

## AMANDA M. HALE Curriculum Vita

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### EDUCATIONAL BACKGROUND

<b>Ph.D.</b> in Biology, University of Miami	2004
<b>M.S.</b> in Ecology, Purdue University	1998
<b>B.S.</b> in Biology and <b>B.A.</b> in Spanish, Phi Beta Kappa, Purdue University	1995
La Complutense, The University of Madrid, Spain	1993-1994

### YEAR OF APPOINTMENT TO THE UNIVERSITY AND RANK

2019	Professor of Biology, Texas Christian University
2013	Associate Professor of Biology, Texas Christian University
2008	Assistant Professor of Biology, Texas Christian University
2007	Visiting Research Professor, Texas Christian University

### PREVIOUS TEACHING AND RESEARCH APPOINTMENTS

2005-2007	Postdoctoral Associate, Department of Biology, University of Miami
2005	Lecturer, Department of Biology, University of Miami

### CURRENT TEACHING RESPONSIBILITIES

BIOL 10003 Contemporary Issues in Biology	2007-present
BIOL 30403 Ecology and the Environment	2021-present
BIOL 40803 Biological Research & Writing	2009-present
BIOL 40900 Independent Research in Biology	2009-present
BIOL 50123 Biostatistics	2009-present
BIOL 50903 Tropical Biology	2010-present
BIOL 60131 Introduction to Scientific Research and Writing	2017-present
BIOL 60320 Graduate Research in Biology	2018-present
BIOL 60703 Advanced Teaching in Biology	2022

## RECENT GRANTS

Understanding interspecific differences between collision risk of male and female bats to inform minimization strategies. Co-PI with S. Weaver (lead organization – Bowman Consulting Group), D. Nelson, S. Fritts, T. Katzner. Wind Wildlife Research Fund, AWWI. 2021-2023.

Hoary bat population status and trends report. The National Renewable Energy Lab. 2020.

Reducing bat mortality at wind turbines: improving mitigation strategies. NextEra Energy Resources. 2018-2020.

SERC – Evaluating raptor interactions with snake mimics to assess the urban predation paradox. A. Schenk, A. Hale. Science and Engineering Research Center – Graduate Student Research Grant. 2019/2020.

SERC – Genetic diversity and population structure of two species of yellow bats in south Texas. A. Chipps, A. Hale, D. Williams. Science and Engineering Research Center – Graduate Student Research Grant. 2019/2020.

SERC – How do habitat specialists persist in urban forests? A case study using the swamp rabbit. T. Stevens, A. Hale, D. Williams. Science and Engineering Research Center – Graduate Student Research Grant. 2019/2020.

SERC – Use of DNA barcoding to identify unknown bats. J. James, D. Williams, A. Hale. Science and Engineering Research Center - Undergraduate Research Grant. 2019/2020.

SERC – Assessing genetic diversity of northern yellow bats killed at a wind energy facility. J. Joyce, D. Williams, A. Hale. Science and Engineering Research Center - Undergraduate Research Grant. 2019/2020.

## GRADUATE THESES AND DISSERTATIONS DIRECTED

17. Sarah LiCari, MS Biology, expected May 2023 – Understanding sex biases in bat-wind turbine collision mortality to inform mitigation and minimization strategies. Co-advised with D. Williams.
16. Thomas K. Stevens, PhD Biology, expected May 2022 – How do habitat specialists persist in urban forests? A case study using the Great Trinity Forest. Co-advised with D. Williams.
15. Austin Chipps, MS Biology, May 2020 – Genetic diversity, population structure, and effective population size in two yellow bat species from south Texas. Co-advised with D. Williams.
14. Amber Schenk, MS Biology, May 2020 – Evaluating predator-prey dynamics in an urban forest: assessment using raptor predation on prey mimics.
13. Brynn E. Huzzen, MS Environmental Science, 2019 – Bat behavior at smooth and texture-treated wind turbine towers. Co-advised with V. Bennett.
12. Cole T. Lindsey, MS Biology, 2017 – Assessing changes in bat activity in response to an acoustic deterrent – implications for decreasing bat fatalities at wind facilities. Co-advised with V. Bennett.
11. Cecily F. Foo, MS Biology, 2016 – Are tree bats foraging at wind turbines in the southern Great Plains? Co-advised with V. Bennett.
10. Christina R. Bienz, MS Environmental Science, 2016 – Surface texture discrimination by wild-caught bats: implications for reducing mortality at wind turbines. Co-advised with V. Bennett.

