Christopher L. Crawford

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Summary

I am currently a AAAS Science & Technology Policy Fellow placed in the USDA Office of the Chief Scientist, where I am applying my experience in conservation science to a broad range of agricultural and environmental science policy topics in the USDA. As a conservation scientist, I aim to use the tools of geospatial analysis, ecology, and environmental science to tackle the defining conservation challenge of our time: reconciling our collective agricultural needs with biodiversity conservation. My past research examined how changes in the distribution of humans and agriculture affect biodiversity and carbon storage, with a focus on cropland abandonment and expansion. Throughout my work, I aim to use science to inform land use policy and better protect and restore wildlife and wild places.

Education

Princeton University *Princeton, NJ | 2016 – 2022*

- Ph.D. in Science, Technology, & Environmental Policy, School of Public and International Affairs
  - Dissertation: "Agriculture in flux, biodiversity in the balance: conservation implications of agricultural expansion and abandonment."
  - Adviser: David S. Wilcove, Professor of Ecology and Evolutionary Biology and Public Affairs, Princeton University
  - GPA: 3.95
- M.A. in Public and International Affairs, awarded 2018

University of Michigan *Ann Arbor, MI | 2008 – 2012*

- Bachelor of Science (with distinction) in Ecology & Evolutionary Biology, Minor in Physics
  - Cumulative GPA: 3.82/4.00, Major GPA: 3.85/4.00
- Phi Beta Kappa Society Inductee; University Honors for Academic Excellence: 2008-2012; James B. Angell Scholar: 2012

EcoQuest Education Foundation Program in Applied Field Studies *New Zealand | Winter 2011*

- Studied ecology, natural resources management, and policy during a semester-long field program capped by a month-long research project assessing avian diversity and abundance after invasive species removal on a mainland ecological island.

Publications

Peer-reviewed (see Google Scholar)

1. Zeng Y, Senior RA, **Crawford CL**, & Wilcove DS. (2023). Gaps and weaknesses in the global protected area network for safeguarding at-risk species. *Science Advances*, 9(22). https://doi.org/10.1126/sciadv.adg0288
2. Ma L, Conradie SR, **Crawford CL**, Gardner AS, Kearney MR, Maclean IMD, McKechnie AE, Mi CR, Senior RA, & Wilcove DS. (2023). Global Patterns of Climate Change Impacts to Desert Bird Communities. *Nature Communications,* 14, 211. https://doi.org/10.1038/s41467-023-35814-8
3. **Crawford CL**, Yin H, Radeloff VC, & Wilcove DS. (2022). Rural land abandonment is too ephemeral to provide major benefits for biodiversity and climate. *Science Advances*, 8(21). https://doi.org/10.1126/sciadv.abm8999
4. **Crawford CL,** Estes LD, Searchinger TD, & Wilcove DS. (2021). Consequences of under-explored variation in biodiversity indices used for land-use prioritization. *Ecological Applications*, 31(7): e02396. https://doi.org/10.1002/eap.2396
5. **Crawford CL*,** Volenec ZM*, Sisanya M, Kibet R, & Rubenstein DI. (2018). Behavioral and Ecological Implications of Bunched, Rotational Cattle Grazing in East African Savanna Ecosystem. *Rangeland Ecology & Management*, 72(1):204-209. https://doi.org/10.1016/j.rama.2018.07.016 (*Co-lead author.)
6. Price JJ, & **Crawford CL**. (2013). Use and characteristics of two singing modes in Pine Warblers. *The Wilson Journal of Ornithology*, 125(3):552-561. https://doi.org/10.1676/13-006.1

Manuscripts in review

1. **Crawford CL,** Wiebe RA, Yin H, Radeloff VC, & Wilcove DS. Cropland abandonment benefits more birds and mammals than it harms but rarely compensates for habitat loss.

Reports

1. Sustainable Conservation. (2015). Lower Mokelumne River Restoration Assessment. http://suscon.org/mokelumne-river-restoration-assessment/ **(Lead author of report.)**
2. **Crawford, CL.** (2011). Bird diversity and abundance at Maungatautari Ecological Island: regeneration after a landmark mainland restoration project. *Unpublished*. EcoQuest Education Foundation, New Zealand.

Research and Professional Experience

U.S. Department of Agriculture — AAAS Science & Technology Policy Fellow, Office of the Chief Scientist — *Washington, DC | Sept. 2023 – present*

- Leveraging my background in ecology, biodiversity, and conservation science to support agricultural science-policy work at the USDA through diverse projects on climate-smart agriculture, animal agriculture sustainability, protein innovation and diversification, infectious disease risk, and accelerating agricultural innovation and advanced manufacturing to solve environmental challenges.
- Supporting the USDA Honey Bee and Pollinator Research Coordinator's efforts to build connections between research and data related to pollinator conservation and agricultural production across the USDA, including the development of a Pollinator Data Portal and interagency efforts to reconcile Monarch Butterfly conservation and agricultural production.
- Helping to accelerate agricultural innovation to address environmental challenges by representing USDA interests on the National Science & Technology Council (NSTC) Subcommittee on Advanced Manufacturing and contributing to the implementation of the USDA Science & Research Strategy priority focused on innovated technologies and practices.

