

Matthew A. Mumma

Ecology and Evolutionary Biology
Princeton University
224 Guyot Hall
Princeton, NJ 08544
mttmmm@hotmail.com
610-212-9590

Ecosystem Science and Management
University of Northern British Columbia
3333 University Way
Prince George, BC V2N 4Z9
matt.mumma@unbc.ca
250-960-5201

EDUCATION

Ph.D., Wildlife Science, University of Idaho, 2014

Advisor: Lisette Waits

Dissertation: Using molecular tools to evaluate predator-prey relationships in Newfoundland

Graduate Certificate: Statistics

B.S., Biology, Kutztown University of Pennsylvania, 2003

Thesis: The effect of seed size on germination and growth of chestnut oak and red oak

Minor: Professional Writing

RESEARCH EXPERIENCE

Postdoctoral Research Associate, 2019–Present

Princeton University, Ecology and Evolutionary Biology

Supervisor: Rob Pringle, PhD

Following a 15-year civil conflict in Mozambique, many large mammal populations in Gorongosa National Park were reduced by >90%. I am studying the influence of interspecific competition on the recovery of large herbivore species and examining prey selection for African wild dogs (*Lycaon pictus*) to better understand the health and success of this reintroduced population.

Postdoctoral Fellow, 2017–2019

Fulbright Postdoctoral Scholar in Northern Issues, 2017–2018

University of Northern British Columbia, Ecosystem Science and Management Program

Supervisor: Michael Gillingham, PhD

Mountain pine beetle (*Dendroctonus ponderosae*) outbreaks and salvage logging corresponded to regional declines in moose (*Alces alces*) abundance in British Columbia. I examined the impact of disturbance and climate on moose survival and space-use using location and monitoring data from 455 collared moose. I modeled survival under a competing risks framework to evaluate the influence of landscape change on risk to moose from gray wolves (*Canis lupus*), human hunters, and apparent starvation. I am also using integrated step-selection analyses to examine the importance of thermal refugia for moose by considering movement patterns across a gradient of disturbance and climatic conditions. Insights from this research will inform British Columbia forestry practices, particularly following large-scale disease outbreaks.

Postdoctoral Fellow, 2015–2017

University of Northern British Columbia, Ecosystem Science and Management Program

Supervisor: Michael Gillingham, PhD

Boreal woodland caribou (*Rangifer tarandus caribou*) are federally listed as threatened across their range, largely as a result of landscape changes associated with resource extraction. I examined the effects of fossil fuel development on caribou and caribou interactions with moose and gray wolves in northeast British Columbia using survey data and location data from 240 collared caribou, 63 collared moose, and 30 collared wolves. I used resource selection functions, beta regressions, and Cox proportional hazards models to evaluate support for the effects of disturbance on predation risk via the exacerbation of apparent competition with moose and the alteration of wolf distribution. My findings suggest that management efforts in northeast BC should focus on restoring existing and limiting future anthropogenic linear features to reduce wolf movement and distribution.

Postdoctoral Researcher, 2015

University of Alaska, Institute of Arctic Biology

Supervisor: Laura Prugh, PhD

I managed all aspects of a genetic laboratory, provided input on projects monitoring carnivore occupancy and abundance in Alaska, and instructed graduate students in spatial capture-recapture modeling. I facilitated all genetic testing of scat, hair, and tissue samples for multiple graduate student projects, hired and trained staff, and maintained laboratory equipment and supplies. I also contributed to manuscripts evaluating changes in mesocarnivore diets and densities as a function of gray wolf harvest.

Graduate Research Assistant, 2010–2014

University of Idaho, Department of Fish and Wildlife Sciences

Advisor: Lisette Waits, PhD

Woodland caribou abundance in Newfoundland decreased by >66% since 1998, with high calf predation implicated as the proximate cause of population declines. I used molecular techniques to evaluate predator diets from scats and estimated predator densities using noninvasive genetic sampling and spatial capture-recapture models. I identified predator species at caribou calf mortality locations using swabs containing residual predator saliva and then used these molecular identifications and field observations in a generalized boosted tree model to predict predator species for mortalities where a molecular identification was unavailable. I also evaluated the intrinsic traits of calves killed by black bears (*Ursus americanus*) and cursorial coyotes (*Canis latrans*) under a competing risks framework using Cox proportional hazards models.

