

# Nicholas J. Kooyers

nkooyers@gmail.com

(616)-610-1202

University of Louisiana, Lafayette

Department of Biology

411 E. St. Mary Blvd., Wharton Hall 506A

Lafayette, LA 70503-2039

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## Education

**Ph.D. Biology and Biomedical Sciences, Washington University, St. Louis, MO** 2007-2013  
Adviser: Kenneth M. Olsen  
Program: Evolution, Ecology and Population Biology  
Thesis: Mechanisms of recurrent cyanogenesis cline evolution in *Trifolium repens* (white clover)

**B.S - Biology, B.S- Chemistry, Magna Cum Laude, Valparaiso University, Valparaiso, IN** 2003-2007  
Advisors: Laurie S. Eberhardt and Robert J. Swanson

## Employment

Assistant Professor, **University of Louisiana, Lafayette** 2018-Present  
Postdoctoral Research Associate, **University of South Florida** 2016-2018  
Adviser: Independent PI status, Supervisor: Valerie Haywood (dept. chair)  
Visiting Scholar, **University of California, Berkeley** 2016-2018  
Postdoctoral Research Associate, **University of California, Berkeley** 2016  
Adviser: Benjamin Blackman  
Postdoctoral Research Associate, **University of Virginia** 2013-2016  
Adviser: Benjamin Blackman  
Research Technician, **University of Chicago** 2006  
Adviser: Daphne Preuss, Robert J. Swanson

## Peer-Reviewed Publications

- Kooyers, N.J.**, J.M Colicchio, A.B. Greenlee, E. Patterson, N.T. Handloser, B.K. Blackman. *In revision*. Lagging adaptation to climate change supersedes local adaptation to herbivory in an annual monkeyflower. *American Naturalist*.
- Kooyers, N.J.**, B.H. Bakken, M.C. Ungerer, K.M. Olsen. 2018. Freeze-induced cyanide toxicity does not maintain the cyanogenesis polymorphism in white clover (*Trifolium repens*). *American Journal of Botany* 105(7): 1-8
- Kooyers, N.J.**, B. James, B.K. Blackman. 2017. Competition drives trait evolution and character displacement between *Mimulus* species along an environmental gradient. *Evolution* 71(5): 1425-1427  
*Featured*: K.E. Eisen. 2017. Digest: Trait variation in *Mimulus* provides new evidence for the joint action of ecological sorting and character displacement. *Evolution* 71(5): 1425-1427
- Kooyers, N.J.**, B.K. Blackman, L.M Holeski. 2017. Optimal defense theory explains deviations from latitudinal herbivory defense hypothesis. *Ecology* 98(4): 1036-1048
- Kooyers, N.J.** 2015. The evolution of drought escape and avoidance in natural herbaceous populations. *Plant Science* 234: 155-162
- Kooyers, N.J.**, A.B. Greenlee, J.M. Colicchio, M. Oh, B.K. Blackman. 2015. Replicate altitudinal clines reveal evolutionary flexibility underlies adaptation to drought stress in annual *Mimulus guttatus*. *New Phytologist*. 206: 152-165

7. **Kooyers, N.J.**, K.M. Olsen. 2014. Adaptive cyanogenesis clines in introduced regions evolve through geographical sorting of previously existing gene deletions. *Journal of Evolutionary Biology* 27: 2554-2558
8. **Kooyers, N.J.**, L.R. Gage, A. Al-Lozi, K.M. Olsen. 2014. Aridity shapes cyanogenesis cline evolution in white clover (*Trifolium repens* L.). *Molecular Ecology* 23:1053-1070
9. Olsen, K.M., **N.J. Kooyers**, L. Small. 2014 Adaptive gains through repeated gene loss: Parallel evolution of cyanogenesis polymorphisms in the genus *Trifolium*. *Philosophical Transactions of the Royal Society B: Biological Sciences* 369: 20130347.  
*Featured:* Futuyma D.J., M. Kirkpatrick. 2017. *Evolution*, Fourth Edition. Sinauer. Oxford
10. **Kooyers, N.J.**, K.M. Olsen. 2013. Searching for the Bull's-eye: Targets of selection on cyanogenesis in white clover (*Trifolium repens* L.) vary between geographically disparate clinal replicates. *Heredity*. 11:495-504
11. Olsen, K.M., **N.J. Kooyers**, L. Small. 2012. Recurrent gene deletions and the evolution of adaptive cyanogenesis polymorphisms in white clover (*Trifolium repens* L.). *Molecular Ecology* 22: 724-738
12. **Kooyers, N.J.**, K.M. Olsen. 2012. Rapid evolution of an adaptive cyanogenesis cline in introduced North American white clover (*Trifolium repens* L.) *Molecular Ecology* 21: 2455-2468  
*Featured:* *Molecular Ecology Perspective*, Olson, M.S., N. Levsen (2012) Classic clover cline clues. *Molecular Ecology* 21: 2315-2317
13. Dobritsa, A.A. , A. Geanconteri, J. Shrestha, A. Carlson, **N.J. Kooyers**, D. Coerper, E. Urbanczyk, B.J. Bench, L.W. Sumner, R. Swanson, D. Preuss. 2011. A large-scale genetic screen in *Arabidopsis thaliana* to identify genes involved in pollen exine production. *Plant Physiology* 157: 947-970.

