**Liza M. Holeski**

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**APPOINTMENTS**

2023-2024. Provost Leadership Fellow, Northern Arizona University. Flagstaff, AZ.

2019- present. Associate Professor, Northern Arizona University. Flagstaff, AZ.

2013-2019. Assistant Professor, Northern Arizona University. Flagstaff, AZ.

2011-2013. Assistant Scientist, University of Wisconsin. Madison, WI.

2007-2011. Post-doctoral Research Associate, University of Wisconsin. Madison, WI.

**EDUCATION**

2007. Ph. D. in Ecology and Evolutionary Biology (with Honors) University of Kansas,

 Lawrence, KS.

2001. B.A. in Biology (with Distinction), B.A. in Philosophy. St. Olaf College, Northfield, MN.

**RESEARCH INTERESTS**

Plant evolutionary genetics and adaptation

Plant-herbivore interactions, plant response to changing climate

Quantitative genetics and trait evolution in plant populations

**PUBLICATIONS**

Robinson M.L., et al. (**L.M. Holeski** one of 189 co-authors listed alphabetically). Plant size, latitude, and phylogeny explain variability in global herbivory. Science 382: 679-683.

Blanchard M.L., **L.M. Holeski**. 2023. Consequences of Costs and Chemical Complexity: The Evolutionary-Ecology of Direct Phytochemical Defense Against Herbivores. International Journal of Plant Science, doi.org/10.1086/727902.

Christie K.C., N.R. Pierson\*, **L.M. Holeski**, D.B. Lowry. 2023 Resurrected seeds from herbarium specimens reveal rapid evolution of drought resistance in a selfing annual. American Journal of Botany. In Press.

Scharnagl, A., Genug, M., **Holeski, L.M.**, and N.J. Kooyers. 2023. Life history and chemical defense interact to drive patterns of adaptation in an annual monkeyflower. Evolution, 77: 370-383.

Christie K.C., N.R. Pierson\*, D.B. Lowry, **L.M. Holeski**. 2022. Local adaptation of seed and seedling traits along a natural aridity gradient may both predict and constrain adaptive responses to climate change. American Journal of Botany, 109:1529-1544.

Rotter, M.C., K.C. Christie, **L.M. Holeski**. 2022. Climate and the biotic community structure plant resistance across biogeographic groups of yellow monkeyflower. Ecology and Evolution, 12:e9520.

​Scharnagl, A., Genug, M., **Holeski, L.M.**, and N.J. Kooyers. 2022. Life history and chemical defense interact to drive patterns of adaptation in an annual monkeyflower. Evolution, 77:370-383

**Holeski, L.M**. 2021. The genetic basis of plant-herbivore interactions. Pp. 59-91 in Plant-

Animal Interactions, K. Del-Claro, H.M. Torezan-Silingardi, eds. Springer Nature, Switzerland.

**Holeski, L.M.**, K. Keefover-Ring, J.M. Sobel, and N.J. Kooyers. 2021. Evolutionary

history and ecology shape the diversity and abundance of phytochemical arsenals

across monkeyflowers. Journal of Evolutionary Biology 34: 571-583.

Durben, R.M., F.M. Walker, **L.M. Holeski**, A.R. Keith, Z. Kovacs, S.R. Hurteau, R.L.

Lindroth, and T.G. Whitham. 2021. Bugs, beavers, and chemistry: A mammalian herbivore changes chemistry composition and arthropod communities in foundation tree species. Forests 12: 877.

Kooyers, N.J, A. Donofrio, B.K. Blackman, and **L.M. Holeski**. 2020. The genetic

architecture of plant defense tradeoffs in a common monkeyflower. Journal of

Heredity 111: 333-335.

Kruger, E.L., K. Keefover-Ring, **L.M. Holeski**, and R.L. Lindroth. 2020. To compete or

 defend: Linking functional trait variation with life-history tradeoffs in a foundation tree species. Oecologia 192: 893-907.

