

Sara Souther, Ph.D.

Northern Arizona University • Assistant Professor
School of Earth and Sustainability • Center for Adaptive Western Landscapes
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EDUCATION

Post-doctoral training

University of Wisconsin-Madison

David H. Smith Conservation Research Postdoctoral Fellowship: 2011- 2014

Ph.D.

West Virginia University

Department of Biology, 2006-2011

Undergraduate degrees

West Virginia University

B.S., Department of Biology, May 2003, *summa cum laude*

B.A., Department of Sociology and Anthropology, May 2003, *summa cum laude*

CURRENT APPOINTMENT

Assistant Professor

Northern Arizona University

Landscape Conservation Initiative, 2017 - present

PAST APPOINTMENTS

Assistant Professor

West Virginia Wesleyan College

Department of Biology, 2014 – 2016

Peace Corps Volunteer - Agriculture

Ybycu'i, Paraguay, 2003 - 2006

PUBLICATIONS

Souther, S., Aslan, C. E., and D. Stuart. 2025. Traditional harvest systems as models for advancing understanding of socio-ecological systems. *In review at Ecography*.

Souther, S., Aslan, C. E., Grady, K., and K. Haubensak. 2025. Evaluating the restoration and commercial seed grower potential of native plants that support pollinators. *In review at Restoration Ecology*.

Stevenson, E., VanBuren, C., Haubensak, K., Aslan, C.E., and **S. Souther**. 2025. Changes in plant community composition and declines in forb diversity over time in a high-elevation rangeland: Implications for pollinators *in review at Rangeland Ecology and Management*.

Garcia-Rivera, A., Aslan, C. E., Foster, J., and **S. Souther**. 2025. Identifying patterns of seed dispersal and predation across the Emory oak (*Quercus emoryi* torr.) range in Arizona *in review at Southwestern Naturalist*.

Gilb, S., Aslan, C. E., Haubensak, K., Holeski, L., Faske, T., and **S. Souther**. 2025. Population structure and genetic connectivity in the endangered *Pectis imberbis*: Addressing

- conservation and genetic gaps in the Arizona Sky Islands in review *Evolutionary Applications*.
- Souther, S.**, Sample, M., and C. E. Aslan. 2025. Interacting stressors drive landscape variation in demographic response of the endangered plant, *Pectis imberbis* (Gray) *Journal of Arid Environments*.
- Aslan, C., **Souther, S.**, Thode, A., Youberg, A., and Z. Evans. 2024. Measuring and predicting disturbance resilience in ecosystems, with emphasis on fire: A review and meta-analysis. *Journal of Environmental Management* 372, 123353.
- Souther, S.**, Lyndon, Nanabah Nez. 2024. Leveraging FIA data to evaluate ecocultural impacts of climate change in the Southwest. *Proceedings of the 2022 Forest Inventory and Analysis (FIA 2022) science stakeholder meeting: grow. adapt. regenerate—monitoring and responding to global change to promote resilient and productive forests*. U.S. Department of Agriculture, Forest Service, Northern Research Station. <https://doi.org/10.2737/NRS-GTR-225>.
- Judith D. Springer, Michael M. Stoddard, Kyle C. Rodman, David W. Huffman, Paula J. Fornwalt, Rory J. Pedersen, Daniel C. Laughlin, Christopher M. McGlone, Mark L. Daniels, Peter Z. Fulé, Margaret M. Moore, Becky K. Kerns, Jens T. Stevens, Julie E. Korb, **S. Souther**. 2023. Increases in plant cover and richness persist following thinning and burning treatments in semi-arid coniferous forests. *Journal of Applied Ecology*, 61(1), 25-35.
- Souther, S.** Sandor, M., Sample, M., Gabrielson, S. and Clare E. Aslan. 2023. Records indicate pollinator losses and knowledge gaps in western and southern North America. *Plos one*, 19(5), e0289742.
- Abercrombie, S., Stuart, D., Aslan, C., **Souther, S.** and B. Peterson. 2023. Training community engaged climate adaptation leaders using multiple case study analysis: Insights from cognitive learning sciences. *Frontiers in Climate*, 5, 1196467: <https://doi.org/10.3389/fclim.2023.1196467>
- Souther, S.**, Columbo, S. and N. Lyndon. 2023. Integrating traditional ecological knowledge into US public land management: Knowledge gaps and research priorities. *Frontiers in Ecology and Evolution*, 11, 27. <https://doi.org/10.3389/fevo.2023.988126>
- Souther, S.**, Sample, M., Connelly, G., and C.E. Aslan. 2022. Demographic analysis of the endangered plant *Pectis imberbis* A. Gray highlights tradeoffs between deer browse and interspecific competition. *Natural Areas Journal*. 42(3): 230-241. <https://doi.org/10.3375/22-3>
- Aslan, C.E., and **S. Souther**. 2022. The interaction between administrative jurisdiction and disturbance on public lands: emerging socioecological feedbacks and dynamics. *Journal of Environmental Management* 319: 1 – 10.
- Souther, S.**, McGraw, J. B., Souther, J. D., and D. Waller. 2021. Effects of altered climates on American ginseng population dynamics. *Population Ecology*. 64(1):47-63. <https://doi.org/10.1002/1438-390X.12099>
- Aslan, C.E., Sandor, M., Sample, M., Stortz, S., **Souther, S.**, Levine, C., Samberg, L., Gray, M., and B. Dickson. 2021. Estimating social-ecological fire resilience across an arid region. *Ecological Applications*. 31(4):e02303. doi: 10.1002/eap.2303.
- Souther, S.**, Randall, V., Lyndon, N. The use of citizen science to achieve multivariate management goals on public lands. *Diversity* 2021, 13, 293, doi:10.3390/d13070293.
- Souther, S.**, Nez-Lyndon, N., and D. Randall. 2021. Insights into the restoration and sustainable management of Emory oak: A southwestern cultural keystone species. 420: *Forestry Ecology and Management*. <https://doi.org/10.1016/j.foreco.2020.118900>

