

## Eric J. Baack

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### Appointments

2007- Assistant Professor, Dept. of Biology, Luther College, Decorah, IA.  
Associate professor starting fall 2013. Rulon Distinguished Professor starting 2016.

### Education

2006- Post-doctoral researcher, University of British Columbia, Vancouver, BC, in collaboration with Dr. Loren Rieseberg. Sunflower domestication, crop-wild gene flow, and genome evolution.  
2007

2003- Post-doctoral researcher, Indiana University, Bloomington, in collaboration with Dr. Loren Rieseberg.  
2006

2003 Ph.D., Population Biology, UC Davis. Dissertation: Ecological factors affecting tetraploid speciation in snow buttercups (*Ranunculus adoneus*: Ranunculaceae). Advisor: Dr. Maureen L. Stanton.

1990 MA, Secondary Science Education, Lewis and Clark College, Portland, OR.

1989 BA, *summa cum laude*, Philosophy, Carleton College, Northfield, MN. Noyes Prize for top junior student; honors on thesis.

### Teaching

Current courses: Principles of Biology: Ecology, Evolution, and Biodiversity (Bio 151); Biological Statistics (Bio 256), Evolutionary Biology (Bio 354), Ecology of the Southwest (Bio 140/240), Theater: Mirror of Society (Paideia 450).

### Research interests

My work is on plant ecology and evolution. In particular, I am interested in the origin of new plant species, the consequences of hybridization, and genome size evolution. Much of my research is conducted on sunflowers, including studies of domestication, gene flow from crops to wild relatives, and species barriers. My current collaborators include Dr. Daniel Ortiz-Barrientos (University of Queensland), Dr. Jennifer Dechaine (Central Washington University), Dr. John Burke (University of Georgia), and Dr. Jon Corbi (University of Georgia).

**Publications** (\* designates undergraduate co-author)

Baack, E, Melo, M, Rieseberg, L, and Ortiz-Barrientos, D. 2015. The origins of reproductive isolation. *New Phytologist* 207:968-984.

Ortiz-Barrientos, D and Baack, E. 2014. Species integrity in trees. *Molecular Ecology* 17: 4188-4191.

Delaney, J\* and Baack, E. 2012. Intraspecific chromosome number variation and prairie restoration: a case study in NE Iowa. *Restoration Ecology* 20: 576-583.

Sambatti, J. B., Strasburg, J. L, Ortiz-Barrientos D., Baack, E., and Rieseberg, L. 2012. Reconciling extremely strong barriers with high levels of gene exchange in annual sunflowers. *Evolution* 66:1459-1473.

Whitney, K. D., Boussau, B., Baack, E., and Garland, T, Jr. 2011. Drift and Genome Complexity Revisited. *PLoS Genet* 7:e1002092.

Whitney, K, Baack, E, Hamrick, J, Godt, M, Barringer, B, Bennett, M, Eckert, C, Goodwillie, C, Kalisz, S, Leitch, I, Ross-Ibarra, J. 2010. A role for nonadaptive processes in plant genome size evolution. *Evolution* 64:2097-2109.

Gammon, M, Baack, E, Forman, J, Kesseli, R. 2010. The viability, growth, and fertility of knapweed cytotypes in North America. *Invasive plant science and management* 3:208-218.

Sambatti, J. M. B., Ortiz-Barrientos, D., Baack, E. J., Rieseberg, L. H. 2008. Ecological selection maintains cytonuclear incompatibilities in hybridizing sunflowers. *Ecology Letters* 11:1082-1091.

Baack, E. J., Sapir, Y., Chapman, M., Burke, J, and Rieseberg, L. H. 2008. Selection on domestication traits and QTLs in crop-wild sunflower hybrids. *Molecular Ecology* 17:666-677.

Whitton, J, Sears, C, Baack, E., Otto, S. 2008. The dynamic nature of apomixis in angiosperms. *International Journal of Plant Sciences* 169:169-182.

Baack, E. J. and Rieseberg, L. H. 2007. A genomic view of hybrid speciation and introgression. *Current Opinion in Genetics and Development* 17:513-518.

Kane, N. and Baack, E. 2007. The origins of weedy rice. *Molecular Ecology* 16:4423-4425.

Baack, E. J., Emery N. C., and Stanton, M. L. 2006. Ecological factors limiting the distribution of *Gilia tricolor* in a California grassland mosaic. *Ecology* 87:2736-2745.

