

Emma R. Fryer

Curriculum Vitae
Im Raindörfli 25, 8038 Zürich, Switzerland
emmarosefryer@gmail.com

EDUCATION

Doctoral Student, Plant Ecology Group, Institute of Integrative Biology – 2023 to present
ETH Zürich

Master of Science in Biological Sciences, with distinction – 2023
California Polytechnic State University, San Luis Obispo

Bachelor of Science in Botany, *summa cum laude* – 2016
California State Polytechnic University, Humboldt (formerly Humboldt State University)

GRANTS, AWARDS, SCHOLARSHIPS & HONORS

- 2023 – Outstanding Graduate Student (College of Science & Mathematics), California Polytechnic State University, San Luis Obispo
- 2023 – Outstanding Graduate Student (Department of Biological Sciences), California Polytechnic State University, San Luis Obispo
- 2023 – Best Oral Paper, 29th Graduate Student Symposium, California Botanical Society
- 2022 – Graduate Research Award, Department of Biological Sciences, California Polytechnic State University, San Luis Obispo – \$500
- 2021 – Malcolm McLeod Scholarship, San Luis Obispo California Native Plant Society Chapter – \$800
- 2021 – Paul Silva Student Research Grant, California Botanical Society – \$600
- 2021 – Student Research Scholarship, Northern California Botanists – \$1,000
- 2021 – Research Grant, Alta Peak California Native Plant Society Chapter – \$500
- 2021 – Howard-Kohn Memorial Scholarship, Marin California Native Plant Society Chapter – \$3,000
- 2021 – Graduate Student Research Fellowship, Torrey Botanical Society – \$1,000
- 2021 – Summer Scholarship in Field Botany, Garden Club of America – \$3,000
- 2021 – Gertrude R. Hardman Native Plant Research Award, California Native Plant Society – \$600
- 2021 – Jessica Mae Orozco Grant, Southern California Botanists – \$1,000
- 2020 – Sally Casey Research Scholarship, Santa Clara California Native Plant Society Chapter – \$1,500
- 2020 – David & Frieda Wertman Scholarship, College of Science and Mathematics, California Polytechnic State University, San Luis Obispo – \$2,500
- 2020 – Honorable Mention, Graduate Research Fellowship Program, National Science Foundation
- 2016 – Dennis K. Walker Botany Award, California State Polytechnic University, Humboldt – \$1,000
- 2015 – Blanche G. Williams & Gertrude G. Graham Award, California State Polytechnic University, Humboldt – \$1,000
- 2015 – PLANTS Grant, Botanical Society of America & National Science Foundation – \$1,000

PUBLICATIONS

1. **Fryer, E. R.**, N. Bales, A. Shon, H. Huntley, S. McKinnon, R. O'Dell, and N. Rajakaruna. (*in press*). Clay affinity and endemism in California's flora. *Madroño*.
2. **Fryer, E. R.** 2024. Book Review: *Geocology of California and Nevada Landscapes & Ultramafic Geocology of North America*. *Madroño*, 71(1): 59–60. <https://doi.org/10.3120/0024-9637-71.1.59>
3. **Fryer, E. R.**, M. Mulroy, C. Hodge, J. Eulensen-Wallace, J. Dart, and N. Rajakaruna. 2024. A preliminary exploration of an understudied lichen flora: Lichens of the basin of Carrizo Plain National Monument, California. *Evansia*, 41(2): 35-46. <https://doi.org/10.1639/0747-9859-41.2.35>
4. Burnett, J. K., **E. R. Fryer**, C. R. Unger, and A. M. F. Tomescu. 2016. Pinaceous wood from the Lower Cretaceous (Barremian-early Aptian) of California, USA – Lower Chikabally Member, Budden Canyon Formation. *Ameghiniana*, 53(6): 685-694. <https://doi.org/10.5710/AMGH.18.08.2016.2973>

BOOKS

1. Grossenbacher, D. L. and **E. R. Fryer**. 2025. *A Manual for Plant Identification and Classification*. Vervante, Springville, UT.