### **Popular Science and Non Peer-Reviewed Publications**

1. **Kooyers, N.J.**, B.K. Blackman. 2017. Walking with Wildflowers: Citizen science along the PCT. *The Jepson Globe* 27(1): pp. 1, 4.

### **Grants, Honors and Awards**

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|---------|--|
| 2017    | University of South Florida New Researcher Grant: "Investigating the role of pleiotropy in plant adaptation using next generation sequencing" (5/1/2017-4/30/2018; PI; <b>\$9,937</b> )  |
| 2017    | American Genetics Association Ecological, Evolutionary, and Conservation Genomics Research Grant: "Investigating the role of pleiotropy in the adaptive divergence of plant defense arsenals" (4/6/2017-10/15/18; PI; <b>\$9,862</b> )               |
| 2016    | Southeastern Population Ecology and Evolutionary Genetics Meeting (SEPEEG) Best Postdoctoral Researcher Talk   |
| 2016    | <b>NSF IOS-1558035</b> : "Mechanisms of malleability and resilience of flowering responses to current and future variability in seasonal cues in a geographically-widespread species" (5/1/16-4/30/20; Co-PI, PI: Ben Blackman; <b>\$1,072,974</b> ) |
| 2015    | Donald Danforth Fall Symposium Best Poster Contest Award   |
| 2011    | <b>NSF DEB-1110588</b> : "Dissertation Research: Determining the mechanisms of recurrent cline evolution in white clover ( <i>Trifolium repens</i> )" (6/1/2011-5/31/2013; Co-PI, PI: Kenneth Olsen; <b>\$13,539</b> )                               |
| 2011    | Midwest Consortium of Sciences Travel Grant: Lawrence University ( <b>\$580</b> )  |
| 2011    | Penn State Plant Biology Symposium Travel Grant ( <b>\$350</b> )   |
| 2010-12 | Washington University: GAANN fellowship  |
| 2008    | Washington University: Conservation Genetics Workshop Aid Grant ( <b>\$3,000</b> )   |

2008	American Genetics Association Tuition Aid Grant ( <b>\$300</b> )
2007	NSF Research Experience for Undergraduates Fellowship
2006	Lumina Award for Outstanding Scholarship (Valparaiso University)
2005	Kooyers, N. Valparaiso University: Undergraduate Research Grant ( <b>\$500</b> )
2003-06	College of Arts and Science Achievement Award

### **Select Presentations**

*Invited talks* (21 total)

**2018** – Auburn University; University of Louisiana, Lafayette; Tulane University; Mississippi State University

**2017** -- German Institute of Biodiversity Research (iDiv); University of Florida; New College of Florida; North Carolina State University; Georgia Southern University; Purdue University; University of Central Florida

**2016** – University of South Florida (GeoSciences); Smithsonian Institution (Dept. of Botany);

**2015** – Fresno State University; Davidson College; San Jose State University

**Prior 2015** -- Mt. Lake Biological Station; University of Virginia; Maryville University; Colorado College; Valparaiso University

*Contributed Talks (Meeting/Venue, Date)*

Evolution (2011, 2012\*, 2014, 2016, 2017)

University of South Florida Integrative Biology Seminar Series (2017)

University of Virginia Population Biology Seminar (2014, 2016) University of Virginia Biology Retreat (2013)

SEPEEG (2013, 2016)

ESA (2012)