Barker, H.L., J. Riehl, C. Bernhardsson, K. Rupert-Nason, **L.M. Holeski**, P.K. Ingvarsson, and R.L. Lindroth. 2019. Linking plant genes to insect communities: Identifying the genetic bases of plant traits and community composition. Molecular Ecology 28:

4404-4421.

Lowry, D.B., D. Popovic, D.J. Brennan, and **L.M. Holeski**. 2019. Mechanisms of a locally adaptive shift in allocation among growth, reproduction, and herbivore resistance in Mimulus guttatus. **Evolution** 73: 1168-1181.
Lowry, D.B., 36 co-authors with equal contributions (including **L.M. Holeski**). 2019. The case for the continued use of the genus name Mimulus for all monkeyflowers. Taxon 68: 617-623.

Rothwell, E., and **L.M. Holeski**. 2019. Phytochemical defenses and performance of specialist and generalist herbivores: A meta-analysis. Ecological Entomology 45: 396-405.

Rotter, M.C., M. Vallejo-Marin, and **L.M. Holeski**. 2019. A test of the evolution of increased competitive ability in two invaded regions. Evolutionary Ecology 33: 713-735.

Selmants, P.C., J.A. Schweitzer, K.L. Adair, L.M. Holeski, R.L. Lindroth, S.C. Hart, and T.G. Whitham. 2019. Genetic variation in tree leaf chemistry predicts the abundance and activity of autotrophic soil microorganisms. Ecosphere 10: e02795.

Barker, H.L., **L.M. Holeski**, and R.L. Lindroth. 2018. Independent and interactive effects of plant genotype and environment on plant traits and insect herbivore performance: a meta-analysis with Salicaceae. **Functional Ecology** **33:422-435.**

Barker, H.L., **L.M. Holeski**, and R.L. Lindroth. 2018. Genotypic variation in plant traits shapes herbivorous insect and ant communities on a foundation tree species. PLoS One 13:e0200954.

Rotter, M.C., and **L.M. Holeski**. 2018. A meta-analysis of the evolution of increased competitive ability hypothesis: genetic-based trait variation and herbivory resistance trade-offs. Biological Invasions 20: 2647-2660.

Rotter, M.C., J.J. Couture, E.M. Rothwell, J. Garcia\* and **L.M. Holeski**. 2018. Evolutionary ecology of plant resistance traits across the herbivore diet spectrum: A test in the model plant *Mimulus guttatus.* Evolutionary Ecology Research 19: 423-440.

Rotter, M.C., and **L.M. Holeski**. 2017. The Lepidopteran herbivores of the model plant

 *Mimulus guttatus*. Journal of the Lepidopterist’s Society 71: 162-168.

Kooyers, N., Blackman, B., and **L.M. Holeski**. 2017. Optimal defense theory explains deviations from latitudinal herbivory defense hypothesis. Ecology 98: 1036- 1048.

**Holeski, L.M.**, S.C. McKenzie, E.L. Kruger, J.J. Couture, K. Rubert-Nason, and R.L.

 Lindroth. 2016. Phytochemical traits underlie genotypic variation in susceptibility

 of quaking aspen (*Populus tremuloides*) to browsing by a keystone forest ungulate.

 Journal of Ecology 104: 850-863.

Whipple, A.V., and **L.M. Holeski**. 2016. Epigenetic inheritance across the landscape. Frontiers in Genetics 7: 189.

Lamit, L.J., **L.M. Holeski**, L. Flores-Rentería, T.G. Whitham, and C.A. Gehring. 2016.

 Tree genotype influences ectomycorrhizal fungal community structure: ecological

 and evolutionary implications. Fungal Ecology 24: 124-134.

Mason, C. J., J.A. Pfammatter, **L.M. Holeski** and K.F. Raffa. 2015. Foliar bacterial community of trembling aspen (*Populus tremuloides*) in a common garden. Canadian Journal of Microbiology 61: 143-149.

Keefover-Ring, K., **L.M. Holeski**, M.D. Bowers, A. Clauss, and R.L. Lindroth. 2014. Phenylpropanoid glycosides of *Mimulus guttatus* (yellow monkeyflower). Phytochemistry Letters 10: 132-139.