- Aslan, C. E., S. **Souther**, S. Stortz, M. Sample, M. Sandor, C. Levine, L. Samberg, et al. 2020. Land management objectives and activities in the face of projected fire regime change in the Sonoran Desert. *Journal of Environmental Management*: 111644.
- Souther, S.**, Loeser, M., Crews, T. E., & Sisk, T. 2020. Drought exacerbates negative consequences of high-intensity cattle grazing in a semiarid grassland. *Ecological Applications*, 30(3). <https://doi.org/10.1002/eap.2048>
- Souther, S.**, M. Loeser, T. E. Crews, and T. Sisk. 2019. Complex response of vegetation to grazing suggests need for coordinated, landscape-level approaches to grazing management. *Global Ecology and Conservation* 20:e00770.
- Ticktin, T., Kindscher, K., **Souther, S.**, Weisberg, P., Chamberlain, J.L., Hummel, S., Mitchell, C., and S. Sanders. Ecological dimensions of nontimber forest product harvest (Chapter 3). Eds. Chamberlain, James L.; Emery, Marla R.; Patel-Weynand, Toral. 2018. Assessment of nontimber forest products in the United States under changing conditions. General Technical Report SRS-GTR-232. USDA Forest Service, Southern Research Station. 268p. <https://doi.org/10.2737/SRS-GTR-232>
- McGraw, J.B., Turner, J.B., **Souther, S.**, Bennington, C., Vavrek, M., Shaver, G., Fetcher, N. 2015. Northward displacement of optimal climate conditions for ecotypes of *Eriophorum vaginatum* L. across a latitudinal gradient in Alaska. *Global Change Biology* 21: 3827-3835.
- Hruska, A., **Souther, S.**, & J.B. McGraw. 2014. Songbird dispersal of American ginseng (*Panax quinquefolius* L.). *Ecoscience* 21(1): 46-55.
- Souther, S.** & J.B. McGraw. 2014. Synergistic effects of climate change and harvest on extinction risk of American ginseng. *Ecological Applications* 24(6): 1463-1477.
- Souther, S.**, Terrell, K., Tingley, M.W., Hayman, D.T.S., Popescu, V.D., Ryan, M.E., Graves, T.A. & B. Hartl. 2014. Biotic impacts of energy development from shale: research priorities and knowledge gaps. *Frontiers in Ecology and the Environment* 12: 330-338.
- Souther, S.**, Fetcher, N., Fowler, Z., Shaver G. & J.B. McGraw. 2014. Ecotypic differentiation in photosynthesis and growth of *Eriophorum vaginatum* along a latitudinal gradient in Alaska. *Botany* 92: 551-561.
- Aslan, C., Pinsky, M., Ryan, M.E., **Souther, S.** & K. Terrell. 2013. Cultivating creativity in conservation science. *Conservation Biology* 28(2): 345-353.
- Souther, S.** 2013. Letter: Drawbacks to Natural Gas. *Science* 340: 141.
- McGraw, J.B., Lubbers, A.E., Van der Voort, M., Mooney, E.H., Furedi, M.A., **Souther, S.**, Turner, J.B. & J. Chandler. 2013. Ecology and conservation of American ginseng in a changing world. *Annals of the New York Academy of Sciences* 1286: 62-91.
- Souther, S.**, Lechowicz, M. & J.B. McGraw. 2012. Experimental test for adaptive differentiation of ginseng populations reveals complex response to temperature. *Annals of Botany* 110(4): 829-837.
- Souther, S.** & J.B. McGraw. 2011. Evidence of local adaptation in demographic response of American ginseng to interannual temperature variation. *Conservation Biology* 25(5): 922-931.
- Souther, S.** & J.B. McGraw. 2010. Vulnerability of American ginseng to an extreme early spring temperature fluctuation. *Population Ecology* 53(1): 119-129.
- McGraw, J.B., **Souther, S.** & A.E. Lubbers. 2010. Rates of harvest and compliance with regulations in natural populations of American ginseng (*Panax quinquefolius* L.) *Natural Areas Journal* 30: 202 – 210.