PRESENTATIONS (* with published abstract)

1. **Fryer, E. R.**, N. Bales, A. Shon, H. Huntley, S. N. McKinnon, R. E. O'Dell, and N. Rajakaruna. 2025. Clay Endemism and Affinity in California's Flora. California Botanical Society 30th Graduate Student Symposium, San Luis Obispo, California. *
2. **Fryer, E. R.** 2024. The Ontogenetic Ecology of Trees: A Physiological and Anatomical Perspective. Guest lecture. California State Polytechnic University, Humboldt. Arcata, California.
3. **Fryer, E. R.** 2024. The Ontogenetic Ecology of Trees & the Future of Forest Regeneration. Lab Seminar. Colorado State University, Fort Collins. Colorado.
4. **Fryer, E. R.** 2024. Plant-Soil-Lichen Relations of Carrizo Plain National Monument. Guest lecture. California Polytechnic State University, San Luis Obispo, California. Virtual meeting.
5. **Fryer, E. R.** 2024. Anatomy of a Superbloom: Soil, Competition, and Survival in the San Joaquin Desert. Torrey Botanical Society, New York, New York. Virtual meeting.
6. **Fryer, E. R.**, R. E. O'Dell, and N. Rajakaruna. 2023. Niche shifts, competition and edaphic differences shape a floral mosaic on vertic clay soils in California's San Joaquin Desert. Ecological Society of America 2023 Annual Meeting, Portland, Oregon. *
7. **Fryer, E. R.**, A. Shon, H. Huntley, R. E. O'Dell, and N. Rajakaruna. 2023. Clay Endemism and Affinity in the California Floristic Province. International Conference on Serpentine Ecology, Nancy, France. *
8. **Fryer, E. R.**, R. E. O'Dell, and N. Rajakaruna. 2023. The Vertic Clay Flora of the San Joaquin Desert: Niche, Competition & Floral Mosaics on a Novel Substrate. International Conference on Serpentine Ecology, Nancy, France. *
9. **Fryer, E. R.**, R. E. O'Dell, and N. Rajakaruna. 2023. Niche, competition and soils shape a floral mosaic on vertic clay soils in California's San Joaquin Desert. California Botanical Society 29th Graduate Student Symposium, Arcata, California. *
10. **Fryer, E. R.**, R. E. O'Dell, and N. Rajakaruna. 2022. The Role of Competition and Soil Chemistry in the Community Assembly of the Vertic Clay Endemic Annual Plant Communities of the San Joaquin Desert. California Native Plant Society Conference, San Jose, California. *
11. **Fryer, E. R.**, R. E. O'Dell, and N. Rajakaruna. 2022. The Vertic Clay Endemic Annual Plant Communities of the San Joaquin Desert. Invited Speaker. North-West University, Potchefstroom, South Africa. Virtual meeting.

