

Catherine G Haase

Department of Biology Austin Peay State University, Clarksville, TN 37044

Phone: (931) 221-6531

E-mail: haasec@apsu.edu

Lab website: www.haaseecolab.com

Current Position

2019- **Assistant Professor, Department of Biology, Austin Peay State University**

Current Research

2019- **Changes in the bat community in Fort Campbell, KY**

Project collaborators: Fort Campbell Fish and Wildlife

Funding: Intergovernmental Support Agreement (\$388,385 received)

2019- **Temperature-mediated habitat selection of moose in Jackson, WY**

Project collaborators: Dr. Paul Cross (US Geological Survey), Wyoming Game and Fish Department, and Troy Koser (PhD student at Montana State University)

2019- **Impacts of supplemental feeding on disease transmission in feral cat colonies**

Project collaborators: Drs. Stefan Woltmann and Mollie Cashner (APSU)

Previous Positions

2016-2019 Postdoctoral Research Associate, Department of Microbiology, Montana State University

2018 Lecturer, School of Animal and Range Sciences, Hawassa University, Ethiopia

2016 Postdoctoral Research Associate, Department of Geography, University of Florida

2011-2012 Research Associate, Northern Rocky Mountain Science Center, US Geological Survey

2010-2011 Research Associate, Cary Institute of Ecosystem Studies

Education

2016 **PhD in Interdisciplinary Ecology, University of Florida**

School of Natural Resources and Environment

Department of Wildlife Ecology and Conservation

2010 **MS in Conservation Biology, SUNY College of Environmental Science and Forestry**

Department of Environmental and Forest Biology

2007 **BS in Wildlife, Unity College**

Teaching Experience

2019- **Austin Peay State University**

BIOL 5700 Topics in Biology: Biostatistics in R (4 credits) Spring

HON 1045 Science in the Movies (3 credits) Fall

BIOL 3330/3331 Principles of Evolution (4 credits) Fall/Spring

BIOL 3000 Biological Methods (3 credits) Fall/Spring

BIOL 4630/4631 & 5630/5631 Mammalogy (4 credits) Fall

BIOL 1110 Principles of Biology (3 credits) Fall

2018 **Hawassa University, Ethiopia**

ARSc 701 Research Methods and Biostatistics in R (3 credits) Fall

2013-2014 **University of Florida**

EVR 2001 Introduction to Environmental Science (1 credit) Fall/Spring

2007-2009 **SUNY College of Environmental Science and Forestry**
 EFB 220 Urban Ecology (3 credits) Fall
 EFB 484 Winter Mammalian Ecology (3 credits) Spring
 EFB 493 Wildlife Habitats and Population Management (4 credits) Fall
 EFB 311 Principles of Evolution (3 credits) Spring
 NSF Undergraduate Mentoring Experience in Biology (6 credits) Summer

Advising

Current Graduate Students	Sarah Zirkle, MS thesis track, <i>graduate advisor</i> Sarah Krueger, MS thesis track, <i>graduate advisor</i> Trevor Walker, MS thesis track, <i>graduate advisor</i> Holly Latta, MS non-thesis track, <i>committee chair</i> Brandon Brown, MS thesis track, <i>committee member</i> Connor Hughes, MS thesis track, <i>committee member</i> Jocelyn Stalker, MS thesis track, <i>committee member</i> Alexis Culley, MS thesis track, <i>committee member</i> Jacob Barrett, MS thesis track, <i>committee member</i> River Watson, MS thesis track, <i>committee member</i> Nathaniel Selleck, MS thesis track, <i>committee member</i> Brittney Georgic, MS thesis track, <i>committee member</i>
Past Graduate Students	Robert Ryan, MS thesis track, <i>committee member</i> (2020) Lyranda Thiem, MS thesis track, <i>committee member</i> (2020) Molly Richard, MS thesis track, <i>committee member</i> (2020) Chelsea Blumbergs, MS non-thesis track, <i>committee member</i> (2020)
Current Undergraduate Research Students	John Hansen* Jonathan Crockarell* Shelia Staples

*Received APSU Undergraduate Research Enrichment Funds as listed mentor

Grants and Fellowships (\$425,049 granted)

