Zachary L. Steel

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EDUCATION

University of California, Davis, Ph.D. Ecology 2014–2018

University of California, Davis, M.S. Ecology 2008–2011

Whitman College, B.A. Biology 2002–2006

EMPLOYMENT

USDA Forest Service Rocky Mountain Research Station:

Research Biological Scientist 2022–Present

University of California, Berkeley:

Post-doctoral Researcher 2019–2022

University of California, Davis:

Graduate Student Researcher 2014–2018

Jr. Specialist Researcher 2012–2014

Fire Science Consortium Coordinator 2012–2013

US Fulbright Program, Santiago, Chile:

Research Fellow 2011

University of California, Davis:

Graduate Student Researcher 2008–2011

University of California, Santa Cruz:

Assistant Biologist 2007–2008

PRBO Conservation Sciences:

Biology Technician 2007–2008

PUBLICATIONS

Journal Articles

Accepted – Williams, J., H. Safford, N. Enstice, J. Tangenberg, **Z. Steel**, and A. Paulson. "High severity burn area and proportion exceed historic conditions in forests of Sierra Nevada and adjacent ranges (USA)". *Ecosphere*.

Accepted – Weeks, J. M., H. Safford, J. Miller, **Z. Steel**, and E. Batzer. "High Severity Fire Drives Floristic Homogenization in Human-Altered Forests", *Ecosphere*.

2022 – **Steel, Z. L.**, G. M. Jones, B. M. Collins, R. Green, A. Koltunov, K. L. Purcell, S. C. Sawyer, M. R. Slaton, S. L. Stephens, P. Stine, and C. Thompson. "Mega-disturbances cause rapid decline of mature conifer forest habitat in California", *Ecological Applications*.

2022 – Viljur, M. and 46 others including **Steel, Z. L.**. "The effect of natural disturbances on forest biodiversity: An ecological synthesis", *Biological Reviews* 97(5):1930-1947.

2022 – Levine, J., B. Collins, **Z. L. Steel**, P. de Valpine, and S. Stephens. "High-severity fire risk heightened both on and near industrially managed forests". *Frontiers in Ecology and the Environment*.

2022 – Safford, H., A. Paulson, **Z. Steel**, D. Young, and R. Wayman. "The 2020 California fire season: A year like no other, a return to the past, or a harbinger of the future?". *Global Ecology and Biogeography 31(10):2005-2025*.

2022 – **Steel, Z. L.**, A. Fogg, R. Burnett, L. J. Roberts, H. D. Safford. 2022. "When bigger isn't better – implications of large high-severity wildfire patches for avian diversity and community composition". *Diversity and Distributions* 23(3):439-453.

2021 – **Steel, Z. L.**, B. M. Collins, D. B. Sapsis, and S. L. Stephens. "Quantifying pyrodiversity and its drivers". *Proc. R. Soc. B* 288(1948).

2021 – **Steel, Z. L.**, M.J. Goodwin, M.D. Meyer, G.A. Fricker, H.S.J. Zald, M.D. Hurteau, and M.P. North. Do forest fuel reduction treatments confer resistance to beetle infestation and drought mortality? *Ecosphere* 12(1):e03344.

2021 – Jager, H., J. Long, R. Malison, B. Murphy, A. Rust, L. Silva, R. Sollman, **Z. Steel**, M. Bowen, J. Dunham, J. Ebersole, and R. Flitcroft. "Resilience of terrestrial and aquatic fauna to historical and future wildfire regimes in western North America". *Ecology and Evolution* 11(18):12259-12284.

2021 – Stephens, S., S. Thompson, G. Boisrame, B. Collins, L. Ponisio, K. Rakhmatulina, **Z. Steel**, J. Stevens, K. Wilken, and J. van Wagtendonk. "Fire, water, and biodiversity in the Sierra Nevada: A possible triple win". *Environmental Research Communications* 3(08):1004.

2021 – **Steel, Z. L.**, D. Foster, M. Coppoletta, J. M. Lydersen, B. Wing, S. L. Stephens, and B. M. Collins. "Ecological resilience and vegetation transition in the face of multiple large wildfires". *Journal of Ecology* 109(9):3340-3355.

2019 – **Steel, Z. L.**, B. Campos, W. Frick, R. Burnett, and H. D. Safford. "The effects of wildfire severity and pyrodiversity on bat occupancy and diversity in fire-suppressed forests". *Scientific Reports* 9, 16300.