Wildlife Technician, 2008–2009

University of Delaware, Department of Entomology and Wildlife Ecology

I led a field crew in the trapping and tracking of collared sika deer (*Cervus nippon*) in eastern Maryland. We used clover box traps and drop nets to capture juvenile males and radio-telemetry to monitor collared deer. I also coordinated research efforts with local outfitters, landowners, and state agency officials.

Staff Biologist, 2004–2008

Merck and Co., Inc., Department of Safety Assessment

I worked with a team of biologists to evaluate the toxicity and carcinogenicity of drug candidates. I performed necropsies on small and large mammals and processed slides for histological examination. I also served as the primary trainer for the microtomy laboratory.

PUBLICATIONS

Publications – Peer-Reviewed

Mumma, M. A., G. Bastille-Rousseau, S. Gullage, C. E. Soulliere, S. P. Mahoney, and L. P. Waits. **Accepted**. Intrinsic traits of woodland caribou (*Rangifer tarandus caribou*) calves depredated by black bears (*Ursus americanus*) and coyotes (*Canis latrans*). *Wildlife Biology*.

DeMars, C. A., R. Serrouya, **M. A. Mumma**, M. Gillingham, R. S. McNay, and S. Boutin. **Accepted**. Moose, caribou and fire: have we got it right yet? *Canadian Journal of Zoology*.

Johnson, C. J., **M. A. Mumma**, and M.-H. St-Laurent. 2019. Modelling multispecies predator-prey dynamics – Predicting the outcomes of conservation strategies for woodland caribou. *Ecosphere*:e02622.

Mumma, M. A., M. P. Gillingham, C. J. Johnson, K. L. Parker, and M. Watters. 2018. Risk for boreal caribou in human-modified landscapes: evidence for wolf spatial responses independent of apparent competition. *Biological Conservation* 228:215–223.

Mumma, M. A., M. P. Gillingham, C. J. Johnson, and K. L. Parker. 2018. Where beavers (*Castor canadensis*) build: testing the influence of habitat quality, predation risk, and anthropogenic disturbance on colony occurrence. *Canadian Journal of Zoology* 96:897–904.

Sivy, K. J., C. B. Pozzanghera, K. E. Colson, **M. A. Mumma**, and L. R. Prugh. 2018. Apex predators and the facilitation of resource partitioning among mesopredators. *Oikos* 127:607–621.

Rayl, N. D., G. Bastille-Rousseau, J. K. Organ, **M. A. Mumma**, S. P. Mahoney, C. E. Soulliere, K. P. Lewis, R. D. Otto, D. L. Murray, L. P. Waits, and T. K. Fuller. 2018. Spatiotemporal heterogeneity in prey abundance and vulnerability shapes the foraging decisions of an omnivore. *Journal of Animal Ecology* 87:874–887.

Bastille-Rousseau, G., J. A. Schaefer, M. J. L. Peers, E. H. Ellington, **M. A. Mumma**, N. D. Rayl, S. P. Mahoney, and D. L. Murray. 2018. Climate change can alter predator-prey dynamics and population viability of prey. *Oecologia* 186:141–150.

Mumma, M. A., M. P. Gillingham, C. J. Johnson, and K. L. Parker. 2017. Understanding predation risk and individual variation in risk avoidance by boreal caribou. *Ecology and Evolution* 7:10266–10277.

Mumma, M. A., J. D. Holbrook, N. D. Rayl, C. K. Zieminski, T. K. Fuller, J. F. Organ, S. P. Mahoney, and L. P. Waits. 2017. Examining spatial patterns of selection and use for an altered predator guild. *Oecologia* 185:725–735.

Mumma, M. A., J. R. Adams, C. Zieminski, T. K. Fuller, S. P. Mahoney, and L. P. Waits. 2016. A comparison of morphological and molecular diet analyses of predator scats. *Journal of Mammalogy* 97:112–120.

Bastille-Rousseau, G., N. D. Rayl, E. H. Ellington, J. A. Schaefer, M. J. L. Peers, **M. A. Mumma**, S. P. Mahoney, and D. L. Murray. 2016. Temporal variation in habitat use, co-occurrence, and risk among generalist predators and a shared prey. *Canadian Journal of Zoology* 94:191–198.

Bastille-Rousseau G., J. A. Schaefer, K. Lewis, **M. Mumma**, E. Ellington, N. Rayl, D. Pouliot, R. Latifovic, S. P. Mahoney, and D. L. Murray. 2016. Phase-dependent climate-predator interactions explain three decades of variation in neonatal caribou survival. *Journal of Animal Ecology* 85:445–456.

