundant white-tailed deer. D.R. Etter, T.R. Van Deelen, and B.A. Rudolph.

2005 Joint Furbearer Workshop, May 10-12, 2005, Bismarck, ND. Estimation of black bear (*Ursus americanus*) abundance in the northern Lower Peninsula of Michigan using microsatellite DNA markers. D.R. Etter, B.P. Dreher, S.R. Winterstein, K.T. Scribner, and V.A. Lopez.

2005 Joint Furbearer Workshop, May 10-12, 2005, Bismarck, ND. Managing Michigan's bobcats in the face of litigation. D.R. Etter.

10th Annual Conference of The Wildlife Society, September 6-10, 2003, Burlington, VT. Population demographics of non-hunted, suburban deer populations. A. J. DeNicola and D.R. Etter.

10th Annual Conference of The Wildlife Society, September 6-10, 2003, Burlington, VT. How many bears, plus or minus: Effects of errors associated with non-invasive population size estimation. B.P. Dreher, G.J.M. Rosa, K.T. Scribner, S.R. Winterstein, V.A. Lopez, S.V. Libants, and D.R. Etter.

Michigan Chapter of The Wildlife Society, Spring Meeting, April 16-17, 2003, Grand Rapids, MI. Home range size, survival and habitat use for urban deer in Chicago. K.M. Hollis, D.R. Etter, C.L. Anchor, J.E. Chelsvig, T.R. Van Deelen, D.R. Ludwig, B.P. Piccolo, and R.E. Warner.

Michigan Chapter of The Wildlife Society, Spring Meeting, April 16-17, 2003, Grand Rapids, MI. How many bears? Methods for non-invasive sampling to estimate black bear abundance in Michigan. B.P. Dreher, V.A. Lopez, S.R. Winterstein, K.T. Scribner, D.R. Etter, and G.J.M. Rosa.

17th Eastern Black Bear Workshop, Mount Olive, NJ, March 2-5, 2003. Social Carrying Capacity of Black Bear in the Lower Peninsula of Michigan (Invited Speaker). D.R. Etter, P. Bull, B. Peyton, T. Reis, and L. Visser.

Virginia Chapter of The Wildlife Society Winter Meeting, Blacksburg, VA. March 20-22, 2002. Survival of white-tailed deer neonates in suburban Chicago, Illinois. B.P. Piccolo, K.M. Hollis, T.R. Van Deelen, R.E. Warner, D.R. Etter, and C.L. Anchor.

Conservation in Fragmented Habitats, 7th Annual Stewardship Forum, February 16, 2002, The Morton Arboretum, Lisle, IL. Ecology of deer in Chicago's natural areas: implications for

management (Invited Speaker). D.R. Etter.

63rd Midwest Fish and Wildlife Conference, December 9-12, 2001, Des Moines, Iowa. Home range size and habitat use patterns by urban white-tailed deer in Chicago, Illinois. K.M. Hollis, D.R. Etter, C.L. Anchor, J.E. Chelsvig, B.P. Piccolo, and R.E. Warner.

63rd Midwest Fish and Wildlife Conference, December 9-12, 2001, Des Moines, Iowa. Survival of white-tailed deer neonates in suburban Chicago, Illinois. B.P. Piccolo, K.M. Hollis, T.R. Van Deelen, R.E. Warner, D.R. Etter, and C.L. Anchor.

63rd Midwest Fish and Wildlife Conference, December 9-12, 2001, Des Moines, Iowa. Effort and the functional response of deer hunters. T.R. Van Deelen and D.R. Etter.

8th Annual Conference of The Wildlife Society, September 25-29, 2001, Reno, NV. Searching strategies and techniques for capturing neonate white-tailed deer fawns around Chicago, IL. B.P. Piccolo, K.M. Hollis, R.E. Warner, T.R. Van Deelen, D.R. Etter, and C.L. Anchor.

Illinois Department of Natural Resources, May 24, 2001, Springfield, IL. Ecology and management of overabundant white-tailed deer in the forest preserves of Chicago, Illinois. D.R. Etter.

Forest Preserve District of DuPage County, May 16, 2001, Wheaton, IL. Population dynamics of deer in the forest preserves of DuPage County. D.R. Etter.

3rd Illinois Renewable Natural Resources Conference, March 7-9, 2001, Peoria, IL. Modeling geographic differences in survival of white-tailed deer in Chicago, Illinois. D.R. Etter, K.M. Hollis, T.R. Van Deelen, J.L. Aycrigg, and R.E. Warner.

3rd Illinois Renewable Natural Resources Conference, March 7-9, 2001, Peoria, IL. Home range size and habitat use patterns by urban white-tailed deer in Chicago, Illinois. K.M. Hollis, D.R. Etter, C.L. Anchor, J.E. Chelsvig, R.E. Warner, and B.P. Piccolo.

62nd Midwest Fish and Wildlife Conference, December 3-6, 2000, Minneapolis, MN. Spatial analysis of geographic differences in survival of white-tailed deer in a fragmented urban landscape. D.R. Etter, K.M. Hollis, T.R. Van Deelen, J.L. Aycrigg, and R.E. Warner.

62nd Midwest Fish and Wildlife Conference, December 3-6, 2000, Minneapolis, MN. Radio-telemetry and geographic information systems to assess urban deer zoonoses. K.M. Hollis, C.L. Anchor, J.E. Chelsvig, D.R. Etter, R.E. Warner, and L. L. Hungerford.

62nd Midwest Fish and Wildlife Conference, December 3-6, 2000, Minneapolis, MN. Searching strategies and techniques for capturing neonate white-tailed deer fawns around Chicago, Illinois. B.P. Piccolo, K.M. Hollis, R.E. Warner, T.R. Van Deelen, D.R. Etter, and C.L. Anchor.

62nd Midwest Fish and Wildlife Conference, December 3-6, 2000, Minneapolis, MN. Variation of white-tailed deer home ranges in fragmented urban habitats around Chicago, Illinois (Poster; Best student poster award). B.P. Piccolo, K.M. Hollis, R.E. Warner, T.R. Van Deelen, D.R. Etter, and C.L. Anchor.

9th Eastern Wildlife Damage Management Conference October 5-8, 2000, University Park, PA. Overabundant deer, better management through research. D.R. Etter, T.R. Van Deelen, D.R. Ludwig, K.M. Hollis, J.E. Chelsvig, and R.E. Warner (Tied for best student presentation).

9th Eastern Wildlife Damage Management Conference October 5-8, 2000, University Park, PA. Radio-telemetry and Geographical Information Systems to assess urban deer zoonoses. K.M. Hollis, C.L. Anchor, J. Chelsvig, D. R. Etter, J. P. Dubey, R. E. Warner, and L. L. Hungerford.

9th Eastern Wildlife Damage Management Conference October 5-8, 2000, University Park, PA. Variation of white-tailed deer home-ranges in fragmented urban habitats around Chicago, Illinois (poster). B.P. Piccolo, K.M. Hollis, R.E. Warner, T.R. Van Deelen, D.R. Etter, and C.L. Anchor.

7th Annual Conference of The Wildlife Society, September 12-16, 2000, Nashville, TN. Sex affects age determination and wear of molariform teeth in white-tailed deer. T.R. Van Deelen, K.M. Hollis, C.L. Anchor, and D.R. Etter.

7th Annual Conference of The Wildlife Society, September 12-16, 2000, Nashville, TN. Variation of white-tailed deer home-ranges in fragmented urban habitats around Chicago, Illinois (poster). B.P. Piccolo, K.M. Hollis, R.E. Warner, T.R. Van Deelen, D.R. Etter, and C.L. Anchor.

80th Annual Meeting of the American Society of Mammalogists, June 17-21, 2000, Durham, NH. Survival and movements of white-tailed deer in a fragmented urban landscape. D.R. Etter, K.M. Hollis, J.E. Chelsvig, D.R. Ludwig, T.R. Van Deelen, and R.E. Warner.

80th Annual Meeting of the American Society of Mammalogists, June 17-21, 2000, Durham, NH. Radio-telemetry and Geographic Information Systems to assess urban deer zoonoses. K.M. Hollis, C.L. Anchor, J.E. Chelsvig, D.R. Etter, R.E. Warner, L.L. Hungerford, and J. Aycrigg.

Forest Preserve District of Cook County, Illinois, May 18, 2000. Ecology, management, and modeling of urban deer populations: insights from harvest management theory (Invited Workshop). D.R. Etter.

Illinois Natural History Survey, March 31, 2000, Champaign, IL. Modeling deer populations in suburban Chicago: insights into the reproductive life history strategy (Invited Speaker). D.R. Etter.

19th Vertebrate Pest Conf., March 6-9, 2000, San Diego, California. Management of white-tailed deer in Chicago, Illinois forest preserves (Invited Speaker). D.R. Etter, D.R. Ludwig, S.N.

Kobal, T.R. Van Deelen, and R.E. Warner.

61st Midwest Fish and Wildlife Conference, December 8, 1999, Chicago, IL. Density dependent reproduction in a managed urban deer population. D.R. Etter, T.R. Van Deelen, R.E. Warner, and D.R. Ludwig.

Chicago Wilderness, June 11, 1999, Chicago, IL. Modeling suburban deer populations (Invited Workshop). D.R. Etter.

Illinois Chapter of the Wildlife Society Annual Meeting, March 4-5, 1999, Monticello, IL. Overabundant deer in the Midwest: Slouching towards synthesis. T.R. Van Deelen and D.R. Etter.

Illinois Chapter of the Wildlife Society Annual Meeting, March 4-5, 1999, Monticello, IL. Sex-biases in wear and morphology of molariform teeth in adult white-tailed deer. T.R. Van Deelen, K.M. Hollis, C. Anchor, and D.R. Etter.

60th Midwest Fish and Wildlife Conference, December 7, 1998, Cincinnati, OH. Sex-biases in wear and morphology of molariform teeth in adult white-tailed deer. T.R. Van Deelen, K.M. Hollis, C. Anchor, and D.R. Etter.

WCC-95 Vertebrate Pests of Agriculture, Forestry and Public Lands, November 17, 1998, Reno, Nevada. Operation and successes of a lethal deer removal program in suburban Chicago, Illinois. D.R. Etter, D.R. Ludwig, D. Thompson, S. Kobal and T.R. Van Deelen.

5th Annual Conference of The Wildlife Society, September 25, 1998, Buffalo, NY. An empirical model for predicting deer population trends in suburban Chicago, Illinois. D.R. Etter, T.R. Van Deelen, R.E. Warner, and B.M. Hannon.

2nd Illinois Renewable Natural Resources Conference, March 6, 1998, Springfield, IL. Successes of a lethal deer removal program in DuPage County Forest Preserves. D.R. Etter, D.R. Ludwig, S. Kobal, and T.R. Van Deelen.

59th Midwest Fish and Wildlife Conference, December 8, 1997, Milwaukee, WI. Operation and Successes of a lethal deer removal program in suburban Chicago, Illinois. D.R. Etter, D.R. Ludwig, D. Thompson, and T.R. Van Deelen.

58th Midwest Fish and Wildlife Conference, December 10, 1996, Omaha, NE. Survival of white-tailed deer in suburban Chicago, Illinois. D.R. Etter, K.M. Hollis, T.R. Van Deelen, D.R. Ludwig, C. Anchor, J. Chelsvig, and L.L. Hungerford.

23rd Natural Areas, 15th North American Prairie, and Indiana Dunes Ecosystems Conferences, October 1996, Saint Charles, IL. Home-range and habitat use by deer in DuPage County Forest Preserves. D.R. Etter and D.R. Ludwig.

55th Midwest Fish and Wildlife Conference, December 1993, St. Louis, MO. Home range and habitat use by related female white-tailed deer during parturition in west-central Illinois (poster). D.R. Etter, C.M. Nixon, J.B. Sullivan, T.L. Esker, R. Koerkenmeier, P.G. Weston, and M.A. Romano.

RESEARCH SUPPORT:

Statistical catch-at-age assessment of Michigan black bear population dynamics

Funding Source: Michigan Department of Natural Resources, Federal Aid in Wildlife Restoration, 2012-2014

P.I.s: J. Bence, S. Winterstein, T. Brenden, S. Mayhew and D. Etter

Amount: \$102,000

Factors influencing snowshoe hare occupancy and abundance.

Funding Source: Michigan Department of Natural Resources, Federal Aid in Wildlife Restoration, 2012-2014

P.I.s: G.J. Roloff, Henry Campa, III, D.R. Etter and E. Clark

Amount: \$118,000

Developing and implementing effective black bear exclusion devices to protect apiaries.

Funding Source: Berryman Institute, 2011

P.I.s: G.J. Roloff, J. Pusateri-Burroughs, and D.R. Etter

Amount: \$15,000

Southern Michigan black bear research.

Funding Source: Safari Club International-Michigan Involvement Committee, 2011

P.I.: D.R. Etter

Amount: \$5,000

Developing and implementing effective black bear exclusion devices to protect apiaries.

Funding Source: Berryman Institute, 2010

P.I.s: G.J. Roloff, J. Pusateri-Burroughs, and D.R. Etter

Amount: \$15,000

Landscape genetic analysis of harvest intensity, land-cover and land-use features affecting black bear movements, abundance, and source-sink dynamics in Michigan's Lower Peninsula.

Funding Source: Michigan Department of Natural Resources, Federal Aid in Wildlife

Restoration, 2010-2012

P.I.s: K.T. Scribner, S. Winterstein, and D.R. Etter

Amount: \$260,000

Southern Michigan black bear research.

Funding Source: Safari Club International-Michigan Involvement Committee, 2010

P.I.: D.R. Etter

Amount: \$4,500

Expansion of black bear range in the agro-forested region of central Michigan.

Funding Source: Michigan Department of Natural Resources, Federal Aid in Wildlife

Restoration, 2010-2012

P.I.s: T.R. Van Deelen and D.R. Etter.

Amount: \$68,000

Monitoring bobcats using noninvasive genetic techniques in the Northern Lower Peninsula of Michigan

Funding Source: Michigan Department of Natural Resources, Federal Aid in Wildlife

Restoration, 2006

P.I.s: K.T. Scribner, S. Winterstein, and D.R. Etter

Amount: \$28,000

Assessment of furbearer population size and effects of landscape features on distribution and population structure.

Funding Source: Michigan Department of Natural Resources, Federal Aid in Wildlife

Restoration, 2004-2005

P.I.s: K.T. Scribner, B.W. Williams, S. Winterstein, K. Millenbah and D.R. Etter

Amount: \$42,000

A model for managing overabundant deer populations in the natural areas of the Chicago Wilderness

Funding Source: Chicago Wilderness, 1998

P.I.s: D.R. Etter and T.R. Van Deelen

\$14,900

Impacts of deer herbivory upon natural areas in the Chicago Wilderness

Funding Source: Chicago Wilderness, 1998

P.I.s: T.R. Van Deelen and D.R. Etter

\$25,600

Ecology of deer from intensively farmed areas of west-central Illinois

Funding Source: Dal Briar Corporation, 1993

P.I.s: J.A. Thomas and D.R. Etter

\$5,000

Ecology of deer from intensively farmed areas of west-central Illinois

Funding Source: Dal Briar Corporation, 1992

P.I.s: J.A. Thomas and D.R. Etter

\$5,000

GRADUATE STUDENT ADVISORY COMMITTEES:

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INSTRUCTION:

Fall 2011, 2012, 2013 and 2014: Co-taught Wildlife Capture module in LCS 660-Wildlife Disease Ecology & Management, Michigan State University, Department of Fisheries and Wildlife, and College of Veterinary Medicine, East Lansing, MI. Professor Jean Tsao.