2021	NFWF Cumberland Plateau-Southern Appalachians Fund - \$216,616 (<i>submitted</i>)
2020	Intergovernmental Support Agreement with the Department of Defense - \$388,385
2020	Technology Access Fee (APSU) - \$5,264
2020	Undergraduate Research Enrichment Fund (APSU) (<i>listed as mentor</i>) - \$6,000
2020	Morris Animal Foundation – pilot study (International) - \$10,000 (<i>not funded</i>)
2019	Morris Animal Foundation – first award (International) - \$105,656 (<i>not funded</i>)
2017	NSF Infectious Disease Evolution Across Scales (National) - \$3,000
2014-2016	Debra Lowe Fellowship (UF) - \$6000
2014-2016	University of Florida Travel grants (UF) - \$4500
2012-2015	Grinter Fellowship (UF) - \$5500
2010	North American Moose Conference Newcomer's Award (International) - \$1000
2010	Alumni Association Award (SUNY ESF) - \$400
2009	Sigma Xi Society Research in Need Grant (International) - \$1000
2009	Edna B Sussman Foundation Fellowship (State) - \$5800

Peer-reviewed Publications

16. Hranac, CR, **CG Haase**, NW Fuller, ML McClure, JC Marshall, CL Lausen, LP McGuire, SH Olson, DTS Hayman. *In press*. What is a winter? Modelling spatial variation in bat host traits and hibernation and their implications for overwintering energetics. *Ecology and Evolution*
15. McClure, ML, **CG Haase**, D Crowley, LP McGuire, NW Fuller, DTS Hayman, CL Lausen, RK Plowright, BG Dickson, SH Olson. *In press*. A hybrid correlative-mechanistic approach for modeling and mapping winter distributions of western bat species. *Journal of Biogeography*
14. **Haase, CG**, NW Fuller, YA Dzal, DTS Hayman, CR Hranac, C Lausen, KA Silas, SH Olson, RK Plowright. 2020. Body mass and hibernation microclimate may predict bat susceptibility to white-nose syndrome. *Ecology and Evolution* 1-10
13. McClure, ML, D Crowley, **CG Haase**, LP McGuire, NW Fuller, DTS Hayman, CL Lausen, RK Plowright, BG Dickson, SH Olson (2020) Linking surface and subterranean climate conditions: implications for the study of hibernating bats and other cave dwellers. *Ecosphere* 11(10): 1-17
12. Fuller, NW, LP McGuire, EL Pannkuk, T Blute, **CG Haase**, HW Mayberry, TS Risch, CKR Willis (2020) Disease recovery affected by white-nose syndrome. *Experimental Biology* 223(6):1-12
11. **Haase, CG**, RJ Fletcher, Jr, DH Slone, JP Reid, SM Butler (2020) Traveling to thermal refuges during stressful temperatures leads to foraging constraints in a central-place forager. *Journal of Mammalogy* 101(1): 271-280
10. **Haase, CG**, NW Fuller, CR Hranac, DTS Hayman, LP McGuire, KJO Norquay, KA Silas, CKR Willis, RK Plowright, SH Olson (2019) Incorporating evaporative water loss into bioenergetic models of hibernation to test influence of host and pathogen traits on white-nose syndrome. *PLOS ONE* 14(10): e022231
9. Fuller, NW, **CG Haase**, KA Silas, SH Olson, LP McGuire (2019) First reported case of diphallia in *Corynorhinus townsendii*. *Western North American Naturalist* 79(3): 454-457
8. **Haase, CG**, NW Fuller, CR Hranac, DTS Hayman, SH Olson, RK Plowright, LP McGuire (2019) Bats are not squirrels: revisiting the assumptions of costs of cooling in hibernating mammals. *Journal of Thermal Biology* 81: 185-193
7. Yang, A, JP Gomez, **CG Haase**, KM Proffitt, JK Blackburn (2019) Effects of Brucellosis serological status on physiological conditions and behavioral mechanisms of Southwestern Montana Elk. *Journal of Wildlife Diseases* 55(2): 304-315
6. **Haase, CG**, RJ Fletcher, Jr DH Slone, JP Reid, SM Butler (2017) Landscape complementation revealed through bipartite networks: the Florida manatee. *Landscape Ecology* 32: 1999-2014
5. Slone, DH, SM Butler, JP Reid, **CG Haase** (2017) Timing of warm water refuge use in Crystal River National Wildlife Refuge by manatees—results and insights from Global Positioning System telemetry data. US Geological Survey Open-File Report
4. Hayward, A, M Pajuelo, **CG Haase**, DM Anderson, JF Gillooly (2016) Common metabolic constraints on dive duration in endothermic and ectothermic vertebrates. *PeerJ* 4: e2569
3. Cross, PC, ES Almborg, **CG Haase**, PJ Hudson, S Maloney, M Metz, A Munn, P Nugent, O Putzeys, DR Stahler, AC Stewart, DW Smith (2016) Energetic costs of range in Yellowstone wolves estimated from infrared thermography. *Ecology* 97(8): 1938-1948
2. **Haase, CG**, AK Long, JF Gillooly (2016) Energetics of stress: Linking plasma cortisol levels to metabolic rate in mammals. *Biology Letters* 12(1): 1-4
1. **Haase, CG**, HB Underwood (2013) Integrating thermal constraints into habitat suitability for moose in the Adirondack State Park, NY. *Alces* 49: 49-64

