

# Clarissa Starbuck

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## **EDUCATION**

July 2014–May 2019

Northern Arizona University

Flagstaff, AZ

***Ph.D. in Forest Science***

Dissertation: “Using echolocation to predict bat habitat in northern Arizona”

Degree awarded: May 2019

January 2011–May 2013

University of Missouri

Columbia, MO

***M.S. in Fisheries and Wildlife Sciences***

Thesis: “Bat occupancy of forests and managed savannas and woodlands in the Missouri Ozark Region”

Degree awarded: May 2013

August 2006–May 2010

University of Missouri

Columbia, MO

***B.S. in Fisheries and Wildlife Sciences with minors in Captive Wild Animal Management, Animal Sciences, and Biological Sciences***

Degree awarded: May 2010

## **POSITIONS**

May 2019–Present

Terre Haute, IN

Indiana State University

***Postdoctoral Research Associate***

Supervisor: Joy O’Keefe, Ph.D.

- Oversee technicians and graduate students during summer field work in northeastern Missouri
- Capture surveys of bats in northeastern Missouri using mist nets
- Fall swarm surveys of bats in southern Missouri using harp traps
- Tracking Indiana bats to roost trees using radio telemetry
- Emergence counts at Indiana bat roost trees
- Data management and analysis

October 2018–March 2019

Flagstaff, AZ

Northern Arizona University

***Instructor***

Supervisor: James Allen, Ph.D.

- Prepared presentations, quizzes, and exams for Forestry 250-Arizona Forests and Wildlife, an online course for undergraduate students
- Graded assignments and exams

June 2014–July 2018

Flagstaff, AZ

Northern Arizona University

***Graduate Research Assistant***

Supervisor: Carol Chambers, Ph.D.

- Designed a research study and developed hypotheses
- Wrote a project proposal that was approved by my dissertation committee before beginning field work
- Generated maps in ArcGIS for placement of equipment
- Hired and managed four field technicians for the research project
- Installed Wildlife Acoustics SM3Bat detectors and identified bat calls using Sonobat 3 and Analoow
- Analyzed landscape data in ArcMap version 10
- Organized and identified hundreds of thousands of bat call data files for analysis
- Built and analyzed landscape models in program R
- Prepared three manuscripts for publication
- Compiled hundreds of papers for a literature review to be published
- Completed qualifying exams in the following subjects: bat ecology and evolution, statistics, bat conservation
- Relevant coursework: Research Methods, Statistical Methods I and II, Map Design and GIS, Introduction to R, Wildlife Habitat Relationships, Applied Sampling

January 2017–May 2017

Flagstaff, AZ

Northern Arizona University

***Teaching Assistant***

Supervisor: James Allen, Ph.D.

- Graded exams for undergraduate Forestry classes
- Attended undergraduate GIS labs and answered questions from students about using ArcMap version 10

May 2013–June 2014

Columbia, MO

University of Missouri

***Senior Research/Lab Technician*** (Post Graduate)

Supervisor: Sybill Amelon, Ph.D.

- Compiled and analyzed data for bat home range by day study using program R and ArcGIS
- Helped with White Nose Syndrome treatment trials project on captive gray bats in hibernation chambers
- Compiled data on roost trees of bats in northern Missouri
- Installed Anabat II and SD1 bat detectors
- Conducted vegetation surveys using prism plots
- Captured bats at locations in Missouri using mist nets and harp traps
- Collected and identified bat call data using Anabat and Analoow
- Entered data into a database
- Published a manuscript in the Wildlife Society Bulletin

January 2011–May 2013

Columbia, MO

University of Missouri

***Graduate Research Assistant***

Supervisors: Frank Thompson, Ph.D. and Sybill Amelon, Ph.D.

- Designed a research study and developed hypotheses
- Wrote a project proposal that was approved by my thesis committee before beginning field work
- Generated maps in ArcGIS for placement of equipment
- Installed Anabat II and SD1 bat detectors and identified bat calls with AnaloookW
- Conducted vegetation surveys prism plots and fixed radius plots
- Entered vegetation data using Microsoft Excel
- Used ArcMap and Fragstats to analyze landscape data
- Analyzed data using SAS and single-season occupancy modeling in program Presence
- Hired and managed two technicians to help with field work
- Wrote and defended my thesis
- Relevant coursework: Conservation Biology, Introduction to GIS, Design of Ecological Experiments, Applied Statistical Models, Landscape Ecology and GIS Analysis, Practice of Silviculture

January 2012–May 2012

Columbia, MO

University of Missouri

***Teaching Assistant***

Supervisor: Matthew Gompper, Ph.D.