Princeton University — Postdoctoral Research Associate — *Princeton, NJ | Jan. 2023 – Aug. 2023*
Postgraduate Research Associate — *June 2022 – Dec. 2022*
Center for Policy Research on Energy and the Environment

- Explored the environmental, socioeconomic, and biophysical drivers of recent cropland abandonment and recultivation to better target investments and make restoration more durable.

Princeton University — Graduate Researcher & PhD Candidate, School of Public and International Affairs — *Princeton, NJ | Sep. 2016 – May 2022*

- Developed an expertise in biodiversity metrics by showing that commonly used methods for measuring biodiversity produce radically different land-use recommendations for either biodiversity protection or agricultural conversion, resulting in a peer-reviewed article with recommendations for incorporating biodiversity into spatial land-use prioritization and planning decisions.
- Produced quantitative assessments of the impact of cropland abandonment and recultivation on carbon storage and biodiversity by leveraging a high-resolution land cover time series for 11 sites across 4 continents alongside maps of biodiversity and carbon.
- Developed R and shell scripts to process hundreds of millions of pixels of data on Princeton's computing clusters in order to quantify the persistence of cropland abandonment through time, producing a high-impact peer-reviewed article illuminating a pivotal factor that influences abandonment's potential to help meet carbon and biodiversity goals.
- Combined high-resolution land cover data with distribution and habitat data for over 2000 bird and mammal species to produce the first detailed analysis of how abandonment, secondary succession, and recultivation affect the amount of habitat available for individual mammal and bird species through time.
- Investigated methods to increase the sustainability of livestock grazing in Kenya's savanna ecosystems through intensive field research, producing one of the first quantifications of the behavioral and environmental consequences of rotational grazing.
- Served as an Assistant in Instruction (TA) for two semesters of SPI/ENV 350 – The Environment: Science and Policy (2019, 2020), leading three weekly discussion sections on environmental policy issues including natural resource management, biodiversity, wildlife trade, climate change, and ecosystem services, contributing to lesson planning, and grading student papers and exams.

Sustainable Conservation — Project Manager — *San Francisco, CA | Jan. 2016 – May 2016*
Project Associate — *July 2013 – Dec. 2015*

- Mapped all restorable areas along California's Mokelumne River and quantified the corresponding costs and ecosystem service benefits of restoration, producing a cost-benefit analysis and report informing watershed-wide conservation planning.

- Managed PlantRight's annual Spring Nursery Survey to track the retail market for invasive plants in California, coordinating and training more than 150 volunteers each year to survey more than 250 stores.
- Led annual process to update PlantRight's list of commonly sold invasive plants, leveraging data on horticultural prevalence (from annual survey), invasion risk, geographic range, and expert recommendations on non-invasive alternatives.
- Developed strong collaborations across diverse sectors and industries in order to solve environmental problems and facilitate restoration projects, including businesses (e.g., retail garden centers recruited as "PlantRight Partners"), landowners, farmers, public utilities, industry groups, volunteer groups, academics, and conservation NGOs.

Sustainable Conservation Intern (part time) *San Francisco, CA | February – June 2013*

- Provided program support for PlantRight's 2013 Spring Nursery Survey for invasive garden plants in California's horticultural industry, managing over 100 volunteers, preparing survey materials, screening potential nurseries, and managing large data sets.

Michigan State University Data Quality Controller *Western Province, Zambia | May – July 2012*

- Trained, supervised, and managed survey teams as part of the 2012 Rural Agricultural Livelihoods Survey, a nationally representative economic survey of 8,500 Zambian farm households.

University of Michigan Biological Station NSF Research Experience for Undergraduates *Pellston, MI | June – Aug. 2011*

- Designed and conducted two-month research project studying patterns of song interaction in two migratory populations of birds in northern Michigan, establishing baseline data to inform further science and co-authoring a peer-reviewed article in *The Wilson Journal of Ornithology*.
- Gained hands-on experience in independent field research, writing, and programming for statistics and GIS (SPSS, R, ArcMap).

Technical Skills

- Geospatial analysis in R, Google Earth Engine, ArcGIS, and QGIS.
- Programming languages: R (advanced), linux/unix/bash (moderate), Python (beginner), JavaScript (beginner).
- Programming skills: cluster computing with SLURM, version control and collaboration with Github, producing reproducible research with Markdown, data visualization with ggplot2.
- R package expertise: tidyverse, data.table, terra, raster, sf, arrow.