### **Publications, continued**

Baack, E. J. 2006. Engineered crops: when transgenes go wild. *Current Biology* 16: R583-584.

Rieseberg, L. H., Wood, T. E., and Baack, E. J. 2006. The nature of plant species. *Nature* 440: 524-527.

Baack, E. J. 2005b. Ecological factors affecting tetraploid speciation in *Ranunculus adoneus*: Minority cytotype disadvantage and barriers to triploid formation. *American Journal of Botany* 92: 1827-1835.

Baack, E. J. and Stanton, M. L. 2005. Ecological factors influencing tetraploid speciation in snow buttercups (*Ranunculus adoneus*): niche differentiation and tetraploid establishment. *Evolution* 59: 1936-1944.

Baack, E. J., Whitney, K. D. and Rieseberg, L. H. 2005. Hybridization and genome size evolution: timing and magnitude of nuclear DNA content increases in *Helianthus* homoploid hybrid species. *New Phytologist* 167: 623-630.

Baack, E. J. 2005a. To succeed globally, disperse locally: a stochastic spatial model for tetraploid establishment. *Heredity* 94: 538–546.

Baack, E. J. 2004. Cytotype segregation on regional and microgeographic scales in snow buttercups (*Ranunculus adoneus*: Ranunculaceae). *American Journal of Botany* 91: 1782-1787.

Robbins, L., Nadeau, J., Johnson, K., Kelly, M., Roselli-Reh fuss, L., Baack, E., Mountjoy, K., Cone, R. D. 1993. Pigmentation phenotypes of variant extension locus alleles result from point mutations that alter MSH receptor function. *Cell* 72: 827-834.

Koppula, S. V., Robbins, L. S., Lu, D., Baack, E., White, C. R., Swanson, N., Cone, R.D. 1997. Identification of common polymorphisms in the coding sequence of the human MSH receptor (MCIR) with possible biological effects. *Human Mutation* 9:30-36.

### **Book chapters**

Vogelsang, K., and Baack, E. 2009. "At the forest's edge: a place-based approach to teaching ecosystem services." In Reynolds et al (eds) *Teaching Environmental Literacy: Across Campus and Across the Curriculum*. Indiana University Press.

### **Book reviews**

Baack, E. (2009) Review of *Reticulate Evolution and Humans*. *Quarterly Review of Biology* 84:409-410.

**Publications, continued – book reviews**

Baack, E. J. and Rieseberg, L. H. (2006). Review of *The Hope, Hype and Reality of Genetic Engineering*. *Perspectives in Biology and Medicine* 49:150-152.

**Grants, Fellowships, and Honors**

- 2016            USDA National Institute of Food and Agriculture. \$499,505. With Dr John Burke, University of Georgia. Short-term experiments as predictors of long-term patterns of gene introgression in crop-wild hybrids.
- McElroy Foundation. \$2000. With undergraduate Sheri Schwert. “A Study of the Hydrology of Six Springs in Decorah, Iowa, Using Dye Tracing.
- 2014            Iowa Science Foundation, \$5000. Using next-generation DNA sequencing technologies to reveal relationships among perennial species of sunflowers (*Helianthus*)
- 2012            Howard Hughes Medical Institute – Undergraduate Science Education. \$1,500,000. (Part of Luther College team that wrote the proposal).
- McElroy Foundation. \$2000. With undergraduate Chelsea Weiss. Multi-drug resistant bacteria and efflux pumps.
- 2010            USDA National Institute of Food and Agriculture. \$492,000. With Drs. John Burke and Jenny Dechaine. A Multigenerational assessment of the fate and impact of crop gene introgression into wild sunflower
- 2008            Australian Research Council, AU\$248,000, with Dr. Daniel Ortiz-Barrientos. Speciation and the breakdown of coevolution during hybridization.
- Iowa Science Foundation, \$5000. Adaptation of native species to allelopathic invaders
- 2007            Grow Iowa Values Fund Grant, \$32,300. Ploidy variation in Iowa native and invasive species.
- 2000 - 2002    **NSF Dissertation Improvement Grant**, Environmental Biology, \$9100
- 2000            University of California Graduate Research Award, \$1500
- 1999 – 2000    Jastro Shields Research Grant, University of California, \$2400
- 1998            Pengelley Award for evolutionary research, \$1200  
Achievement Rewards for College Scientists (ARCS), \$5000