Mumma, M. A., C. Zieminski, T. K. Fuller, S. P. Mahoney, and L. P. Waits. 2015. Evaluating noninvasive genetic sampling methods to estimate the abundance of three large carnivores. *Molecular Ecology Resources* 15:1133–1144.

Mumma, M. A., C. A. Soulliere, S. P. Mahoney, and L. P. Waits. 2014. Enhanced understanding of predator-prey relationships using molecular methods to identify predator species, individual and sex. *Molecular Ecology Resources* 14:100–108.

Landguth, E. L., B. C. Fedy, S. J. Oyler-McCance, A. L. Garey, S. L. Emel, **M. Mumma**, H. H. Wagner, M. Fortin, and S. A. Cushman. 2012. Effects of sample size, number of markers, and allelic richness on the detection of spatial genetic pattern. *Molecular Ecology Resources* 12:276–284.

Publications – In Revision, In Review, Submitted, or Internal Review

Mumma, M. A., M. P. Gillingham, C. J. Johnson, and K. L. Parker. **In Revision**. Functional responses to anthropogenic linear features in a complex multi-prey-predator system. *Landscape Ecology*.

Mumma, M. A., M. P. Gillingham, M. Scheideman, S. Marshall, and C. Procter. **In Prep**. Explaining variation in moose (*Alces alces*) responses to forestry cutblocks. *Forest Ecology and Management*.

Publications – Non-Peer-Reviewed

Mumma, M. A. and M. P. Gillingham. 2019. Determining factors that affect survival of moose in central British Columbia. Technical Report for the Habitat Conservation Trust Foundation, Victoria, British Columbia.

Kuzyk, G., S. Marshall, C. Proctor, H. Schindler, H. Schwantje, M. Gillingham, D. Hodder, S. White, and **M. Mumma**. 2018. Determining factors affecting moose population change in British Columbia: testing the landscape change hypothesis, Progress Report, February 2012–April 2018. BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, British Columbia.

Gillingham, M. and **M. Mumma**. 2018. Determining factors that affect survival of moose in central BC, Progress Report, April 2018. Habitat Conservation Trust Foundation, Victoria, British Columbia.

Mumma, M. and M. Gillingham. 2017. Assessing caribou survival in relation to the distribution and abundance of moose and wolves, Final Report, April 2017. BC Oil and Gas Research and Innovation Society, Victoria, British Columbia. <http://www.bcogris.ca/boreal-caribou/projects/complete>.

Mumma, M. and M. Gillingham. 2016. Assessing caribou survival in relation to the distribution and abundance of moose and wolves, Progress Report, September 2016. BC Oil and Gas Research and Innovation Society, Victoria, British Columbia. <http://www.bcogris.ca/boreal-caribou/projects/complete>.

Mumma, M. and M. Gillingham. 2016. Assessing caribou survival in relation to the distribution and abundance of moose and wolves, Progress Report, March 2016. BC Oil and Gas Research and Innovation Society, Victoria, British Columbia. <http://www.bcogris.ca/boreal-caribou/projects/complete>.

Gillingham, M. and **M. Mumma**. 2015. Assessing caribou survival in relation to the distribution and abundance of moose and wolves, Progress Report, September 2015. BC Oil and Gas Research and Innovation Society, Victoria, British Columbia. <http://www.bcogris.ca/boreal-caribou/projects/complete>.

Mumma, M. and L. P. Waits. 2011 Using genetic techniques to inform wildlife management decisions in Newfoundland, Canada. Safari Club International Newsletter.

Mumma, M. 2001. Hawk Mountain: a great escape. The Keystone, Kutztown University student newspaper.

Mumma, M. 2001. The Buzz of the Towne. The Keystone, Kutztown University student newspaper.

PROFESSIONAL PRESENTATIONS

Invited Talks

Mumma, M., and M. Gillingham. 2018. Determining factors that affect survival of moose in central BC. Provincial Moose Meetings, Prince George, British Columbia.

Mumma, M. A. 2018. Risk for boreal caribou in human-modified landscapes: evidence for wolf spatial responses independent of apparent competition. Natural Resources & Environmental Studies Institute, Prince George, British Columbia.

Mumma, M. A., and M. P. Gillingham, K. L. Parker, C. J. Johnson, and M. Watters. 2016. Evaluating moose resource selection and the influence of disturbance on predation risk for caribou. British Columbia Research and Effectiveness Monitoring Board Researcher Workshop, Fort St. John, British Columbia.