Publications in Review

5. Campione, A, J Orange, E Dinh, **CG Haase**, R Peters, C Peters, S Wisely, J Blackburn. Thermal stresses, diel movement trends, disease risk, and habitat selection of wild and ranched white-tailed deer in Florida. Submitted to Movement Ecology. Manuscript ID# MOVE-D-20-00134
4. **Haase, CG**, A Yang, K McNyset, J Blackburn. GARPTools: R software for data preparation and model evaluation of GARP models. Submitted to Ecography. Manuscript ID# ECOG-05642
3. McGuire, LP, NW Fuller, YA Dzal, **CG Haase**, B Klug-Baerwald, KA Silas, RK Plowright, CL Lausen, CKR Willis, SH Olson. Interspecific variation in evaporative water loss and temperature response, but not metabolic rate, among hibernating bats. Submitted to the Journal of Experimental Biology. Manuscript ID# JEXBIO/2020/242198
2. McGuire, LP, NW Fuller, YA Dzal, **CG Haase**, KA Silas, CKR Willis, SH Olson, CL Lausen. Similar physiology in hibernating bats across broad geographic ranges Submitted to Journal of Comparative Physiology B. Manuscript ID# JCPB-D-20-00184
1. McGuire, LP, NW Fuller, **CG Haase**, KA Silas, SH Olson. Lean mass dynamics in hibernating bats and implications for energy and water budgets Submitted to Physiological and Biochemical Zoology. Manuscript ID# PBZ-S-20-00127

Invited Presentations

13. The energetic costs of disease: a case study of bioenergetics of white-nose syndrome. April 2021. Verena Lighting Talks, Verena Research Initiative, Seattle, WA
12. The energetic costs of disease: a case study of bioenergetics of white-nose syndrome. April 2021. Department of Biological Sciences Seminar Series, Wright State University, Dayton, OH
11. Energetic costs of disease: a case study of bioenergetics of white-nose syndrome. February 2021. School of Forestry and Wildlife Sciences Seminar Series, Auburn State University, Auburn, AL
10. Current White-nose Syndrome Research. November 2020. Tri-Beta Honor Society Speaker Series, Austin Peay State University, Clarksville, TN
9. Correlated, Random, Brains! What animal movement models can tell us about a zombie apocalypse. November 2019. Honors Biology course, Austin Peay State University, Clarksville, TN
7. The importance of scale: What landscape ecology can teach us about thermoregulation. September 2019. Department of Biology Seminar Series, Murray State University, Murray, KY
4. Careers in Science. November 2019. Tri-Beta Honor Society Speaker Series, Austin Peay State University, Clarksville, TN
4. The importance of scale: What landscape ecology can teach us about thermoregulation May 2019 Department of Biological Sciences Seminar Series, Texas Tech University, Lubbock, TX
3. The energetics of disease: A case study of white-nose syndrome in western bats. March 2019. Department of Microbiology Seminar Series, Montana State University, Bozeman, MT
2. The importance of scale: What landscape ecology can teach us about thermoregulation. February 2019. Department of Biology Seminar Series, Austin Peay State University, Clarksville, TN
4. Energetics of disease. November 2017. Montana State University, Bozeman, MT
1. Some like it hot: Understanding how temperature shapes animal energetics and behavior. September 2017. Women in Science Lecture Series, St Mary's College, IN
1. Understanding manatee behavior in response to temperature. August 2016. The Institute of Learning in Retirement Science Lecture Series, Oak Hammock Retirement Center, Gainesville, FL