2019 – Wilkins, L. G. E., K. R. Matthew, **Z. L. Steel**, S. C. Nussle, and S. M. Carlson. "Population dynamics of *Rana sierrae* at Dusy Basin: Influence of non-native predators, drought, and restoration potential". *Ecosphere* 10(11):e02951.

2018 – **Steel, Z. L.**, M. Koontz, and H. Safford. "The changing landscape of wildfire: Burn pattern trends and implications for California's yellow pine and mixed conifer forests". *Landscape Ecology* 33(7): 1159-1176.

2017 – **Steel, Z. L.**, A. E. Steel, J. Williams, J. H. Viers, P. Marquet, and O. Barbosa. "Patterns of bird diversity and habitat use in mixed vineyard-matorral landscapes of Central Chile". *Ecological Indicators* 73:345-357.

2017 – Grof-Tisza, P., **Z. L. Steel**, E. Cole, M. Holyoak, and R. Karban. "Testing predictions of movement behavior in a hilltopping moth". *Animal Behavioral* 133:161-168.

2017 – Grof-Tisza, P., **Z. L. Steel**, and R. Karban. "The spatial distribution and oviposition preference of the Ranchman's tiger moth, Platyprepia virginalis (Lepidoptera: Arctiidae)". *Journal of the Lepidopterists' Society* 71(1):16-19.

2015 – **Steel, Z. L.**, H. D. Safford, and J. H. Viers. "The fire frequency-severity relationship and the legacy of fire suppression in California forests". *Ecosphere* 6(1):1-23.

2013 – Schwartz, M.W., L. B. Smith, and **Z. L. Steel**. "Conservation investment for rare plants in urban environments". *PLOS ONE* 8(12):e83809.

2012 – **Steel, Z. L.**, M. L. Bond, R. B. Siegel, and P. Pyle. "Avifauna of Sierra Nevada Network parks: Assessing distribution, abundance, stressors, and conservation opportunities for 145 bird species". National Park Service, Fort Collins, Colorado. Natural Resource Report NPS/SIEN/NRR—2012/506.

2011 – Siegel, R. B, R. L. Wilkerson, J. F. Saracco, and **Z. L. Steel**. "Elevational distribution of common bird species on the Sierra Nevada's west slope". *Western Birds* 42:2-26.

In Review or Revision

Stephens, S.[1], **Z. Steel**[1], B. Collins, D. Fry, S. J. Gill, H. Rivera-Huerta, and C. N. Skinner. "Climate and fire removal impacts on tree recruitment in mixed conifer forests in Northwestern Mexico and California". *Ecological Applications*.

[1] *Authors contributed equally to this work*

Francis, E. J., S. Pourmohammadi, **Z. Steel**, B. M. Collins, and M. D. Hurteau. "Proportion of forest area burned at high-severity increases with increasing forest cover and connectivity in western US watersheds".

Outreach Documents & Software

2021 – Meyer, M., Long, J., Safford, H. (editors) and 22 contributors including **Z. Steel**. "Postfire restoration framewok for national forests in California". USDA Forest Service Pacific Southwest Research Station. PSW-GTR-270.

2021 – **Steel, Z. L.**, M. D. Meyer, M. P. North, A. Wuenschel, and S. M. Ostoja. "Reforestation tool for tree mortality landscapes." In: Meyer, M.D.; Long, J.W.; Safford, H.D., eds. Postfire restoration framework for national forests in California. Gen. Tech. Rep. PSW-GTR-270. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 191-192. Appendix 7.

2021 – USFS Region 5 Climate Change Trend Assessments (8 reports). E.g.:

Wuenschel, A., S. Gross, B. Estes, K. Merriam, H. Safford, S. Sawyer, **Z. Steel**, L. Wolf. Sierra National Forest Climate Change Trend Summary. Unpublished report. USFS Pacific Southwest Region, Vallejo CA.