Fall 2014: Taught Wildlife Capture module in FW 413-Wildlife Techniques, Michigan State University, Department of Fisheries and Wildlife, East Lansing, MI. Professor Gary Roloff.

Fall 2010, 2011 and 2012: Taught Wildlife Surveys and Population Estimation modules in FW 413-Wildlife Techniques, Michigan State University, Department of Fisheries and Wildlife, East Lansing, MI. Professor Gary Roloff.

Spring 2002: Developed and taught NRES 399-Wildlife Techniques, University of Illinois, Department of Natural Resources and Environment, Urbana-Champaign, IL.

1997-present: Guest lectures in capture of free-ranging wildlife; use of research in wildlife management; mammal morphology; urban wildlife ecology; harvest management theory; and track identification:

Baker Community College, Flint, MI

Central Michigan University, Department of Biology

Michigan State University, Department of Fisheries and Wildlife

Montcalm Community College, Department of Biology

University of Illinois, Urban-Champaign, Department of Natural Resources and Environment

University of Michigan-Flint, Department of Biology

PROFESSIONAL SERVICE, ACCOMPLISHMENTS, AWARDS AND CERTIFICATIONS:

- Wildlife Biologist Certification, The Wildlife Society
- Adjunct Assistant Professor, Michigan State University

- Adjunct Assistant Professor, Central Michigan University
- Adjunct Associate Professor, Wayne State University
- Member, The American Society of Mammalogists
- Member, The Wildlife Society (National, Northcentral and Michigan Chapters)
 - Michigan Chapter, Nominating and Elections Committee, 2008
 - Michigan Chapter, Executive Board Member, 2004-2006
- Member, The University of Illinois Student Chapter of The Wildlife Society
 - Activities Committee (Chair), 2000-2001
 - Membership Committee, 2000-2001
 - Nominating and Elections Committee (Chair), 2001
- President, Western Illinois University Student Chapter of The Wildlife Society, 1993-94
- Associate Editor – *Ursus* (2013-2014)
- Reviewer of Scientific Journals: *American Midland Naturalist*, *Ecological Modeling*, *Human-Wildlife Conflicts*, *Journal of Mammalogy*, *Journal of Wildlife Management*, *Wildlife Society Bulletin*, *Ursus*
- Reviewer: Management and Conservation Plan for American Martens in Wisconsin (2010)
- Chair, Midwest Association of Fish and Wildlife Agencies Furbearer Workshop, September 10-13, 2006, Sault Ste. Marie, MI
- Michigan Representative to the Midwest Association of Fish and Wildlife Agencies, Midwest Feral Swine Working Group
- Michigan Representative to the Midwest Association of Fish and Wildlife Agencies, Furbearer Technical Working Group
- Michigan Representative to the Association of Fish and Wildlife Agencies Committee for Animal Use Issues/Furbearer Resources
- MDNR Representative to the Michigan Rabies Working Group
- 2011 President's Award, Michigan Trappers and Predator Caller's Association
- 2009 MDNR, Wildlife Division, Merrill L. "Pete" Petosky Award For Outstanding Accomplishment In Managing Michigan's Wildlife Resources
- Best Student Presentation, 9th Eastern Wildlife Damage Management Conference, October 5-8, 2000, University Park, PA
- Illinois Class A Nuisance Wildlife Control Permit, 1995-99
- Michigan Research Laboratory Controlled Substance License (Exp June 30, 2016)
- Chemical Immobilization Certification, Safe Capture International, 1995
- Pope and Young Big Game Records Scorer, 1994-1998

Scientific Peer Review for Delisting of Greater Yellowstone Ecosystem Grizzly Bears

Reviewer 1
May 2016

Grizzly bears (*Ursus arctos*) of the Greater Yellowstone Ecosystem (GYE) are likely the most well studied group of their species worldwide and the depth of understanding of the bears and their ecosystem has reached a profound level rarely matched by other large carnivores. This background of scientific insight provides a solid basis for the three documents reviewed in this report. In overview, the Federal Register Proposed Rule, Conservation Strategy, and Grizzly Bear Recovery Plan Draft Supplement are all rigorous and scientifically sound documents. I could find no errors of logic or scientific method. The Conservation Strategy is a comprehensive and well-considered document. The management efforts that arise from this document are profound and well designed to meet the target of managing a delisted species such as the GYE grizzly bears.

The Proposed Rule provides an adequate review and analysis of the factors relating to the persistence of the grizzly bear population in the GYE. The document is rigorous, science-based, and founded on the best available science. The Recovery Plan and Draft Supplement are scientifically sound.

I conclude that the three documents provide a science-based approach to the GYE grizzly bears management and conservation. The three documents provide a science-based plan for management into the future. The Conservation Strategy, if fully implemented as outlined, is a scientifically sound and logical approach to ensure the long-term viability of the GYE grizzly bear population. The care, thought, and attention to the full range of threats to the GYE grizzly bears is evident and I have no hesitation in supporting the full breadth of the Conservation Strategy and other two documents. This is a robust and well-considered approach that meets the highest standards of science-based management and conservation.

My review covers the three documents provided and include:

- 1) Federal Register / Vol. 81, No. 48 Friday March 11, 2016 / Proposed Rule 13174-13227
- 2) Final Draft: Draft 2016 Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Ecosystem
- 3) Grizzly Bear Recovery Plan: Draft Supplement: Draft Revised Demographic Recovery Criteria for the Yellowstone Ecosystem. Draft Approved: 2.19.16

I have provided direct responses on the 13 questions identified as part of the Scientific Peer Review for Greater Yellowstone Grizzly Bears: some of this information is repeated in the specific sections on each document. My review also identifies specific points noted with a reference to location in the document; these are provided following my answers to the 13 questions.

Scientific Peer Review for Delisting of Greater Yellowstone Ecosystem Grizzly Bears

Proposed Rule:

1. *Does the proposed rule provide adequate review and analysis of the factors relating to the persistence of the grizzly bear population in the Greater Yellowstone (demographics, habitat, disease and predation, and genetics)?*

The Proposed Rule provides an adequate review and analysis of the factors relating to the persistence of the grizzly bear population in the GYE. The document is rigorous, science-based, and founded on the best available science. Much more could be written to cover the full breadth of the literature on the GYE grizzly bears but the current document provides a solid overview.

The demographic information is solid, science-based, in-depth, and based on the best available science. The methods used attain a very high level acceptable on an international level. Similarly, the analyses of habitat, disease, predation, and genetics are all held to the same high standard.

I could find no errors of interpretation or analyses in the documents. The conclusions on each of the factors pertaining to the persistence of grizzly bears in the GYE are well supported by the Proposed Rule.

2. *Are our assumptions and definitions of suitable habitat logical and adequate?*

The assumptions and definitions of suitable habitat are both logical and adequate. It is possible that new findings may alter our understanding of grizzly bear habitat and what is deemed secure but the Proposed Rule uses the best available science to support the habitat analyses and management protocols. The use of adaptive management will allow new scientific insights or methods to be applied should they prove to be advances beyond the current state of knowledge.

3. *Are the details for habitat management adequate in the proposed rule?*

The details for habitat management are adequate in the Proposed Rule. Use of adaptive management and the ongoing research and monitoring will allow for improvements, should they prove possible, over time. The standards applied for the GYE grizzly bears as they pertain to habitat management are of the highest standard possible. Scientific methods and the depth of understanding of the GYE grizzly bears are profound and few other wildlife species have such a depth of science supporting their management and conservation.

4. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the proposed rule?*

Connectivity of the GYE grizzly bear population is an ongoing issue and one that will persist into the foreseeable future. The current levels of genetic diversity do not indicate a problem at this time and ongoing monitoring will allow detection of any emerging issues. The proposal to increase linkages with adjacent areas is a meaningful conservation solution and, thus, I have no concerns about the proposed management protocols to facilitate connectivity with other grizzly bear populations. The consideration of translocation of bears is a viable option should connectivity and gene flow not be adequately established. At this time, I concur that connectivity as it exists now has not been detrimental to the GYE grizzly bears. The proposed facilitation of linkages is meaningful, logical, and based on the best available scientific data.

Scientific Peer Review for Delisting of Greater Yellowstone Ecosystem Grizzly Bears

5. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently detailed?*

The approach taken to manage discretionary mortality, including hunting, is based on the best available scientific information. I am satisfied that the discretionary mortality management plan is adequate and sufficiently detailed such that it should pose no significant threat to the GYE grizzly bear population. Actions that allow relisting are a significant inducement to ensure that no future threat emerges from discretionary mortality. In summary, I am satisfied that the proposed approach is scientifically sound, conservative, and is precautionary in approach.

6. *Are the conclusions relating to the effects of changes in food resources on the GYE grizzly bears scientifically based and logical?*

Grizzly bears are omnivores and their diet across their range is hugely variable. This pattern of a highly diverse diet in grizzly bears in the GYE is also well supported. The monitoring of the 4 main high-energy foods is a meaningful approach but given the generalist nature of grizzly bears, the evidence suggests that changes in the abundance and availability of these four foods do not pose a significant threat to the GYE grizzly bears. The conclusions about the effects of changes in food resources are scientifically sound and based on the best available science. The use of adaptive management approaches, habitat management, and close monitoring of the GYE grizzly bear population is adequate to minimize any risk to the population from changes in food resources. The conclusion pertaining to the effects of changes in food resources in the GYE is based on the best available science, is logically addressed, and is scientifically sound.

7. *Is our explanation of density dependent effects versus whitebark pine decline driven effects scientifically sound?*

Demonstration of carrying capacity in any wildlife population remains a challenge. On balance, the evidence in the GYE grizzly bears is that the decline in the population rate of increase is associated with carrying capacity. This finding was supported by van Manen et al. (2016) that "Cub survival and reproductive transition were negatively associated with an index of grizzly bear density, indicating greater declines where bear densities were higher." Nonetheless, the documentation of density dependence in the GYE grizzly bear population remains inconclusive although it is unlikely that any additional research or monitoring could provide a conclusive answer. From the perspective of conservation of the GYE grizzly bears, I do not deem the existence of density dependence a critical component of the delisting process. Density dependence is useful for understanding the observed changes in the population but the existing analyses and data cannot fully preclude other mechanisms. Lastly, van Manen et al. (2016) could not find a link between the observed demographic patterns and whitebark pine but this does not in and of itself result in acceptance of density dependence although I concur that it is a plausible explanation that is consistent with the data. Further to this point, van Manen et al. (2016, page 309) noted that a decrease in carrying capacity was a possible alternative explanation for the demographic changes. In overview, the logic and science behind the explanation of density dependent effects versus whitebark pine decline favors the density dependent explanation although firm conclusions on this are impossible at this time with the available data.

It would be useful to assess the importance of whitebark pine as a dietary item to know if there are significant differences in the vital rates of bears that feed on whitebark pine compared to those that do not. I recommend an assessment of the survival rates and reproductive rates of grizzly bears that feed on whitebark pine compared to those that do not. Potential differences in vital rates relative to

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diet are viewed as a research recommendation and do not impinge on the delisting of the DPS and the proposed rule.

Draft 2016 Conservation Strategy:

1. *Are the habitat management mechanisms scientifically sound and sufficiently detailed in the draft 2016 Conservation Strategy?*

The habitat Conservation Strategy as outlined is a stellar merger of the best available science and the best known approaches for wildlife management. The specific mechanisms to maintain habitat to conditions during which the GYE grizzly bear population was increasing (i.e., 1998) is a meaningful and scientifically sound approach. The care and attention to the full breadth of possible threats is meaningful, science-based, and appropriate. Integration of adaptive management is a valid approach to ensure that habitat-based threats to the GYE grizzly bear population do not emerge and are mitigated, if they develop over time.

2. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently clear and detailed so that managers can use this document to successfully implement mortality management in the future?*

The management of discretionary mortality, including hunting, is scientifically sound and well considered. Managers will be well served by the outlined criteria and the approach is adequately described to allow replication across the range of the GYE grizzly bear population. The rationale presented for the management of discretionary mortality is based on the best available science and the close monitoring in association with adaptive management should result in a well-managed harvest that poses little or no threat to the GYE grizzly bear population for the foreseeable future. Safeguards for emergency relisting based on the criteria noted provide additional confidence in the approach taken.

3. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the draft 2016 Conservation Strategy?*

The Conservation Strategy's approach to facilitate connectivity of the GYE grizzly bear population with other areas is adequately addressed. Given the use of adaptive management, the approach taken may provide additional insights and guidelines to improve the likelihood of successful genetic linkages with adjacent populations. Identification of potential linkage areas and management of these habitats will be an important component of the management of the GYE grizzly bear population. Guidelines for road construction, however, are vague and would benefit from additional clarification. Use of crossing structures, signage, and other aspects that might reduce effective immigration would benefit from additional clarity. Use of words such as "should", "encouraged", "consideration", and "can recommend" are inadequate to bring about consistent and effective management responses. In the foreseeable future, however, the steps being taken to facilitate connectivity are meaningful and science-based. Application of adaptive management is a positive aspect for future improvements in management protocols and connectivity.

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4. *If implemented, is the Conservation Strategy adequate to reasonably ensure the long-term viability of the Greater Yellowstone grizzly bear population?*

The Conservation Strategy, if fully implemented as outlined, is a scientifically sound and logical approach to ensure the long-term viability of the GYE grizzly bear population. The care, thought, and attention to full range of threats to the GYE grizzly bears is evident and I have no hesitation in supporting the full breadth of the Conservation Strategy. This is a very robust and well-considered approach that meets the highest standards of science-based management and conservation.

Draft Recovery Plan Supplement: Revised Demographic Criteria:

1. *Please provide your scientific evaluation (e.g., the pros and cons) of the revised recovery goal's objective to manage and maintain the population around the 2002–2014 model-average Chao2 estimate of 674 (95% CI 600–757).*

With respect to the use of Chao2 population estimate for the DMA, Keating et al. (2002) noted “Over all CV values, RMSEs for NChao2 were lower than for NC2 (Fig. 2), but Nchao2 became increasingly and negatively biased as CV increased (Fig. 1). Because individual animals clearly are not equally sightable, use of such an estimator would introduce a chronic, negative bias into estimates of population size and sustainable mortality.” Therefore, the use of the Chao2 estimator would tend towards a conservative estimate of population size and a lower level of sustainable harvest. Because of this bias over all of the CV (coefficient of variation) values, the approach being proposed is precautionary and viewed as a “pro”.

The only “con” associated with the use of the Chao2 estimator is that is negatively biased and thus, should the goal of management be to increase the harvest levels, use of other, less biased estimators may indicate a higher level of sustainable mortality.