Presentations at Professional Conferences

20. Olson, SH, D Crowley, B Dickson, YA Dzal, NW Fuller, **CG Haase**, DTS Hayman, CR Hranac, EM Johnson, EL Kunkel, CL Lausen, ML McClure, LP McGuire, RK Plowright, KA Silas, CKR Willis (2020) A multi-species evaluation of hibernation physiology and influence on white-nose syndrome risk factors. White-nose Syndrome National Webinar

19. **Haase, CG***, NW Fuller, YA Dzal, DTS Hayman, CR Hranac, C Lausen, K Silas, LP McGuire, SH Olson, RK Plowright (2020) Adaptations to drier hibernacula mitigate mortality from white-nose syndrome in western bat species. American Society of Mammalogy Conference. Boulder, CO
18. Fuller, NW, **CG Haase**, K Silas, SH Olson, LP McGuire (2019) The hibernation phenotype: interspecific and regional variation of hibernation physiology. North American Society for Bat Research Annual Meeting. Kalamazoo, MI
17. McClure, ML, **CG Haase**, D Crowley, DTS Hayman, CR Hranac, C Lausen, NW Fuller, LP McGuire, RK Plowright, SH Olson (2019) Modeling and mapping western bat hibernaculum suitability before and after *Pd* exposure. North American Society for Bat Research Annual Meeting. Kalamazoo, MI
16. Hranac, CR, **CG Haase**, NW Fuller, JC Marshall, CL Lausen, LP McGuire, SH Olson, DTS Hayman (2019) What is a winter? Addressing data deficiency in model parameters in overwintering bat models. North American Society for Bat Research Annual Meeting. Kalamazoo, MI
15. **Haase, CG**, NW Fuller, YA Dzal, DTS Hayman, CR Hranac, C Lausen, K Silas, LP McGuire, SH Olson, RK Plowright (2019) Estimating susceptibility of western bat species to WNS with the application of bioenergetic disease modeling. Western Bat Working Group. Tulsa, OK
14. **Haase, CG**, NW Fuller, DTS Hayman, CR Hranac, SH Olson, RK Plowright, LP McGuire (2019) Bats are not squirrels: revisiting the costs of cooling in hibernating mammals. Society for Integrative and Comparative Biology. Tampa, FL
13. **Haase, CG**, NW Fuller, DTS Hayman, CR Hranac, SH Olson, RK Plowright, LP McGuire (2018) Bats are not squirrels: revisiting the costs of cooling in hibernating mammals. North American Society for Bat Research. Puerto Vallarta, Mexico
12. Fuller, NW, **CG Haase**, KA Silas, SH Olson, LP McGuire (2018) Implications for white-nose syndrome in western bats. North American Society for Bat Research. Puerto Vallarta, Mexico
11. **Haase, CG**, NW Fuller, DTS Hayman, CR Hranac, LP McGuire, SH Olson, RK Plowright (2018) Modelling the influence of evaporative water loss on hibernation energetics and implications for white-nose syndrome. National White-nose Syndrome Meeting. Tacoma, WA
10. Olson, SH, **CG Haase**, NW Fuller, LP McGuire, DTS Hayman, CR Hranac, ML McClure, D Crowley, RK Plowright, YA Dzal, CKR Willis, EL Kunkel, C Lausen, BJ Klug-Baerwald, KA Silas (2018) A combined empirical and modeling approach to assess the impact of WNS in the West. National White-nose Syndrome Meeting. Tacoma, WA
9. McGuire, LP, NW Fuller, **CG Haase**, KA Silas, SH Olson (2018) Regional variation in hibernation phenotype: *Myotis velifer* hibernation at southern latitudes and implications for white-nose syndrome. Society for Integrative and Comparative Biology. San Francisco, CA
8. **Haase, CG**, NW Fuller, DTS Hayman, CR Hranac, LP McGuire, SH Olson, RK Plowright (2017) Modelling the influence of evaporative water loss on hibernation energetics and implications for white-nose syndrome. North American Society for Bat Research. Knoxville, TN
7. McClure, ML, **CG Haase**, DTS Hayman, CR Hranac, N Justice, B Dickson, SH Olson (2017) Western bat distributions before and after exposure to white-nose syndrome: A hybrid correlative-mechanistic modeling approach. North American Society for Bat Research. Knoxville, TN
6. Hranac, CR, **CG Haase**, YA Dzal, C Lausen, JC Marshall, SH Olson, DTS Hayman (2017) Modeling the impact of white-nose syndrome on two western bat species. Second International Symposium on Infectious Diseases on Bats. Fort Collins, CO
5. **Haase, CG**, RF Fletcher, Jr, DH Slone, JP Reid, SM Butler (2016) Quantifying landscape complementation with bipartite networks and applications to habitat selection. International Association for Landscape Ecologists. Asheville, NC
4. **Haase, CG** and BH Underwood (2010) Integrating thermal cover into habitat models for moose. North American Moose Conference. International Falls, MN
3. **Haase, CG** and BH Underwood (2010) A habitat suitability index model incorporating thermal cover for moose in the Adirondack Park. Northeast Fish and Wildlife Conference. Boston, MA
2. **Haase, CG** and BH Underwood (2010) Characterizing critical thermal environments: applications to habitat suitability for moose. New York Chapter of the Wildlife Society. Alexandria Bay, NY
1. **Haase, CG** and BH Underwood (2009) Characterizing critical thermal environments: applications to habitat suitability modeling for moose. New York Chapter of American Foresters. Syracuse, NY