9. Luyi Z. Jarzombek, MS Environmental Science, 2016 – Aerial-hawking bats can glean prey items from surfaces similar to wind turbine towers: implications for reducing bat fatalities at wind facilities. Co-advised with V. Bennett.
8. Brad R. Yuen, MS Environmental Science, 2015 – Surface texture differentiation using synthetic bat echolocation calls: implications for reducing bat fatalities at wind turbines. Co-advised with V. Bennett.
7. Aaron M. McAlexander, MS Biology, 2013 – Evidence that bats perceive wind turbine surfaces to be water.
6. C. Danielle Cochran, MS Environmental Science, 2013 – Bats, bugs and wind farms – is there a connection?
5. Jennifer M. Korstian, MS Biology, 2012 – High genetic diversity and lack of structure in eastern red bats (*Lasiurus borealis*). Co-advised with D. Williams.
4. Erin S. Hatchett, MS Environmental Science, 2011 – Wind turbines do not negatively impact density and nest success in grassland birds at a north Texas wind farm.
3. Thomas K. Stevens, MS Environmental Science, 2011 – The effects of wind energy on overwintering grassland birds.
2. Jeffrey A. Meyer, MS Environmental Science, 2010 – Effects of wind turbines on breeding grassland birds in north-central Texas.
1. Trevor G. Rubenstahl, MS Environmental Science, 2010 – Scissor-tailed Flycatcher (*Tyrannus forficatus*) nest placement and success in relation to wind turbines at a utility-scale wind farm in north-central Texas.

## PUBLICATIONS

41. Guest EE, BF Stamps, ND Durish, **AM Hale**, CD Hein, BP Morgan, SP Weaver, and SR Fritts. 2022. An updated review of hypotheses regarding bat attraction to wind turbines. *Animals* 12, 343 DOI 10.3390/ani12030343. *Special Issue: Bat Biology in Relation to Wind Energy Development*.
40. **Hale AM**, CD Hein, and BR Straw. 2022. Acoustic and genetic data can reduce uncertainty regarding populations of migratory tree-roosting bats impacted by wind energy. *Animals* 12, 81 DOI 10.3390/ani12010081. *Special Issue: Bat Biology in Relation to Wind Energy Development*.
39. Hein C, **A Hale**, and B. Straw. 2021. Acoustic and genetic approaches for informing population status and trends of migratory tree bats. National Renewable Energy Laboratory Technical Report, NREL/TP-5000-78563. <https://www.nrel.gov/docs/fy21osti/78563.pdf>.
38. Chipps AS, **AM Hale**, SP Weaver, and DA Williams. 2020. Genetic diversity, population structure, and effective population size in two yellow bat species in south Texas. *PeerJ* 8:e10348 DOI 10.7717/peerj.10348.
37. Chipps AS, **AM Hale**, SP Weaver, and DA Williams. 2020. Genetic approaches are necessary to accurately understand bat-wind turbine impacts. *Diversity* 12, 236 DOI:10.3390/d12060236.
36. Huzzen BE, **AM Hale**, and VJ Bennett. 2020. An effective survey method for studying volant species activity and behavior at tall structures. *PeerJ* 8:e8438 DOI 10.7717/peerj.8438.
35. Williams DA, ND Rains, and **AM Hale**. 2019. Population genetic structure of Texas horned lizards: implications for reintroductions and captive breeding. *PeerJ* 7:e7746 DOI 10.7717/peerj.7746.
34. Hein C, and **AM Hale**. 2019. Chapter 6. Wind Energy and Bats *in* Renewable Energy and Wildlife Conservation, C Moorman, S Grodsky, S Rupp, eds. John Hopkins University Press.