12. **Fryer, E. R.**, R. E. O'Dell, and N. Rajakaruna. 2022. The Role of Invasive Species and Soil Chemistry in the Community Assembly of the Vertic Clay Endemic Annual Plant Communities of the San Joaquin Desert. Botanical Society of America 117th Annual Meeting, Anchorage, Alaska. *
13. Eulensen-Wallace, J., C. Hodge, M. Mulroy, **E. R. Fryer**, and N. Rajakaruna. 2022. Lichens of Carrizo Plain. Biological Sciences Frost Research Symposium, California Polytechnic State University, San Luis Obispo, California.
14. **Fryer, E. R.**, R. E. O'Dell, and N. Rajakaruna. 2022. How Invasive Species and Soil Chemistry Shape the Vertic Clay Endemic Annual Plant Communities of the San Joaquin Desert. California Native Plant Society San Luis Obispo Chapter Meeting. Virtual meeting.
15. **Fryer, E. R.**, and M. Mulroy. 2022. A Brief Introduction to Lichens. Student workshop, San Luis Obispo, California.
16. **Fryer, E. R.**, Rajakaruna, N., Shon, A., and S. McKinnon. 2022. Community Assembly of Vertic Clay Endemic Annual Plants of the San Joaquin Desert. College of Science and Mathematics Student Research Conference, California Polytechnic State University San Luis Obispo, California. *
17. Shon, A., **E. R. Fryer**, and N. Rajakaruna. 2021. Determining Edaphic Factors of Vertic Clay Communities. Biological Sciences Frost Research Symposium, California Polytechnic State University, San Luis Obispo, California.
18. McKinnon, S., **E. R. Fryer**, and N. Rajakaruna. 2021. Effects of edaphic factors and competition on flowering phenology and reproductive output of native California desert annuals. Biological Sciences Frost Research Symposium, California Polytechnic State University, San Luis Obispo, California.
19. **Fryer, E. R.**, R. E. O'Dell, and N. Rajakaruna. 2021. Community Assembly of Vertic Clay Endemic Annual Plants of the San Joaquin Desert. Botanical Society of America 116th Annual Meeting. Virtual meeting. *
20. **Fryer, E. R.**, R. E. O'Dell, and N. Rajakaruna. 2021. Community Assembly of Vertic Clay Endemic Annuals of the San Joaquin Desert. California Botanical Society 28th Graduate Student Symposium. Virtual meeting. *
21. **Fryer, E. R.** 2019. Rare Lichens and Bryophytes. Caltrans Central Region Off-site Conference, Stockton, California.
22. **Fryer, E. R.**, and A. M. F. Tomescu. 2016. Conifer wood from the Lower Cretaceous of northern California: implications for *Protocedroxylon* taxonomy. Botanical Society of America 111th Annual Meeting, Savannah, Georgia. *
23. **Fryer, E. R.**, and A. M. F. Tomescu. 2015. Early Cretaceous permineralized wood with araucarioid characters in the Budden Canyon Formation of California. Botanical Society of America 110th Annual Meeting, Edmonton, Canada. *

WORK EXPERIENCE

ETH Zurich – Tutor

September 2023 to present

Mentored and supervised students on student research projects, provided revisions feedback on student writing, assisted in lab course materials and instruction, and provided student guidance on topics of plant ecology.

California Polytechnic State University – Lecturer

April 2023 to August 2023

Prepared, and graded quizzes and coursework, prepared and delivered lab lectures in coordination with instructing professors and laboratory coordinator. Prepared course materials, syllabi, and curricula, held office hours, and provided student guidance on topics of botany, biology, and ecology.

California Polytechnic State University – Teaching Associate

January 2021 to March 2023

Prepared, and graded quizzes and coursework, prepared and delivered lab lectures in coordination with instructing professors and laboratory coordinator. Prepared course materials, syllabi, and curricula, held office hours, and provided student guidance on topics of plant and animal physiology and anatomy, and microbiology.

California Polytechnic State University – Frost Summer Undergraduate Research Fellowship Program Graduate Supervisor

July 2021 to September 2021, July 2022 to September 2022

Supervised undergraduate fellows in the Frost Undergraduate Research Fellowship Program over two summers and two research projects. Planned and coordinated summer research projects and provided research mentorship and guidance for professional presentations on research. Trained undergraduate fellows in lichen identification and lab and field techniques and prepared research authorization requests to federal agencies.

California Polytechnic State University – Graduate Assistant

September 2020 to August 2021

Prepared grant applications and conducted literature reviews, experimental design, coordination, and implementation, and various academic research activities, on an as-needed basis in coordination with academic advisor.

HDR Engineering, Inc. – Field Botanist & Specialist Environmental Planner

October 2017 to November 2019

Provided staff augmentation and acted as a specialist environmental planner and field biologist for Caltrans Central Region Biology, preparing technical environmental documents, biological impact assessments, permit applications for Fish and Game Code Section 1602 Lake and Streambed Alteration Agreements, Clean Water Act Section 404 Nationwide Permits, and Clean Water Act Section 401 Water Quality Certifications. Prepared permit compliance reports, managed conservation measure compliance, conducted biological monitoring, worker environmental awareness training, and mitigation monitoring and reporting, and planned, lead, and reported for protocol- and reconnaissance-level surveys for special status species.