St. Louis Behavior, Ecology, Evolution and Systematics Meeting (2012) Washington University Bioforum (2012)

Washington University Ecology, Evolutionary, and Population Biology Seminar (2008, 2010, 2011)

*\*Featured:* New Phytologist Meeting Review: New Phytologist 196: 975-977 (2012)

### *Contributed Posters*

1. The ecological genetics of critical photoperiod clines in annual monkeyflowers (*Mimulus guttatus*). Donald Danforth Fall Symposium. St Louis, MO. 2015  
\*received Danforth Fall Symposium Poster Award (e.g. 1 of top 3 posters)
2. Replicate altitudinal clines reveal intricately related patterns of local adaptation in photoperiod response, flowering time, and drought stress tolerance in *Mimulus guttatus*. Gordon Conference: Ecological and Evolutionary Genomics. Biddeford, ME. 2013.
3. Mechanisms of parallel cline evolution in introduced populations of white clover (*Trifolium repens* L.). Penn State Plant Biology Symposium (Plant Evolutionary Genomics). College Station, PA. 2011.
4. Testing predictions of clinal dynamics using a system of recurrent cline in cyanogenesis in white clover (*Trifolium repens*). Ecological Genomics Symposium. Kansas City, MO. 2010.
5. Coarse-grain selection creates clinal variation in introduced populations of white clover (*Trifolium repens*) Ecological Genomics Symposium. Kansas City, MO. 2009.

### **Teaching Experience**

*Course Creation and Instruction-*

Introduction to R workshop (University of Virginia) Three part series – Basics and Data Manipulation, Statistics, Graphing	2013, 2015
<i>Guest Lecturer-</i>	
Organic Evolution (University of South Florida) “Adaptation. Historical perspectives, empirical realities, and practical applications.”	2017
Molecular Ecology (University of Richmond) “Predictability, parallel evolution and genetics underlying adaptation in natural populations” *Including lab period with cyanogenesis in local populations module	2015
Graduate Student Survival Skills (University of Virginia) “How I survived: A dummies guide to graduate school”	2014
Evolution, Ecology and Development (University of Virginia) “Plasticity, range size and climate change”	2013, 2014
Plant-Animal Interactions (Lawrence University) “Using plant secondary compounds as model systems for understanding evolution”	2011
Evolution (Washington University) “Species concepts, speciation mechanisms and the genetics of speciation”	2011
Populations Genetics (Washington University) “Neutral theory, molecular evolution and mutation load”	2011
History of Genetics in the Twentieth Century (Washington University) “An introduction to the biology, history and ethics of GMO’s”	2009, 2010
Population Genetics (Washington University) “Introduction to Quantitative Genetics”	2009
<i>Primary Lab Instructor-</i>	
NSF Summer Institute for Biology Teachers Constructed and taught evolutionary biology labs for a week-long program for secondary education teachers	2009, 2012
<i>Teaching Assistant-</i>	
Population Genetics (Washington University) Held student help sessions and created discussion classes.	2009
History of Genetics in the Twentieth Century (Washington University) Co-created and led a discussion group, assisted with course planning and test making.	2009
Evolution (Washington University) Led a discussion group, assisted in creating test material and held review sessions for students.	2008
<i>Graduate Student Rotation Co-Mentor (with Ben Blackman)</i>	
<u>Alyssa Black</u> Population genomic signals of selection underlying photoperiod response QTL	Fall 2015
<u>Catherine Debban</u> Population genetics and genomics of adaptation across an elevational gradient in <i>Mimulus</i>	Fall 2014

*Undergraduate Research Mentor (13 senior undergrads, 4 junior undergrads, 4 postbac technicians, 2 work-study students)*

Clint Gibson (Undergrad; University of South Florida) 2017-2018  
*Project:* Adaptation following invasion in creeping indigo (*Indigofera spicata*)

Kaitlyn Clark (Undergrad; University of South Florida) 2017-2018  
*Project:* Rapid evolution in monkeyflowers in response to a historical drought

Abigal Donofrio (Undergrad, University of South Florida) 2016-2018  
*Project:* Local adaptation in the giant duckweed, *Spirodela polyrhiza*

Alia Wofford (Undergrad, Elizabeth City State University) 2015  
*Project:* Integrating photoperiod and temperature cues into a coherent flowering mechanism  
*Program:* NC/VA Minority Alliance Program