I deem the use of the Chao2 estimator as appropriate and precautionary in approach. The statement that new estimators may be used, should an improved method become available, is a meaningful and scientifically sound approach. Continuation of the Chao2 estimator should a new estimator be used is deemed appropriate for long-term monitoring and trend detection.

2. *Please provide your scientific evaluation (e.g., the pros and cons) of monitoring the demographic criteria exclusively within the demographic monitoring area.*

The proposed approach to monitor the demographic criteria within the specified “demographic monitoring area” (DMA) is a scientifically meaningful approach. Populations at their fringes may differ in vital rates due to a variety of biotic and abiotic factors. The major advantages of the DMA approach is consistency over time, focus on the core reproductive nucleus of the GYE grizzly bear population, and the approach is scientifically sound. Monitoring the GYE as a whole would likely result in greater stochasticity in the data and would not necessarily provide any information that would significantly alter management. The core objective of the Conservation Strategy is the maintenance of the primary conservation area as the reproductive core of the GYE grizzly bear population. The DMA is a significantly larger area and, thus, liable to provide more information on the status of the GYE population as a whole.

The “cons” associated with having a smaller DMA than the whole area of suitable grizzly bear habitat is that the status of the broader area will be less well understood. From a management perspective, knowing the status of the core DMA is a scientifically sound approach. Monitoring of segments of a population is a common strategy and there is no logical reason to not apply it for GYE grizzly bears.

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Literature cited

- Bunnell FL, Tait DEN (1980) Bears in models and in reality - implications to management. *Int Conf Bear Biol Manage* 4:15-23.
- Delibes M, Gaona P, Ferreras P (2001) Effects of an attractive sink leading into maladaptive habitat selection. *Am Nat* 158:277-285.
- Harvell CD, Mitchell CE, Ward JR, Altizer S, Dobson AP, Ostfeld RS, Samuel MD (2002) Climate warming and disease risks for terrestrial and marine biota. *Science* 296:2158-2162.
- Keating KA, Schwartz CC, Haroldson MA, Moody D (2002) Estimating numbers of females with cubs-of-the-year in the Yellowstone grizzlybear population. *Ursus* 13:161-174.
- van Manen FT, Haroldson MA, Bjornlie DD, Ebinger MR, Thompson DJ, Costello CM, White GC (2016) Density dependence, whitebark pine, and vital rates of grizzly bears. *The Journal of Wildlife Management* 80:300-313.

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13175 – Greater Yellowstone Ecosystem (GYE): No issues of concern.

13176 - Taxonomy and Species Description: No issues of concern.

13176 - Behavior and Life History: No issues of concern.

13177 – Nutritional Ecology

13178 – “Nearly one third of grizzly bear home ranges in the GYE do not contain any whitebark pine... Bears in these areas consume other food even during years of good whitebark pine production.”

It would be useful to the assessment of whitebark pine as a dietary item to know if there are differences in the vital rates of bears that feed on whitebark pine compared to those that do not. I recommend an assessment of the survival rates and reproductive rates of grizzly bears that feed on whitebark pine compared to those that do not. Potential differences in vital rates relative to diet are viewed as a research recommendation and does not impinge on the designation of the DPS and the Proposed Rule.

13178 – Habitat Management

13178 - “*The primary factor affecting grizzly bears at both the individual and population level is excessive human-caused mortality.*”

Issue: Unsubstantiated statement. This may be correct but every population is affected by different factors.

Recommendation: Provide references and justification for the statement or conduct appropriate analyses to support it.

13179 – Population Ecology – Background

In overview, the section is solid, fact-based, and presents the issues clearly. At times, oversimplification has introduced ambiguity but this was viewed as a minor issue.

13180 – “*Among grizzly bears, indicators of density-dependent population regulation can include: (1) Decreased yearling and cub survival due to increases in intraspecific killing*”.

Issue: Intraspecific killing of cubs and yearling can occur for many reasons. Such killing can be, but is not necessarily, restricted to density-dependence. Intraspecific predation may be related to nutritional stress or as part of a reproductive strategy by adult males.

Recommendation: Clarify that intraspecific predation cannot be used to assume density-dependent population regulation.

13180 – “*Indicators that density-independent effects are influencing population growth can include... increases in age of first reproduction due to limited food resources*”

Issue: The text is presenting a simplified perspective on indicators of density dependence and density independence. There is solid scientific evidence to link an increase in age of first reproduction to density dependence (e.g., food resources are limited due to scramble

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competition or interference competition) but equally to density independent factors (e.g., weather, climate).

Recommendation: Clarify that indicators as noted are insufficient to assess population status relative to carrying capacity. The data needed to demonstrate density dependence is beyond most wildlife monitoring programs and particularly so for large carnivores.

13180 – Figure 1.

Issue: Portrayal of carrying capacity as a constant is a dated perspective. Most ecologists view carrying capacity as dynamic over time.

Recommendation: Clarify that Figure 1 is a simplification.

13181 – Recovery Planning and Implementation

13182 – Habitat-Based Recovery Criteria

As noted, there are no published methods to calculate minimum habitat values for a healthy and recovered population. Nonetheless, the approach taken, using the 1990s as a baseline (specifically 1998) for conditions is logical and well considered. The monitoring items noted (e.g., food resources, grizzly mortality) are useful for informing management actions and assessing population information.

13183 – Suitable Habitat

The process of defining suitable habitat is logical and well founded in the best available science.

13186 – Population and Demographic Recovery Criteria

The assumptions and methods used are appropriate and scientifically sound.

13187 – Demographic Recovery Criterion 1

The recover criterion is well described and rigorously applied. The criterion has been met since 2003 and, thus, supports removing the GYE population of grizzly bears from the Federal List of Endangered and Threatened Wildlife.

13188 – Demographic Recovery Criterion 2

The recover criterion is well described and rigorously applied. The criterion has been met since 2003 and, thus, supports removing the GYE population of grizzly bears from the Federal List of Endangered and Threatened Wildlife.

13188 – Demographic Recovery Criterion 3

The recover criterion is well described and rigorously applied. The criterion has been met since 2003 and, thus, supports removing the GYE population of grizzly bears from the Federal List of Endangered and Threatened Wildlife.

13188 – The Conservation Strategy

The scientific basis of the Conservation Strategy is sound. The proposal to allow updating of the 2016 strategy based upon the best available science, subject to public comment, is meaningful and logical.

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13190 – Distinct Vertebrate Population Segment Policy Overview

The two identified factors for DPS are logical and appropriate for conservation and management.

13190 – Past Practice and History of Using DPSs

The case studies are meaningful and useful context for the GYE DPS. Use of a DPS for the GYE grizzly bears is consistent with its application to other taxa.

13191 – Distinct Vertebrate Population Segment Analysis

13191 – Analysis of Discreteness in Relation to Remainder of Taxon

No issues of concern. The scientific basis for discreteness of the GYE DPS is logical and well supported from the information provided and published research.

13192 – Analysis of Significance of Population Segment to Taxon

No issues or concerns. Consideration under points 1, 2, and 4 are logical.

13192 – Unusual or Unique Ecological Setting

The Proposed Rule concludes that the GYE grizzly bear population does not meet the standard for significance based on its persistence in an ecological setting unusual or unique for the taxon. Whitebark pine, which has a large extension in range into British Columbia and Alberta, and the findings of reduced reliance on this species, makes the conclusion of not meeting the standards for significance a logical and science-based finding. Reliance on meat is dynamic in all grizzly bear populations and, in and of itself, is not unusual at any end of the spectrum. The collective assemblage of species in the GYE, however, likely differs from all other parts of the species range so there is an element of unique ecological setting. The contribution of bison to the diet of grizzlies is likely unique when considered in the context of the whole diet of grizzly bears in the GYE. This aspect, however, is not addressed and the decision focuses on the above 2 components (i.e., whitebark pine and meat). In summary, the section's conclusions are well considered.

13192 – Significant Gap in the Range of the Taxon

I concur with the findings of this section. Loss of the GYE DPS would be a significant loss and create a significant gap in the range of grizzly bears.

13193 – Marked Genetic Differences

The lack of clear criteria to identify “marked” genetic differences makes this criterion challenging for any species. The conclusion reached for the GYE DPS is logical.

13193 – Summary of Distinct Population Segment Analysis

I concur that the GYE grizzly bears are discrete and significant and therefore meets the definition of a DPS.

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13193 – Summary of Factors Affecting the Species

13193 - A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

I have no issues with this section. The nine considerations cover the primary concerns relative to grizzly bear habitat or range. It is clear that significant improvements to GYE grizzly bear habitats have been established. The changes are meaningful and improve the status of grizzly bears in the GYE for the foreseeable future.

13194 – Habitat Management Inside the Primary Conservation Area

No reduction of secure habitat below the 1998 level is a meaningful and significant conservation standard.

13194 – Motorized Access Management

Increases in secure habitat are meaningful in the three subunits. Such changes are indicative of measures needed to reduce detrimental effects of human activity. The stated goal of the draft 2016 Conservation Strategy to ensure no net decrease in habitat in the PCA is a significant and important objective. Conservation of secure habitat is a critical aspect of GYE grizzly bear conservation.

13195 – Developed Sites

No issues or concerns. Food storage and attractant control are critical for conservation efforts and measures are in place to reduce concerns

13195 – Livestock Allotments

It is evident that livestock are, and remain, a threat to grizzly bears in GYE with 14% of the human-caused mortalities associated with management removal actions related to livestock. The key issue is the mortality source related to livestock relative to overall mortality and the mortality level remaining at a low enough level to ensure a stable or increasing population. Efforts to minimize livestock-related issues are noted. The key conservation action is the one associated with livestock being kept at or below 1998 levels. Control of livestock to such the 1998 level is a significant and critical aspect of the conservation of the GYE grizzly bears into the foreseeable future. The objective of reducing sheep grazing is an important step in improving the conditions for grizzly bears and should be active pursued as noted.

The conclusion that livestock allotments inside the PCA will not constitute a threat to the GYE grizzly bear DPS now, or in the future, is an optimistic statement that is challenging to assess. Changing environmental conditions may alter the conflict dynamics and, thus, the issue of livestock management remains an important aspect for grizzly bear conservation. In summary, I concur that for the foreseeable future, livestock issues are being controlled and do not pose a significant threat to the GYE grizzly bear DPS.

13196 – Mineral and Energy Development

That up to 4% of all suitable habitat in the PCA is available for surface occupancy is an issue of concern for the conservation of the GYE DPS. The effects of such developments can extend well beyond the footprint itself. While mitigation measures may reduce the

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possible effects of development, the effects of increased human presence, increased potential for conflict, and habitat loss remain an ongoing concern to the population but mitigation and careful management can offset the risk. Within the context of the whole GYE grizzly bear DPS, the effects of mineral and energy development may be mitigated sufficiently to reduce the threat sufficiently to ensure no population decline from associated development.

This aspect will require intense scrutiny, monitoring, and mitigation.

13196 – Recreation

Recreation in the GYE has increased markedly in the recent past. While recreation activities may be similar whether this DPS is listed or not, the trend for increased recreation remains a manageable concern. Presumably a limit on visitation will be needed at some point and should be considered. I concur that recreation is not a threat to the GYE grizzly bear DPS at this time and that management actions as outlined are sufficient to deal with any concerns.

13196 - Snowmobiling

I am not convinced with the finding that snowmobiling does not constitute a threat to the GYE grizzly bear DPS although I concur that the evidence is limited to suggest a major negative effect at the population level. Of particular concern is the risk of den abandonment by females with young cubs: such events could reduce reproductive success.

One mediation approach not considered in the report is the potential to minimize the overlap between snowmobiles and grizzly bear den habitat. Such actions could work to mitigate the potentially negative effects of snowmobiling on the GYE grizzly bears. Monitoring is an inadequate response and an active management program to mitigate impacts is needed. The consideration of the possible effects on reproductively active female grizzly bears was deemed to be below the standard of the precautionary principle (i.e., “Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” Principle 15, Rio Declaration on Environment and Development).

13197 – Vegetation Management: No issues or concerns.

13197- Climate change

I concur with the statement “most grizzly bear biologists in the United States and Canada do not expect habitat changes predicted under climate change scenarios to directly threatened grizzly bears (Servheen and Cross 2010, p.4).” Nonetheless, it is the indirect effects of climate change that are of concern. Despite this, grizzly bears are a species that will likely adapt to changing environmental conditions given the wide range of ecological conditions that they have evolved to exploit (e.g., from Mexico to Arctic Ocean, Gobi Desert to boreal forests in Scandinavia). Climate change is unlikely to present a significant threat to the GYE grizzly bears.

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13197 – Habitat Fragmentation

I concur with the statement that fragmentation is not a major conservation concern for the GYE grizzly bear DPS at this time.

13198 – Habitat Management Outside the Primary Conservation Area

On the whole, the management outside the PCA could cause conservation concerns for the GYE grizzly bear DPS. While mechanisms are in place with various Federal and State agencies to ensure that management plans comply with the ecological needs of grizzly bears, there is cause for careful monitoring of habitat outside the PCA although the core grizzly bear population in the PCA is less likely to be affected. Restriction and reduction of livestock allotments should be a management priority outside the PCA. The presence of 500 development sites on the 5 National Forests is a concern: control, reduction, and outreach will be essential to ensure the long-term conservation of grizzly bears in the GYE. That current Forest Plan direction allows up to 19% of suitable habitat outside the PCA within the DPS boundaries to have surface occupancy and 11% allows timber harvest is an ongoing conservation concern that will require careful management. Mitigation and reclamation of disturbed habitats will be an important conservation measure: oil and gas developments are potentially more problematic than timber harvest. As noted, the level of annual disturbance is much lower than the total and with care for reclamation, the long-term threat is minimal. With 9% of the area of the suitable habitat outside the PCA held privately, education and mitigation will be important to reduce the likelihood of attractive sinks (*sensu* Delibes et al. 2001) developing.

In overview, habitat management procedures in place outside the PCA are significant and likely to achieve the conservation goals for grizzly bears in the GYE for the foreseeable future. Designation of grizzly bears as a species of conservation concern (or equivalent) on Forest Service lands is an important component of ongoing management to ensure that grizzlies remain a management priority. Reduction of conflicts on private lands will be a critical aspect of conservation and population trajectory. While the Proposed Rule considers human population growth to not be a threat on private lands, this conclusion is reliant on careful and intensive management actions undertaken at several levels.

13200 – Summary of Factor A

The summary provides a solid consideration of the threat to the GYE grizzly bear DPS and the efforts to mitigate them. The key is retention of conditions that are at or below those found in 1998. Focus on PCA is a meaningful and well-considered strategy for achieving conservation of the DPS for the foreseeable future. Clearly, the future of the GYE grizzly bears DPS is conservation and management dependent. I am satisfied that the appropriate plans, protocols, and mitigation is in place as it pertains to the 9 factors noted. From a first principles perspective, the GYE grizzly bear DPS is limited in the number of bears that can live in the area: human-related morality will continue but minimizing the losses will reduce population-level impacts. Further, the core of the reproductive potential of the population is in secure habitat and thus provides a safeguard for the foreseeable future.