2020 – **Steel, Z. L.**, M. Meyer, A. Wuenschel, S. Ostoja, and M. North. "Climate-wise reforestation toolkit". Rshiny web application prepared for the US Forest Service, and the California Climate Hub. Available online

2018 – **Steel, Z. L.**, B. R. Campos, and H. D. Safford. "Bat occupancy in Sierra Nevada wildfire areas and implications for post-fire management". Prepared for US Forest Service, Region 5. PDF

2018 – Campos, B. R., **Z. L. Steel**. FIRE-BAT spatial predictive tool. ArcGIS toolbox prepared for US Forest Service, Region 5. Users Manual

2017 – Campos, B. R., R. D. Burnett, and **Z. L. Steel**. "Bird and bat inventories in the Storrie and Chips fire areas 2015-2016: Final report to the Lassen National Forest". Point Blue Conservation Science, Petaluma, CA. Point Blue Contribution No. 2142. PDF

2017 – Fogg, A. M, **Z. L. Steel** and R. D. Burnett. "Avian Monitoring in Freds and Power fires: Final Report". Point Blue Conservation Science, Petaluma, CA. Point Blue Contribution No. 2138. PDF

2013 – Schwartz, M. W., et al. "Sensitive Animals - Appendix 15 to SEKI Natural Resources Condition Assessment". Natural Resource Report NPS/SEKI/NRCA—2013/665. National Park Service. Fort Collins, Colorado. Assessments within:

Steel, Z. L., E. Reddy and R. Green. The American Pika - *Ochotona princeps*

Steel, Z. L., J. Shields. Sierra Nevada Bighorn Sheep - *Ovis canadensis sierrae*

Copeland, S., K. Dybala, **Z. L. Steel**. California Condor - *Gymnogyps californianus*

Steel, Z. L., Sierra Nevada Chipmunks - *Tamais spp.*

2012 – **Steel, Z. L.**, O. Barbosa, and P. Marquet. "Biodiversidad de Aves y Carbono en el Paisaje Vinedo". Three reports prepared for landowner partners in the Colchagua Valley, Chile.

2011 – **Steel, Z. L.**, M. Wilderson, P. Grof-Tisza, and K. Sulzner. "Assessing species and area vulnerability to climate change for the Oregon Conservation Strategy: Willamette Valley Ecoregion". Prepared for the Oregon Department of Fish and Wildlife and the Defenders of Wildlife.

TEACHING

Graduate & Post-graduate Teaching:

Fire Effects on Wildlife – CA State Parks Fire Ecology training	April 2022
Guest Lecturer – UCD, Fire Ecology	Winter 2020-2022
Guest Lecturer – UCB, Fire Ecology Seminar	Spring 2020
Co-Instructor – UCD, Fire Ecology	Winter 2018
Guest Lecturer – UCD, Ecogeomorphology	Springs 2014–2018
Certificate of Completion – UCD Foundations of Teaching workshop series	Fall 2017
Guest Lecturer – American River College, Experimental Design	Spring 2017
Teaching Assistant – UCD, Trees and Forests; PLS 144	Fall 2015
Teaching Assistant – UCD, Trees and Forests; PLS 144	Fall 2014

Mentoring:

Undergraduate Mentor – Student research experience	Spring 2019-Present
Undergraduate Mentor – Association for Women in Science Mentoring program	2019
High School Mentor – Student & Landowner Education Stewardship program	2015–2016
Undergraduate Mentor – Student research experience	Summer 2009

Outdoor Education:

Naturalist/Raft Guide – UCD, Outdoor & Watershed Sciences programs	2013-2018
Teacher/Scientist – Earthwatch citizen science programs	2013
Naturalist/Kayak Guide – San Juan Islands, WA	Summers 2006-2007

Undergraduate Teaching:

Teaching Assistant – Whitman College, Genetics; BIO 205	Fall 2005
Teaching Assistant – Whitman College, Ecology; BIO 277	Spring 2005

AWARDS

Grants written & funded:

2022-2023 – *Linking pyrodiversity and biodiversity with terrestrial LiDAR*. Funded by the Yosemite Conservancy. $40,000

2020-2023 – *Implications of increasing the scale of managed wildfire on forest carbon stocks and pyrodiversity*. Funded by California Department of Forestry and Fire Protection (CALFIRE). $422,000

2017-2018 – *Ecological implications of wildfire and forest restoration on birds and bats (phase II)*. Funded by US Forest Service. $122,000

2014-2017 – *Ecological implications of wildfire and forest restoration on birds and bats (phase I)*. Funded by US Forest Service. $127,000

2011 – *Quantifying avian habitat use and carbon stocks in Chilean vineyards*. Funded by US Fulbright Program. $17,000