Mumma, M.A., M. P. Gillingham, K. L. Parker, C. J. Johnson, and M. Watters. 2016. Preliminary moose resource selection models by sex and their implications for wolf distribution in the boreal. BC Oil and Gas Research and Innovation Society Webinar Series.

Mumma, M. A., 2015. Using molecular tools to evaluate predator-prey relationships in Newfoundland. Institute of Arctic Biology Life Science Seminar Series, University of Alaska, Fairbanks, Alaska.

Conference Presentations

Gillingham, M. P., and **M. Mumma**. 2019. Causes and drivers of moose mortality following mountain pine beetle outbreaks, salvage logging, and burns. British Columbia Chapter of The Wildlife Society, Kelowna, British Columbia.

Johnson, C., M.-H. St-Laurent, and **M. A. Mumma**. 2018. Modelling multispecies predator-prey dynamics – Predicting the outcomes of conservation strategies for boreal woodland caribou (poster). North American Caribou Workshop, Ottawa, Ontario.

DeMars, C., R. Serrouya, **M. Mumma**, M. Gillingham, and S. Boutin. 2018. Moose interactions with natural and human-mediated disturbances: implications for quantifying habitat conditions within caribou range. North American Caribou Workshop, Ottawa.

Rayl, N. D., G. Bastille-Rousseau, J. K. Organ, **M. A. Mumma**, S. P. Mahoney, C. E. Soulliere, K. P. Lewis, R. D. Otto, D. L. Murray, J. A. Schaeffer, L. P. Waits, and T. K. Fuller. 2018. Dynamic foraging tactics of black bears preying on caribou calves in Newfoundland, Canada. 13th Western Black Bear Workshop, Grand Junction, Colorado.

Mumma, M. A., M. P. Gillingham, K. L. Parker, C. J. Johnson, and M. Watters. 2017. Evaluating the role of disturbance on apparent competition between moose and caribou and wolf predation on caribou. North American Moose Conference and Workshop, Ingonish, Nova Scotia.

Mumma, M. A., M. P. Gillingham, K. L. Parker, and C. J. Johnson. 2017. Linear features exacerbate predation risk for boreal caribou via changes in moose and wolf distributions. American Society of Mammalogists' Conference, Moscow, Idaho.

Rayl, N. D., G. Bastille-Rousseau, J. F. Organ, **M. A. Mumma**, S. P. Mahoney, C. E. Soulliere, K. P. Lewis, R. D. Otto, D. L. Murray, L. P. Waits, and T. K. Fuller. 2017. Spatiotemporal heterogeneity in prey abundance and vulnerability shapes the foraging decision of an omnivore. American Society of Mammalogists' Conference, Moscow, Idaho.

Mumma, M. A., M. P. Gillingham, K. L. Parker, and C. J. Johnson. 2016. Understanding predation risk and age-specific variation in wolf avoidance by boreal caribou. The Wildlife Society Conference, Raleigh, North Carolina.

Mumma, M. A., M. P. Gillingham, K. L. Parker, C. J. Johnson, and M. Watters. 2016. Anthropogenic drivers of moose resource selection and implications for the boreal ecosystem. North American and International Moose Conference and Workshop, Brandon, Manitoba.

Mumma, M. A., M. P. Gillingham, C. J. Johnson, K. L. Parker, and M. Watters. 2016. Understanding the impacts of linear features on predation risk and avoidance of wolves by boreal caribou. North American Caribou Workshop, Thunder Bay, Ontario.

Rayl, N., G. Bastille-Rousseau, J. Organ, **M. A. Mumma**, C. E. Soulliere, R. Otto, S. P. Mahoney, and T. Fuller. 2016. Dynamic foraging decisions of black bears preying on caribou calves. Alaska Chapter of the Wildlife Society, Anchorage, Alaska.

Mumma, M. A., J. Holbrook, N. Rayl, C. Zieminski, T. Fuller T, S. Mahoney, and L. Waits. 2015. Patterns of selection in a changing predator complex. The Wildlife Society Conference, Winnipeg, Manitoba.

Mumma, M. A., N. Rayl, T. Fuller, J. Organ, S. Mahoney, and L. Waits. 2014. Evaluating predator densities across a landscape in the midst of a predator avoidance strategy. North American Congress for Conservation Biology, Missoula, Montana.