AWARDED GRANTS & FELLOWSHIPS

DoD: Proposal for Phase II – FY2023 MSO High elevation fuel treatment, Ft. Huachuca, Arizona (\$100,000) PI: Clare E. Aslan Co-PI: **Souther, S.**

October 15th, 2023 – October 14th, 2024

USFS: Examination of fire effects on the endangered plant, *Pectis imberbis* A. Gray to aid species management and recovery (\$50,000) PI: **Souther, S.**

March 15th 2023 – March 14th 2025

USFS: Integration of Indigenous knowledge and values in federal and cross-boundary fire management practices (\$108, 606) PI: **Souther, S.**

October 15th 2023 – October 14th 2024

DoD SERDP: Using population and fire models to predict interacting responses of invasive and Threatened and Endangered plants to invasive foundational species controls (\$1,117,935) PI: Aslan, C.E. Co-PI: **Souther, S.**, Sandor, M., Liang, C.

May 1st 2023 – January 1st 2027

NOAA: Projecting socio-ecological impacts of drought in southwestern ecosystems to prioritize restoration initiatives (\$571,844) PI: **Souther, S.**; Co-PI: Stuart, D., Chischilly, S.

October 18th 2022 – October 17th 2024

NSF DISES: Restoration of a southwestern cultural keystone species: Integrating socio-ecological systems to predict resilience of traditional acorn harvest by western Apache communities. (\$1,460,000) PI: **Souther, S.** Co-PIs: Stuart, D., Whipple, A., Saxena, A., Stan, A., Fulé, P., Aslan, C.E., and A. Thode.

March 15th 2023 – March 14th 2028

NSF RaMP: Advancing Indigenous perspectives to address climate vulnerability in the Southwest: research training for and by diverse communities. (\$2,998,230) PI: Whipple, A. Co-PI: **Souther, S.**, Antoninka, A., Best, R., Propper, C.

August 1st 2022 – July 31st, 2026

NPS: Critically needed genetic assessment of proposed endangered plant at Coronado National Memorial (\$104,663) PI: **Souther, S.** Fitting, H.

January 1, 2023 – December 31, 2025

USFWS Section 6: Fine-scale habitat and genetic analysis of *Pectis imberbis* A. Gray (\$9,000) PI: **Souther, S.** Co-PIs: Sample, M., Aslan, C. E.