Scholarships and Awards

- Princeton University Dean's Completion Fellowship *2022*
- Princeton Energy and Climate Scholar (PECS) *2019 – 2021*
- Honorable Mention, National Science Foundation (NSF) Graduate Student Research Fellowship Program (GRFP) *2018*
- Princeton University Graduate Fellowship, School of Public & International Affairs (SPIA) *2016 – 2021*
- NSF Research Experience for Undergraduates (REU) fellowship, University of Michigan Biological Station *2011*

Press Coverage

1. Beans, Carolyn. June 2022. Can Countries Expand Agriculture without Losing Biodiversity? Weighing the options for feeding a growing world. *BioScience* 72(6). Pages 501–507 https://doi.org/10.1093/biosci/biac030.
2. Huber, B. Rose. June 9th, 2022. How restoring abandoned farms to natural habitats can mitigate climate change. Princeton University. https://www.princeton.edu/news/2022/06/09/how-restoring-abandoned-farms-natural-habitats-can-mitigate-climate-change.
3. Roston, Eric. May 25th, 2022. Countries are redeveloping farms that could be cutting carbon. *Bloomberg*. https://www.bloomberg.com/news/articles/2022-05-25/abandoned-farms-can-grow-trees-fight-climate-change.
4. Udasin, Sharon. May 25th, 2022. Restoring abandoned farms could help mitigate climate change: study. *The Hill*. https://thehill.com/policy/equilibrium-sustainability/3500618-restoring-abandoned-farms-could-help-mitigate-climate-change-study/.

Presentations

Research

1. "Rural land abandonment: implications for biodiversity and climate" with H Yin, VC Radeloff, RA Wiebe, DS Wilcove. Guest lecture presented in EEB 308, Princeton University, November 14th, 2022.
2. "Rural land abandonment is too ephemeral to provide major benefits for biodiversity and climate, despite substantial potential to create habitat and store carbon," with H Yin, VC Radeloff, RA Wiebe, and DS Wilcove. Annual meeting of the Ecological Society of America (ESA), joint with Canadian Society for Ecology and Evolution (CSEE), Montréal, Canada, August 15, 2022.
3. "Rural land abandonment is too ephemeral to provide major benefits for biodiversity and climate," with He Yin, Volker C. Radeloff, and David S. Wilcove. North American Congress on Conservation Biology (NACCB), Reno, NV, July 19th, 2022.
4. "Timing and durability of agricultural abandonment." Science, Technology, and Environmental Policy & High Meadows Environmental Institute (STEP-HMEI) Program-wide seminar, Princeton University, April 7th, 2021.
5. "Tradeoffs between Agriculture & Biodiversity: agricultural expansion in Zambia," invited presentation to ENV 405, Princeton University, December 12th, 2018.
6. "Achieving the Biggest Bang for the Buck: Framework for Weighing Riparian Restoration Costs and Benefits," presented at the 2015 California Association of Resource Conservation Districts (CARCD) Conference, Yosemite, Nov. 20th, 2015, and at SERCAL 2016 (the California Society for Ecological Restoration), Kings Beach CA, May 12, 2016.

Public Outreach

1. "Environmental Impacts of Climate Change," with Julie Tierney and Yiheng Tao. Presentation to Energy and Climate Scholars Program, Princeton Day School, Nov. 17th, 2020.
2. "Environmental Impacts of Climate Change," with John Tracey and Nic Choquette-Levy. Presentation to Energy and Climate Scholars Program, Princeton Day School, Nov. 5th, 2019.
3. "PlantRight: Promoting Noninvasive Garden Plants for California," presented to the Santa Clara County Master Gardeners (Mar. 2014), Carmel-by-the-Sea Garden Club (Feb. 2015), Monterey Bay Master Gardeners (Feb. 2015), Kings & Tulare County Master Gardeners (Mar. 2015), and Fresno & Madera County Master Gardeners (Mar. 2015).
4. "PlantRight's Invasive Plants Webinar and Survey Training," presented six times, in February and April of 2014, 2015, and 2016. Included background on invasive plants, survey volunteer training, and a feature presentation by Calflora.org and Dan Gluesenkamp of the California Native Plant Society. View recording here.
5. "Planting Right: Choosing Noninvasive Plants for your Garden, Community, & Environment," presented at the 2014 University of California Master Gardener Conference, Yosemite, Oct. 7-10, 2014.

SERVICE

Invited Peer Reviewer for academic journals *Science*, *BioScience*, and *International Journal of Ecology*

Journal of Public and International Affairs Associate Editor *Princeton, NJ | 2018, 2019*

- Reviewed and edited academic articles submitted by policy graduate students, as part of this student-run academic journal jointly published by the Association of Professional Schools of International Affairs (APSIA) and Princeton's School of Public & International Affairs (SPIA).

INTERESTS

- Perfecting my sourdough technique, looking for birds, listening to Swedish music, taking photos of clouds, & cooking spicy food.