Fellowships received:

2014-2018 (7 quarters) – *Graduate Group of Ecology Fellowship*. Funded by UC Davis. $79,000

2017 – *Ecology Student Endowment*. Funded by UC Davis. $1500

2010 – *Graduate Group of Ecology Fellowship*. Funded by UC Davis. $11,000

2002-2006 – *Walter Brattain Merit scholarship*. Funded by Whitman College. $32,000

2001-2002 (2 awards) – *Governor's college scholarship*. Funded by State of California. $2000

SELECT PRESENTATIONS

Invited talks

2022 – California Native Plant Society Conference, *Declining southern Sierra Nevada conifer forests in an age of mega-disturbances: applying remote sensing tools to inform mature forest conservation*

2021 – International Fire Ecology and Management Congress, *Forest resilience and transition in the face of successive large wildfires in California's Sierra Nevada Mountains*

2021 – Berkeley EcoLunch Seminar, *Wildlife and wildfire: a love-hate relationship*

2021 – Yosemite National Park Forum, *Restoring pyrodiversity to benefit Sierra Nevada wildlife communities*

2021 – Western Section of the Wildlife Society Annual Meeting **(Plenary)**, *Implications of changing fire patterns on habitats and wildlife*

2020 – Natural Areas Association Annual Meeting, *Implications of changing fire regimes for Sierra Nevada bat and bird communities*

2017 – Instituto Politécnico Nacional, CIIDIR-Unidad Oaxaca, Mexico, *Murcielagos en un paisaje caracterizado por incendios: Impactos en diversidad y uso de habitat*

2017 – Northwest Science Conference, *The influence of burn severity on bat species occurrence in post-fire landscapes*

2011 – Universidad Mayor, Santiago, Chile, *Mercados de carbono: una oportunidad potencial para biodiversidad en agroecosistemas*

Contributed talks

2022 – Yosemite National Park Hydroclimate Meeting, *The chiropteran fire pulse: vegetation and hydro-climate mediate changes in bat activity in Sierra Nevada wilderness*

2022 – International Association of Landscape Ecology, *Megadisturbances Cause Rapid Decline of Mature Forest Habitat in California*

2021 – International Association of Landscape Ecology, *Quantifying pyrodiversity and its drivers*

2020 – Ecological Society of America Annual Meeting, *What doesn't kill you makes you stronger - or not: Conifer mortality following forest treatments and drought*

2019 – The Wildlife Society Annual Conference, *The Influence of Burn Severity and Pyrodiversity on Bat Communities in Sierra Nevada Forests*

2018 – Mediterranean Forest Ecosystems International Conference (MedPine6), *Changing patterns of severe wildfire lead to bird diversity declines & community transitions in conifer forests of California, USA*

2018 – Ecological Society of America Annual Meeting, *Bat species occupancy varies across a disturbance gradient; implications for a future of extreme wildfire events*

2017 – Ecological Society of America Annual Meeting, *The influence of spatial context and successional pathways on bird communities following high-severity wildfire*

2017 – Mediterranean Ecosystems Conference (MEDECOS), *Shifting patterns of California fire and forest landscapes in an era of global change*

2016 – Natural Areas Conference, *The Changing Landscape of California Fire: Trends in Burn Patterns and Post-Fire Forest Heterogeneity*

2011 – Buenos Aires Fulbright Regional Enhancement Seminar, *Carbon Sequestration: Risk or tool for biodiversity?*

2011 – Bay Area Conservation Biology Symposium, *Assessing species vulnerability to climate change in the Willamette Valley Ecoregion*

SERVICE

Professional Society Memberships: Ecological Society of America, The Wildlife Society, Natural Areas Association, International Association of Landscape Ecology, Association for Fire Ecology

Journal Referee: *Global Change Biology, Environmental Research Letters, Landscape Ecology, Current Landscape Ecology Reports, PLOS One, Ecosphere, Ecography, Diversity and Distributions, Ecology and Society, Forest Ecology and Management, Biological Conservation, Fire Ecology*

Special Symposium co-organizer: "Toward a comprehensive understanding of pyrodiversity: How landscape- scale heterogeneity in fire history influences biodiversity across taxa, fire regimes, and spatial scales." International Association of Landscape Ecology 2021 meeting, Reno, NV

Dissertation Committee Member: For a PhD student of the Autonomous University of Baja California