September 14, 2021 – September 13, 2024

BLM Utah Plant Materials: Evaluating the restoration functionality and commercial seed grower potential of native pollinator plants (\$49,137) PI: **Souther, S.** Co-PIs: Aslan, C. E., Haubensak, K., Grady, K.

September 15, 2020 – September 14, 2021

USFS Citizen Science Competitive Funding Program; Level III: Location of plants traditionally used by American Indian tribes to improve management on 4FRI (\$20,000) PI: **Souther, S.**

May 1, 2020 – April 30, 2021

Commission for Environmental Cooperation: Developing a North American Pollinator Conservation Framework (\$96,524) PI: Aslan, C.E., Stortz, S., **Souther, S.**

June 1, 2020 – May 31, 2021

USGS Science Support Partnership: Analysis and restoration of two rare plants, *Amsonia kearnayana* Woodson and *Pectis imberbis* A. Gray. (\$257,302). PI: **Souther, S.** Co-PI: Aslan, C.E. USGS lead: Norman, L.

October 1, 2019 – September 30, 2022

Section 6 Funding for Research on Threatened and Endangered Arizona Plants: Enhancing recruitment to promote recovery of *Amsonia kearneyana* Woodson (\$19,866). PI: **Souther, S.** Co-PI: Aslan, C.E.

December 1, 2019 – November 30, 2021

USFWS: Endangered species conservation and recovery implementation funds: Demographic and reproductive analysis of *Pectis imberbis* A. Gray (\$35,000). PI: **Souther, S.** Co-PI: Aslan, C.E.

September 2019 – October 2020

Restoration of Emory oak stands to ensure the long-term sustainable harvest and resilience of a cultural keystone species on federal lands (\$384,032). PI: **Souther, S.**

September 2019 – December 2023

Location of plants traditionally used by American Indian tribes to improve management of federal lands (\$25,000). PI: **Souther, S.**

August 2018 – August 2021

National Science Foundation Experimental Program to Stimulate Competitive Research (NSF EPSCoR) (\$20,000). PI: **Souther, S.**

January 2016 – January 2017

West Virginia – Idea Network for Biomedical Research Excellence (WV-INBRE) Faculty Research Development Award. PI: Huggins, L. Co-PI: **Souther, S.**

November 2015 – August 2016

David H. Smith Conservation Research Fellowship (\$142,000) PI: **Souther, S.**

September 2011 – September 2014

National Science Foundation Doctoral Dissertation Improvement Grant (\$15,000) PI: **Souther, S.**

May 2009 – April 2011

Eberly Office of the Dean Research Grant, West Virginia University, Morgantown. PI: **Souther, S.**

May 2010 (\$700), May 2009 (\$500), May 2008 (\$600) & May 2007 (\$700)

Arctic Climate Change Graduate Research Fellowship (\$2,000). PI: **Souther, S.**

May 2008 - 2010

Graduate Conservation Research Fellowship (\$84,000). PI: **Souther, S.**

September 2006 – May 2011

CONFERENCE PRESENTATIONS

Souther, S., Stuart, D., and S. Chischilly. 2024. Projecting socio-ecological impacts of drought in southwestern ecosystems to prioritize restoration initiatives. NTICC Session:

Supporting Tribal Drought Resilience. Anchorage, Alaska.

Aslan, C.E., **Souther, S.**, Liang, C., Sandor, M., and K. Haubensak. 2024. Predicting interacting responses of invasive and threatened and endangered plants to foundational invaders.

SERDP Annual Conference. Washington, D.C.

Souther, S. and D. Stuart. 2023. Building Ecological and Cultural Resilience in Co-Evolved Emory Oak Systems. Society of Human Ecology Conference. Tucson, AZ (11/8/23)

Aslan, C. E., and **S. Souther**. 2023. Exploring the influence of grazing management and climate change on rangeland pollinator resources. Arizona Society of Rangeland Management, Maricopa, AZ. (2/7/23)

Souther, S., and N. Nez-Lyndon. 2022. Leveraging FIA data to evaluate ecocultural impacts of climate change in the Southwest. Virtual Conference. USFS Forest Inventory and Analysis Stakeholder Meeting.

