

**Elizabeth F. Waring**  
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### Education

2010-Present: **PhD candidate**, Department of Biological Sciences, Texas Tech University  
Dissertation title: **Linking nitrogen availability to carbon and nitrogen assimilation: how nutrient use strategies differ between native and invasive wetland species**  
Advisor: A. Scott Holaday

2010: **Master of Science in Biology**, Department of Biological Sciences, Fort Hays State University  
Thesis title: **Flooding tolerance of native and nonnative grasses: variation in photosynthesis, transpiration, respiration, and carbon isotope discrimination**  
Advisor: Brian R. Maricle

2007: **Bachelor of Science in Biology**, University of Wisconsin-Milwaukee

### Publications

Holaday, A.S., D.W. Schwilk, **E.F. Waring**, H. Guvvala, C.M. Griffin, *O.M. Lewis*. 2015. Plasticity of nitrogen allocation in the leaves of the invasive wetland grass, *Phalaris arundinacea* and co-occurring *Carex* species determines the photosynthetic sensitivity to nitrogen availability. *Journal of Plant Physiology*. 177:20-29. doi:10.1016/j.jplph.2015.01.008

**Waring, E.F.** and D.W. Schwilk. 2014. Plant dieback under exceptional drought driven by elevation, not by plant traits, in Big Bend National Park, Texas USA. *PeerJ* 2:e477 DOI: <http://dx.doi.org/10.7717/peerj.477>

**Waring, E.F.** and B.R. Maricle. 2013. Stomatal conductance correlates with flooding tolerance in *Phragmites australis* and *Sorghum halepense*. *Transactions of the Kansas Academy of Science* 115:161-166.

**Waring, E.F.** and B.R. Maricle. 2012. Photosynthetic variation and carbon isotope discrimination in invasive wetland grasses in response to flooding. *Environmental and Experimental Botany* 77:77-86

### Manuscripts in prep

**Waring, E.F.** and A.S. Holaday. Rise in growth temperatures and nitrogen availability may reduce the gap in carbon gain and structural leaf traits between an invasive and a native wetland species. In prep.

**Waring, E.F.**, D.W. Schwilk, J. Moore-Kucura and A.S. Holaday. Differences in nitrogen-use strategies and soil nitrogen availability throughout the growing season in native *Carex stricta* and invasive *Phalaris arundinacea*. In prep.

**Waring, E.F.** and A.S. Holaday. Competition and nitrogen availability affect nitrogen-use strategies in native and invasive wetland plants. In prep.

### Grants

Student Research Grant from the Society of Wetland Scientists 2014 (\$1000)

Student Travel Grant from The Wetland Foundation 2013 (\$1200)

Student Travel Grant for ESA 2012 from the Physiological Ecology Section of ESA (\$500)

Field Travel Grant 2011 from The Wetland Foundation (\$800)

Graduate Student Research Grant 2009 from Kansas Academy of Science (\$1000)  
Student Travel Grant for Weed Science Society of America Annual Meeting 2010 (\$750)  
Student Research Mini-Grant 2010 from Fort Hays State University Graduate School (\$250)  
Student Research Travel Grant 2010 from Fort Hays State University Graduate School (\$250)

### **Awards/Scholarships**

Best Presentation in Plant and Soil Science Category: Texas Tech Annual Biological Sciences Symposium, 2014  
Best Presentation in Proposal Category: Texas Tech Annual Biological Sciences Symposium, 2011  
Honorable Mention Student Paper Presentation: Society of Wetland Scientists Annual Meeting, 2010  
AT&T Chancellor's Fellowship: Texas Tech University, 2010-2014  
Provost Doctoral Fellowship: Texas Tech University, 2010-2012  
Outstanding Thesis/Field Study: Fort Hays State University, 2010  
3rd place master's paper presentation: Kansas Academy of Science 2010 meeting  
Fleharty Fellowship: 2009-2010  
3rd place graduate student poster: Fort Hays State University's Research and Creative Activities week