Mumma, M. A., and L. Waits. 2014. A novel molecular and statistical approach to identifying predator species at caribou calf kill sites. University of Idaho Innovation Showcase, Moscow, Idaho.

Pugesek, G., **M. A. Mumma**, S. Gullage, S. P. Mahoney, and L. P. Waits. 2014. A genetic evaluation of the effects of supplementary feeding on black bear diet. Northwest and Idaho Chapters of The Wildlife Society Conference, Boise, Idaho.

Mumma, M. A., C. Soulliere, S. Mahoney, and L. Waits. 2014. A predictive model of predator species at caribou calf kill sites in a multi-predator community. Northwest and Idaho Chapters of The Wildlife Society Conference, Boise, Idaho.

Mumma, M. A., C. Soulliere, S. Mahoney, and L. Waits. 2013. CSI Newfoundland: Molecular identification of caribou calf predators. Idaho Chapter of The Wildlife Society Conference, Coeur d'Alene, Idaho.

Mumma, M. A., K. Lewis, D. Fifield, and L. Waits. 2012. A comparison of abundance and density estimation techniques for black bears and coyotes in Newfoundland. American Society of Mammalogists' Conference, Reno, Nevada.

Adams, J., **M. A. Mumma**, C. Zieminski, T. Fuller, and L. Waits. 2011. Molecular identification of multiple prey species remains in predator scats. The Wildlife Society Conference, Waikoloa, Hawaii.

Lewis, K., **M. A. Mumma**, L. Waits, C. Zieminski, and C. Soulliere. 2011. Preliminary estimates of black bear density in caribou calving areas, Newfoundland, Canada (poster). International Conference on Bear Research and Management, Ottawa, Ontario.

Mumma, M. A., C. Soulliere, and L. Waits. 2011. CSI Newfoundland: Molecular identification of caribou calf predators. Arctic Ungulate Conference, Yellowknife, Northwest Territories.

Mumma, M. A., L. Waits, C. Zieminski, T. Fuller, and C. Soulliere. 2010. Evaluating non-invasive genetic techniques to estimate the population sizes of the major predators of Newfoundland caribou. The Wildlife Society Conference, Snowbird, Utah.

Mumma, M. A., and C. Sacchi. 2003. The effect of seed size on germination and growth of red oak and chestnut oak. Commonwealth of Pennsylvania University Biologists' Annual Meeting, Shippensburg, Pennsylvania.

GRANTS AND FELLOWSHIPS

- \$30,000 **Fulbright Postdoctoral Scholar Award in Northern Issues, University of Northern British Columbia, 2017–2018**
Understanding the Impact of Climate and Disturbance on Moose Survival
Mumma, M. A.
- \$6,000 **General Research Fund Grant, University of Northern British Columbia, 2016**
A Critical Appraisal of British Columbia's Cumulative Effects Framework
Fredeen, A., C. Johnson, C. Buse, and M. A. Mumma
- \$1,550 **Travel Grant, University of Northern British Columbia, 2015**
Mumma, M. A.
- \$2,500 **Sustainability Center Grant, University of Idaho, 2014**
Oceans, Ice, and Climate Change" Speaker Series
Mumma, M. A. and R. Lonsinger
- \$1,500 **American Society of Mammalogists' Grant, University of Idaho, 2013**
Using Molecular Tools to Evaluate a Black Bear Diversionary Feeding Project
Mumma, M. A.

Matthew A. Mumma

- \$630 **Travel Grant, University of Idaho, 2012**
Mumma, M. A.
- \$150 **Commonwealth of Pennsylvania University Biologists' Student Research Grant, Kutztown University of Pennsylvania, 2003**
Effect of Seed Size on Germination and Growth of Chestnut Oak and Red Oak
Mumma, M. A. and C. A. Sacchi
- \$9,000 **Pennsylvania Science and Technology Scholarship, Kutztown University of Pennsylvania, 2001–2003**
Mumma, M. A.
- \$1,000 **Manheim Touchdown Club Scholarship, Kutztown University of Pennsylvania, 1999**
Mumma, M. A.