I concur with the conclusions of the Summary of Factor A.

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131200 – B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Four bands of mortality are set based on the population size in the DMA. The mortality rates vary from no discretionary mortality up to 22% for independent males should the population be >747 individuals. The basis for these mortality rates is unclear and the rates are at the higher end of the range of what I would consider sustainable. Given that these rates can be modified should reproductive rates decline, I believe the risk of overutilization is very low. These are annual rates intended to reduce the population back to the state target size in some areas. Given that the mortality rates can be adjusted, the consequences of the removal can be dynamic and respond to changing conditions over time. Given that the stated goal is to maintain the population around the long-term average population size of 674, harvest is a means of controlling the population size. In theory, however, the harvest levels at the upper end would be unlikely if the population is thought to be close to, or at, carrying capacity with 674 bears.

Implementation of a hunt for grizzly bears as a management tool requires careful and conservative harvest levels. Tables 2 and 3 outline the management framework and total mortalities.

My major concerns on the allowable number of mortalities are:

- 1) the basis for the allowable number of total mortalities,
- 2) the high level of allowable and the potential to overshoot (i.e., excessive mortality) the target population size with hunting.

Bear populations, noted for their slow reproductive potential (e.g., Bunnell and Tait 1980), are relatively easy to deplete by non-sustainable harvest but slow to recover. If the allowable mortality rates are viewed as adaptive management guidelines, the management scenario and the planned responses are adequate for population management. In and of itself, harvest of grizzly bears in DPS is not a threat to their persistence but it will increase the risk of over-harvest and the need for recovery actions or reduced mortality.

The harvest management protocol for assigning allowable harvest mortality is reasonable and scientifically sound. The only caveat is that there is little or no consideration of annual environmental considerations in setting of discretionary hunting levels. Consideration of environmental conditions such as drought, fire, or berry crop failure may refine and temper harvest levels. As ecological conditions change with climate change, developing and formalizing protocols for a more ecological harvesting strategy may be less risky.

The possible response by the Service to implement an emergency relisting of the GYE grizzly population is a significant management response that works to ensure mortality limits are not exceeded and that the target population size is maintained.

The proposal for the IGBST to conduct a demographic review every 5 to 10 years was deemed inadequate. The generation length for grizzly bears is likely close to 10 years and a frequency of review closer to 5 years would be more consistent with precautionary management. The various conditions set for changes in laws or rules, population size, total independent female mortality, and occupancy of bear management units are all meaningful

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triggers for initiation of a status review but a review of demographics more frequently would diminish the likelihood of the population entering a depleted state.

13204 – Summary of Factor B

The regulatory commitments to minimize the threats posed by commercial and recreational hunting is significant and precautionary. Responses are rigorous and reflect a very high level of monitoring with appropriate responses that can act in a timely fashion. The statement “In addition, the Service may initiate a status review with possible emergency relisting...” is vague. Specifically, the four identified conditions should be sufficient to warrant a status review although an emergency listing would remain only a possible outcome. The four conditions noted and the thresholds noted are significant indicators of major changes in the DPS. Having a firm threshold for a review would be preferable to a “may initiate” position. The lack of commitment on this point diminishes the conclusion that the Federal regulatory commitments result in commercial and recreational hunting that do not constitute a substantial threat to the GYE grizzly bear DPS. Nonetheless, the risk was deemed minimal.

Again, the demographic review period upper limit of 10 years was deemed too long. A review every 5 years would be precautionary.

The overall approach meets the highest standards for wildlife management. I concur that the commercial and recreational hunting will not constitute a substantial threat to the GYE grizzly bear DPS but it warrants the close and careful monitoring as outlined. Clear conditions to trigger a status review would be preferable.

13204 – Disease or Predation

13205 - Disease

In overview, I agree with the conclusion that disease is unlikely to be a significant threat to the GYE grizzly bear DPS. The only caveat is that both diseases and parasites are likely to change with climate change (Harvell et al. 2002). Monitoring for new or emerging diseases should be a priority for ongoing monitoring.

13205 – Natural Predation

I concur with the findings of this section.

13205 – Human-Caused Mortality

The statement “If anything, authorized hunting through designating the grizzly bear as a game animal may reduce the amount of illegal poaching.” The scientific basis for this supposition is unclear. I can find no supporting information. It is equally likely, with the information presented, that the level of illegal poaching could remain the same or increase. The amount of illegal poaching is an unknown that needs to be monitored.

I concur with the remaining findings of this section.

13208 –Summary of Factor C

The definition of a recovered population as being able to “sustain the existing level of known and estimated unknown, unreported human-caused mortality that exists within the ecosystem,” is a meaningful approach. Further, that “the 1993 Recovery Plan recognized

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that eliminating all human-caused mortality was not possible or necessary” is a scientific and management aspect central to the delisting process. The evidence is clear and well-founded that the existing levels of mortality are balanced by existing levels of recruitment. Fundamental to the recovery is the maintenance of the various vital rates close to those of the growth phase of the DPS and sufficient to offset all sources of mortality. Science-based management, monitoring, and education efforts to date, and projected for the future, are essential for delisting.

I concur with conclusions of this section and find no failure of scientific thought.

13208 – D. The Inadequacy of Existing Regulatory Mechanisms: No issues or concerns.

13209 – U.S. Forest Service: No issues.

13210 – National Park Service: No issues.

13210 – Tribal Lands: No issues.

13210 – State Regulatory Mechanisms: No issues.

13211 – Summary of Factor D

No issues or concerns. I concur that sufficient safeguards, proposed or in place, and regulatory mechanisms, proposed or in place, are adequate to protect the GYE grizzly bear DPS, if adequately imposed.

13211 – E. Other Natural or Manmade Factors Affecting Its Continued Existence

13211 – Genetic Health

I have no concerns about the genetic health of the DPS and the effective population size is sufficiently large enough to assure minimal risks of detrimental effects due to genetic issues. Translocation of bears into GYE every 10 years would further minimize genetic risk and is a meaningful management action for consideration in the future. I concur that there is no immediate need for translocation of grizzly bears. Facilitation of movement from adjacent grizzly bear populations is a useful conservation action and should be supported as a management objective.

I have assumed the statement “This approach ensures that long-term genetic diversity does warrant a continued threatened listing for the GY DPS.” [13212, 2nd column, 23 lines up] is a typo and should read “does not warrant”.

13212 – Changes in Food Resources

No issues or concerns. Grizzly bears have a highly variable diet across their range (over 260 species in the GYE as noted in the Proposed Rule) and changes in the abundance of a few items are unlikely to be a major concern. The only exception in the GYE would be whitebark pine loss or reduction as a dietary component. Loss of whitebark pine as a dietary item could affect grizzly bear mortality and reproduction but such an issue would be identified during the demographic reviews and changes to mortality schedules (Tables 1, 2, and 3) could be modified to reflect these changes. The increase in the GYE grizzly bear DPS in 2002 to 2011 despite low whitebark pine availability suggests that the DPS will not be threatened by changes in this one dietary component. Similarly, cutthroat trout

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as a food source does not appear to be critical to the persistence of the grizzly bear DPS for the foreseeable future.

Collectively, the body of research on grizzly bear diet in the GYE DPS is significant, rigorous, and appropriate to address the diverse concerns that arise from changes in the diet of the DPS. The review provided in this section is sufficient to allay concerns about threats to the GYE grizzly bear DPS.

I concur that changes in food resources for the GYE grizzly bear DPS do not present a threat to the bears.

13216 – Climate change

I concur with the overall conclusion that climate change does not present a significant threat to the GYE grizzly bear DPS. This potential threat, however, warrants monitoring (as proposed) to assess the possible effects of climate change on vital rates over time.

13217 – Public Support and Human Attitudes

I concur with the conclusions of this section: public support and attitude do not constitute a threat to the GYE grizzly bear DPS.

13219 – Summary of Factor E

I concur with the findings of this section and find no errors of logic or scientific interpretation.

13219 – Cumulative Effects of Factors A Through E: No issues.

13219 – Summary of Factors Affecting the Greater Yellowstone Ecosystem Grizzly Bear Population

I concur with the conclusions of this section. Threats exist for any species but effective management (as proposed for the GYE grizzly bear DPS) greatly minimize the threats and allow effective and time responses should the threats significant alter vital rates.

13220 – Proposed Determination

I concur with the conclusion that the GYE grizzly bear DPS is a biologically recovered population. The scientific evidence supporting this conclusion is rigorous.

13221 – Significant Portion of Range Analysis

13221 – Background: No issues.

13222 – SPR Analysis for the GYE Grizzly Bear DPS

I concur with the logic of the section. Removing the GYE grizzly bears DPS from the List of Endangered and Threatened Species is a logically proposed consequence.

13223 – Effects of the Rule: No issues.

13223 – Post-Delisting Monitoring: No issues.

13223 - Monitoring

No issues. The proposed monitoring is rigorous and appropriate to the stated purpose.

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13224 – Triggers for a Biology and Monitoring Review by the IBGST

The triggers for a biology and monitoring review are significant, meaningful, and comprehensive. The approach taken is rigorous and follows a precautionary approach. I support the triggers and outline as proposed.

13225 – Triggers for a Service Status Review

The four stated triggers for a Service status review are significant, meaningful, and appropriate.

The stated example “For example, if independent female mortality limits were exceeded in 3 of 4 years, the Service would conduct a status review.” is unclear and requires further clarification as it appears inconsistent with points 1-4. What example is this statement supporting or supposedly clarifying?

No additional issues noted.

13225 – Required Determinations

13225 – Clarity of the Rule: No issues.

13225 – National Environmental Policy Act: No issues.

13225 – Government-to-Government Relationships With Tribes: No issues.

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DOCUMENT 2: Draft 2016 Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Ecosystem – Final Draft

The Conservation Strategy provides a vision of how the grizzly bears in the GYE will be managed for their long-term conservation if delisted.

Chapter 1 Introduction and Background

In overview, the approach is to use standard wildlife management techniques to monitor the population, maintain a core-protected area, and manage grizzly bears as a game animal (i.e., allow a regulated hunt). Of the whole Conservation Strategy, it is the management of grizzly bears as a game animal that is likely to be the most controversial aspect. The issue of harvest as a game animal, however, is not a scientific issue but rather one that reflects the philosophy of the individual. Harvest management with a science-based approach can allow for harvest of grizzly bears and retain the core conservation values in the non-harvested areas. The potential, however, exists for excessive harvest, which could put the core conservation value of the GYE grizzly bears at risk but the key is to ensure adequate oversight, monitoring, and timely management action should changes to the Conservation Strategy be required.

The use of a Primary Conservation Area (PCA) is consistent with population conservation strategies and is deemed a meaningful and scientifically sound approach warranted by the shift from recovery to management. The approach results in 2 management scenarios where the PCA is protected and the areas outside the PCA allow management actions including a regulated hunt. Given that the core of the GYE grizzly bear population will remain protected, the strategy is a logical approach to dealing with a population recovered in this specific area and in particular, a population that is likely approaching carrying capacity when additional management action and public information is needed to address the likelihood of increased dispersal and range expansion of grizzly bears into areas where the potential for human-bear conflicts is likely high. That the GYE grizzly bear population cannot increase in perpetuity is a biological reality and, thus, transition to management from recovery efforts is a logical and necessary step.

The use of 18 bear management units and 40 subunits is a logical approach and allows greater refinement of monitoring and management activities.

I concur that, as stated (page 24), it is impossible to specify the precise mixture of the diverse habitats and area required to support a grizzly bear population. Therefore, the approach taken to use a benchmark condition when the population was growing (i.e., 1998) is logical and scientifically sound. The use of both population metrics and habitat maintenance is a solid approach to the long-term conservation of the GYE grizzly bears. Use of adaptive management is appropriate.

Issues pertaining to food, cover, denning, and secure habitat were deemed relevant and appropriate considerations for management of the GYE grizzly bear population. Control of motorized access is a key factor in the Conservation Strategy and should be rigorously pursued.

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Some sources used in the Final Draft would benefit from updated information. Use of Boyce et al. (2001b) and Schwartz et al. (2002) on page 28, reflect analyses that are over 15 years old. Updated information and citations would increase rigor.

The management improvements related to habitat were deemed significant and meaningful changes that would aid in the conservation of GYE grizzly bears. The focus on land management practices, scientific information to support management and recovery, problem bear guidelines, access, highway changes, closed areas, and development have allowed a very high level of management. Given that an adaptive management approach is proposed, the recent history of management bodes very well for the future of the GYE grizzly bears.

Reduction of human-caused mortality is significant and essential for maintenance of the recovered status of the GYE grizzly bears. Reduction of human-caused mortality is mainly an issue when it is uncontrolled. Therefore, a regulated hunt would not be counter to the aim of the limiting human-caused mortality although it is clear that careful, precautionary, and conservative harvest levels are necessary. Advances in this area will be required. For example, it was noted that “some counties and communities have improved their landfills and garbage collection” (page 31). It is unfortunate that improvements in waste management have not been expanded as a priority across the entire GYE.

Provisions to end baiting across the GYE for the purposes of bear hunting would reduce the potential for human-bear conflicts. While Montana does not allow baiting, use of baits in Wyoming and Idaho, even though it would be outside the PCA, may be a risk to the long-term conservation and management of the GYE grizzly bears. I recommend that baiting for bears be discontinued throughout the GYE. It is unlikely to be possible to bait and not have grizzly bears associate humans with food. Further, baiting may create attractive sinks for bears that are in the PCA. The risks associated with baiting outweigh any possible benefits (e.g., possible hunter selectivity, reduced wounding) and a full review of bear baiting is warranted. Use of adaptive management and additional research on bear baiting is warranted.

No other issues or concerns.

Chapter 2 Population Standards and Monitoring

This chapter identifies seven population standards and monitoring items that pertain to maintenance of a healthy (i.e., recovered) grizzly bear population in the GYE. The increase in the DMA was deemed a significant improvement over the 1993 Recovery Plan. Each of the items is well considered, scientifically rational, and reflects the best available scientific approaches. In essence, the standards are designed to ensure recruitment, mortality within sustainable limits, spatial distribution, and abundance near the goal set to provide for genetic health.

The specifics of each of the targets are set based on logical values but are subjective reflecting that no clearly definable level is possible for biological systems. The core goal, however, is to maintain the population abundance and the standards and monitoring items are designed to achieve this goal with a high level of robustness. Grizzly bears in the GYE

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will remain a conservation dependent species for the foreseeable future and the management responses are a key to success.

Explicitly including state plans in the Conservation Strategy assists with long-term coordination and management effects. Given the importance of national forest and national park plans, the close working relationship of the YGCC will be critical for maintaining a recovered population.

Issues pertaining to the 3 Demographic Recovery Criterion are addressed under the Proposed Rule Section.