RESEARCH PROJECTS

1. The ontogenetic ecology of forest regeneration – with Dr. Janneke Hille Ris Lambers (ETH Zurich) and Dr. Alana Chin (California State Polytechnic University, Humboldt).
2. Saxicolous and terricolous lichens of Carrizo Plain National Monument – with Dr. Nishanta Rajakaruna and Michael Mulroy (California Polytechnic State University, San Luis Obispo).

3. Quantifying clay endemism and association with clay soils in California's flora – with Dr. Nishanta Rajakaruna (California Polytechnic State University, San Luis Obispo) and Ryan O'Dell (Bureau of Land Management Central Coast Field Office).
4. Community assembly of the vertic clay endemic annual flowering plants of the San Joaquin Desert – with Dr. Nishanta Rajakaruna (California Polytechnic State University, San Luis Obispo) and Ryan O'Dell (Bureau of Land Management Central Coast Field Office).
5. Processing micrographs of an anatomical fossil of the dicksoniaceae fern *Onychiopsis* for 3D rendering and producing a 3D reconstruction of *Onychiopsis* vasculature – with Dr. Alexandru Tomescu (California State Polytechnic University, Humboldt)
6. Taxonomic placement and description of a Lower Cretaceous araucarioid fossil conifer wood from the Budden Canyon Formation of northern California – with Dr. Alexandru Tomescu (California State Polytechnic University, Humboldt)
7. Identification and description of a Lower Cretaceous pinaceous fossil conifer wood from the Budden Canyon Formation of northern California – with Dr. Alexandru Tomescu (California State Polytechnic University, Humboldt)
8. Collection and mounting of a sample flora of the disturbed areas and roadsides of Humboldt County, California – directed study with the California State Polytechnic University, Humboldt Herbarium and Dr. J.P. Smith (California State Polytechnic University, Humboldt)
9. Investigation into the effects of media sucrose content and gas availability on gemmae production by cultured *Marchantia polymorpha* – directed study with Dr. Casey Lu (California State Polytechnic University, Humboldt)

TEACHING EXPERIENCE

ETH Zurich (2023 to present)

Environmental Biology (Umweltbiologie Praktikum): Laboratory

Ecology and Evolution Seminar: Individual supervision & mentorship

California Polytechnic State University, San Luis Obispo (2021 to 2023)

BOT 121 – General Botany: Lecture & Laboratory

BIO 114 – Plant Diversity & Ecology: Laboratory

BOT 313 – Taxonomy of Vascular Plants: Laboratory

BIO 111 – General Biology: Laboratory

BIO 162 – Introduction to Organismal Form & Function: Laboratory

MCRO 221 – Microbiology: Laboratory

MENTORSHIP

Nicolas Cuellar – Heat and drought tolerance traits of *Fagus sylvatica* and *Acer pseudoplatanus*.

Skyler McKinnon & Alyssa Shon – Reproductive output and phenological patterns in vertic clay endemic annual forbs of the San Joaquin Desert; with Frost Undergraduate Research Fellowship Program.

Chloe Hodge & Jujú Eulensen-Wallace – Saxicolous and terricolous lichens of Carrizo Plain National Monument, with additional instruction on lichen identification; with Frost Undergraduate Research Fellowship Program.

Chloe Hodge, Gilbert Yu, Skyler McKinnon & Alyssa Shon – Seed banking for vertic clay endemic annual forbs of the San Joaquin Desert.

Alyssa Shon, Hannah Huntley & Skyler McKinnon – Quantifying clay affinity in California’s vascular plant flora.

FIELDWORK & SURVEY EXPERIENCE

Seedling and tree sampling of *Acer pseudoplatanus*, *Fagus sylvatica*, *Picea abies*, and *Abies alba* – with Dr. Janneke Hille Ris Lambers (ETH Zurich, June – September 2024).

Lichen sampling: sampling and collection of saxicolous and terricolous lichens from Carrizo Plain National Monument – with Dr. Nishanta Rajakaruna and Michael Mulroy (California Polytechnic State University; July 2022).

Botanical surveys: point-intercept and percent cover, following project-specific protocol – with Dr. Tim Bean and Dr. Lorelei Larios (California Polytechnic State University and University of California Riverside; April 2022).