### **Professional Experience**

2013- Graduate Teaching Assistant, Department of Biological Sciences at Texas Tech University  
2012-2013 Graduate Research Assistant, Department of Biological Sciences at Texas Tech University  
2010-2012 Graduate Research Assistant, recipient of a Provost's Research Assistantship.  
2009-2010 Fleharty Fellow, Project title: Mechanisms of cold-tolerance in C4 photosynthetic plants  
Autumn 2009 Teaching Assistant. Taught lab for Biol 250, Introductory Botany.  
Autumn 2008-Autumn 2009 Graduate Wetlands Assistantship, Kansas Wetlands Education Center, Great Bend, KS.  
Autumn 2008 – Spring 2009 Sternberg Museum of Natural History, Hays, KS.  
Fall 2007 Research Assistant in Project in Cedarburg Bog for Drs. Jason Mills and Erica Young at the University of Wisconsin-Milwaukee.

### **Class Taught**

Biology 3306- Plant Biology: Summer 2013, Autumn 2013-2015  
Biology 1401-Biology of Plants for Non-Majors: Autumn 2013-Present  
Biology 250L- Botany Lab, Fort Hays State University, Autumn 2009

### **Professional Development**

TEACH (Teaching Effectiveness And Career enHancement) Fellow 2013-2014 "Program assists Ph.D. students in further developing teaching skills and exploring faculty roles. Program activities include one-on-one consultation, instructor videotaping, comprehensive class feedback, peer observations, project work with a faculty mentor, workshop attendance, and the development of a professional teaching portfolio."-from TEACH program website (<http://www.tlpd.ttu.edu/teach/index2.asp>) As part of the program attended workshops on improving rapport with students, discipline issues, using technology in classroom and other topics to improve teaching abilities.

### **Oral Presentations**

**Waring, E.F.** Teaching science to those who don't want to learn it. Presented during the Science Communication ignite session at the 99th meeting of the Ecological Society of America, Sacramento, CA, August 2014

**Waring, E.F., J. Moore-Kucera, D.W. Schwilk and A.S. Holaday.** Differences in nitrogen-use strategies

and soil nitrogen availability throughout the growing season in native *Carex stricta* and invasive *Phalaris arundinacea*. Presented at the 99th meeting of the Ecological Society of America, Sacramento, CA, August 2014

**Waring, E.F.**, J. Moore-Kucera and A.S. Holaday. Examining the relationship between seasonal variation in soil nitrogen and nitrogen-use strategies in native and invasive wetland plants. Presented at the Joint Aquatic Sciences Meeting, Portland, OR, May 2014

**Waring, E.F.**, J. Moore-Kucera and A.S. Holaday. Seasonal changes in nitrogen-use strategies and soil nitrogen availability in native and invasive wetland plants. Presented at the Texas Tech Annual Biological Sciences Symposium, Lubbock, TX, April 2014

**Waring, E.F.** and D.W. Schwilk. Influence of drought on canopy cover and plant dieback on an elevational gradient at Big Bend National Park Presented at the 98th Meeting of the Ecological Society of America, Minneapolis, MN, August 2013

**Waring, E.F.** and A.S. Holaday. Seasonal change effects on photosynthesis, nitrogen metabolism and soil nitrogen in competing invasive *Phalaris arundinacea* and native *Carex stricta*. Presented at the Annual Meeting of the Society of Wetland Scientists, Duluth, MN, June 2013  
<http://dx.doi.org/10.6084/m9.figshare.717199>

**Waring, E.F.** and A.S. Holaday. Effects of seasonal change on photosynthesis, nitrogen metabolism and soil nitrogen in competing invasive grass and native sedge Presented at the Southern Section American Society of Plant Biology, Little Rock, AR, April 2013

**Waring, E.F.** and A.S. Holaday. Effects of seasonal change on photosynthesis, nitrogen metabolism and soil nitrogen in competing invasive grass *Phalaris arundinacea* and native sedge *Carex stricta*. Presented at Texas Tech Annual Biological Science Symposium, Lubbock, TX, March 2013