**Holeski, L.M.•**, P. Monnahan**•**, B. Koseva, N. McCool, R.L. Lindroth, and J.K. Kelly. 2014. A high-resolution genetic map of yellow monkeyflower identifies chemical defense QTLs and recombination rate variation. G3-Genes, Genomes, Genetics 4: 813-821*.*

Couture, J.J., **L.M. Holeski**, and R.L. Lindroth. 2014. Long-term exposure to elevated CO2 alters aspen foliar chemistry across developmental stages. Plant, Cell, and Environment 37: 758-765.

Rubert-Nason, K., C.J. Hedman, **L.M. Holeski**, and R.L. Lindroth. 2014. Determination of salicinoids by micro-high-performance liquid chromatography and photodiode array detection. Phytochemical Analysis 25:185-191*.*

**Holeski, L.M**, M.S. Zinkgraf, T.G. Whitham, and R.L. Lindroth. 2013. Maternal herbivory reduces offspring allocation to resistance traits, but not growth, in cottonwood. Journal of Ecology 101: 1062-1073.

**Holeski, L.M**., K. Keefover-Ring, M.D. Bowers, Z.T. HarnEnz\*, and R.L. Lindroth. 2013. Patterns of phytochemical variation in *Mimulus guttatus* (yellow monkeyflower*).* Journal of Chemical Ecology 39: 525-536.

Rubert-NasonK.F., **L.M. Holeski**, A. Gusse, D. J. Undersander, and R.L. Lindroth. 2013. Rapid phytochemical analysis of birch (*Betula*) and poplar (*Populus*) foliage by near infrared reflectance spectroscopy. Journal of Analytical Chemistry 405: 1333-1344.

**Holeski, L.M.**, G. Jander, and A. Agrawal.2012.Transgenerational induction of defense and epigenetic inheritance in plants. Trends in Ecology and Evolution 27: 618 626.

**Holeski, L.M.**, M.L. Hillstrom, T.G. Whitham, and R.L. Lindroth. 2012. Relative importance of plant species identity, genotype, ontogeny, induction, and temporal variation in producing a mosaic of defenses by a foundation tree species. Oecologia 170: 695-704.

Lamit, L.J., M.A. Bowker, **L.M. Holeski**, R.R. Naesborg, S.C. Wooley, M. Zinkgraf, R.L. Lindroth, T.G. Whitham, and C.A. Gehring. 2011. Genetically-based trait variation within a foundation tree species influences a dominant bark lichen. Fungal Ecology 4: 103-109.

**Holeski, L.M.**, R. Chase-Alone\*, and J.K. Kelly. 2010. The genetics of phenotypic plasticity in plant defense: Trichome production in *Mimulus guttatus*. The American Naturalist 175: 391-400.

**Holeski, L.M.**, M.J.C. Kearsley, and T.G. Whitham. 2009. Separating ontogenetic and

environmental variation in resistance to herbivory in cottonwood. Ecology 90: 2969-2973. (A “Featured Article”).

**Holeski, L.M.**, A. Vogelzang, G. Stanosz, and R.L. Lindroth. 2009. Incidence of *Venturia* shoot blight in aspen (*Populus tremuloides* Michx.) varies with tree chemistry and genotype. Biochemical Systematics and Ecology 37: 139-145.

Kelly, J.K., **L.M. Holeski**, and H.S. Arathi. 2008. The genetic correlation between flower size and water use efficiency in Monkeyflowers. Evolutionary Ecology Research 10: 147-152.

**Holeski, L.M**. 2007. Within and among generation phenotypic plasticity in trichome density of *Mimulus guttatus*. Journal of Evolutionary Biology 20: 2092-2100.

**Holeski, L.M**. and J.K. Kelly. 2006. Mating system and the evolution of quantitative traits: An experimental study of *Mimulus guttatus*. Evolution 60: 711-723.

\* Indicates female, minority undergraduate mentored by L.M.H.