33. Allison TD, JE Diffendorfer, EF Baerwald, JA Beston, D Drake, **AM Hale**, CD Hein, MM Huso, SR Loss, JE Lovich, MD Stickland, KA Williams, and VL Winder. *In Press*. Impacts to wildlife of wind energy siting and operation in the United States. Submitted to *Issues in Ecology*.
32. Bennett VJ, and **AM Hale**. 2018. Resource availability may not be a useful predictor of migratory bat fatalities or activity at wind turbines. *Diversity* 10, 44. DOI 10.3390/d10020044 \*Special Issue *Diversity and Conservation of Bats*.
31. Korstian JM, MM Chumchal, VJ Bennett, and **AM Hale**. 2018. Mercury contamination in bats from the central United States. *Environmental Toxicology and Chemistry* 37:160-165. DOI 10.1002/etc.3940
30. Foo CF, VJ Bennett, **AM Hale**, JM Korstian, AJ Schildt, and DA Williams. 2017. Increasing evidence that bats actively forage at wind turbines. *PeerJ* 5:e3985. DOI 10.7717/peerj.3985
29. Bennett VJ, **AM Hale**, and DA Williams. 2017. When the excrement hits the fan: fecal surveys reveal species-specific bat activity at wind turbines. *Mammalian Biology* 87:125-129. DOI 10.1016/j.mambio.2017.08.003
28. **Hale AM**. 2016. Interpreting failure to reject the null hypothesis of displacement from wind turbines in three species of grassland birds: Response to Johnson (2016). *The Condor: Ornithological Applications* 118:676-679. DOI 10.1650/CONDOR-16-71.1
27. Katzner T, V Bennett, T Miller, A Duerr, M Braham, and **A Hale**. 2016. Wind energy development: methods for assessing risks to birds and bats pre-construction. *Human-Wildlife Interactions* 10:42-52. \*Invited review
26. Korstian JM, **AM Hale**, VJ Bennett, and DA Williams. 2016. Using DNA barcoding to improve bat carcass identification at wind farms in the United States. *Conservation Genetics Resources* 8:27-34. DOI 10.1007/s12686-015-0509-4
25. Korstian JM, **AM Hale**, and DA Williams. 2015. Genetic diversity, historic population size, and population structure in 2 North American tree bats. *Journal of Mammalogy* 96:972-980. DOI 10.1093/jmammal/gyv101
24. Korstian JM, AJ Schildt, VJ Bennett, DA Williams, and **AM Hale**. 2015. A method for PCR-based identification of bat species from fecal samples. *Conservation Genetics Resources* 7:803-806. DOI 10.1007/s12686-015-0488-5
23. Groff PA, **AM Hale**, and BA Whitlock. 2015. Chloroplast lineages in disjunct western North American populations of *Swertia perennis* (Gentianaceae). *Systematic Botany* 40:220-228.
22. Bennett VJ, and **AM Hale**. 2014. Red aviation lights on wind turbines do not increase bat-turbine collisions. *Animal Conservation* 17:354-358.
21. Bennett VJ, **AM Hale**, KB Karsten, CE Gordon, and BJ Suson. 2014. Effect of wind turbine proximity on nesting success in shrub-nesting birds. *American Midland Naturalist* 172:317-328.
20. **Hale AM**, ES Hatchett, JA Meyer, and VJ Bennett. 2014. No evidence of displacement due to wind turbines in breeding grassland songbirds. *The Condor: Ornithological Applications* 116:472-482.
19. Horner JD, EB Hodcroft, **AM Hale**, and DA Williams. 2014. Clonality, genetic variation, and the origin of isolated western populations of the carnivorous plant, *Sarracenia alata*. *Journal of the Torrey Botanical Society* 141:326-337.
18. Korstian JM, **AM Hale**, and DA Williams. 2014. Development and characterization of microsatellite loci for eastern red and hoary bats (*Lasiurus borealis* and *L. cinereus*). *Conservation Genetics Resources* 6:605-607. DOI 10.1007/s12686-014-0151-6
17. Hatchett ES, **AM Hale**, VJ Bennett, and KB Karsten. 2013. Wind turbines do not negatively affect nest success in the Dickcissel (*Spiza americana*). *The Auk* 130:520-528.