**Grants, Fellowships, and Honors, continued**

1997 - 2002	Center for Population Biology Research Award \$4200
1996	<b>NSF Pre-doctoral Fellowship</b> , \$70,000 (stipend and tuition)
1995	Partners in science implementation grant, \$3000. (Awarded to implement molecular biology curriculum in high school)
1995	Fred Meyer Memorial Trust, \$5000. (Molecular biology curriculum)
1993	Partners in Science Teachers Research Fellowship, \$12,000 (for summer research on molecular biology of mammalian pigmentation).
1992	NIH Teachers Research fellowship, \$5000 (stipend for summer research on molecular biology of mammalian pigmentation)

**Invited Presentations**

2015	University of New Mexico Luther College
2014	University of British Columbia University of Minnesota, Duluth, MN
2012	US Department of Agriculture Biotechnology Risk Assessment Principal Investigators Meeting, College Park, MD
2010	St Olaf College, Northfield, MN
2009	Indiana University, Bloomington, IN
2008	Washington University, St. Louis, MO
2007	Portland State University, Portland, OR
2006	Union College, Schenectady, NY Colgate University, Hamilton, NY Luther College, Decorah, IA

**Invited presentations, continued**

- 2004 Sweet Briar College, Sweet Briar, VA.  
Rutgers University, Newark, NJ  
University of Missouri, Columbia, MO  
Rice University, Houston, TX
- 2005 Wabash College, Crawfordsville, IN  
Kenyon College, Gambier, OH

**Other presentations**

- 2014 Other from an other other: scientists in human-alien encounters. Luther College Paideia Texts and Issues lecture, February 8, 2014, with Dr. Andy Hageman.
- 2011 Ecological restoration: keeping space for the wild. Luther College Paideia Texts and Issues lecture, February 22, 2011, with Dr. Beth Lynch.
- 2010 Darwin, Human Nature, and Morality. Luther College Philosophy Colloquium, March 2, 2010, with Dr. Loyal Rue.

**Conference presentations and posters (\* designates undergraduate co-author)**

- Joel Denney\*, Max Eness\*, Luke VonEschen\*, Kayla Ingvalson\*, Eric Baack. 2017. Bacteria levels and drug resistance in Decorah Area Streams, Springs, and the Upper Iowa River. Iowa Water Conference, Ames, IA.
- Sheri Schwert\*, Jack Hedstrom, Eric Baack. 2017. Connections between sinkholes and springs in NE Iowa. Iowa Ground Water Conference, Newton, IA.
- Abby Mark\*, Isabel de Ayala\*, David Carius\*, and Eric Baack. 2015. Genome size estimates for perennial sunflowers. Iowa Academy of Science, Des Moines, IA.
- Kimberly Howell\* and Eric Baack. 2014. Diversity and effect of endophytic fungi on Iowa prairie grasses. Iowa Academy of Science, Fort Dodge, IA.
- Eric Baack, Jennifer Dechaine, Birkin Owart, Gerald Seiler, and John Burke. 2012. Analysis of selection on domestication traits in sunflower (*Helianthus annuus*) crop-wild hybrids. Annual meeting of the Society for the Study of Evolution (poster, evolution meetings). Ottawa, Canada.
- Eric Baack and Beth Lynch. 2012. Developing institutional support for land stewardship at a Midwestern liberal arts college. Annual meeting of the Ecological Society of America (poster, ecology meetings). Portland, OR

