

# **Matthew M. Hayes**

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## **Education**

### **M. S. Rangeland Ecology and Watershed Management/Water Resources, Dec 2012.**

University of Wyoming, Laramie, Wyoming

Thesis title: *Alterations to riparian vegetation resulting from beaver pond life histories.*

GPA: 4.0/4.0 (47 semester hours)

Advisor: Dr. Scott N. Miller

### **B. S. Wildlife Biology and Management, May 2010.**

University of Wyoming, Laramie, Wyoming

GPA (Junior/Senior): 3.2/4.0 (130 semester hours)

## **Professional experience and employment**

- 2016 – Research Scientist; Department of Environment and Natural Resources, University of Wyoming, Laramie, Wyoming.
- 2012 – Researcher/Founder; Lone Pine Analytics, Laramie, Wyoming.
- 2013 – 2016 Research Scientist (*Spatial Analyst*); Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie, Wyoming.
- 2013 Environmental Simulation Lab Manager; Department of Ecosystem Science and Management, University of Wyoming, Laramie, Wyoming.
- 2011 – 2013 Volunteer; Spatial Analysis of Watershed and Landscape Systems Group, University of Wyoming, Laramie, Wyoming.
- 2011 – 2012 Volunteer; Wyoming Game and Fish Department/University of Wyoming, Laramie, Wyoming.
- 2010 – 2012 Graduate Research Assistant; Department of Ecosystem Science and Management, University of Wyoming, Laramie, Wyoming.
- 2009 – 2010 Internship; Wyoming Geographic Information Science Center, University of Wyoming, Laramie, Wyoming.
- 2006 – 2009 Field and Laboratory Technician; University of Wyoming/University of Alberta, Laramie, Wyoming, Alberta, Canada.
- 2004 – 2005 Infantryman; United States Marine Corps, Camp Pendleton, California.

**Peer-Reviewed Publications**

- Ali A. H., A. T. Ford, D. Mallon, J. S. Evans, J. King, **M. M. Hayes**, R. Amin, and J. R. Goheen. 2016. Resource selection and range collapse of hirola antelope following landscape change in eastern Kenya. *Applied Ecology*.
- Armstrong, J. B., G. T. Takimoto, D. E. Schindler, **M. M. Hayes** and M. J. Kauffman. 2016. Resource waves: phenological diversity enhances foraging opportunities for mobile consumers. *Ecology*.
- Hayes, M. M.**, S. N. Miller, and M. Murphy. 2014. High-resolution landcover classification using random forests. *Remote Sensing Letters* 5:112-121.
- Hayes, M. M.** 2012. Alterations to riparian vegetation resulting from beaver pond life histories. M.S., University of Wyoming, United States -- Wyoming.
- Hayes, M. M.**, S. N. Miller, and P. Caffrey. 2012. Relationship among beavers, ecology and geomorphology in southeastern Wyoming. *Proceedings of Geographic Information Systems (GIS) and Water Resources VII*, New Orleans, Louisiana.
- Merkle, Jerod A., Kevin L. Monteith, Ellen O. Aikens, **Matthew M. Hayes**, Kent R. Hersey, Arthur D. Middleton, Brendan A. Oates, Hall Sawyer, Brandon M. Scurlock, and Matthew J. Kauffman. 2016. Large herbivores surf waves of green-up during spring. *Proc. R. Soc. B*, vol. 283.
- Sawyer, H., A. D. Middleton, K. L. Monteith, **M. M. Hayes** and M. J. Kauffman. 2016. The extra mile: ungulate migration distance alters use of seasonal range and exposure to anthropogenic risk. *Ecosphere* 7(10).

**Peer-Reviewed Publications in review or final stages of preparation**

- Hayes, M. M.**, K. L. Monteith, E. Wald, R. P. Long and E. C. Fuller. 2016. Predicting parturition timing in ungulates using GPS collar data. *In prep.*
- Hayes, M. M.**, H. Copeland, M. J. Kauffman and K. L. Monteith. 2016. Machine-learning techniques facilitates large-scale mapping of migratory habitat for targeted research and conservation planning. *In prep.*
- Middleton A. D., M. J. Kauffman, **M. M. Hayes**, J. A. Merkle, P. Atwood, J. Beckman, D. Brimeyer, E. Cole, A. Courtemanch, S. Dewey, D. McWhirter, K. Proffitt and P. J. White. 2016. Causes and consequences of a mass elk migration in the Greater Yellowstone Ecosystem? *In prep.*
- Monteith, K. L., **M. M. Hayes**, H. Sawyer, M.J. Kauffman and H.E. Copeland. 2016. Modeling the way forward: novel methods to advance conservation of a rapidly diminishing phenomenon. *In prep.*