16. Korstian JM, **AM Hale**, VJ Bennett, and DA Williams. 2013. Advances in sex determination in bats and its utility in wind-wildlife studies. *Molecular Ecology Resources* 13:776-780.
15. Stevens TK, **AM Hale**, KB Karsten, and VJ Bennett. 2013. An analysis of displacement from wind turbines in a wintering grassland bird community. *Biodiversity and Conservation* 22:1755-1767.
14. Rubenstahl TG, **AM Hale**, and KB Karsten. 2012. Nesting success of Scissor-tailed Flycatchers (*Tyrannus forficatus*) at a wind farm in northern Texas. *Southwestern Naturalist* 57:189-194.
13. Williams DA, C Leach, **AM Hale**, KB Karsten, E Mujica, D Barber, LA Linam, and N Rains. 2012. Development of tetranucleotide microsatellite loci and a non-invasive DNA sampling method for Texas horned lizards (*Phrynosoma cornutum*). *Conservation Genetics Resources* 4:43-45. DOI 10.1007/s12686-011-9469-5
12. Whitlock BA, **AM Hale**, JL Indorf, and CF Wilkins. 2011. Polyphyly of *Rulingia* and *Commersonia* (Lasiopetaleae, Malvaceae s.l.). *Australian Systematic Botany* 24:215-225.
11. Whitlock BA, and **AM Hale**. 2011. The phylogeny of *Ayenia*, *Byttneria*, and *Rayleya* (Malvaceae s.l.) and its implications for the evolution of growth forms. *Systematic Botany* 36:129-136.
10. Whitlock BA, **AM Hale**, and PA Groff. 2010. Intraspecific inversions pose a challenge for the *trnH-psbA* plant DNA barcode. *PLoS ONE* 5(7): e11533. doi:10.1371/journal.pone.0011533
9. Williams DA, and **AM Hale**. 2008. Investment in nesting activities and patterns of within- and extra-group genetic paternity in a cooperatively breeding bird. *The Condor* 110:13-23.
8. Williams DA, and **AM Hale**. 2007. Female-biased helping in a cooperatively breeding bird: female benefits or male costs? *Ethology* 113:534-542.
7. **Hale AM**. 2006. The structure, context, and functions of group singing in black-breasted wood-quail (*Odontophorus leucolaemus*). *Behaviour* 143:511-533.
6. **Hale AM**. 2006. Group living in the black-breasted wood-quail and the use of playbacks as a survey technique. *The Condor* 108:107-119.
5. Williams DA, and **AM Hale**. 2006. Helper effects on offspring production in cooperatively breeding brown jays (*Cyanocorax morio*). *The Auk* 123:847-857.
4. **Hale AM**. 2004. Predation risk associated with group singing in a Neotropical wood-quail. *The Wilson Bulletin* 116:167-171.
3. Williams DA, E Berg, **AM Hale**, and CR Hughes. 2004. Characterization of microsatellites for parentage studies of white-throated magpie-jays (*Calocitta formosa*) and brown jays (*Cyanocorax morio*). *Molecular Ecology Notes* 4:509-511.
2. **Hale AM**, DA Williams, and KN Rabenold. 2003. Territoriality and neighbor assessment in brown jays (*Cyanocorax morio*) in Costa Rica. *The Auk* 120:446-456.
1. **Hale AM**, and CR Hughes. 2003. Characterization of polymorphic microsatellite loci in a Neotropical wood-quail, *Odontophorus leucolaemus*. *Molecular Ecology Notes* 3:508-510.

#### **PRESENTATIONS (past 3 years)**

- Stevens TK, **AM Hale**, and DA Williams. 2022. How does urbanization impact the distribution of a habitat specialist in an urban forest fragment? Texas Conservation Symposium, Georgetown, TX, Virtual Meeting. *\*Best Graduate Student Oral Presentation.*
- Stevens TK, **AM Hale**, and DA Williams. 2021. How does urbanization impact the distribution of a habitat specialist in an urban forest fragment? The Wildlife Society's 28<sup>th</sup> Annual Conference, Virtual Meeting.