**Conference presentations and posters (continued)**

- Eric Baack, \*Paul Atkins, and Daniel Ortiz-Barrientos. 2011. Reproductive barriers and gene flow between two species of *Helianthus*. Annual meeting of the Society for the Study of Evolution (Poster, Evolution meetings). Norman, OK.
- Eric Baack and \*Adam Ragheb. 2011. Investigating the genetic basis for tolerance of allelopathic invaders – I presentation. Iowa Academy of Sciences meeting, Waverly, IA
- \*Kimberly Stocks, \*Max Molzahn, \*Jason Hagemeyer, Eric Baack, Beth Lynch, and Kirk Larsen. 2011. Effect of fire and clearing on herbaceous vegetation in a woodland clearing - poster. Iowa Academy of Sciences meeting, Waverly, IA
- Eric Baack, Julianno Sambatti, Jared Strasburg, Daniel Ortiz-Barrientos, and Loren Rieseberg. 2010. Reproductive barriers and gene flow between two species of *Helianthus* – poster. Annual meeting of the Society for the Study of Evolution (Evolution meetings). Portland, OR.
- Baack, E., Wood, T., and Rieseberg, L. 2006. Effects of life history and mating system on reproductive incompatibility in flowering plants. Poster. Genetics of Speciation meeting, hosted by the American Genetics Association, Vancouver, BC.
- Baack, E., Sapir, Y., and Rieseberg, L. 2006. Selection on artificial crop-wild sunflower hybrids – oral presentation. Annual meeting of the Society for the Study of Evolution (Evolution meetings), Stony Brook, NY.
- \*Henderson, T., Baack, E, and Rieseberg, L. 2005. Selection against crop alleles in crop-wild sunflower hybrid zones - poster. Annual meeting of the Society for the Study of Evolution (Evolution meetings), Fairbanks, AK.
- Baack, E. J. 2003. Minority cytotype disadvantage and triploid block in snow buttercups. International Polyploid meetings, Linnean Society, London, UK.
- Baack, E. J. 2003. Minority cytotype disadvantage in snow buttercups. Evolution meetings, Chico, CA.
- Baack, E. J. 2002. Succeed globally, disperse locally: a stochastic spatial model for tetraploid establishment. Evolution meetings, Urbana, IL.
- Baack, E. J. 2001. Reproductive interference in sympatric snow buttercups. Annual meeting of the Botanical Society of America, Albuquerque, NM.
- Baack, E. J. 2001. Tetraploid advantage in snow buttercups? Evolution meetings, Knoxville, TN.
- Baack, E. J. 2000. Testing for niche differentiation in snow buttercups. Annual meeting of the Ecological Society of America, Snowbird, UT.

### **Teaching Experience**

- 2007- Assistant Professor, Dept. of Biology, Luther College. Biostatistics (BIO 256), Evolution (BIO 354), Principles: Evolution, Ecology, Biodiversity (BIO 151), Ecology of the Southwest (BIO 140 / 240), Theater, Mirror of Society (Paideia 450), Natural history of food (BIO 185)
- 2006-2007 Instructor, Evolutionary Genetics (Biology 336) and Population Ecology (Biology 303) University of British Columbia.
- 2006 Instructor, Evolution (Biology 318), Indiana University.
- 1997-2002 Teaching assistant, UC Davis. Courses included Evolution, Ecology, Plant Ecology, Introductory Zoology, and Future of Biology (experimental honors biology writing course).
- 1995-1996 Half-time coordinator for Health Sciences/Biotechnology Magnet Program at Jefferson High School, Portland, OR.
- 1990-1995 Biology teacher, Jefferson High school, Portland, Oregon. Department chair 1993-1995. Developed an integrated Biology/English course for freshman, wrote curriculum portions of US Dept. of Education magnet grant.

### **Undergraduate students mentored**

- 2016-2017 Luke Voneschen, Kayla Ingvalson, Max Eness, Joel Denney. Multi-drug resistant bacteria in local springs. HHMI & Rulon endowment funded research project.
- 2015-2017 Isabel de Ayala and Abby Mark. Estimates of genome size in perennial sunflowers. Research assistants / independent project.
- 2015 Megan Martinez, University of New Mexico. Genome size does not predict invasiveness in reed canary grass.
- 2013-2014 Ellen Behrens. Co-infection of deer ticks (*Ixodes scapularis*) by three pathogenic parasites: *Borrelia burgdorferi*, *Anaplasma phagocytophylum*, and *Babesia microtii*. Independent project.  
Kimberly Howell. Diversity of fungal endophytes in Indian Grass (*Sorghastrum nutans*) and effects on growth. Independent project.  
Anna Gudjonsdottir, Matt Rosene, Rebekah Schulz . Frequency of multi-drug resistant bacteria in NE Iowa streams. Independent project.