Selected Conference Posters

4. **Haase, CG**, NW Fuller, DTS Hayman, CR Hranac, LP McGuire, SH Olson, RK Plowright (2018) Modelling the influence of evaporative water loss on hibernation energetics and implications for white-nose syndrome. National White-nose Syndrome Meeting. Tacoma, WA
5. McGuire, LP, NW Fuller, JG Boyles, **CG Haase**, KA Silas, SH Olson (2018) A conceptual framework of hibernation phenotype and interspecific variation in hibernation physiology. National White-nose Syndrome Meeting. Tacoma, WA
6. **Haase, CG**, RF Fletcher, Jr, DH Slone, JP Reid, SM Butler (2015) Influence of spatial patterns of thermal and forage resources on manatee behavioral decisions. Conference on the Biology of Marine Mammals. San Francisco, CA
3. **Haase, CG**, DH Slone, RF Fletcher, Jr, JP Reid, SM Butler (2015) Influence of the spatial distribution of water temperature on manatee behavior. Florida Chapter of the Wildlife Society. Jacksonville, FL
4. **Haase, CG**, DH Slone, JP Reid, RF Fletcher, Jr (2014) Influence of landscape and environmental variables on seasonal home range use of the Florida manatee in the Greater Everglades Region. Gordon Research Conferences: Unifying Scales Across Ecology. Biddeford, ME
1. **Haase, CG**, PC Cross, DW Smith, O Putzeys, P Nugent (2012) Are many wolves ENERGY STAR compliant? Energetic impacts of Sarcocystis mangle (*Sarcocystis scabiei*) on gray wolves (*Canis lupus*) in Yellowstone. Ecology and Evolution of Infectious Disease Workshop. Ann Arbor, MI

Theses

Haase, Catherine G (2016) The effects of the spatial configuration of thermal and forage habitats on behavior of the Florida manatee (*Trichechus manatus latirostris*). PhD Dissertation. School of Natural Resources and the Environment, University of Florida, 110 p.

Haase, Catherine G (2010) Characterizing critical thermal environments for moose (*Alces alces*) in the Adirondacks. MS Thesis. Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, 125 p.