With respect to the use of Chao2 population estimate for the DMA, Keating et al. (2002) noted “*Over all CV values, RMSEs for NChao2 were lower than for NC2 (Fig. 2), but Nchao2 became increasingly and negatively biased as CV increased (Fig. 1). Because individual animals clearly are not equally sightable, use of such an estimator would introduce a chronic, negative bias into estimates of population size and sustainable mortality.*” Therefore, the use of the Chao2 estimator would tend towards a conservative estimate of population size and a lower level of sustainable harvest. Because of this bias over all of the CV (coefficient of variation) values, the approach being proposed, and allowing for a change in approach should an improved method become available, was deemed appropriate and scientifically sound.

The 10 points used to manage mortality are robust and scientifically sound.

For the criteria of probable mortalities, reliance on past male and female deaths in the GYE was deemed an issue requiring further consideration and monitoring. As the population composition may change over time (e.g., fewer males with a regulated hunt), the sex ratio of lone bears may change. Therefore, I recommend shifting from a 59:41 male:female sex assignment for probable adult mortalities to either be a dynamic ratio or preferentially, a more conservative 50:50 sex ratio. The most conservative approach would be to assume any probable mortality was an adult female and thus, the onus on sex verification would be critical to sustain a higher level of allowable harvest. Sex ratio assignment for cubs-of-the-year was not deemed a significant issue.

Demonstration of carrying capacity in any wildlife population remains a challenge. On balance, the evidence in the GYE grizzly bears is that the decline in the population rate of increase is associated with carrying capacity was supported by van Manen et al. (2016) that “*Cub survival and reproductive transition were negatively associated with an index of grizzly bear density, indicating greater declines where bear densities were higher.*” Nonetheless, the documentation of density dependence in the GYE grizzly bear population remains uncertain. From the perspective of conservation of the GYE grizzly bears, the existence of density dependence was not deemed a critical component of the delisting process. Density dependence is useful for understanding the observed changes in the population but the existing analyses and data cannot fully preclude other mechanisms. Lastly, van Manen et al. (2016) could not find a link between the observed demographic patterns and whitebark pine but this does not in and of itself result in acceptance of density dependence although I concur that it is a plausible explanation. Further to this point, van Manen et al. (2016, page 309) noted that a decrease in carrying capacity was a possible alternative explanation for the demographic changes.

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The target of maintaining 25 adult females collared was deemed a sufficient sample size for monitoring.

I concur that genetic issues do not pose as substantial risk to the GYE grizzly bear population at this time. The goal increasing connectivity with other grizzly bears is a positive step for the long-term genetic health of GYE grizzly bears.

This section meets the goal of presenting the best available science.

I see no other omissions or errors in logic in this chapter.

Chapter 3 Habitat Standards and Monitoring

The overall goal is to maintain habitat at the levels identified within the Primary Conservation Area. The habitat standards are to be revised based on the best available science and this was deemed a significant and meaningful goal.

The maintenance of secure habitat at the 1998 levels in each Bear Management Unit is critical to the long-term persistence of the GYE grizzly bears. Definition of “secure habitat” is a key parameter that may need modification over time but such a change is allowed under the management protocols.

Monitoring of the four high-calories foods was deemed relevant for understanding changes observed into the future and for ongoing monitoring. Regular reviews of the diet of the GYE grizzly bears as a whole, however, would also provide interesting additional insights of possible dietary shifts beyond these 4 foods. Clearer description of terms such as “detectable declines” and “are related to biologically significant changes in demographic parameters” would be beneficial for clarity and repeatability. A change may be detectable yet have no biological ramifications. Conversely, a major decline might not be statistically significant yet from a precautionary perspective, might warrant management action. Similarly, clarification of “biologically significant” would be useful. For example, a decline in litter size may be biologically significant yet have no effect on population growth rate if offset by higher survival.

The use of a flexible management strategy to promote acceptance and tolerance for grizzly bears as they expand into suitable habitat outside the PCA was deemed a reasonable approach. Expansion in the range of grizzly bears after a long period of absence is a major adjustment for people in the area and to ensure acceptance over the longer term, an adaptive approach is critical.

Issues pertaining to secure habitats are robust and meaningful. Measures to ensure no net loss are appropriate and sensible.

Existing oil and gas or other mineral leases remain an ongoing possible source of habitat loss. I view this as a chronic threat but one that is likely manageable with mitigation measures. The limits placed on habitat loss are critical to ensure the population does not slip below the recovered level.

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Controlling livestock to levels that do not exceed 1998 levels inside the PCA is appropriate and meaningful. Phasing out sheep allotments is a positive step for the future and should reduce human-bear conflicts. Reducing sheep grazing should be a long-term goal for the GYE in areas with high conflict or in areas with high value habitat.

Management of developed sites is a critical conservation strategy. Exceptions for administrative and maintenance needs should be minimized (or stated more clearly).

The four monitored areas (i.e., access, foods, hunters, and habitat connectivity) are important and meaningful for conservation. In association with the monitoring of four high-calorie foods, there would be merit to monitoring diet in the population overall. Grizzly bears are generalist omnivores and monitoring overall diet would allow insights should changes in the population be observed. The protocols for monitoring are not detailed in the Conservation Strategy but the overview suggests the methods will be adequate for monitoring.

I deemed monitoring habitat connectivity as a high priority. Even small losses in connectivity can accumulate over time and result in negative consequences for the GYE grizzly bears. Effective mitigation will be a key aspect of ensuring the long-term persistence of the grizzly bears in GYE. Some of the wording is unnecessarily vague or weak (e.g., “Highway planner are encouraged to place warning signs at points of high mortality risk...” page 86). Such weak wording does not provide the directives needed. This section on page 86 would benefit from more rigorous actions.

No other issues or concerns were noted.

Chapter 4 Management and Monitoring of Grizzly Bear-Human Conflicts

The overall goal is to reduce human-bear conflicts and to develop plans for management of nuisance bears. The definitions and protocols are meaningful and appropriate. I find the details sufficient for consistent application across the GYE.

Monitoring the fate of relocated grizzly bears should be a priority for ongoing research. Tracking the success of relocated animals should be assessed to determine its efficacy (i.e., genetic contribution to relocation sites, homing of bears).

Chapter 5 Information and Education

Public information and responsiveness to public concerns are critical to long-term success. The approach outlined is meaningful and appropriate.

The section is mute on use of more modern media (e.g., social media). It may be advantageous to integrate education with apps appropriate for remote use. Use of citizen science approaches may also be advantageous.

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Chapter 6 Implementation and Evaluation

The key to the Biology and Monitoring review is the ability for the YGCC to assess the success of the Conservation Strategy objectives and if they are not, and cannot be met, to then petition for relisting. The mechanism identified is a simple majority. Given the clear goals of the Conservation Strategy, the assessment of attaining the stated goals should be achievable. The composition of the YGCC provides the breadth across the management agencies and stakeholders necessary to act for the success of the Conservation Strategy or to recommend relisting. The alternatives to petition for relisting provide additional safeguards. The potential for emergency relisting provides a meaningful additional safeguard.

The four stated triggers for a Biology and Monitoring Review are significant and appropriate. The stated purposes of the Review are clearly articulated.

The protocols outlined are appropriate and I have no concerns on this chapter.

Chapter 7 Existing Authorities

Memorandum of Understanding Detailing Agency Agreement to Implement this Conservation Strategy

No issues identified.

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DOCUMENT 3: Grizzly Bear Recovery Plan – Draft Supplement: Draft Revised Demographic Recovery Criteria for the Yellowstone Ecosystem *Draft Approved* 2.19.16

In overview, the Draft Supplement (DS) outlines changes to three demographic recovery criteria for the GYE.

The Demographic Recovery Criterion 1 focuses on the method applied to determine grizzly bear abundance, with the target of maintenance of at least 500 grizzly bears and at least 48 females in the DMA. The Criterion change is to allow flexibility in the specific method applied to obtain the population estimate. This objective is deemed both reasonable and meaningful for the conservation and management of grizzly bears in the GYE. The proposal to remove the single prescribed population estimator (i.e., Chao2) is deemed reasonable, science-based, and is viewed as a positive step in management. Reliance on a single population estimator may or may not be the best option and while the Chao2 method is both appropriate and conservation-based, allowing for improved methods to be applied is a logical step forward. Development of population estimation methods is an active field and it is deemed sensible and scientifically sound to allow for modification in estimation methods over time. There is, however, a need to calibrate any new estimation method with the previous approaches to ensure long-term comparability of data.

Setting a goal of at least 500 grizzly bears and at least 48 females with cubs in the DMA is significant and meaningful, especially when combined with Demographic Recovery Criterion 2. Focusing on the DMA is a logical and meaningful approach that ensures that the core of the GYE grizzly bears is maintained over the foreseeable future.

Demographic Recovery Criterion 2 is focused on the spatial distribution of reproductive females and the potential for recruitment to be spread across the DMA. The goal is conservation oriented and a meaningful objective. Having 16 of 18 bear management units occupied by females with young (with some time caveats) was deemed appropriate and logical.

Demographic Recovery Criterion 3 is focused on the goal to maintain the population of grizzly bears in the DMA at the size observed in 2002-14 based on the Chao2 modeled average. The annual mortality limits for independent females, independent males, and dependent young are intended to reduce the likelihood of a population decline below 612 (i.e., the lower bound of the 90% confidence interval). If the abundance estimate drops below 612, a Biology and Monitoring Review will be undertaken to review management responses. The implementation of a trigger for no discretionary mortality is a meaningful management and conservation measure.

Sustainable mortality rates are dynamic and vary over time. For large mammals such as grizzly bears, they are unlikely to show high variation over the short-term (i.e., several years) but may vary for both biotic and abiotic reasons. Annual variation, however, is to be expected and thus working across multiple years and averaging is a meaningful and logical approach. Over longer-term periods (i.e., decades or more), we may expect mortality rates to vary in response to both intrinsic factors and extrinsic factors. The downward adjustment of the sustainable mortality rates is reasonable and reflects the best available science. Maintaining the population close to the size where density-dependent population

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regulation was noted is meaningful from a conservation perspective given the genetic benefits of a larger population and the reduction of possible impacts from stochastic events. Confining the population size goal and the mortality limits to the DMA is a logical approach.

All methods applied to wildlife management and conservation have an inherent level of risk. The approach taken to modify the three criteria is sensitive to the risk, conservation-oriented, and reflects the best available scientific knowledge.

Appendix A outlines the implementation schedule and the costs associated with key monitoring actions. The outline is significant and meets the key information and monitoring needs. The resources allocated are meaningful but cannot be assessed with the information provided.

Note: Figure 3 is mislabeled as Figure 1 (page 12).

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Reviewer 2
May 2016

Proposed Rule:

1. *Does the proposed rule provide adequate review and analysis of the factors relating to the persistence of the grizzly bear population in the Greater Yellowstone (demographics, habitat, disease and predation, and genetics)?*

The Proposed Rule does provide adequate review and analysis of the factors relating to the persistence of the grizzly bear population in the Greater Yellowstone Ecosystem (GYE). Some comments are as follows:

I agree that available information supports that disease possess little threat to grizzly bears and this is sufficiently addressed; however, statements throughout the Proposed Rule make it clear that human-caused mortality has the greatest population level impact on grizzly bears in the GYE. Several statements are also made regarding increased numbers of people living and recreating in the GYE (some examples on pages 13178, 13185 and 13206). The fact that the GYE population is increasing or stable is used to justify that present actions to limit human-caused mortalities are effective. This is somewhat misleading because the rate of growth (or stabilization) is partly a function of the rate of human-related mortalities, and thus an increase in human-caused mortalities could be decreasing the rate of growth and limiting growth beyond the present population goal. One could question whether the stabilization of the population is a function of reaching biological carrying capacity or social carrying capacity? Given that human occupancy and recreation will likely continue to increase in the GYE (see page 13196), there should be additional review and consideration regarding how factors used to regulate human-caused mortality (e.g., public education, management removal policy or procedures, etc.) might be modified in response to changes in human activity in the GYE.

Given that human caused mortality is significant relative to the management of grizzly bears in the GYE, it would be of value to provide a brief review of the social aspects of managing large predators. There is considerable literature available on the subject.

On page 13205, there is a statement regarding changing attitudes of persons regarding poaching when predators are made a game species. "If anything, authorized hunting through designating the grizzly bear as a game animal may reduce the amount of illegal poaching." I've seen this statement previously, most recently in regard to harvesting wolves in the Upper Great Lakes Region, but have not seen literature that supports this? Can a citation be provided? If not, this is a strong statement to make without supporting documentation.

Detecting movements among different population segments in order to evaluate genetic exchange might be improved by incorporating relatively new sampling strategies. For example, establishing periodic sampling protocols for collection of environmental DNA (eDNA) among the different population segments or in intervening habitat might reveal new mitochondrial DNA haplotypes indicating grizzly bear movements. Collection and storage of grizzly bear scat is also relatively inexpensive and could be analyzed when funding is available. Additional review and discussion of these options is warranted.

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2. *Are our assumptions and definitions of suitable habitat logical and adequate?*

The assumptions and definitions of suitable habitat are logical, but I find some to be less than adequate in their description.

The definition presented for “suitable habitat” is “the area within the DPS boundaries capable of supporting grizzly bear reproduction and survival now and in the foreseeable future”. Of the 3 Criteria listed on page 13183, very little is addressed regarding Criteria 1 and 2. I suggest more detailed descriptions of what “biological” habitats grizzly bears focus on in the GYE during the different seasons and how these vary by sex-age classes (e.g., females with cubs and yearlings, sub-adult males, etc.). Home-range size information could also be included to better understand the extent of area required by grizzly bears.

3. *Are the details for habitat management adequate in the proposed rule?*

I find what is described throughout the Proposed Rule as “habitat management” is more about “managing human activity” to reduce grizzly bear mortality.

I suggest that more focus be given to “what makes up biological grizzly bear habitat in the GYE” other than just controlling human induced mortality (e.g., secure habitat).

On page 13182, “The habitat-based recovery criteria established objective, measurable values for levels of motorized access, secure habitat, developed sites, and livestock allotments (i.e., “the 1998 baseline”) for the GYE.” What is listed is not “habitat management” per se, but rather managing landscape change specific to human activities. This is all focused on limiting human induced mortality, but it does not address habitat needs of the different sex-age classes of grizzly bears. For example, what habitats (food resources and cover) are required for females with cubs? “Habitat” (not just secure habitat) play a critical role in all grizzly bear vital rates and it can also facilitate dispersal which links to genetic stability of the GYE population.

On page 13178 the following statement is made, “The GYE is part of the Middle Rockies ecoregion (Omernik 1987, pp. 120–121; Woods et al. 1999, entire; McGrath et al. 2002, entire; Chapman et al. 2004, entire) and provides the habitat heterogeneity necessary for adequate food, denning, and cover resources. Because there are limited opportunities to increase or control these habitat components, the objective for grizzly bear habitat management is to reduce or mitigate the risk of human-caused mortality.” There needs to be more detail about what makes up grizzly bear “biological” habitat before one can understand the limitations of managing for these resources. Are there really no plans to “control important habitat components” within the GYE? One question that comes to mind is, what role does fire play in the GYE and what are the plans for managing fires (both natural and human-induced). How does this influence grizzly bear biological habitat? Additionally, are there habitat management actions in place within the GYE directed at influencing abundance or distribution of ungulates? If so, wouldn’t these potentially influence abundance and distribution of their predators? What role did the introduction of wolves to the GYE play in habitat management?

4. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the proposed rule?*

I found this area to be lacking in detail about what factors potentially influence connectivity.

The citations describing grizzly bear genetics and movements are scientifically sound. Not everyone reviewing the Proposed Rule may be familiar with the distribution of the different grizzly

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bear population segments. A map of the segments would be useful for better understanding connectivity.

There is discussion about distances among the different population segments, but more information about the landscape (i.e., topography, man-made structures, etc.) and how these mediate movements would be useful. For example, the distance between the GYE and NCDE is 160 km but there has not been detection of movement. Distance alone likely is not enough to limit movements between these populations, but are there other factors that could be limiting?

5. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently detailed?*

Management of discretionary mortality, including hunting, is scientifically sound, but there should be some additional details.

Management of “discretionary mortality” is about managing numbers of bears in the different sex-age classes. Regarding the total population, the Chao 2 estimate of 674 (95% CI = 600–747) is presented throughout the Proposed Rule but there is no additional information to evaluate potential impacts of mortality to the different sex-age classes. Population and Demographic Recovery Criteria require maintaining a total population of 500 bears and at least 48 females with cubs, but there is nothing presented regarding the later or the trend in sex-age distribution over the same time period as the model-averaged Chao2 estimate (2002-2014). Without this information it is not possible to comprehend what, “7.6 % of independent females” represents (e.g., 10 bears, 5 bears, 2 bears?) and how it might impact the total population (Note: I made these comments before reviewing the example provided on page 13203, however; I still believe a long-term examination of how many individual bears would be available for discretionary mortality would be of value). A suggestion is a statement on page 13202 of how many years from 2002-2014 were there bears available for hunting harvest, and what was the annual range of bears available. These differences are significant, particularly in the context of simultaneously coordinating and controlling hunting harvest among several states and tribal governments. Furthermore, in open systems there is no such thing as a stable age distribution and natural (or regarding discretionary mortality, man-made) shifts in age distribution can be expected. Is there a contingency for how discretionary mortality might be adjusted in response to substantial shifts in sex-age distribution of the population? For example, drastic changes in environmental conditions (i.e., severe drought or another fire event such as 1988) would likely impact sex-age classes differently. Would there be a way to track population level changes in sex-age distribution and would it alter how discretionary mortality is distributed?

The definition of the “Chao2 estimator” in the Glossary is “a bias-corrected estimator of the total number of female grizzly bears with cubs-of-the year, derived from the frequency of single sightings or double sightings of unique females with cubs-of-the-year as identified based on a rule set by Knight et al. (1995)”. However, throughout the Proposed Rule the Chao2 estimator is referenced as producing an estimate of “overall grizzly bear abundance within the DMA”? This discrepancy should be resolved.

There is a great deal of emphasis placed on the ability of the Chao2 estimator to predict abundance of total population and sex-age cohorts. Although a number of citations are provided that address sightability issues for female bears with cubs of the year (i.e., Cherry et al. 2007, Keating et al. 2002), there is no “one” citation describing in its entirety the “Chao2 estimator”. There is reference to the Chao2 estimator in the Interagency Grizzly Bear Study Team reports, but these are not easy documents to obtain. If there is readily available published literature describing the Chao2 estimator in its entirety, than it should be referenced. These statistical models are often complex,

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and from what I can interpret from the Proposed Rule the Chao2 estimator likely contains some derivations specific to the GYE population? Has the Chao2 population estimator been subjected to peer review? In general, there needs to be more transparency regarding the Chao2 estimator (i.e., What are the demographic inputs and how were they determined? What are the model assumptions? How were initial population size and the different sex-age distributions estimated? and How were natural mortalities estimated and incorporated? etc.). Furthermore, on page 13201, there are separate Discretionary Mortality Criteria if the Chao2 population estimate = 674. No population model is accurate to a single animal and this falsely implies that it is. There should be agreement to incorporate the estimate of 674 into one of the adjacent ranges.

6. *Are the conclusions relating to the effects of changes in food resources on the GYE grizzly bears scientifically based and logical?*

Over the past decade, this area has been extensively researched and published in peer-reviewed journals. The conclusions and scientific basis is sound with a few minor suggestions.

On page 13213, it should be recognized that a significant decrease in combined important food resources (e.g., such as whitebark pine seeds, fish and ungulates) could result in a decrease in biological carrying capacity of the GYB population.

The findings of Schwartz et al. (2014) that body fat in adult females showed a slight decline since 2006 is important because of the link between body fat and reproduction. Although this is recognized in the Proposed Rule, there should be additional attention to overall cub survival throughout this time period (assuming this data is available). Complex predator-prey relationships may take many years to become evident. More meat consumption by adult females with cubs in replace of whitebark pine seeds could be a sink if accessing these resources results in additional cub mortalities during confrontations with other predators or adult male grizzly bears.

An alternative hypothesis presented to answer Research Questions 5 & 6 (page 13213) as stated on page 13214 is that movements and home-range size of females decreased in response to increasing bear density because females with cubs were attempting to decrease encounters with other bears (particularly adult males). If true, this would decrease the food resources available to females with cubs but also would support the hypothesis that the population is approaching biological carrying capacity. If sufficient data is available to assess movements and home-range size of females with cubs it would be worth examining.

The statement on page 13214, “In response to the seventh question, while land managers have little influence on how calories are spread across the landscape we have much more influence on human-caused mortality risk” is misleading and focuses on the easier solution (e.g., control human induced mortality). Options to “spread more calories across the landscape” include among other things, increasing ungulate densities through improving habitat and controlling hunting harvest; improving fish stocks and habitat; controlling invasive species to protect native food resources desired by grizzly bears, etc. Additionally, existing actions to decrease bison abundance in Yellowstone National Park to control brucellosis also impacts habitat and existing food resources for grizzly bears.

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7. *Is our explanation of density dependent effects versus whitebark pine decline driven effects scientifically sound?*

The explanation of density dependent effects versus whitebark pine decline has been addressed in peer-reviewed literature and is scientifically sound. However, as noted above, it should be recognized that a significant decrease in combined important food resources (e.g., such as whitebark pine seeds, cutthroat trout and ungulates) could result in a decrease in biological carrying capacity of the GYE population.

Draft 2016 Conservation Strategy:

1. *Are the habitat management mechanisms scientifically sound and sufficiently detailed in the draft 2016 Conservation Strategy?*

The habitat management mechanisms are scientifically sound, but there is need for more detail.

What is the significance of “10 acres” in defining “secure habitat”?

Consideration should be given to analyzing the relationship between annual abundance and availability of the four food types with reproductive parameters (i.e., fecundity, recruitment and survival of young bears). Any declines in nutrition are likely to be observed first in females with young and in younger bears.

Monitoring “bear use of army cutworm moth sites” may not be a good measure of cutworm moth relative abundance because grizzly bears may return to areas where they’ve found abundant food sources in the past even though those resources are not present. This relationship should be explored and monitoring protocols adjusted if the relationship is not true.

“Land managers will ensure that habitat connectivity is addressed...” is vague. For consideration, can there be a commitment that land managers “include habitat connectivity” in planning any new road construction and “maintain or improve existing habitat connectivity” in any reconstruction projects?

Consideration should be given to limit snowmobile use after typical den emergence dates. Den emergence is a critical time for mothers with new cubs, and disturbance and stress of the mother at this time could result in lowered cub survival. When bears are out of dens, all motorized traffic should be limited.

Consideration should be given to eliminate vacant livestock allotments if chronic grizzly bear conflicts have occurred on these allotments in the past.

2. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently clear and detailed so that managers can use this document to successfully implement mortality management in the future?*

The management of discretionary mortality, including hunting, is scientifically sound and sufficiently clear and detailed so that managers can use this document to successfully implement mortality management in the future. However, Appendix P will not be added until the Plan is finalized. The complexities of simultaneously allocating harvest among three states and a tribal government are many. However, given that harvest will occur only outside the PCA any difficulties in managing hunting harvest should not immediately impact recovery of the GYE grizzly bear population.

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Assigning sex of orphaned cubs as probable deaths is described as follows, “cubs-of-the-year that are orphaned and counted as mortalities will be assigned sex based a 50:50 sex ratio at birth (Eberhardt et al. 1994). For each cub, a random number will be drawn between 1 and 100. If the number is 1 through 50, the sex will be assigned as male; if the number is 51 to 100, the sex will be assigned as female.” As cub sex ratio in a given year is unlikely to fluctuate >60:40 it is more logical to alternate assignment of sex with the more conservative approach assigning female first.

3. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the draft 2016 Conservation Strategy?*

This section is not adequately addressed.

Monitoring is limited to road projects; however, many other factors influence connectivity with other grizzly bear populations. Listing these factors is an important first step to assess if connectivity is adequately addressed. Additionally, are there references to support the successful use of crossing structures by grizzly bears?

Landscape features alone do not facilitate connectivity with other grizzly bear populations and the likelihood of potential immigration and emigration. Some of these factors are likely associated with human-induced mortality which are addressed in other sections of the plan, but these should also be discussed here. If connectivity is important, should bears be hunted outside of the GYE, as these bears are living in suboptimal habitat and most likely to disperse? As biological carrying capacity is reached in the different populations, dispersal by young males is likely to increase. Many factors play a role in connecting the different grizzly bear populations and it should be addressed in more detail.

What is the plan for monitoring movements? Given that this is a plan for the GYE, detecting movements and potential gene flow into, as opposed to out of, the population is most critical. How will this be achieved? If bears are hunted outside of the GYE, genetic samples could be easily obtained through mandatory registration.

4. *If implemented, is the Conservation Strategy adequate to reasonably ensure the long-term viability of the Greater Yellowstone grizzly bear population?*

Yes, if implemented the Conservation Strategy is adequate to reasonably ensure the long-term viability of the GYE grizzly bear population.

Draft Recovery Plan Supplement: Revised Demographic Criteria:

1. *Please provide your scientific evaluation (e.g., the pros and cons) of the revised recovery goal's objective to manage and maintain the population around the 2002–2014 model-average Chao2 estimate of 674 (95% CI 600–757).*

This appears to be the same goal that was listed in the Draft Plan? Regardless, the information provided within the Draft Plan indicate that the GYE population appears to be reaching biological carrying capacity and thus the goal proposed will assure that the population is maintained at this level for the foreseeable future. Furthermore, if the population has reached biological carrying capacity, abundance beyond the present level likely will not increase unless there is an increase in available resources or changes in vital rates (i.e., human-induced mortality).

The change (described in the supplement under Demographic Recovery Criterion 1) to eliminate the criterion's dependence on the Chao2 estimator if improved, peer-reviewed methods become

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available agrees with using the best available science. The Chao2 estimator is somewhat dated and there are likely improved statistical methods available. However, if it is the opinion of the scientists and statisticians involved that the Chao2 estimator is performing well and there are independent measures of relative abundance to verify that it is, then there likely isn't a significant advantage of switching to a newer estimator. All models of biological systems perform poorly with poor input data and those that have been through the peer-review process should perform well if provided with good inputs. It is my opinion that the input data for the GYE is excellent for informing biological models.

Within the Proposed Plan or the Supplement there is no mention of independent measures to verify model trends. Including independent sampling for this purpose would strengthen interpretation of any model employed.

2. *Please provide your scientific evaluation (e.g., the pros and cons) of monitoring the demographic criteria exclusively within the demographic monitoring area.*

It's logical and scientifically sound to monitor the demographic criteria within the area for which an estimate will be generated (e.g., DMA). This represents the best available data and assures that changes in vital rates will not be unnecessarily influenced by altered vital rates outside of the DMA. There are biologically sound reasons why vital rates (particularly mortality) may differ outside of the DMA. More resources (i.e., radio-telemetry) can be focused in a defined area improving precision of estimates of vital rates. Because the majority of lands within the DMA are in Federal ownership, access to monitor grizzly bears will not be denied. However, this could also be a disadvantage regarding rules limiting certain types of access on National Park lands.

One vital rate that could be misinterpreted by limiting monitoring to the DMA is mortality. Bears killed outside of the DMA could also spend time inside of the DMA if they have a home-range that overlaps the boundary. Misinterpreting mortalities could also impact sex-age ratios. Unforeseen, catastrophic events within the DMA (for example another fire on the scale of 1988) could displace grizzly bears forcing some to shift home-ranges to outside of DMA boundaries. This could result in decisions having to be made to sample areas outside of the DMA or extend DMA boundaries. An important reason to sample grizzly bears outside the DMA is to detect likely immigrants or emigrants which are important to document for potential genetic exchange among populations. Monitoring grizzly bears outside the DMA also provides valuable information about vital rates in the area where expansion is still occurring. There also will likely be considerable resources spent managing grizzly bear-human conflicts outside of the DMA and having additional information on grizzly bears in this area will be important for managing these conflicts. Lastly, the DMA does not make up what is considered the entire GYE population. Impacts to grizzly bear vital rates outside the DMA still influences the entire GYE population.

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Reviewer 3
May 2016

I have reviewed the proposed rule in the Federal Register, the new conservation strategy, and the supplement on revised demographic criteria. Overall, these documents represent a large amount of effort and demonstrate strong familiarity with the scientific literature on grizzly bear ecology and management. I agree with the assessment presented in the Proposed Rule and concur that the best-available science indicates that the species is secure and delisting is appropriate. I will respond to the specific questions as requested.

Proposed Rule:

1. *Does the proposed rule provide adequate review and analysis of the factors relating to the persistence of the grizzly bear population in the Greater Yellowstone (demographics, habitat, disease and predation, and genetics)?*

Generally I found the proposed rule to be remarkably comprehensive and conservative. Clearly the GYE grizzly bear population has far exceeded recovery criteria and the probability of long-term persistence is extremely close to one. That said, one can always argue that there remains considerable uncertainty about the status and future of the grizzly bear population (Artelle et al. 2013, 2014). Yet, all resource management decisions are made in the context of uncertainty and the Yellowstone grizzly bears are among the most-intensively study populations of large mammals in the world. Even in the face of climate change, grizzly bears are highly adaptable and can use a broad array of habitats and their omnivorous foraging ensures that they will find something to eat. I agree with the Proposed Rule's assessments on disease, predation, and genetics. I found it to be a very powerful observation that "we know levels of genetic diversity have not declined in the last century."

2. *Are our assumptions and definitions of suitable habitat logical and adequate?*

The definitions of suitable habitat are qualitative and weakly done. Indeed, this is one of the weakest components of the *Proposed Rule*. Quantitative methods for identifying habitats selected by grizzly bears are well developed, e.g., see Proctor et al. (2015). Estimating resource selection functions or similar models to characterize habitat selection and use is an important research need. There exists precedent where courts have accepted resource selection functions as rigorous definition of suitable habitat, and these methods certainly ought to be in the tool kit of the US Fish & Wildlife Service.