AWARDS AND HONORS

- Alumni Award for Excellence, University of Idaho, 2014**
Outstanding Graduate Student Wildlife Science, University of Idaho, 2014
Outstanding Student Biological Sciences, Kutztown University of Pennsylvania, 2003
Best Ecological Presentation, Commonwealth of Pennsylvania University Biologists' Conference, 2003
Dean's List, Kutztown University of Pennsylvania, 1999–2000, 2002–2003
All-Star Baseball and Football, Lancaster/Lebanon League, 1999

TEACHING AND MENTORSHIP EXPERIENCE

- Guest Lecturer, University of Northern British Columbia, Spring 2018**
Conservation Biology Lecture, 32 students
- Guest Lecturer, University of Northern British Columbia, Fall 2017**
Environment and Society Lecture, 24 students
- Guest Lecturer, University of Northern British Columbia, Fall 2016**
Spatial and Temporal Analyses Lecture, Graduate Course, 4 students
- Co-Lead Instructor – Lecturer on Record, University of Idaho, Fall 2014**
Fish and Wildlife Population Ecology Lecture, 48 students
- Undergraduate Research Mentor, University of Idaho, Fall 2013**
Genevieve Pugesek, Ecology and Conservation Biology Program
Senior Thesis: A molecular evaluation of the effects of supplementary feeding on black bear diet in Newfoundland

Matthew A. Mumma

Co-Instructor, University of Idaho, Fall 2013

Conservation Biology Lecture, 63 students

Teaching Assistant, University of Idaho, Spring 2013

Wildlife Ecology Lab, 55 students

Principles of Population Dynamics Lab, 16 students

Plant Lab Assistant, Kutztown University of Pennsylvania, 2002–2003

Introduction to Botany Lab

Taxonomy of Vascular Plants Lab

Plant Physiology Lab

Tutor, Kutztown University of Pennsylvania, 2000–2001

Principles of Biology Lecture and Lab

Intro to Zoology Lecture and Lab

Intro to Botany Lecture and Lab

SERVICE

Wildfire Evacuee Services Volunteer, City of Prince George, British Columbia, 2017

Wildlife Contractor Selection Committees, Ministry of Forests, Lands, Natural Resources, and Rural Development, British Columbia, 2015–2016.

Art Days Volunteer, Two Rivers Gallery, Prince George, British Columbia, 2016

Department of Fish and Wildlife Population Ecology Professor Search Committee, University of Idaho, 2013

Palouse Prairie School Science Day Instructor, University of Idaho, 2013

“Oceans, Ice and Climate Change” Speaker Series Coordinator, University of Idaho, 2013

Alternatives to Violence of the Palouse Volunteer, Lentil Festival Parade, Pullman, Washington, 2013

Department of Fish and Wildlife Science Associate Professor Promotion Committee, University of Idaho, 2013

Graduate and Professional Student Association Senator, University of Idaho, 2012–2013

Service Trip Volunteer, Agros International, El Quiché, Guatemala, 2009

Branch Creek Community Church Food Bank Volunteer, Harleysville, Pennsylvania, 2008

Service Trip, Homeless Shelter, and Soup Kitchen Volunteer, Baltimore, Maryland, 1998

PROFESSIONAL ACTIVITIES

Member

Society for Conservation Biology, 2014–Present
American Society of Mammalogists, 2012–Present
The Wildlife Society, 2010–Present

Referee

Biological Conservation
Ecosphere
Journal of Biodiversity Management & Forestry
Journal of Mammalogy
Journal of Wildlife Management
Mammal Research
Molecular Ecology
Molecular Ecology Resources
Urban Naturalist Journal
Western North American Naturalist
Wildlife Biology
Wildlife Society Bulletin

WORKSHOPS AND TRAININGS

Chemical Immobilization of Wildlife Training, 2-day workshop offered by Dr. Helen Schwantje, Prince George, British Columbia, 2016

Analysis of Resource Selection by Animals Workshop, 2-day workshop offered by Dr. Ryan Long, University of Idaho, Moscow, Idaho, 2014

Introduction to the R Software Environment for Statistical Computing and Graphing Workshop, 2-day workshop offered by Dr. Jan Eitel, University of Idaho, Moscow, Idaho, 2012

New Approaches to Studies of Home Range, Habitat Selection, and Space-use Workshop, 5-day workshop offered by Dr. Oz Garton, University of Idaho, Moscow, Idaho, 2012

Capture-recapture for Spatial Data, 3-day workshop offered by Dr. Murray Efford, Yukon College, Whitehorse, Yukon, 2012

Analysis of Mark-recapture Data to Estimate Abundance Survival and Detection Probability, 4-day workshop offered by Dr. Jeffrey Manning, University of Idaho, Moscow, Idaho, 2011