Brooke James (Undergrad, University of Virginia) 2014- 2015  
*Project:* Character displacement of photoperiod response in *Mimulus alsinoides*

Katherine Aracena (Undergrad, University of Virginia) 2014-2015  
*Project:* amiRNA silencing of genes in *Mimulus guttatus* photoperiod pathway  
*Awards:* UVA Harrison Undergraduate Research Award

Shawnette Toney (Undergrad, Elizabeth City State University) 2014  
*Project:* The evolution of seed dormancy as an adaptation to altitude in *M. alsinoides*  
*Program:* NC/VA Minority Alliance Program

Dania Zuniga (Undergrad, University of Virginia) 2013  
*Project:* Floral candidate genes are response for photoperiod response QTL in *M. guttatus*.

Lily Rose Gage (Undergrad, Carleton University) 2012  
*Project:* Heat/Drought as an ecological tradeoff maintaining the cyanogenesis polymorphism.  
*Awards:* Carleton College Undergraduate Research Fellowship

Joseph Lampe (Undergrad, Washington University) 2010-2012  
*Project:* Quantitative genetics of cyanogenesis in white clover.

Amal Al-Lozi (Undergrad, Washington University) 2010-2011  
*Project:* The fitness consequences of cyanotype-herbivore interactions in white clover

Graham Caulkins (Undergrad, Washington University) 2009  
*Project:* Determining common garden slug preference in invasive and native clover populations  
*Awards:* Washington University Student Undergraduate Research Fellowship

Josh Levy (Undergrad, Washington University) 2008  
*Project:* Characterizing the molecular basis of cyanogenesis in lotus (*Lotus japonicas*).

*Junior Undergraduates (no independent project)*

Ashley Ramirez (USF), Qiara Perez (USF), Allison Blakely (USF), Kevin Shimkaveg (USF)

*High School Research Mentor*

Asha Clark (High School Student, Clyde C. Miller Career Academy) 2011-2012  
*Project:* The relationship between drought stress and production of HCN in white clover

## **Service Activities**

Undergraduate and Graduate Talk and Poster Judge (SEPEEG 20016)	2016
Coordinated Software Carpentry Workshop at Washington University	2012
WUSTL EEPB Seminar Coordinator	2009-2010

*Public Outreach*

Co-Creator of 'Walking with Wildflowers' A citizen science program utilizing hikers to survey phenology along the Pacific Crest Trail	2015-Present
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Speaker at University of Colorado-Boulder Teaching Evolution Workshop Using cyanogenesis in white clover as a model lab exercise for understanding adaptation.	2011
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Cyanogenesis Kits for High School Students Commercialization of cyanogenesis kits for secondary education by teaching lab sections in St. Louis Intercity High Schools.	2010-2013
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Shaw Institute for Field Training program (SIFT) Developed a research experience for advanced high school students to assist in understanding population genetics.	2008
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Young Scientist Program (Washington University) Brought evolutionary theory into urban schools (teaching grades 6-12) and created lesson plans for lab-based activities.	2007-2009
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*Reviewer*

Molecular Ecology\*, Molecular Ecology Resources, Journal of Experimental Botany, Plant Science, Journal of Heredity, Functional Ecology, Evolution, PLOS One, Journal of Evolutionary Biology, New Phytologist, American Journal of Botany, Integrative and Comparative Biology, Oecologia, Biological Invasions, Journal of Plant Research

\*Molecular Ecology top reviewer for 2015 (top 8% of reviewers, nominated by subject editors)

*Professional Organizations*

Society for the Study of Evolution, Ecological Society of America, American Genetics Association, Phi Lambda Epsilon (Beta Sigma Chapter)- National Chemistry Honor Society

**Short Courses/Internships**

<b>Transcriptome Assembly Workshop, Charlottesville, VA</b>	2013
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<b>Next Generation Sequencing Workshop, Evolution 2012, Ottawa, Canada</b>	2012
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<b>Software Carpentry, Washington University, St. Louis, MO</b>	2012
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<b>Workshop for Early Career Success, Midwest Consortium for Math and Science, Holland, MI</b>	2011
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<b>Conservation Genetics, Organization for Tropical Studies, Palo Verde, Costa Rica</b> Conservation and Biodiversity Genetics	2008
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<b>Research Experience for Undergraduates, La Selva Biological Station, Costa Rica</b> Advisor: Dr. Johel Chaves- Campos	2007
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