**•** Indicates shared authorship

**GRANTS and AWARDS**

2022. National Science Foundation. L.M. Holeski, D.B. Lowry. Supplement: The mechanisms of adaptive shifts in allocation to growth versus defense.

2020. National Science Foundation. L.M. Holeski, T. Martinez. REU Site: Ecology,

Genetics, and Adaptation on the Colorado Plateau.

2019. National Science Foundation. D.B. Lowry, L.M. Holeski. The mechanisms of adaptive shifts in allocation to growth versus defense.

2019. National Institutes of Health. Y. Yuan, L.M. Holeski. Genetic origin, developmental mechanism, and evolutionary process of a novel phenotype in *Mimulus* (monkeyflower).

2019. Hooper Undergraduate Research Award. J. Crowley (undergraduate mentee), L.M. Holeski. Studying plant and insect interactions: Focusing on generalist and specialist herbivores.

2018. National Science Foundation. L.M. Holeski, T. Martinez. REU Site: Place-based research and training in biology and environmental research on the Colorado Plateau.

2016. U.S. Bureau of Land Management. B.J. Butterfield, L.M. Holeski. Integrated monitoring and seed testing to improve restoration outcomes on the Colorado Plateau.

2016. Hooper Undergraduate Research Award. E. Mee (undergraduate mentee), L.M. Holeski. Characterization of glandular trichome exudate on yellow monkeyflower.

2016. Dept. of Biological Sciences, NAU. Jerry O. Wolff Distinguished Faculty award.

2016. Northern Arizona University Faculty Grants Program. L.M. Holeski. Fitness costs of defense traits in a model plant species.

2014. Northern Arizona University Faculty Grants Program. L.M. Holeski. Identification of genetic loci underlying plant defense against insect herbivores in *Mimulus guttatus* (yellow monkeyflower).

**TEACHING**

**Courses taught (Northern Arizona University):**

2016, 2017. Graduate seminar: Plant Evolutionary Ecology and Genetics

2016. Graduate seminar: Meta-analysis

2016, 2017. Evolution

2015. Meta-analysis for Ecology and Evolution (Graduate-level)

2014, 2018. Graduate seminar: Genetics and Evolution of Plant Defenses

2014. Graduate seminar: Genes to Environment

2014, 2015, 2017, 2018, 2019, 2020, 2022. Genetics and Evolution

2013, 2014, 2016, 2018, 2021. Population Genetics (Graduate-level)

**Courses taught (University of Wisconsin, Madison):**

2010. Insect Ecology (co-taught with Rick Lindroth)

2010. Graduate seminar: Roles of Insects in Emerging Environmental Issues (co-taught with Rick Lindroth)
2008. Undergraduate Research seminar: Entering Research, Part 2 (co-taught with Janet

 Branchaw).

**MENTORING**

**Undergraduate students**

40+ undergraduates mentored, including over 24 females and over 14 minorities.

10 minority undergraduate students completed independent research projects under my

mentorship. To date, one of these students presented her research at a national meeting, nine presented research at university-level forums, and two are co-authors on publications.

# ACADEMIC SERVICE and PUBLIC OUTREACH

**Editorial board:**

2022-present. Senior Editor and Commissioning Editor, Functional Ecology

2017-2022. Associate Editor, Functional Ecology

2013- 2018. Associate Editor, Genetica

**Reviewer:**

National Science Foundation (panelist; external reviewer)

Austrian Science Fund (external reviewer)

Dutch Research Council (external reviewer)

Israel Science Foundation (external reviewer)

Swiss National Science Foundation (external reviewer)

American Journal of Botany

American Naturalist

Annals of Botany

Basic and Applied Ecology

Biochemical Systematics and Ecology

Ecosphere

Ecological Monographs

Ecology Letters

Evolution

Evolutionary Ecology

Evolutionary Ecology Research

Functional Ecology

Heredity

Journal of Ecology

Journal of Evolutionary Biology

Molecular Ecology

New Phytologist

PeerJ

Philosophical Transactions of the Royal Society, B

Plant Ecology

PLoS One

Tree Genetics and Genomes

Tree Physiology
Trends in Plant Science

**Public outreach:**

2016, 2017, 2019, 2020. Oak Ridge National Labs Science Bowl, Question reviewer.