**Waring, E.F.**, Z. He and A.S. Holaday. Photosynthetic response of the invasive grass, *Phalaris arundinacea*, and the native sedge *Carex stricta* that it replaces to climate change and nitrogen availability. Presented at the Southern Section American Society of Plant Biology, Ocean Springs, MS, April 2011

**Waring, E.F.**, Z. He and A.S. Holaday. Photosynthetic response of the invasive grass, *Phalaris arundinacea*, and the native sedge *Carex stricta* that it replaces to climate change and nitrogen availability. Presented at Texas Tech Annual Biological Science Symposium, Lubbock, TX, April 2011

**Waring, E.F.** and B.R. Maricle. Photosynthetic variation and carbon isotope discrimination in response to flooding in native and invasive grasses of central Kansas. Presented at Society of Wetland Scientist annual meeting, Salt Lake City, UT, June 2010

**Waring, E.F.** Mechanisms of chilling tolerance in C4 plants. Fleharty Fellowship Series. Fort Hays State University, May 2010

**Waring, E.F.** and B.R. Maricle. Changes in photosynthesis caused by flooding in native and nonnative wetland grasses of central Kansas. Presented at Southwestern Association of Naturalists annual meeting, Junction, TX, April 2010

**Waring, E.F.** and B.R. Maricle. Mechanisms of chilling tolerance in C4 plants. Kansas Academy of Science Annual Meeting, Hays, KS, April 2010

**Waring, E.F.** and B.R. Maricle. Effects of flooding on photosynthesis and respiration in native and invasive wetland grasses of central Kansas. Presented at Society of Range Management/Weed Science Society of America Joint Annual Meeting, Denver, CO, February 2010

Poster Presentations (\*indicates undergraduate researcher)

**Waring, E.F.** and A.S. Holaday. Competition and nitrogen availability affect nitrogen-use strategies in native and invasive wetland plants. Presented at the 100th Meeting of the Ecological Society of America in Baltimore, MD, August 2015. <http://dx.doi.org/10.6084/m9.figshare.1500792>

Griffin, C.M.\*, **E.F. Waring**, A.S. Holaday. The effects of soil nitrogen availability on the allocation of nitrogen to leaf processes for an invasive grass, *Phalaris arundinacea*, and native *Carex* species. Presented at the 99th Meeting of the Ecological Society of America in Sacramento, CA, August 2014. <http://f1000.com/posters/browse/summary/1096701>

**Waring, E.F.** and A.S. Holaday. The response of leaf nitrogen metabolism to seasonal changes in ammonium and nitrate for competing invasive *Phalaris arundinacea* and native *Carex stricta*. Presented at the 97th Meeting of the Ecological Society of America in Portland, OR, August 2012

**Waring, E.F.** and B.R. Maricle. Differences in photosynthesis and respiration due to flooding in native and nonnative wetland grasses of central Kansas. Presented at the Society of Wetland Scientists Annual Meeting, Madison, WI, June 2009

**Waring, E.F.** and B.R. Maricle. Effects of flooding on light harvesting and CO<sub>2</sub> fixation in native and nonnative wetland grasses of central Kansas. Presented for Fort Hays State University's Research and Creative Activities Week, Hays, KS, April 2009

**Waring, E.F.** and B.R. Maricle. Effects of flooding on light harvesting and CO<sub>2</sub> fixation in native and nonnative wetland grasses of central Kansas. Presented at the Kansas Academy of Science Annual Meeting, Topeka, KS, March 2009

### **Service**

Board of Directors, Texas Tech University Association of Biologists, 2012-2014

Vice-President, Texas Tech University Association of Biologists, 2011-2012

Grant Committee, Texas Tech University Association of Biologists, 2010-2011

Graduate student representative on Animal Physiologist position search committee. Fort Hays State University. 2010

Volunteer at National Wildlife Refuge Week, Quivira National Wildlife Refuge, 2008

### **Professional Societies**

Ecological Society of America; 2008 to present

Society of Wetland Scientists; 2009 to present

Southern Section-American Society of Plant Biologists; 2011 to present