### **Popular Articles**

Sawyer, H., **M. Hayes**, B. Rudd, and M. J. Kauffman. 2014. The Red Desert to Hoback Mule Deer Migration Assessment. Wyoming Migration Initiative, University of Wyoming, Laramie, WY.

Rashford, B.S., A.M. Scott, **M.M. Hayes**, and H. Sawyer. 2015. Targeting conservation easements for wildlife – A case study of mule deer migration. Open Space Bulletin, Ruckelshaus Institute, University of Wyoming, Laramie, WY.

### **Reports**

Kauffman, M.J., H. Sawyer, W. Schultz, and **M.M. Hayes**. 2015. Seasonal Ranges, Migration, and Habitat Use of the Platte Valley Mule Deer Herd. Final report to Wyoming Game and Fish Department.

Peck, D. and **M. M. Hayes**. 2016. Cattle-elk-deer interactions in northeast Oregon. Final report to USDA Animal and Plant Health Inspection Services, Cooperative Agreement Award No. 15-9200-0426-CA, August 31, 2016, 15pp.

### **Professional Presentations**

Bedrosian, B., R. Domenech, A. Shreading and **M.M. Hayes**. 2016. Golden eagle migration corridors along the rocky mountain front and intermountain flyways. Wind Wildlife Research Meeting XI, Broomfield, CO.

**Hayes, M.M.**, M.J. Kauffman, K.L. Monteith and E.C. Fuller. 2014. Predicting ungulate parturition using movement data. Wyoming Chapter of The Wildlife Society, Sheridan, WY.

**Hayes, M.M.** 2014. New techniques to improve wildlife habitat models. Annual cooperators meeting, University of Wyoming, Laramie, WY.

**Hayes, M.M.** 2014. Determining dates of parturition in mule deer using movement data. AniMove 2014, Front Royal, Virginia.

**Hayes, M. M.**, K. L. Monteith, H. Sawyer, and M. J. Kauffman. 2013. Evaluating patterns of migration across Wyoming's ungulates. Wyoming Chapter of The Wildlife Society, Rock Springs, Wyoming.

**Hayes, M. M.**, S. N. Miller. 2013. Alterations to riparian vegetation resulting from beaver pond life histories. Izaak Walton League of America, Travelle Chapter, Laramie, Wyoming.

**Hayes, M. M.** 2012. Alterations to riparian vegetation resulting from beaver pond life histories. MS Thesis Defense, University of Wyoming, Laramie, Wyoming.

**Hayes, M. M.**, S. N. Miller, and P. Caffrey. 2012. Alterations to riparian vegetation associated with beaver ponds in the Pole Mountain Recreation Area of southeastern Wyoming. Wyoming Chapter of The Wildlife Society, Laramie, Wyoming.

**Hayes, M. M.**, S. N. Miller. 2012. Riparian vegetation mapping: Pole Mountain Recreation Area. Wyoming Game and Fish Annual Habitat Meeting, Laramie, Wyoming.

**Hayes, M. M.**, S. N. Miller, and P. Caffrey. 2012. Relationships among beavers, riparian systems and woody vegetation dynamics in Wyoming. American Water Resources Association Spring Specialty Conference: GIS and Water Resources, New Orleans, Louisiana.

**Hayes, M. M.**, S. N. Miller, and P. Caffrey. 2011. Project update: beavers, water and wildlife in southeastern Wyoming. Wyoming Chapter of The Wildlife Society,

Jackson, Wyoming.

**Hayes, M. M.** 2011. Spatial analysis of the interactions among beavers, vegetation and water. Wyoming Geospatial Organization 1<sup>st</sup> Annual Ignite Session, Laramie, Wyoming.

### **Professional Posters**

**Hayes, M. M.**, S. N. Miller. 2012. Creation of local high resolution landcover maps using National Agriculture Imagery Program data and random forests. Wyoming Chapter of The Wildlife Society, Laramie, Wyoming.