Botanical surveys: point-intercept, line-intercept, and percent cover, following project-specific protocols for vegetation sampling on Santa Cruz Island – with California Polytechnic State University (California Polytechnic State University and The Nature Conservancy, March 2022).

Small mammal trapping for Tipton kangaroo rat (*Dipodomys nitratooides nitratooides*), Fresno kangaroo rat (*Dipodomys nitratooides exilis*), and giant kangaroo rat (*Dipodomys ingens*) – with Caltrans Central Region staff, U.S. Fish and Wildlife (HDR, Caltrans Central Region Biology, Pixley Wildlife Refuge; May 2018 - October 2018).

Biological monitoring of migratory nesting birds and San Joaquin kit fox natal dens – with Caltrans Central Region staff (HDR and Caltrans Central Region Biology; February 2018 - November 2019).

Protocol surveys for Swainson’s hawk (*Buteo swainsoni*), San Joaquin kit fox (*Vulpes macrotis mutica*), and blunt-nosed leopard lizard (*Gambelia sila*) – with Caltrans Central Region staff (HDR and Caltrans Central Region Biology; February 2018 - November 2019).

Relocation and transplantation of a population of Sanford’s arrowhead (*Sagittaria sanfordii*) in Cameron Slough, Fresno County, California – with Caltrans Central Region staff (HDR and Caltrans Central Region Biology; November 2017).

Botanical surveys: percent-cover, presence/absence, and protocol, following *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* – with Caltrans Central Region Biology staff (HDR and Caltrans Central Region Biology; October 2017 - November 2019).

Collecting Devonian plant fossils from Cottonwood Canyon, Wyoming – with Dr. Alexandru Tomescu (California State Polytechnic University, Humboldt; July 2017).

VOLUNTEER WORK

Mounting plant collections from the Central Valley region, processing and evaluating collections – with Dr. Katherine Waselkov and the Fresno State University Herbarium; October 2017 to March 2020.

Rare plant status reviewer – with California Native Plant Society; March 2019 to present.

Student panelist, “Finding Your Way (in College and in Life)” – with California Polytechnic State University Department of Biological Sciences; November 2020.

WORKSHOPS

California Environmental Quality Act Impact Assessment – with the California Native Plant Society; Berkeley, California, October 2019

Poaceae – with Dr. Travis Columbus and the Jepson Herbarium; Berkeley, California, May 2019

Wetland Delineation – with the Wetland Training Institute; Roseville, California, April 2019

Rare Plant Survey Protocols – with the California Native Plant Society; Imperial Beach, California, March 2019

Small Mammal Trapping Workshop – with the Yosemite Audubon Society; Ahwahnee, California, May 2018) – with Melissa Odell, SCIN 11023

PROFESSIONAL AFFILIATIONS

Southern California Botanists
Northern California Botanists
California Botanical Society

Botanical Society of America
American Bryological & Lichenological Society
Ecological Society of America

SKILLS

Basic Arcmap/GIS

R statistical software

Keying vascular plants to species, including with *The Jepson eFlora*, and *The Jepson Manual*

Keying bryophytes, lichens, macrofungi, and microfungi to species

Keying vegetation types with the *Manual of California Vegetation*

Scientific botanical illustration

Basic map and compass skills, backpacking and survival skills

Light microscope photography

Cellulose-acetate peel technique for plant fossil sectioning

Basic bacterial culture and media preparation, aseptic technique

Basic plant tissue culture media preparation

Fluorescence microscopy

RELEVANT COURSEWORK († indicates course audits)

Botany
Field Botany
Paleobotany
Ascomycetes & Basidiomycetes
Biology of the Microfungi
Plant Taxonomy
General Plant Physiology
Principles of Ecology
General Bacteriology
Proposal Writing for Biological Research

Lichens & Bryophytes
General Chemistry I & II
Organic Chemistry
Genetics
Evolution
Spatial Ecology
Cellular & Molecular Biology
Biostatistics
Developmental Plant Anatomy †
Experimental Design & Regression Modeling