- Souther, S.,** Randall, V., and N. Nez-Lyndon. 2022. Invited talk for session: ‘Tribal Forestry in the Southwest; Perspectives, Practices and Possibilities’. Emory oak restoration in the Southwest. Southwest Society of American Foresters, Show Low, AZ. (10/29/22)
- Souther, S.** RMRS/ERI - Climate Regen Webinar Fall 2022 Nov 9th @ 11 am Mtn Emory Oak Collaborative Tribal Restoration Initiative (EOCTRI) with Apache Tribes (Yavapai-Apache, White Mountain, San Carlos, and Tonto).
- Souther, S.,** Randall, V., and N. Nez-Lyndon. 2022. Emory Oak Collaborative Tribal Restoration Initiative (EOCTRI): Fostering the protection and restoration of culturally sensitive natural resources. Biennial Conference of Science and Management on the Colorado Plateau and the Southwest Region, Flagstaff, AZ.
- Souther, S.** and N. Nez-Lyndon. 2022. Evaluating ecocultural impacts of climate change in the Southwest. Biennial Conference of Science and Management on the Colorado Plateau and the Southwest Region, Flagstaff, AZ.
- Souther, S.** and N. Nez-Lyndon. 2022. Traditional Ecological Knowledge (TEK) and Land Management. Biennial Conference of Science and Management on the Colorado Plateau and the Southwest Region, Flagstaff, AZ.
- Souther, S.,** Sample, M., and C. Aslan. 2020. Pollinators in North America: Diversity, spatiotemporal patterns, and knowledge gaps. Ecological Society of America. Virtual conference (8/3/20-8/6/20).
- Souther, S.,** Randall, V., and N. Nez-Lyndon. 2020. The use of citizen science to restore traditional harvest practices on public lands. North American Congress for Conservation Biology. Virtual conference (7/27/20-7/31/20).
- Souther, S.,** Loeser, M., Crews, T., and T. Sisk. 2019. Climate interacts with grazing to alter diversity and composition of a semiarid grassland. Biennial Conference of Science and Management on the Colorado Plateau and Southwest region. Flagstaff, AZ (9/11/2019)
- Souther, S.,** Vincent Randall, and Nanebah Lyndon. 2019. An evolving partnership between Arizona Tribes, the Forest Service, and researchers to ensure the availability and sustainability culturally important plant species on federal lands. Biennial Conference of Science and Management on the Colorado Plateau and Southwest region. Flagstaff, AZ (9/10/2019)
- Souther, S.,** Lyndon, N. & M. Christiano. 2019. Forest Service/Tribal Collaborative Cultural Preservation Projects Part 1: Tribal Nations Botanical Research Collaborative. Arizona Historic Preservation Conference. Prescott, AZ. (6/13/19)
- Souther, S.,** Randall, V. & Lyndon, N. 2019. Forest Service/Tribal Collaborative Cultural Preservation Projects Part 2: The Emory Oak Restoration Project. Arizona Historic Preservation Conference. Prescott, AZ. (6/13/19)
- Souther, S.** 2018. Digging deeper: Population-level dynamics influence ginseng response to climate change. School of Earth and Science departmental seminar. Flagstaff, AZ.
- Souther, S.** 2015. Invited talk: Consequences of local adaptation on extinction risk of American ginseng. Organized oral session: Evolutionary Responses to Directional Climate Change. 100th Ecological Society of America Conference, Baltimore, MD.
- Souther, S.** 2014. Ginseng as a case study: Conservation of non-timber forest product (NTFP) species in a changing climate. National Assessment of Non-Timber Forest Products. Raleigh, NC. During this conference, we participated in working groups to structure the National Assessment of Non-timber Forest Products.
- Souther, S.** 2014. Synergistic effects of climate change and harvest on extinction risk of American ginseng (*Panax quinquefolius* L.). Society for Conservation Biology’s 2nd North America Congress for Conservation Biology, Missoula, MT.