3. *Are the details for habitat management adequate in the proposed rule?*

I certainly agree that access management is probably one of the most-important management actions that can be used to enhance grizzly bear habitats. But there is little else in this section. Elsewhere domestic sheep management is mentioned, and probably belongs here. Likewise, competing land uses get little attention, e.g., livestock use, timber harvest, mining, but these have major consequences for grizzly bear habitat and are human influences that could be managed if there was sufficient will. Obviously there would be strong political opposition to infringing on any of these to benefit grizzly bear habitat. All of these topics are covered in the *Conservation Strategy*.

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4. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the proposed rule?*

Substantial advance on this topic appeared in a recent paper by Proctor et al. (2015). Yet, I do not see that anything in this paper that would change the *Proposed Rule*.

5. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently detailed?*

Yes, I think that this material is fine and I agree with the assessment. Despite the media attention to hunting, carefully managed hunting is not a threat to the long-term viability of this population and can be highly effective at reducing concerns by local ranchers and other members of the public.

6. *Are the conclusions relating to the effects of changes in food resources on the GYE grizzly bears scientifically based and logical?*

Yes, I agree and find the summary to be reasonably complete.

7. *Is our explanation of density dependent effects versus whitebark pine decline driven effects scientifically sound?*

Yes, I do not see any problems here. Clearly bear populations have continued to increase despite declines in whitebark pine and cutthroat trout. Those food resources are not available over major portions of the species range and my view is that these food resources were beneficial but not essential for grizzly bears.

Draft 2016 Conservation Strategy:

1. *Are the habitat management mechanisms scientifically sound and sufficiently detailed in the draft 2016 Conservation Strategy?*

The habitat management section fails to rigorously identify grizzly bear habitats and as a consequence some of the habitat recommendations are actually demographic recommendations and not necessarily related to habitat. See, for example, the first paragraph under Background on p. 55. The first sentences make reference to habitat preservation but then the discussion drifts off to causes of bear mortality. On page 57, the goal for habitat management is stated to reduce human-caused mortality—the connection with habitat is not defined. I believe that the *Conservation Strategy* would be improved with a rigorous quantitative assessment of grizzly bear habitats, which is currently lacking, although there exists extensive literature on the topic. The habitat management guidelines that are actually habitat management guidelines seem sensible and appropriate.

There is no scientific basis for the lower limit of 500 bears. We have no evidence that this is the number of bears required for genetic integrity, and the theory behind this estimate is almost entirely irrelevant, referencing an old reference by Franklin (1980). Incidentally, this reference is not included in the Literature Cited; I think that this is a typo and the appropriate source is Frankham (1980) although again this paper is not listed in the Literature Cited. The 500 bears guideline might be the right number, but it is not based on sound science. A critical assessment of the use of effective population size in conservation is found in Ewens (1990) and a reassessment of the old 50/500 rule was published by Frankham et al. (2014).

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My concerns about habitat effectiveness raised above regarding the Proposed Rule, are covered quite adequately in the *Conservation Strategy*.

2. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently clear and detailed so that managers can use this document to successfully implement mortality management in the future?*

Yes, I agree with the *Conservation Strategy*'s assessment that mortality management is key to successful grizzly bear management. And I concur with the proposed management strategy.

3. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the draft 2016 Conservation Strategy?*

On page 7, the document notes: "Land managers will ensure that habitat connectivity is addressed throughout the Yellowstone area as part of any new road construction or reconstruction and that food storage orders are in place." I can understand how roads can create barriers to movement as explained on page 85, thereby interfering with connectivity. But what does food storage orders have to do with habitat connectivity? I think that the author of this section was considering the road construction crews for which storage orders need to be in place. If this was the intent, it is poorly articulated and I believe that this is in the wrong place. On page 57, we are told that habitat connectivity will be monitored but how this will be done has not been explained. Really, the only connectivity discussion appears to relate to roads. As for habitat selection, some sophisticated methods have been developed for modelling grizzly bear connectivity, but none of this material is cited. For example, step-selection functions can be used to model habitat attributes that facilitate movement and connectivity (Thurfjell et al. 2014), but this is not reviewed. I believe that more discussion about how to achieve connectivity to the north and to the west of the GYE might receive more attention.

4. *If implemented, is the Conservation Strategy adequate to reasonably ensure the long-term viability of the Greater Yellowstone grizzly bear population?*

Yes, absolutely. There is no basis for concern about the long-term viability of the population except for the fact that we cannot anticipate the future. Political interference, climate change, and disease outbreaks cannot be predicted and might become issues in the future (Artelle et al. 2013, 2014). Only through adaptive management can we accommodate such vagaries about the future into sound management policy. Such uncertainties should not interfere with our ability to perform sound management practices based on the best available science today.

Draft Recovery Plan Supplement: Revised Demographic Criteria:

1. *Please provide your scientific evaluation (e.g., the pros and cons) of the revised recovery goal's objective to manage and maintain the population around the 2002–2014 model-average Chao2 estimate of 674 (95% CI 600–757).*

The target population size is largely arbitrary, yet reasonable, given existing information and the apparent leveling of population size. I attempted to find the details of model averaging as used with the Chao2 estimator, but could not find it. Model averaging is a method used when alternative models are evaluated using information-theoretic procedures. This is something that warrants careful attention because of problems that can exist with model averaging (Cade 2015). Or possibly

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the intent is to estimate abundance for each year between 2002 and 2014 and to average those estimates. If the latter, a few more words of clarification might be inserted and the term “model-averaged Chao2 estimate” should be avoided.

Likewise, again, the lower population target of 500 cannot be defended based on science. This estimate was based on a mutation rate for *Drosophila* abdominal bristle number and we know that mutation rates can vary by 2 orders of magnitude.

2. *Please provide your scientific evaluation (e.g., the pros and cons) of monitoring the demographic criteria exclusively within the demographic monitoring area.*

I think that the demographic monitoring area concept makes sense. Yes, covering a larger area could encompass the entire area occupied by bears, but I think that it is evident that bears on the margins of their distribution are at greater risk. And this risk does not necessarily jeopardize the population. Indeed, the higher mortality along the range boundary is what creates the range boundary. Persistence of the population will be better reflected by focusing on the demographic monitoring area as proposed. A much greater effort could go into monitoring, but it is not clear to me that this would improve conservation and expenditures for monitoring compete for limited funds needed for grizzly bear management (McDonald-Madden et al. 2010).

LITERATURE CITED

- Artelle, K. A., et al. 2013. Confronting uncertainty in wildlife management: Performance of grizzly bear management. PLoS ONE 8(11): e78041 (doi:10.1371/journal.pone.0078041).
- Artelle, K. A., J. D. Reynolds, P. C. Paquet, and C. T. Darimont. 2014. When science-based management isn't. Science 343:1311-1311.
- Cade, B. 2015. Model averaging and muddled multimodel inferences. Ecology 96:2370-2382.
- Ewens, W. J. 1990. The minimum viable population size as a genetic and a demographic concept. In Convergent Issues in Genetics and Demography, ed. J. Adams, D. A. Lam, A. I. Hermalin, P. E. Smouse, pp. 307-16. Oxford: Oxford Univ. Press.
- Frankham, R., C. J. Bradshaw, and B. W. Brook. 2014. Genetics in conservation management: revised recommendations for the 50/500 rules, Red List criteria and population viability analyses. Biological Conservation 170: 56-63
- McDonald-Madden, E., Baxter, P.W.J., Fuller, R.A., Martin, T.G., Game, E.T., Montambault, J. & Possingham, H.P. 2010. Monitoring does not always count. Trends in Ecology & Evolution 25: 547-550.
- Proctor, M. F., S. E. Nielsen, W. F. Kasworm, C. Servheen, T. G. Radandt, A. G. MacHutchon, and M. S. Boyce. 2015. Grizzly bear connectivity mapping in the Canada-US trans-border region. Journal of Wildlife Management 79:544-558.
- Thurfjell, H., S. Ciuti, and M. S. Boyce. 2014. Applications of step-selection functions in ecology and conservation. Movement Ecology 2:4, pp. 1–12 (doi:10.1186/2051-3933-2-4).

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Reviewer 4
May 2016

Proposed Rule:

1. *Does the proposed rule provide adequate review and analysis of the factors relating to the persistence of the grizzly bear population in the Greater Yellowstone (demographics, habitat, disease and predation, and genetics)?*

A key word in consideration of the Greater Yellowstone Ecosystem (GYE) Distinct Population Segment (DPS) delisting is persistence, meaning long-term viability in one or more areas. Most factors that influence bear population dynamics are adequately addressed in some detail in the proposed rule. The GYE population in and of itself is large enough to sustain losses in heterozygosity due to genetic drift, and it would be easy enough to supplement the population using translocation of a few individuals to maintain genetic diversity of this population. However, the uncertainty about the impacts of climate change on bear food sources, surrounding human land use patterns, and the synergistic effects of these multiple potential threats to grizzly bear persistence are unclear and difficult to predict. Without clear evidence of connectivity to other grizzly populations (e.g. NCDE) in the 6 recovery ecosystems, nor concrete implementation plans for creating redundant populations elsewhere through reintroductions (e.g. Bitterroots), the GYE population would remain more vulnerable to local extinction than if connectivity was well established to other populations.

2. *Are our assumptions and definitions of suitable habitat logical and adequate?*

Habitat designations appear adequate for GYE grizzly bears, a habitat generalist species, in most areas of the PCA, a sizeable portion of which are National Parks that already have management policies that favor grizzly occupancy. The GIS-based classification of habitats as suitable or unsuitable are largely habitat and conflict-based which is logical and typical of habitat suitability models of large carnivores. I would, however, strongly recommend development of a comprehensive assessment of the impacts of climate change on habitat suitability in the GYE. Climate change renders the future occupancy of protected areas such as parks into question.

3. *Are the details for habitat management adequate in the proposed rule?*

The habitat plan appears to be science-based and adequate for managing the species within the GYE. There is essentially a “no net loss” policy of maintaining or reducing 1998 levels of activities that conflict with grizzly occupancy. Approximately 90% of suitable habitat is already occupied, leaving little room for range expansion and population growth. Consideration of “edge” areas on the periphery of grizzly range that have livestock (particularly sheep) allotments could be problematic. Grizzly conflict with livestock interests is the top source of mortality. If these edge areas are leases on public land, then consideration should be given to removing these areas from grazing use in favor of species such as the grizzly where there are opportunities to expand population size and range and make it less vulnerable to local extinction. On federal lands, the phasing out of sheep grazing permits, measures to reduce grizzly attractants in developed areas, and reduction of road access are all positive steps towards grizzly recovery in these peripheral areas. Perpetuating activities (e.g. motorized access, livestock grazing) that may conflict with bear recolonization and long-term occupancy in these edge areas “unless improvements benefit bears” at 1998 baseline levels assures a high probability that bears indeed will not reoccupy these portions of

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their former range. An economic cost benefit analysis of the economic value of grazing leases versus dealing with depredations and perhaps a more intensive grizzly monitoring effort in this peripheral areas should be factored into such a decision.

4. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the proposed rule?*

Not in the rule per se. Other than to “manage for discretionary mortality” and having “attractant storage rules”, other components of Montana’s management plan to facilitate GYE connectivity to the NCDE population are unmentioned.

The delisting proposal only mentions GYE as a source for recolonizing the Bitterroot area, but there are no planned actions to facilitate this process (e.g. road over- or underpasses, land management between these areas). Idaho’s grizzly management plan clearly states that moving grizzlies into new areas (e.g. Bitterroot) is prohibited and intentions to connect GYE bear populations to these unoccupied areas is vague.

5. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently detailed?*

The plan to maintain the GYE grizzly population within the approximate current population estimate appears to be based on sound wildlife science using established and repeatedly tested analyses used to generate these population parameters. Specific numerical criteria are established as multi-agency management “failsafe” switches to minimize the likelihood of population decline through active management and accountability of and response to natural mortality. As a final contingency, USFWS has discretionary power to act unilaterally to propose relisting if deemed necessary. I do have concerns about lags in decision-making in response to population declines that drop numbers below 600.

6. *Are the conclusions relating to the effects of changes in food resources on the GYE grizzly bears scientifically based and logical?*

Several published studies have suggested dietary plasticity of the grizzly bear which was already well known to be a habitat generalist species. The plan outlines several monitoring actions that have been occurring and will continue to further refine our understanding of the relationship between grizzly bear population dynamics and key food sources (e.g. trout, whitebark pine, ungulate neonates). Currently, there appears to be an abundance of many of the more commonly used food sources to sustain grizzly numbers if one fails. What is unclear, however, is how a warming climate in this area, lower elk numbers in the GYE, the continued impacts of invasive species (e.g. rainbow trout) and disease (whitebark pine) will synergistically impact the very complex trophic web in this region and affect bear numbers in coming decades. Concurrent declines in the abundance of multiple food sources could force bears outside core protected areas and into increased conflict with humans on private and public lands, which in turn could lead to population declines below the desired threshold given that bears could be increasingly euthanized for human safety reasons.

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7. *Is our explanation of density dependent effects versus whitebark pine decline driven effects scientifically sound?*

Research on vital rates is suggestive of a density dependent effect leading to population saturation and slowed growth within the past decade. While whitebark pine availability will continue to be an important component of grizzly diet and influence population dynamics in certain areas, recent findings suggest it may not be as critically important a food source as once thought. Longer-term datasets generated by the proposed continued monitoring of whitebark pine nut availability should further clarify the strength of this relationship, and future management plans revised to reflect new findings that may reinforce the relative importance of this food.

Draft 2016 Conservation Strategy:

1. *Are the habitat management mechanisms scientifically sound and sufficiently detailed in the draft 2016 Conservation Strategy?*

Yes. A number of important habitat standards and monitoring activities of key resources (e.g. cutthroat trout) are in the plan. Management is divided at various spatial scales to facilitate delegation of management responsibilities, and data collection and interpretation. A no net loss policy of suitable grizzly habitat within the PCA underpins management of the species. In general, categories of habitat (e.g. “secure”) and application rules are easy to understand and follow.

2. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently clear and detailed so that managers can use this document to successfully implement mortality management in the future?*

Discretionary mortality rules are clearly explained and should be relatively easy to follow within the PCA, but differ on lands outside the PCA where state wildlife agency approaches to this issue somewhat vary depending on the severity of human-bear conflict. The management plans of Idaho, Montana, and Wyoming indicate a desire for the grizzly to be classified as a game species for the purposes of hunting. Montana’s plan also indicates a strong commitment to facilitate reconnection of the GYE and NCDE bear populations in the western portion of the state. Other than to comply with maintaining a minimum population size within the DMA, none of the states establish population targets and associated specific harvest criteria within their management plans. It is concerning that overharvest and a potential subsequent lag in management response could drive bear numbers below the desired minimum population size.

3. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the draft 2016 Conservation Strategy?*

Although Montana considered “limiting grizzly bear distribution to just the PCA”, it was “in FWP’s judgment” “logistically impossible and biologically undesirable”. Montana’s grizzly management plan clearly conveys a desire to have grizzlies repopulate western Montana and create connectivity between GYE and NCDE bear populations through identification of a linkage zone using GIS, management of non-conflict bears, and implementation of subsequent land management measures (e.g. working with DOT on road crossing locations) to catalyze this process. Management plans for Idaho and Wyoming strongly indicate that grizzlies will not be allowed to recolonize major portions of their respective states.