- Taught Fisheries and Wildlife 3660: Mammalogy laboratory to junior and senior undergraduates
- Led review sessions for students in Mammalogy lab
- Set up, proctored, and graded Mammalogy laboratory exams

May 2007–August 2007 and June 2008–January 2011

University of Missouri

Columbia, MO

***Field Research Technician***

Supervisors: Sybill Amelon, Ph.D. and Kathryn Womack

- Transported, installed, maintained, and operated telemetry, acoustic, and insect trap equipment
- Captured and identified bats at several locations in Missouri using mist nets and harp traps
- Tracked Indiana bats at night for resource selection and during the day to roost trees using radio telemetry
- Set up Anabat II and Anabat SD1 bat detectors
- Entered telemetry and prism plot data using Microsoft Excel and Microsoft Access
- Identified bat calls using AnaloookW
- Conducted vegetation surveys using prism plots
- Extracted DNA from bat wing punch samples
- Ran polymerase chain reaction (PCR) on extracted DNA

- Ran agarose gel for electrophoresis

August 2007–May 2010  
 MU Student Recreation Center      Columbia, MO  
*Climbing Wall Technician*

September 2006–May 2007  
 MU Veterinary Teaching Hospital      Columbia, MO  
*After Hours Clinic Crew in the ICU*

May 2003–June 2006  
 The Centre and SplashZone      Rolla, MO  
*Lifeguard*

### **PERMITS**

I am listed under Kathryn Womack’s federal permit (#TE98063A-0) to run my own site for the capture of Indiana bats (*Myotis sodalis*), northern long-eared bats (*Myotis septentrionalis*), and gray bats (*Myotis grisescens*) in Missouri. I will be submitting my own federal permit application for these species in December 2019.

### **WORKSHOPS/TRAINING**

Acoustic Data Management Workshop with      March 7–9, 2015  
 Bat Conservation and Management  
 Alton, IL

- Theory of recording and analyzing bat acoustic calls
- Management of acoustic files
- Used auto-classification software programs (BCID, EchoClass, Sonobat, Kaleidoscope Pro) and learned to interpret outputs from these programs

Acoustic Analysis Workshop with Cori Lausen      April 24–26, 2014  
 Phoenix, AZ

- Used AnaloookW to identify species and species groups from acoustic files
- Learned how to create identifying filters in AnaloookW

Wildlife Acoustics Techniques and Hardware Workshop      April 21–23, 2014  
 Phoenix, AZ

- Basic introduction to bat acoustics and bat detector technology
- Management of raw acoustic files
- Used Kaleidoscope Pro to identify species and species groups from acoustic files
- Learned techniques and gained hands-on experience with techniques for passive and active bat detector use

### **PUBLICATIONS**

Starbuck, C. A., Considine, E. H., and Chambers, C. L. Morphology predicts bat activity at multiple scales in a post wildfire landscape. PLoS ONE. In Preparation.

Starbuck, C. A. 2019. Using echolocation to predict bat habitat in northern Arizona. Dissertation, Northern Arizona University, Flagstaff, USA.

Starbuck, C. A., Amelon, S. K., and Thompson, F. R. 2015. Relationships between bat occupancy and habitat and landscape structure along a savanna, woodland, forest gradient in the Missouri Ozarks. *Wildlife Society Bulletin* 39(1): 20–30.

Starbuck, C. A. 2013. Bat occupancy of forests and managed savanna and woodland in the Missouri Ozark region. Thesis, University of Missouri, Columbia, USA.

### **POSTERS/PRESENTATIONS**

Starbuck, C. A., N. J. Castaneda, M. Jorgensen, M. L. Hoggatt, D. K. Hews, and J. M. O’Keefe. How do Indiana bat populations respond to forest management? [poster]. In: 49<sup>th</sup> North American Symposium on Bat Research, October 23–26, 2019; Kalamazoo, MI.

Starbuck, C. A. and C. L. Chambers. “Predicting habitat use by bats to protect bats and inform wind energy development,” Oral presentation at the 48<sup>th</sup> North American Symposium on Bat Research, October 24–27, 2018; Puerto Vallarta, Jal., Mexico.

Starbuck, C. A. and C. L. Chambers. “Predicting habitat use by bats to protect bats and inform wind energy development,” Oral presentation at the Wildlife Society 25<sup>th</sup> Annual Conference, October 7–11, 2018; Cleveland, OH.

Starbuck, C. A., E. H. Considine, and C. L. Chambers. “Morphology predicts bat activity at multiple scales in a post wildfire landscape,” Oral presentation at the 47<sup>th</sup> North American Symposium on Bat Research, October 18–21, 2017; Knoxville, TN.

Starbuck, C. A., and C. L. Chambers. Predicting habitat use by bats to protect bats and inform wind energy development [poster]. In: The Wildlife Society 24<sup>th</sup> Annual Conference; September 23–27, 2017; Albuquerque, NM.