- Souther, S.** 2012. Restoration of American ginseng: The effects of translocation on population demography. 53rd Annual Meeting of the Society for Economic Botany, Frostburg, MD.
- Souther, S.** 2012. Adaptive genetic differentiation drives American ginseng response to climate change and shapes conservation planning. University of Wisconsin-Stout, Menominee, WI. NSF Advance Invited Talk.
- Souther, S.** 2012. Evaluation of managed relocation as a conservation strategy for threatened herbaceous species. Chicago Botanic Garden, Glencoe, IL.
- Souther, S. & J.B. McGraw.** 2012. Conservation implications of ecotypic differentiation in a changing climate. 25th International Congress for Conservation Biology, Auckland, NZ.
- Souther, S.** 2012. Pursuing a career in conservation biology. 25th International Congress for Conservation Biology, Auckland, NZ. Panelist.
- Souther, S. & J.B. McGraw.** 2010. Patterns of demographic response of American ginseng (*Panax quinquefolius* L.) populations to climatic variation. Ecological Society of America (ESA) Conference, Pittsburgh, PA.
- Souther, S.** 2010. Response of American ginseng to inter-annual temperature variation: Implications for ginseng conservation in a changing climate. Appalachian Center for Ethnobotanical Studies (ACES) Annual Conference, Tai Sophia Institute, Columbia, MD.
- Souther, S. & J.B. McGraw.** 2009. Variable demographic responses to inter-annual temperature variable suggest enhanced risk from global warming for American ginseng. International Conference in Ecology (INTECOL), Brisbane, Australia.
- Souther, S. & J.B. McGraw.** 2008. Extreme weather: Examination of a late season frost event in populations of American ginseng (*Panax quinquefolius*). Ecological Society of America, Milwaukee, WI.

TEACHING EXPERIENCE

- EES 697: Independent Study – Quantitative Methods** (Fall 2023)
- EES 697: Independent Study – Plant Ecology** (Fall 2023)
- EES 685: Graduate Research** (Spring 2023, Fall 2023)
- ENV 499: Contemporary Developments** (Fall 2022)
- ENV 226: Essential Ecology** (Spring 2022, Fall 2022, Spring 2023, Fall 2023)
- EES 697: Advanced Quantitative Exploration**, Instructor (Spring 2022), Northern Arizona University, Flagstaff, AZ.
- ENV 324: Sustainable Ecology**, Instructor (2021), Northern Arizona University, Flagstaff, AZ.
- ENV 326: Essential Ecology**, Co-Instructor (2019), Northern Arizona University, Flagstaff, AZ.
- Bio 254: Experimental Biology**, Instructor (2015), West Virginia Wesleyan College, Buckhannon, WV.
- Bio 111: General Biology I** (Biology for non-majors), Instructor (2015), West Virginia Wesleyan College
- Bio 112: General Biology II** (Biology for non-majors), Instructor (2014-2015), West Virginia Wesleyan College, Buckhannon, WV.
- Bio 161: Principles of Biology I**, Instructor (2014-2015), West Virginia Wesleyan College, Buckhannon, WV.
- Bio 312: Plant Systematics**, Instructor (2014), West Virginia Wesleyan College, Buckhannon, WV.
- Botany 950: Plant Ecology**, Instructor (2014), University of Wisconsin-Madison, Madison, WI.
- Bio 321: The Ultimate Science Experience**, Graduate Teaching Assistant (2007 & 2008), West Virginia University, Morgantown, WV.

AWARDS

2023 USDA FS Nation to Nation Tribal Innovation Award for the EOCTRI
2011 David Fairchild Blaydes Biology Doctoral Dissertation Scholarship
2011 & 2010 Earl L. Core Memorial Scholarship
2010, 2009 & 2008 Eberly Office of the Dean Travel Award
2008 HERF Fellowship
2003 Outstanding Senior, Sociology & Anthropology

PROFESSIONAL AFFILIATIONS

Lifetime Member, Society for Conservation Biology

PROFESSIONAL TRAINING

(starts summer 2019 – no tracking prior):

Conservation in a Changing Climate: An Advanced Communication Workshop (COMPASS training), Seattle, WA. (02/26/2020 – 02/28/2020)

Plant Associations course, USFS, Alpine, AZ. (08/2019)

Indigenous Peoples Curriculum Development seminar, NAU, Flagstaff, AZ. (02/09/2023-03/23/2023)

LANGUAGES

English, Spanish and Guaraní