Christopher L. Crawford

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Summary

I am a conservation scientist using the tools of geospatial analysis, ecology, and environmental science to tackle the defining conservation challenge of our time: reconciling agricultural land use with biodiversity conservation. My work examines how changes in the distribution of people and agriculture affect biodiversity and carbon storage, with a focus on the environmental implications of agricultural abandonment – all aiming to use science to inform land use policy and better conserve 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."
- Advisor: 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 Member; University Honors for Academic Excellence: 2008-2012; James B. Angell Scholar: 2012

EcoQuest Education Foundation *New Zealand | Winter 2011*

- Program in Applied Field Studies
- 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

1. **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
2. **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
3. **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*. https://doi.org/10.1016/j.rama.2018.07.016 (*Co-lead author.)
4. 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 (**Peer**-reviewed article on REU research.)

Manuscripts in review

1. Ma, L, Conradie SR, **Crawford CL**, Gardner AS, Kearney MR, Maclean IMD, McKechnie AE, Mi CR, Senior RA, Wilcove DS. *Nature Communications.* Global Patterns of Climate Change Impacts to Desert Bird Communities. (*Revise and resubmit.*)
2. Zeng, Y, Senior RA, **Crawford CL**, Wilcove DS. Gaps and weaknesses in the global park network for protecting at-risk species.

Manuscripts in prep

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

2. **Crawford CL,** Wiebe RA, Yin H, Radeloff V, & Wilcove DS. Spatial determinants of durable cropland abandonment reveal conservation opportunities.

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.

Academic Research and Professional Experience

Princeton University **Postgraduate Research Associate** *Princeton, NJ | June 2022 - present*

- Exploring the drivers and consequences of recent cropland abandonment, including the environmental, socioeconomic, and biophysical drivers of agricultural abandonment and recultivation.

Princeton University **Graduate Researcher & PhD Candidate** *Princeton, NJ | Sep. 2016 – May 2022*

- Produced a dissertation containing cutting edge research on how transitions in agricultural land-use affect biodiversity conservation and carbon stocks, focused on the two forces of agricultural expansion and agricultural abandonment.
- Designed and led a project showing that commonly used methods for measuring biodiversity produce radically different land use recommendations for both biodiversity protection or agricultural conversion, resulting in a peer-reviewed article and informing how biodiversity is incorporated into spatial land use prioritization and planning decisions.
- Explored how rural outmigration is likely to affect biodiversity and carbon as people from rural areas leave their croplands to seek new economic opportunities in cities, by initiating a research collaboration with research group conducting cutting-edge remote sensing and land use research at the University of Wisconsin, Madison and leveraging a new high-resolution time series of land cover maps for 11 sites across 4 continents.
- Produced a quantitative assessment of the persistence of abandoned croplands by developing R scripts to process hundreds of millions of pixels of data from land cover maps on Princeton's high performance computing clusters, resulting in a high-impact peer-reviewed publication illuminating a previously ignored yet pivotal factor for understanding the potential for abandonment to help meet carbon and biodiversity goals.
- Combined our high-resolution land cover time series with range maps and habitat and elevation preference data from the IUCN for 2023 species of birds and mammals in order to produce the first detailed analysis of how abandonment, secondary succession, and recultivation affected the amount of habitat available for individual mammal and bird species through time.
- Investigated methods for increasing 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 planned grazing, providing a link to the local-scale interventions that make up most conservation work.
- Served as an Assistant in Instruction (TA) for two semesters of SPI/ENV 350: The Environment: Science and Policy, for Professors David Wilcove & Michael Oppenheimer (Spring 2020) and Professors David Wilcove & Jin Sato (Spring 2019). Led three weekly discussion sections covering topics related to environment policy, natural resource management, biodiversity, wildlife trade, climate change, pollution, development, and ecosystem services, and grading student papers and exams.

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

- Produced a cost-benefit analysis and report quantifying the restorable riparian area along the Lower Mokelumne River and the corresponding costs and ecosystem service benefits of restoration, in order to inform watershed-wide conservation planning and help conservation stakeholders maximize the use of limited resources.
- Managed PlantRight's annual survey to track the retail market for invasive plants in California, coordinating and training more than 150 volunteers to survey more than 250 stores. This survey provides critical information to help monitor program impact, inform strategy and partnerships, and update PlantRight's list of commonly sold invasive plants. Fact sheets and reports detailing the results can be found at: plantright.org/spring-nursery-survey.

- Led annual process to update PlantRight's list of commonly sold invasive plants, gathering expert recommendations and considering criteria including horticultural prevalence (through annual survey), invasive impact or risk, and geographic range. Gathered expert recommendations for appropriate non-invasive alternatives to the invasive garden plants listed.
- Leveraged communication and interpersonal skills to build strong relationships with diverse stakeholders critical to conservation work, including academic researchers, local watershed stakeholders, horticultural industry groups, retail garden centers (recruited as "PlantRight Partners"), statewide volunteer groups (e.g., UC Master Gardeners), and conservation NGOs.

Sustainable Conservation Intern (part time) *San Francisco, CA | Feb. – 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*

- Helped implement the 2012 Rural Agricultural Livelihoods Survey, a nationally representative survey of 8,500 Zambian farm households, by training, supervising, and managing survey teams in Western Province, Zambia.
- Effectively solved problems using limited resources and input in a challenging field environment.

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. Co-authored peer-reviewed article in *The Wilson Journal of Ornithology* (Price & Crawford 2013).
- 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: R (advanced), Python (beginner), JavaScript (beginner), Bash (moderate), high performance computing (with SLURM), version control and collaboration with Github, producing reproducible research with Markdown.
- R Package expertise: `tidyverse`, `data.table`, `terra`, `raster`, `sf`.

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 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.
2. "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.
3. "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.
4. "Agriculture & Biodiversity: Expansion, Abandonment, & Regrowth?" STEP-HMEI Seminar, Princeton University, May 7th, 2020.
5. "Agricultural Abandonment = Opportunity for biodiversity?" STEP-HMEI Seminar, Princeton University, April 16th, 2019.
6. "Tradeoffs between Agriculture & Biodiversity: agricultural expansion in Zambia," invited presentation to ENV 405, Princeton University, December 12th, 2018.
7. "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 2015 Invasive Plants Webinar and Survey Training," presented six times, in February and April of 2015, 2016, and 2017. 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 at https://plantright.org/survey/.
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 *BioScience, 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).

Extracurricular

- Enjoys baking sourdough, looking for birds, listening to Swedish music, taking pictures of clouds, and cooking spicy food.