Starbuck, C. A. and C. L. Chambers. “Predicting habitat use by bats to protect bats and inform wind energy development,” Oral presentation at the 14<sup>th</sup> Biennial Conference of Science and Management on the Colorado Plateau and Southwest Region; September 11–14, 2017; Flagstaff, AZ.

Starbuck, C. A. and C. L. Chambers. “Predicting habitat use by bats to protect bats and inform wind energy development,” Oral presentation at the 2<sup>nd</sup> International Symposium on Bat Echolocation Research, March 26–April 1, 2017; Tucson, AZ.

Starbuck, C. A. and C. L. Chambers. “A review of echolocation detection studies,” Oral presentation at the 2<sup>nd</sup> International Symposium on Bat Echolocation Research, March 26–April 1, 2017; Tucson, AZ.

Starbuck, C. A. and C. L. Chambers. “Predicting habitat use by bats to protect bats and inform wind energy development,” Oral presentation at the 50<sup>th</sup> Joint Annual Meeting of the Arizona and New Mexico Chapters of the Wildlife Society and Arizona/New Mexico Chapter of The American Fisheries Society, February 9–11, 2016; Farmington, NM.

Starbuck, C. A. and C. L. Chambers. Predicting habitat use by bats to protect bats and inform wind energy development [poster]. In: Wind Wildlife Research Meeting XI; November 29–December 2, 2016; Broomfield, CO.

Starbuck, C. A. and C. L. Chambers. Predicting habitat use by bats to protect bats and inform wind energy development [poster]. In: The Wildlife Society 23<sup>rd</sup> Annual Conference; October 15–19, 2016; Raleigh, NC.

Starbuck, C. A. and C. L. Chambers. Predicting habitat use by bats to protect bats and inform wind energy development [poster]. In: 46<sup>th</sup> North American Symposium on Bat Research; October 12–15, 2016; San Antonio, TX.

Starbuck, C. A. and C. L. Chambers. “A review of echolocation detection studies,” Oral presentation at the 49<sup>th</sup> Joint Annual Meeting of the Arizona and New Mexico Chapters of the Wildlife Society and Arizona/New Mexico Chapter of The American Fisheries Society; February 4–6, 2016; Flagstaff, AZ.

Starbuck, C. A. and C. L. Chambers. A review of echolocation detection studies [poster]. In: 45<sup>th</sup> North American Symposium on Bat Research; October 28–31, 2015; Monterey, CA.

Womack, K.M., C. A. Starbuck, S. K. Amelon, and F. R. Thompson. “Roost tree selection by Indiana bats in an agricultural landscape,” Oral presentation at the 45<sup>th</sup> North American Symposium on Bat Research; October 28–31, 2015; Monterey, CA.

Starbuck, C. A., E. H. Saunders, and C. L. Chambers. “Bat occupancy in a patchy post-fire landscape,” Oral presentation at the 13<sup>th</sup> Biennial Conference of Science and Management on the Colorado Plateau and Southwest Region; October 4–6, 2015; Flagstaff, AZ.

Starbuck, C. A., C. L. Chambers and S. A. Cushman. “Bat activity in a post-wildfire landscape,” Oral presentation at the North American Joint Bat Working Group Meeting, March 3–6, 2015; St. Louis, MO.

Starbuck, C. A. S. K. Amelon and F. R. Thompson. Bat occupancy of forests and managed savanna and woodland in the Missouri Ozark region [poster]. In: 74<sup>th</sup> Midwest Fish & Wildlife Conference; January 26–29, 2014; Kansas City, MO.

Starbuck, C.A., K.M. Womack and S.K. Amelon. Are we seeing the “Big Picture”? A look at home range size by day for two species [poster]. In: 16<sup>th</sup> International Bat Research Conference and 43<sup>rd</sup> North American Symposium on Bat Research; August 11–15, 2013; San Jose, Costa Rica.

Starbuck, C.A., S.K. Amelon and F.R. Thompson. “Bat occupancy of forest and managed savanna and woodland in the Missouri Ozark Region,” Oral presentation at the 42<sup>nd</sup> North American Society for Bat Research meeting. San Juan, Puerto Rico, October 27, 2012.

Starbuck, C.A., S.K. Amelon, and F. R. Thompson. Bat occupancy of forest and managed savanna and woodland in the Missouri Ozarks [poster]. In: 17<sup>th</sup> Annual Meeting of the Southeastern Bat Diversity Network and 22<sup>nd</sup> Colloquium on Conservation of Mammals in the Southeastern United States; February 23–25, 2012; Louisville, KY.