**Hayes, M. M.**, S. N. Miller, and P. Caffrey. 2011. Land cover classification utilizing high resolution (spatial and temporal) datasets. Wyoming Chapter of The Wildlife Society, Jackson, Wyoming.

**Hayes, M. M.**, S. N. Miller and P. Caffrey. 2011. Alteration of ecosystems by beavers: learning from the past to inform current management strategies. Wyoming Geospatial Information Science Center annual GIS Day, University of Wyoming, Laramie, Wyoming.

### **Graduate Committees**

Raymond Tupling. Resource Development and Mitigation: How Mitigation Policy Mechanisms Influence the Ecological Effectiveness and Economic Efficiency of Public Lands, M.S., Agricultural and Applied Economics, August, 2016.

### **Academic Awards and Honors**

- Recipient: Josephine & Eldon Johnson Graduate Fellowship, University of Wyoming
- Best Student Presentation, The Wildlife Society – Wyoming Chapter 2011 Annual Meeting
- American Society for Photogrammetry and Remote Sensing, Rocky Mountain Region 2011 Regional Scholarship
- Invited Member, Gamma Sigma Delta, the Honor Society of Agriculture
- Invitation to join Gamma Theta Upsilon, the International Geographic Honor Society
- Graduate Research Assistantship, funded by Wyoming Game and Fish Department
- Meritorious promotion: School of Infantry, US Marine Corps

### **Certifications**

- Certified Associate Wildlife Biologist, The Wildlife Society

### **Workshops Attended**

- Animal movements, space use, and resource selection. Dr. Ryan Long. University of Wyoming, Laramie, Wyoming, 29-30 April 2013.
- AniMove 2014: Animal Movement Analysis for Conservation. Smithsonian Conservation Biology Institute, Front Royal, Virginia, 1-12 April 2014.

### **Professional Affiliations**

- The Wildlife Society, 2006-Current

- Ecological Society of America, 2014-Current
- Wyoming Chapter of The Wildlife Society, 2011- present
  - President 2016
- Wyoming Student Chapter of The Wildlife Society, 2006-2011
- American Society for Photogrammetry and Remote Sensing, 2011 – present

### **Professional Service**

- Spatial Analysis workshop, Wyoming Game and Fish Department
- Spatial Analysis workshop, Wyoming Chapter of The Wildlife Society
- President-Elect Wyoming Chapter The Wildlife Society
- GIS/Spatial Modeling workshop organizer (invited), Wyoming TWS, Laramie, Wyoming, May 2015.
- GIS/Spatial Modeling workshop organizer (invited), Wyoming Game and Fish Department, Laramie, Wyoming, June 2015.
- GIS/Spatial Modeling workshop organizer, Annual Meeting Wyoming Chapter of The Wildlife Society, Sheridan, Wyoming, 26-28 August 2014.

### **Teaching Experience**

#### **Teaching Assistant/Guest Lecturer, University of Wyoming**

Spatial Analysis, RNEW 5200, Spring 2012, Professor: Scott Miller

- Taught sections on: Landscape ecology, raster analyses and RSFs
- Assisted with preparation of labs
- Development of vegetation/habitat analysis labs
- Graduate level course

#### **Teaching Assistant/Guest Lecturer, University of Wyoming**

Water Resources Seminar, REWM 4530/ENR 3900, Fall 2012,

Professor: Scott Miller

- Student-led presentation and discussion format course
- Graded students' presentations, tests and homework assignments
- Presented a guest lecture on beaver impacts to riparian systems
- Undergraduate course

### **Consulting**

#### **Founder/Owner Lone Pine Analytics**

##### **Projects:**

- Migratory ungulate public/private land use during migration in a multi-jurisdictional, multi-state landscape
- Resource use and selection of Great Gray Owls in northwestern Wyoming
- Landscape scale land-use change and landscape conversion throughout the Prairie Pothole region
- Analysis of migratory pathways of Golden Eagles in the Western Hemisphere
- Resource selection of Golden Eagles in Fish and Wildlife Service region 6: understanding habitat use to inform regional conservation planning
- Determining timing of ungulate migration using GPS telemetry data
- Cattle-elk-deer interactions to assess disease transmission potential