**Undergraduate students mentored, continued**

- 2012-2013 Hannah Rowse, Sarah Nicla, and Ellen Behrens. Research assistants with with 'A Multigenerational assessment of the fate and impact of crop gene introgression into wild sunflower' Anna Gudjonsdottir. Identification of multi-drug resistant bacteria from the Upper Iowa River. Independent project.
- 2011-2012 Chelsea Weiss. Multi-drug resistant bacteria and efflux pumps. Independent project, biology.  
Kaila Vogt, Anna Gudjonsdottir, Kimberly Stocks, and Sarah Nicla. Research assistants with with 'A Multigenerational assessment of the fate and impact of crop gene introgression into wild sunflower'  
Ellen Behrens. Resolving contamination in Seed Savers Exchange Brassica collections through flow cytometry.
- 2010-2011 Katrina Freund. 'Isolation and Characterization of Endophytic Fungi from Prairie Plants' Honors project, Biology. NCUR talk.  
Rachel Albert. 'Effect of ovulation on female behavior and male perceptions. Honors project, psychology and biology.  
Paul Atkins. "Effect of chloroplast genotype on hybridization" – collaborative research. Honors talk, poster author  
Sharon Heyer and Chelsea Weiss. Lab assistants with 'Speciation and the breakdown of coevolution during hybridization'.  
Megan Gress and Molly Tulkki. Lab assistants with 'A Multigenerational assessment of the fate and impact of crop gene introgression into wild sunflower'
- 2009-2010 David Anderson-Beckman. Resolving contamination in Seed Savers Exchange Brassica collections through flow cytometry  
Maria Carr. Honors thesis: Resveratrol and Pathogen Assessment in Native Grapes. NCUR presentation.  
Adam Ragheb. "Evolutionary response of native plants to allelopathic invaders" – collaborative research, poster author.
- 2008-2011 Katrina Freund & Andrew Kingsriter, field and lab assistants, multiple projects..
- 2009 Kristin Manges. Honors thesis. Epidemiological analysis of medical outcomes related to the historic 2008 flood in Winneshiek County, Iowa. NCUR talk.  
Nicole Littlejohn, Jterm independent study. Selection on crop-wild hybrids in Iowa in the summer of 2008  
John Delaney. Ploidy of seed germplasm used for prairie restoration compared to native prairies.

- 2008 Dan Stone, Luther College. "Evolutionary response of native plants to allelopathic invaders"  
Anna Wikan. "Ecological pressures facing plants at the southern edge of their ranges"  
Claire Schreiber. "Chromosome number variation in Iowa grasses"
- 2007 Christine Woolacott, UBC. "Examination of crop-wild sunflower hybrid zones."
- 2005-2007 Ben Atkinson, Indiana University honor thesis. "Origins of the Hopi and Havasupai sunflower."
- 2005-2006 Kelli Kutruff, Indiana University. "Parentage of the polyploid sunflower, *Helianthus tuberosus*"
- 2005 Phuong Nguyen, Indiana University. "Re-examining intraspecific variation in genome size in wild and domesticated sunflowers".
- 2004-2005 Tanya Henderson, New Mexico State University. "Selection against crop alleles in crop-wild sunflower hybrid zones." NIH Initiative for Minority Student Development in Research.

**Academic and professional service**

2007 - present	Reviewer for: <i>American Journal of Botany</i> <i>American Naturalist</i> <i>Annals of Botany</i> <i>Biological Conservation</i> <i>Biological Journal of the Linnean Society</i> <i>BMC Evolutionary Biology</i> <i>Conservation Genetics</i> <i>Current Biology</i> <i>Evolution</i> <i>Evolutionary Applications</i> <i>Evolutionary Ecology</i> <i>Heredity</i> <i>International Journal of Plant Sciences</i> <i>Journal of Ecology</i> <i>Molecular Ecology</i> <i>New Phytologist</i> <i>Oecologia</i> <i>Plant Biology</i> <i>Plant Ecology</i> <i>Proceedings of the Royal Society - Biology</i> <i>Trends in Biotechnology</i> <i>Trends in Plant Science</i> External reviewer for: Austrian Science Fund Iowa Science Foundation National Research Council (Canada) National Science Foundation (USA)
1994-1995	Curriculum developer, Salmon Watch environmental program, Portland, OR
1995-1996	Green City Data Project steering committee member and handbook editor, Portland, OR. (An NSF-funded education program teaching ecology)

**Service to Luther College**

2013-present	Director, Environmental Studies Program.
2008- 2014	Land Use Committee: co-chair 2013-2014. With B.Lynch, drafted Land Stewardship Plan (2010).
2011-present	Howard Hughes Medical Institute grant proposal team; advisory group; coordinator for assessment and research trips.