Starbuck, C.A., S.K. Amelon, and F.R. Thompson. Bat occupancy of forest and managed savanna and woodland in the Missouri Ozarks [poster]. In: 41<sup>st</sup> Annual North American Symposium on Bat Research; October 26–29, 2011; Toronto, ON, Canada.

### **VOLUNTEER EXPERIENCE**

Arizona Game and Fish Watchable Wildlife Events Multiple sites in Arizona	Summer 2018
<ul style="list-style-type: none"><li>Volunteered with bat netting events with AZ Game and Fish for public</li></ul>	
Led mist netting for bats with the USGS during Grand Canyon Youth river trip Colorado River, AZ	July 12–20, 2017
Invited to speak to 5 <sup>th</sup> and 6 <sup>th</sup> graders at Heritage Elementary School about bats Williams, AZ	March 3, 2017
Northern Arizona School of Forestry Centennial Campout Flagstaff, AZ	September 10, 2016
<ul style="list-style-type: none"><li>Spoke to incoming undergraduates about wildlife research.</li></ul>	
Arizona Bat Blitz 2016 Apache-Sitgreaves National Forest	June 27–July 1, 2016
Invited to speak to children at Early Learning Adventures about bats Flagstaff, AZ	October 26, 2015
Northern Arizona School of Forestry Centennial Campout Flagstaff, AZ	September 12, 2015
<ul style="list-style-type: none"><li>Spoke to incoming undergraduates about wildlife research.</li></ul>	
Arizona Bat Blitz 2014 Apache-Sitgreaves National Forest	June 23–28, 2014
Bat World Ozarks Ashland, MO	Aug 2008–June 2014
<ul style="list-style-type: none"><li>Helped feed and care for orphaned or injured bats brought to the facility.</li></ul>	
Trapped bats in Costa Rica North American Society for Bat Research Field Trip Tirimбина Biological Reserve and La Selva Biological Station	August 15–17, 2013

Invited to speak to Girl Scouts about bats at Women of Wildlife day Columbia, MO	July 20, 2013
Arizona Bat Blitz 2013 Apache-Sitgreaves National Forest	July 8–12, 2013
<ul style="list-style-type: none"> <li>• Captured bats in eastern Arizona with mist nets</li> <li>• Tracked some individuals to their day roosts with radiotelemetry</li> </ul>	
Invited to speak at a Boy Scout meeting about bats Columbia, MO	January 22, 2013
Invited to speak to Girl Scouts about bats at Women of Wildlife day Columbia, MO	June 16, 2012
Invited to speak to Claymont Elementary School 3 <sup>rd</sup> graders about bats Ballwin, MO	March 19, 2012
Costa Rica Christmas Bat Count Tirimina Biological Reserve	December 13–23, 2011
10 <sup>th</sup> Annual Southeastern Bat Diversity Network Bat Blitz Pisgah National Forest and Vicinity Western North Carolina	July 31–August 4, 2011
Bat World Sanctuary 217 N. Oak Avenue Mineral Wells, TX 76067	June 18–July 5, 2009
Rolla Animal Hospital 1011 Stoltz Dr. Rolla, MO 65401	Summers '04, '05, '06
Tri-County Humane Society 705 E. Springfield St. James, MO 65559	Summer 2003

### **HONORS/ACTIVITIES**

The Wildlife Society – Member September 2014–Present  
Arizona Chapter of The Wildlife Society – Member September 2014–Present  
    Webmaster February 2017–Present  
NAU Forestry Graduate Student Association – Member September 2014–Present  
    Vice President January–December 2015  
    President January–December 2016  
North American Society for Bat Research – Member Oct. 2009–Present  
High Altitude Roller Derby – Member August 2014–May 2019  
    Athletic Director January 2015–December 2018



MU Wildlife and Fisheries Graduate Student Organization (WAFGSO) – Member Jan. 2011–May 2013

Graduate Student Association – WAFGSO Representative Fall 2011–May 2013

Mizzou Climbing Club – Member Fall '06–Spring '14, Treasurer '07–'08, President '08–'09

Fisheries and Aquatic Sciences Society – Member Spring '08–Fall '09, Historian Fall 2008

Mizzou Chapter of the Wildlife Society – Member Spring '08–Fall '09

Mizzou Pre-Veterinary Medical Club – Member '06–'07

### **AWARDS**

Indiana State University Research Project Support for Undergraduates (\$300) 2019

Wally Covington Travel Award (\$500) 2017

K.R. & Irene Hafen Forestry Scholarship (\$3,000) 2016

ARCS Award (\$7,500) 2016

Forestry Graduate Student Association Travel Grant (\$100) 2015

NAU Graduate Student Government Travel Award (\$100) 2015

### **STUDY ABROAD**

University of Queensland in Australia

June 8, 2008 to July 5, 2008