- Chipps AC, **AM Hale**, SP Weaver, and DA Williams. 2021. Genetic diversity, population structure, and effective population size in two yellow bat species in south Texas. 100<sup>th</sup> Annual Meeting of the American Society of Mammalogists. Virtual Meeting.
- Stevens TK, **AM Hale**, and DA Williams. 2021. How does urbanization impact breeding bird occupancy in the Great Trinity Forest? Texas Conservation Symposium, Georgetown, TX, Virtual Meeting.
- Guest EE, BF Stamps, SP Weaver, **AM Hale**, CD Hein, M Chaffee, JO Ugland, B Morton, J Crane, and SR Fritts. 2021. Analysis of eastern red bat echolocation behavior in the presence of an ultrasonic acoustic deterrent. Annual Meeting of the Texas Chapter of the Wildlife Society. Virtual Meeting.
- Stamps BF, EE Guest, SP Weaver, **AM Hale**, CD Hein, M Chaffee, JO Ugland, B Morton, J Crane, and SR Fritts. 2021. Tracking eastern red bat movement response to an ultrasonic acoustic deterrent in flight cage trials. Annual Meeting of the Texas Chapter of the Wildlife Society. Virtual Meeting.
- Stamps BF, EE Guest, SP Weaver, **AM Hale**, CD Hein, M Chaffee, JO Ugland, B Morton, J Crane, and SR Fritts. 2020. Preliminary results on effectiveness of an ultrasonic acoustic deterrent from bat flight cage trials. 13<sup>th</sup> NWCC Wind Wildlife Research Meeting. Virtual Meeting.
- Veers P, J Diffendorfer, K Dykes, **A Hale**, T Katzner, E Lanz, and J Mclvor. 2020. Wind energy and wildlife: grand challenges and opportunities. 13<sup>th</sup> NWCC Wind Wildlife Research Meeting. Virtual Meeting.
- Page J, **A Hale**, T Hayes, C Hein, and S Pruitt. 2020. It takes a village: driving a sustainable future for tree-bats and wind energy. AWEA 2020 Wind Project Siting & Environmental Compliance Virtual Summit. Online Event.
- Chipps A, **A Hale**, S Weaver, and D Williams. 2020. Genetic approaches improve our understanding of bat-wind turbine impacts. Annual Meeting of the Texas Chapter of the Wildlife Society, Corpus Christi, TX.
- Stevens TK, **AM Hale**, and DA Williams. 2019. Using time-to-detection to model occupancy in songbirds in an urban bottomland forest. Association of Field Ornithologists (AFO) and Wilson Ornithological Society (WOS) Joint Meeting, Cape May, NJ.
- Chipps A, **A Hale**, S Weaver, and D Williams. 2019. Genetic approaches improve our understanding of bat-wind turbine impacts. 49<sup>th</sup> Annual Symposium of the North American Society for Bat Research, Kalamazoo, MI.
- Hale AM**, A Chipps, K Scolman, S Weaver, and D Williams. 2019. Genetic approaches improve our understanding of bat-wind turbine impacts. 5<sup>th</sup> Conference on Wind Energy and Wildlife Impacts (CWW 2019), Stirling, Scotland.

#### **INVITED SEMINARS (past 5 years)**

- Hale AM**. 2021. Genetic approaches reduce uncertainty regarding bat mortality at wind energy facilities - lessons from south Texas. Western EcoSystems Technology (WEST). Invited Webinar. Cheyenne, WY.
- Becker M, **A Hale**, C Hein, T Peterson, and S Weaver. 2020. Bats: Methodologies and technologies used to study impacts of wind turbines on bats. Wildlife & Wind Energy Webinar Series: Considerations for Monitoring and Managing Impacts. Sponsored by the National Renewable Energy Laboratory and Defenders of Wildlife. Topic #4 in a 9-part series.

