Title

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Journal

Ecological Solutions and Evidence, 5(1)

ISSN

2688-8319

Author

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Publication Date

2024

DOI

10.1002/2688-8319.12311

Received: 7 February 2024 | Accepted: 8 February 2024

DOI: 10.1002/2688-8319.12311

Ecological Solutions and Evidence | BRITISH ECOLOGICAL SOCIETY

EDITORIAL

Co-Designed Projects in Ecological Research and Practice

Creating connections to maximize the mobilization of ecological knowledge into effective practice

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Keywords: biodiversity, co-design, knowledge co-production, partnerships, practitioner, restoration, stakeholders

Publishing research relevant to the management of biological resources and ecological systems is one of the aims of *Ecological Solutions and Evidence* (ESE). Collection of the necessary ecological data, and the chances that their analyses are successfully applied to conservation and management strategies, is frequently much improved when practitioners and academics work together on all aspects of a scientific project (Meadow et al., 2015; Walsh et al., 2019).

To encourage, guide and hopefully increase the prevalence of co-designed projects, ESE hosted an Applied Ecology Resources (AER) Live workshop on the topic of creating and navigating successful co-designed research opportunities in 2021 (AER, 2021). We followed this up with an editorial on the topic (Kurle et al., 2022), co-design workshops at the 2023 annual meetings of the Ecological Society of America and the British Ecological Society, and a forthcoming co-design guide to help facilitate these partnerships. Finally, in the hopes of inspiring more ecologists to create and conduct co-designed research projects, we invited scientists to submit their Practice Insights, Perspectives, and Research Articles featuring examples of successful co-production of knowledge and its applications to effective ecological solutions in this Special Feature.

What follows is a wide-ranging collection of insights and advice for fostering co-designed projects, details of collaborative research for maintaining and restoring biodiversity and studies illustrating the importance of incorporating Indigenous knowledge and multiple stakeholders for expanding scientific participation, increasing successful outcomes and deepening access across multiple areas of expertise. We hope that this collection will inspire and challenge all of us to increase our efforts to forge scientific partnerships to broaden the reach of our ecological investigations and enhance their applications for more effective management and conservation.

1 | CREATING EFFECTIVE CO-DESIGN PARTNERSHIPS

We recognize that there are still barriers to reaching across a perceived divide between practitioners and academics to create and carry out successful co-designed research (Bertuol-Garcia et al., 2018; Walsh et al., 2019), and we hope that the advice and success stories contained in this group of articles will inspire action to overcome those barriers.

Couturier et al. (2023) present two stories of their experiences with long-term co-design partnerships, including potential challenges and best practices for increasing successful outcomes for biodiversity through collaborative ecosystem monitoring, assessment, and creation of effective conservation and management strategies. Piczak et al. (2022) use the example of Aquatic Habitat Toronto's (AHT) partnerships among a number of agencies to illustrate how enhancing knowledge co-production bridges the gap between 'knowledge generators' and 'knowledge users', thereby increasing the success of restoration ecology outcomes.

Reaching back in time to generate meaningful modern data, Dietl et al. (2023) share lessons learned from their experiences building knowledge co-production using paleobiological data from the Historical Oyster Body Size (HOBS) project to cultivate actionable conservation science. Their perspective is an encouragement to resource managers and conservation paleobiologists to cultivate

partnerships so that the 'secrets of the past' can be applied to present-day conservation solutions.

Others focused on how to foster such partnerships, with Powell et al. (2023) synthesizing data from Strengths, Weaknesses, Opportunities and Threats (SWOT) analyses gathered from four case studies, detailing experiences of those co-managing woody invasive alien species in Argentina. Their work provides advice for those interested in co-managing invasive species and natural resources in South America and beyond. Smith et al. (2023) created the Conservation Evidence Program, which is predicated on the simple idea that 'improving the effectiveness of conservation practice requires better use of evidence'. To that end, they engaged with over 1000 conservation agents to co-design a practical Evidence Toolkit containing five strategies for 'delivering improved conservation practice'. Their work also contains multiple recommendations for maximizing positive conservation outcomes from co-designed projects.