2015-16, 2018, 2019. Northern Arizona University Undergraduate Research Symposium. Judge.

2015. Flagstaff Festival of Science. Interactive evolution exhibit.

2015. Discover NAU Days. Volunteer.

2014, 2017. Flagstaff STEM night. Interactive evolution exhibit.

2011. Wisconsin Science Festival volunteer. J.F. Crow Institute for the Study of Evolution.

**Administrative committees:**

2021-present. Faculty Status Committee, Northern Arizona University.

2015-2020. Executive Committee. Merriam-Powell Center for Environmental Research, Northern Arizona University.

2014-2016. Advisory Committee. Dept. of Biological Sciences, Northern Arizona University.

2013-2014, 2016-present. Assessment and Evaluation Committee. Dept. of Biological Sciences, Northern Arizona University.

2011-2013. Evolution Coordinating Committee. J.F. Crow Institute for the Study of Evolution, University of Wisconsin, Madison.

2003-2004. Undergraduate Research and Education Committee, Dept. of Ecology and

 Evolutionary Biology, University of Kansas.

2003-2004. Colloquium Committee, Dept. of Ecology and Evolutionary Biology, University of Kansas

**SELECTED PRESENTATIONS AT NATIONAL MEETINGS**

2019. Gordon Research Conference: Plant-Herbivore Interactions (Ventura, CA): Evolution of phytochemical defense across the monkeyflower phylogeny (poster). L.M. Holeski, K. Keefover-Ring, J. Sobel, N. Kooyers.

2018. Ecological Society of America (New Orleans, LA): Genetics and ecology of plant phytochemical defense. L.M. Holeski

2016. American Society of Naturalists (Asilomar, CA): Genetic architecture of defense traits in *Mimulus guttatus*. L.M. Holeski.

2014. *Mimulus* annual meeting (Duke University, Durham, NC): Genetics of herbivore defense in *Mimulus guttatus*. L.M. Holeski.

2013. Gordon Research Conference: Plant-Herbivore Interactions (Ventura, CA): Genetic variation among *Mimulus guttatus* populations in resistance to a generalist and a specialist herbivore (poster). L.M. Holeski, J.J. Couture, and R.L. Lindroth.

2011. Gordon Research Conference: Ecological and Evolutionary Genomics (Biddeford, ME): Transgenerational induction in cottonwood (poster). L.M. Holeski, M. Zinkgraf, T.G. Whitham, and R.L. Lindroth.

2010. Society for the Study of Evolution meeting (Portland, OR): Phytochemical variation in *Mimulus guttatus* (yellow monkeyflower). L.M. Holeski, K. Keefover-Ring, M.D. Bowers, and R.L. Lindroth

2010. Gordon Research Conference: Plant-Herbivore Interactions (Galveston, TX): Developmental variation and induction in cottonwood (poster). L.M. Holeski, T.G. Whitham, and R.L. Lindroth

2008. Society for the Study of Evolution meeting (Minneapolis, MN): Genetics of

 constitutive and induced trichome density in *Mimulus guttatus*. L.M. Holeski, R. Chase Alone, J.K. Kelly

2006. Ecological genomics symposium “Genes in ecology, ecology in genes” (Overland Park, KS): Genetics and fitness consequences of trichome variation in *Mimulus guttatus* (yellow monkeyflower) (poster). L.M. Holeski

2006. Society for the Study of Evolution meeting (Stony Brook, NY): Genetics and

 fitness consequences of trichome variation in *Mimulus guttatus* (yellow

 monkeyflower). L.M. Holeski

2005. Society for the Study of Evolution meeting (Fairbanks, AK): Mating system and the evolution of quantitative traits: An experimental study of *Mimulus guttatus*. L.M. Holeski and J.K. Kelly

Presentations are talks unless identified as a poster.