Popular Media

"Want to be a Bat Hero this Halloween? Don't Visit the Batcave." *Live Science*, October 29, 2018

"When a Bat Sees Its Shadow: Winter Length Affects Bat Survival." *National Geographic*, April 17, 2018

"Why Bats Are So Good at Gulping Down (Halloween) Prey." *Live Science*, October 25, 2017

Research Featured in Media

"Disease threatens to decimate western bats." *Science Daily*, January 22, 2021

"Austin Peay, Fort Campbell partner in white-nose syndrome study." *APSU News*, September 28, 2020

"Post partners with APSU to track endangered bat species." *Fort Campbell Courier*, August 13, 2020

"Saving the bats, one cave at a time." *The New York Times*. February 18, 2019

"Plague marching west: researchers study bats to stop their demise." *The Guardian*, October 18, 2018

"X-Ray: Yellowstone" *Discovery Channel's Curiosity Series* December 2012

"Color-Coded Wolves: Infrared Reveals an Illness among Wolves." *Science World*, September 2012

"Infrared Imaging Helps Save Yellowstone's Wolves." *Wired*, May 2012

Outreach Activities

Science on Tap, Austin Peay State University, Clarksville, TN, May 5, 2021

Zoom into STEM, Austin Peay State University, Clarksville, TN, January 22, 2020

Skype a Scientist at Zia Elementary School, Albuquerque, NM, May 12, 2020

Skype a Scientist at Lincoln Roosevelt School, Roxbury, NJ, April 29, 2020

Family STEM Night at Moore Magnet Schools, Clarksville, TN, February 27, 2020

Skype a Scientist at Hilton Central Schools, Rochester, NY, November 20, 2019

STEM Night at Bakers Mill Elementary School, Clarksville, TN, October 24, 2019

Hibernation is cool: Using Newton's law of cooling to predict hibernation energetics. 500 Women Scientists Suds and Science Series, Bozeman, MT, June 30, 2019
Careers in science. Washington Township Middle School, Boonton Township, NJ, December 20, 2018
From moose to manatees. 500 Women Scientists Suds and Science, Bozeman, MT, July 28, 2018
Bats at risk: Current status of white-nose syndrome. Speaking of Nature Series, Rancocas Nature Center, Westhampton Township, NJ, October 17, 2017
Mangy wolves: Science in Yellowstone. Valleyview Middle School, Denville, NJ, December 22, 2015

Professional Contributions

Service to Scientific Community

2020- APSU Environmental Health and Safety Advisory University Committee
2020- APSU College of STEM Diversity and Inclusion Committee
2020- APSU Department of Biology Student Learning Outcomes Assessment Committee
2019- Chair, APSU Department of Biology Communications Committee
2019- Faculty advisor, Austin Peay State University Chapter of The Wildlife Society
2018-2019 Co-director, Bozeman 500 Women Scientists
2017 Instructor, R Workshop for Beginners, Montana State University
2013-2016 Instructor, R Workshop for Beginners, University of Florida

Professional Societies

2020- Tennessee Academy of Science (TAS)
2020- Ecological Society of America (ESA)
2017- Society for Integrative and Comparative Biology (SICB)
2015- International Association of Landscape Ecologists - North America (IALE-NA)
2007- American Society of Mammalogists (ASM)
2003- The Wildlife Society (TWS)

Working Groups and Society Sections

2020- ESA Researchers at Undergraduate Institutions Section
2020- ESA Physiological Ecology Section
2020- Southeastern Chapter of ESA
2020- Southeastern Bat Diversity Network
2019- Tennessee Chapter of The Wildlife Society
2019- TWS Spatial Ecology & Telemetry Working Group
2019- TWS Early Career Professional Working Group
2019- TWS College & University Wildlife Education Working Group
2016- Western Bat Working Group

Reviewer

Journals: *Alces*, *Animal Behaviour*, *Biodiversity and Conservation*, *Ecography*, *EcoHealth*, *Functional Ecology*, *Integrative and Comparative Biology*, *Journal of Animal Ecology*, *Journal of Thermal Biology*, *Journal of Wildlife Diseases*, *PLOS One*, *Proceedings of the Royal Society B*

Grants: Bats for the Future Fund (National Fish & Wildlife Foundation), Morris Animal Foundation, Wind Wildlife Research Fund (American Wind Wildlife Institute)

Software Tools Development

GARPTools An R package for GARP species distribution model evaluation
batwintor An R package for computing the metabolic costs of hibernation

Awards

2020 Austin Peay Helping Hands Faculty Award
2011 Adirondack Research Consortium Graduate Student Award
2007 Unity College Wildlife Leadership Award
2005 Maine State Campus Compact Heart and Soul Award