- Hale AM.** 2019. Could the smooth surfaces of tower monopoles be a contributing factor to bat fatalities at wind turbines? State of the Science and Technology for Minimizing Impacts to Bats from Wind Energy, Sponsored by the U.S. DOE WETO and NREL, Golden, CO.
- Hale AM.** 2019. Impacts of wind energy on birds and bats. Texas Master Naturalist, Elm Fork Chapter, Denton, TX.
- Hale AM.** 2019. DE-EE0007033 Texturizing wind turbine towers to reduce bat mortality. U.S. Department of Energy – 2019 Wind Energy Technologies Office (WETO) Peer Review, Washington, D.C.
- Hale AM.** 2018. Overview of strategies to avoid, minimize, and compensate for impacts to bats. American Wind Wildlife Institute Workshop: Wind Energy & Wildlife in New Mexico, Albuquerque, NM.
- Hale AM,** and VJ Bennett. 2018. Texturizing wind turbine towers to reduce bat mortality (DE-EE0007033). National Wind Coordinating Collaborative (NWCC) Webinar: Status and Findings of Developing Technologies for Bat Detection and Deterrence at Wind Facilities Webinar 1: Low TRL (technology readiness level) projects.
- Hale AM,** and VJ Bennett. 2018. TCU-NextEra Energy Resources wind-wildlife research initiative update. NextEra Energy Resources, Juno Beach, FL.
- Hale AM.** 2017. Birds, bats, and habitat. Wyoming’s Wind Energy Future: Opportunities, Challenges, & Tradeoffs. An Emerging Issues Forum convened by the Ruckelshaus Institute and Center for Energy Economics and Public Policy, University of Wyoming, Laramie, WY.
- Hale AM.** 2017. Impacts of wind energy on birds and bats: current efforts to reduce bat mortality. Texas Master Naturalist, North Texas Chapter, Dallas, TX.
- Hale AM.** 2017. DE-EE0007033 Texturizing wind turbine towers to reduce bat mortality. U.S. Department of Energy – 2016 Wind Energy Technologies Office (WETO) Peer Review, Washington, D.C.
- Hale AM,** and VJ Bennett. 2017. TCU-NextEra Energy Resources wind-wildlife research initiative update. NextEra Energy Resources, Juno Beach, FL.

#### **EDITORSHIP, CONSULTANTSHIPS, AND APPLIED PROFESSIONAL ACTIVITIES (past 5 years)**

<b>Reviewer Board</b>	2020-present
Diversity	
<b>Scientific Advisory Committee, Member</b>	2018-present
Bats and Wind Energy Cooperative	
<b>Science Advisor</b>	2011-present
Renewable Energy Wildlife Institute (REWI), Research Committee <i>formerly the American Wind Wildlife Institute (AWWI)</i>	
<b>Associate Editor</b>	2015-2022
Ornithological Applications <i>formerly – The Condor: Ornithological Applications</i>	
<b>Invited Merit Review Panel Participant</b>	2022
RFP No. RFX-2021-10708 “Enabling Coexistence Options for Wind Energy and Wildlife – Bat Behavior Research and Technology Advancement. National Renewable Energy Laboratory (NREL)	
<b>Invited Merit Review Panel Participant</b>	2021

FOA-0002237 Offshore Wind Energy Environmental Research and Instrumentation Validation. U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy

**Guest Editor** 2020-2021

Special Issue of the journal *Animals* (ISSN 2076-2615; IF 2.323): “Bat Biology in Relation to Wind Energy Development”

**Invited Project Reviewer** 2019-2020

FOA0001924 Advanced Wind R&D to Reduce Costs and Environmental Impacts; Topic Area 1: Advancing Smart Curtailment Strategies. U.S. Department of Energy, Energy Efficiency & Renewable Energy

**Invited Speaker and Panelist** 2019

State of the Science and Technology for Minimizing Impacts to Bats from Wind Energy, DOE WETO and NREL, November 13-14, 2019, Golden, CO.

**Invited Merit Review Panel Participant** 2018

FOA0001924 Advanced Wind R&D to Reduce Costs and Environmental Impacts; Topic Area 1: Advancing Smart Curtailment Strategies. U.S. Department of Energy, Energy Efficiency & Renewable Energy

**Invited Panel Participant** 2017

American Wind Wildlife Institute (AWWI) Annual Meeting and Open House, Panel – “How Advanced Technologies are Minimizing Impacts and Creating Opportunities”

## MEMBERSHIPS AND SERVICE TO PROFESSIONAL ORGANIZATIONS

American Ornithological Society (formerly American Ornithologist’s Union and Cooper Ornithological Society); Association of Field Ornithologists; Ecological Society of America; National Wind Coordinating Collaborative (NWCC) Wind Wildlife Research Meetings (abstract reviewer, meeting advisor, session moderator); North American Society for Bat Research (Student Poster Judge 42<sup>nd</sup> Annual Symposium, 2012); The Wildlife Society (Renewable Energy Working Group, 2013-2018, 2019-2023; Student Presentation & Poster Judge, 20<sup>th</sup> Annual Conference, 2013; Poster abstract reviewer 2014); Wilson Ornithological Society

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