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The plan only mentions GYE as a source for recolonizing the Bitterroot area, but there are no planned actions to facilitate this process (e.g. road over- or underpasses, land management between these areas). Idaho's grizzly management plan clearly states that moving grizzlies into new areas (e.g. Bitterroot) is prohibited, and intentions to connect GYE bear populations to these unoccupied areas is vague.

4. *If implemented, is the Conservation Strategy adequate to reasonably ensure the long-term viability of the Greater Yellowstone grizzly bear population?*

The GYE population has recovered to a population of sufficient size to buffer against the most common deleterious vulnerabilities of small populations, including loss of genetic diversity, and typical stochastic events. The prospects of a warming climate and its unknown effects on common grizzly foods, increased development of lands around national parks, and reliance on occupation of a highly geologically unstable area should be strongly considered before a decision on delisting is made. Long-term viability would best be ensured by establishing and maintaining connectivity with grizzly populations in other portions of the species range, reintroducing the species to suitable vacant range within dispersal distance of existing populations, or facilitating recolonization into former areas; state management plans by Idaho and Wyoming appear to disfavor the latter two actions. Montana's stated commitment to reconnection of bear populations should be strongly supported and encouraged to maximize the species persistence in the lower 48 states in the US.

Draft Recovery Plan Supplement: Revised Demographic Criteria:

1. *Please provide your scientific evaluation (e.g., the pros and cons) of the revised recovery goal's objective to manage and maintain the population around the 2002–2014 model-average Chao2 estimate of 674 (95% CI 600–757).*

Advantages:

- a) It establishes a numerical population target and lower population size threshold that can be easily understood, upon which management decisions (e.g. harvest, non-harvest kills) can be based (e.g. sliding scale action), and which can account for variance within the data.
- b) It relies on a given subset of individuals of specific demographic classes (e.g. females w/ cubs) that can be repeatedly monitored over a given time interval using well-established field methods (e.g. radio-telemetry).
- c) Multi-model framework uses currently accepted and established approach ("best available science") for population estimation.

Disadvantages:

- a) Assumes sufficient federal and state funds will be available for the foreseeable future to monitor and detect population changes with enough resolution to trigger management fallback mechanisms (e.g. no discretionary mortality if population < 600).
- b) Monitored individuals may not be representative of the population at large as sample size decreases; very often related to funding and personnel resources.
- c) Monitored individuals may be more susceptible to capture and not be representative of the population (e.g. individuals more likely to exhibit neophilic behavior that could affect survival or other vital rate parameters).

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d) During potentially high mortality years (e.g. natural food shortages leading to increased human-bear conflicts and bear kills), management responses may be lagging and allow population to dip < 600 before corrective actions are taken, (e.g. “the IGBST will produce a Biology and Monitoring Review to inform the appropriate management response” pp. 40).

2. *Please provide your scientific evaluation (e.g., the pros and cons) of monitoring the demographic criteria exclusively within the demographic monitoring area.*

Advantages:

Provides a defined geographical area in which scientific inferences can be made which is important for a wide-ranging species that is difficult and expensive to monitor. In essence, a higher quality dataset can typically be obtained for a “core” area given a limited amount of resources to monitor the species, as opposed to one more disparate and less efficiently collected. With increased sample sizes within the core area, analyses can provide a more accurate portrayal of the entire population.

Disadvantages:

Monitoring is less intense outside the DMA, thus usually resulting in less data about individual bears that may behave differently than those within the DMA. For example, a disproportionate number of bears outside the DMA will likely be young males forced outside existing territories by older bears. Some adult bears outside the DMA may have greater tendencies for dispersal or less fear of humans (neophilia) than those within the DMA, and/or perhaps have differences in vital rates (survival, natality), thus inferences derived inside the DMA may not as applicable in these peripheral areas.

Scientific Peer Review for Delisting of Greater Yellowstone Ecosystem grizzly Bears

Reviewer 5
June 2016

In general I have found the documents reviewed to be quite thorough and complete. In totality, they provide scientifically credible support for delisting the Greater Yellowstone population of grizzly bears. I offer the following comments for consideration with the intent to further improve an already solid and thorough synthesis.

Proposed Rule:

1. *Does the proposed rule provide adequate review and analysis of the factors relating to the persistence of the grizzly bear population in the Greater Yellowstone (demographics, habitat, disease and predation, and genetics)?*

Yes, the proposed rule does an overall excellent job of reviewing and assessing the most important factors influencing the long-term persistence of grizzly bears in the Greater Yellowstone Ecosystem. I have also reviewed associated references and found interpretation of these supporting documents appropriate.

2. *Are our assumptions and definitions of suitable habitat logical and adequate?*

I consider the assumptions and definitions of suitable habitat logical and adequate; that is, the area within the DPS that can support reproduction and survival at present and in the future is direct and straightforward. They have supported this using site-specific peer reviewed literature.

3. *Are the details for habitat management adequate in the proposed rule?*

I recognize the importance of the potential adverse anthropogenic effects on grizzly bears and agree that ameliorating this through management of motorized access is likely the most effective management tool available. Too, I agree that implementation and enforcement of food storage (both waste and non-waste) can also be an effective management tool. Habitat management in the more traditional sense (i.e., direct alteration of habitat) would be largely ineffective and impractical.

Overall, I support the definition of what constitutes secure habitat and appreciate the no net loss of secure habitat as a consequence of human activities, especially that this acquisition occurs within the same area as secure habitat is lost. I do suggest that consideration be given to the juxtaposition of secure habitat, particularly if substantial changes to its distribution occur over time. Connectivity and corridors can be considered hierarchical, not only necessary to facilitate exchange among populations, but to facilitate movements at the individual and subpopulation level. Ensuring the spatial distribution of secure habitat within and across bear management units facilitates these finer scale movements is warranted.

I am uncertain about the apparent spatial mismatch between minimum secure habitat area size (10 acres) and lake size (lakes < 1 mi² are considered secure). I would consider most of any lake (open water) as unsuitable (unused) for grizzly bears, thus by definition cannot be secure. Though bear use of these lakes may in part be dependent on what occurs in areas of the lake unused, bears likely use little more than the edge for foraging. Instead of using the entire lake surface area (for those < 1 mi²) as secure habitat, I would consider creating a buffer along the respective shorelines that represents the actual area used by grizzly bears.

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4. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the proposed rule?*

Management to facilitate connectivity is largely reactionary, through management of impacts of road construction and improvement. In addition, use of genetic sampling will be used to assess and monitor potential gene flow among populations. Overall, this is not a habitat restoration issue but rather a more direct issue of modifying human behavior to facilitate connectivity. Reducing access to human foods (i.e., garbage) and regulation of hunting (presumably of bears) should aid bear movements and improve connectivity. Though genetic heterozygosity is not presently of concern, the proposed actions will maintain and perhaps further increase heterozygosity, which is commendable.

5. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently detailed?*

The management of discretionary mortality is sound and reasonable. Total (I presume annual but should be clarified) mortality rates by sex and age class are provided relative to three population ranges. Discretionary harvest is allocated based on these populations relative to the overall population goal. Planning annual meetings following the results of annual monitoring of populations provides a proactive strategy to ensure discretionary mortality levels are not exceeded.

6. *Are the conclusions relating to the effects of changes in food resources on the GYE grizzly bears scientifically based and logical?*

Yes, the conclusions are logical based on the evidence available. The document interprets the relationships between food and grizzly bear demography well and consistent with prevailing science. When warranted, they exercise appropriate caution in their interpretation of available data.

7. *Is our explanation of density dependent effects versus whitebark pine decline driven effects scientifically sound?*

Based on the documents provided and the references therein, I consider the explanation of this relationship scientifically credible. There can be alternative explanations for some elements, but the interpretations provided are plausible and quite reasonable. There is occasional confusion in the use of 'cause', suggesting causality and 'association'; however, this is minor overall and the intent of statements misusing this term was clear.

Draft 2016 Conservation Strategy:

1. *Are the habitat management mechanisms scientifically sound and sufficiently detailed in the draft 2016 Conservation Strategy?*

Yes, overall the strategies considered are sound and broadly encompass the needs of grizzly bears. The emphases on food abundance and effects of human activities are appropriate.

Food – I am supportive of the four indices of bear foods recommended for monitoring. I also suggest that anthropogenic subsidies in the form of ungulate carcass remains from hunter kills can be an important seasonal food source for grizzly bears. In areas of the PCA where ungulate harvest is allowed, monitoring numbers of ungulates killed, by species, along with mass estimates of typical carcass remains, may be warranted. If numbers of ungulates killed annually are high and

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used by grizzly bears, it could be an important seasonal food source, particularly during hyperphagia. This too could be a better metric than number of hunters. Consideration of NDVI data also may be of value, particularly during the pre-hyperphagic period, to understand bear distributions during this period and potential relationships to human-bear conflict. Finally, with the exception of whitebark pine, sampling across years seems variable relative to intensity and methodologies. I would encourage greater standardization across years to improve strength in inference from these indices.

Denning – I appreciate the consideration of denning habitat as critical for long-term persistence of this grizzly bear population. Further, I agree with their assessment that denning habitat for this population is not limited. Considering the current spatial distribution of known denning habitat, the physical attributes of these sites (e.g., higher elevations), and current levels of human development and recreational activities, I would not anticipate this habitat to become limited in the foreseeable future.

Secure habitat – In general, I support the definition of secure habitat and appreciate the no net loss of secure habitat as a consequence of human activities, especially that this acquisition occurs within the same area as secure habitat is lost. I do suggest that consideration be given to the juxtaposition of secure habitat, particularly if substantial changes to its distribution occur over time. Connectivity and corridors can be considered hierarchical, not only necessary to facilitate exchange among populations, but to facilitate movements at the individual and subpopulation level. Ensuring the spatial distribution of secure habitat within and across bear management units facilitates these finer scale movements is warranted.

I am uncertain about the apparent spatial mismatch between minimum secure habitat area size (10 acres) and lake size (lakes < 1 mi² are considered secure). I would consider most of any lake (open water) as unsuitable (unused) for grizzly bears, thus not secure. Though bear use of these lakes may in part be dependent on what occurs in areas of the lake unused, bears likely use little more than the edge for foraging. Instead of using the entire lake surface area (for those < 1 mi²) as secure habitat, I would consider creating a buffer along the respective shorelines that represents the actual area used by grizzly bears.

Other - The effects of honoring existing oil, gas, and other mineral leases is unclear. Further ‘striving’ to meet the application rules for changes to secure habitat is unclear. Additional clarification on the number of leases, the location and area of leases, and possible range of effects of these leases on grizzly bears is warranted.

I appreciate that the number and net acreage of livestock allotments will not exceed the 1998 baseline. However, there is potential concern that the number of livestock on these allotments is independent of the acreage and allotments. The document states ‘Appropriate analysis by the agency must be conducted to evaluate impacts on grizzly bears’. Evaluation of impacts does not directly translate to ensuring non-detrimental effects on grizzly bears. A brief description of appropriate analyses and the desired outcome relative to grizzly bears is warranted.

2. *Is the management of discretionary mortality, including hunting, scientifically sound and sufficiently clear and detailed so that managers can use this document to successfully implement mortality management in the future?*

The management of discretionary mortality is sound and reasonable. Total (I presume annual but should be clarified) mortality rates by sex and age class are provided relative to 3 population ranges. Discretionary harvest is allocated based on these populations relative to the overall

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population goal. Planning annual meetings to follow the results of annual monitoring of populations provides a proactive strategy to ensure discretionary mortality levels are not exceeded.

To gain additional insight I searched for Appendix P ‘Memorandum of Agreement between the States of Idaho, Montana, Idaho, and Wyoming Regarding the Management and Allocation of Discretionary Mortality of Grizzly Bears in the Greater Yellowstone Ecosystem’. which was not provided and apparently will be added to the overall documentation upon finalization of the conservation strategy.

3. *Is management to facilitate connectivity with other grizzly populations adequately addressed in the draft 2016 Conservation Strategy?*

The emphasis on roads as a primary driver of fragmentation and loss of connectivity is appropriate. However, many of the practices outlined (e.g., place warning signs at points of high mortality risk) appear narrow and limited relative to ensuring grizzly bear connectivity. Also, NEPA analyses of road construction projects in my opinion do not adequately address larger scale and long-term effects of road construction on species. I think an expansion of this area is appropriate and could describe actions taken to preclude cumulative adverse effects of fragmentation from road construction in the context of connectivity.

4. *If implemented, is the Conservation Strategy adequate to reasonably ensure the long-term viability of the Greater Yellowstone grizzly bear population?*

Overall, I believe this conservation strategy is adequate to facilitate the long-term viability of this grizzly bear population. The strategy outlines myriad techniques in a comprehensive framework to ensure this. In particular, I applaud the multiple elements of long-term monitoring (e.g., bear foods, mortality, conflict) and the adaptive nature of strategies to address and mitigate potential adverse effects of mechanisms influencing population change.

However, as with any plan or strategy, the full range of conditions influencing populations are rarely if ever realized. Though the adaptive strategies outlined in this document will address many of the management challenges, I encourage an adaptive process to the plan itself, through periodic assessment and revision as warranted, to ensure any unanticipated mechanisms affecting population-level outcomes are addressed. In addition, the comments offered above are suggestions to further improve an already sound conservation strategy.

Draft Recovery Plan Supplement: Revised Demographic Criteria:

1. *Please provide your scientific evaluation (e.g., the pros and cons) of the revised recovery goal's objective to manage and maintain the population around the 2002–2014 model-average Chao2 estimate of 674 (95% CI 600–757).*

Pros: Management of this bear population using the recent population abundance estimates would be apparent considering the current state of resource conditions and constraints (e.g., human) on this bear population. The population has apparently plateaued under these conditions. Based on previous analyses, the long-term viability of this population is secure.

Cons: To manage populations at pre-determined numeric values (or ranges of values) can be inherently problematic. Considering ecosystems are dynamic, both from natural and anthropogenic processes (e.g., climate change), long-term management of populations against target goals is frequently not tenable. However, having periodic reassessments of population goals in the context of dynamic processes could mitigate this concern.

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2. *Please provide your scientific evaluation (e.g., the pros and cons) of monitoring the demographic criteria exclusively within the demographic monitoring area.*

Pros: The 2-years data provided comparing the previous monitoring area to the demographic monitoring area (DMA) appears to be consistent across the sex and age classes provided. The greatest difference is with independent male mortalities; however, the relative magnitude of difference appeared consistent.

The established DMA was developed using sound criteria, namely estimated suitable habitat and potential mortality sinks.

Cons: As with any index, there is increased opportunity for error when the area of monitoring is reduced with greater potential for loss of accuracy and precision in monitoring. However, in this case I am supportive of using the DMA as currently proposed/defined, based on data reported through 2015, as basic trends seemed supportive. The greatest disparity in mortalities occurred in the independent male segment of the population, the least important from a demographic standpoint.

Though the DMA appears credible from all perspectives, it may be advantageous to have additional years' comparison of mortality events for this and the previous monitoring area to ensure mortalities from the DMA only are not misleading.