2 | CO-DESIGNED PROJECTS FOR INCREASING BIODIVERSITY AND IMPLEMENTING ECOLOGICAL RESTORATIONS

The United Nations' challenge to restore millions of hectares of land during 2021–2030 (the 'decade on restoration') will require considerable effort and guidance as to how best to implement research and practical protocols to maximize the recovery of biodiversity across restored ecosystems worldwide. Co-designing research will be pivotal in achieving these targets, and Pizza et al. (2023) demonstrated this by creating a collaboration between academic scientists, a native seed producer and land stewards to better understand factors related to maximizing plant habitat restorations. Their work demonstrates that the restoration of tallgrass prairies is not amplified when using seed sources considered 'local'; rather, greater seeding rates and increased management of the restoration site after seeding are the elements needed to increase the likelihood that native species will successfully establish.

Biodiversity loss is uniquely problematic in agricultural systems and conservation outcomes in these landscapes can be improved when farmers and researchers come together for co-designed projects. Hölting et al. (2022) make this point in their report detailing methods by which researchers and farming organizations work together for the improvement of biodiversity management in agrarian ecosystems in Europe. To better understand why outcomes from ecological restorations vary widely, Warneke et al. (2023) studied plant re-establishment after wildfire damage to a native upland forest on the Island of Hawai'i. Their work was a highly collaborative effort among several government agencies and academics that resulted in successful management outcomes, multiple research publications and recommendations regarding factors influencing restoration outcomes after wildfire.

3 | INCORPORATING LOCAL AND INDIGENOUS KNOWLEDGE INTO ECOLOGICAL RESEARCH

The inclusion of local and Indigenous knowledge into the data-gathering process creates opportunities for co-designed research that further widen access to information that can deepen the understanding of a habitat and its wildlife (Stern & Humphries, 2022). Christie et al. (2023) detail their process of co-creating a questionnaire designed to collect local and Indigenous information to better evaluate the effects of climate change on aquatic species and habitats in the Arctic. Putting Indigenous knowledge into practice, Khanyari et al. (2023) underscore the value of projects co-designed with local people as they created tools to mitigate negative impacts on livestock brought on by human–wildlife interactions on the western extension of the Tibetan plateau through participatory action research (PAR) practices.

Reflecting on such co-designed research, Richard et al. (2023) highlight the challenges and strengths experienced through their co-designed partnership with the Department of Environment and Climate Change Canada and Inuit partners for long-term monitoring of common eider ducks (*Somateria mollissima*) in the Arctic.

4 | INTEGRATING PARTICIPATION ACROSS MULTIPLE STAKEHOLDERS

Conservation, management and restoration success stories are frequently magnified when multiple stakeholders are included in the processes of creating and implementing effective environmental policies (Laurila-Pant et al., 2019). Stakeholders include the everyday people who interact with the wild spaces studied by ecologists, and Clarke et al. (2023) demonstrate the great potential for scientific gain that can be achieved when people who live near and appreciate their local natural areas are recruited to co-design research and collect data for projects. In this case, citizen scientists carried out eDNA-based surveys of a local stream catchment in Norfolk, England, to inform fish and other vertebrate diversity.

Mganga et al. (2023) share an example of successfully integrating multiple stakeholders for the benefit of ecological restoration and improving farmer outcomes through native plant restoration and developing multiple methods of rainwater harvest in the African drylands of Kenya. Mitchell et al. (2023) brought regional and local stakeholders together to develop a methodology by which to identify land preservation activities to maximize tidal marsh conservation and support watershed-wide management goals in the face of impediments to marsh migration expected with rising sea levels. They used a multi-model approach to combine outcomes from five

existing models and then tested their approach across three locations throughout the Chesapeake Bay in the eastern United States. The outcome is the creation of a single model approach to preserve marsh migration corridors, and this approach is widely applicable to any location that already has peer-reviewed marsh migration models in place.

5 | CLOSING THOUGHTS

The objectives of practitioner and academic scientists in their pursuits of collecting and understanding ecological data are frequently distinct from one another and these differences are precisely why sharing and co-producing knowledge can be so fruitful for both parties. We hope our efforts to highlight co-designed work in this Special Feature make the case for this truth and that the stories contained herein serve as inspiration for all of us to actively pursue these productive collaborations.

CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest.

FUNDING INFORMATION

None.

PEER REVIEW

The peer review history for this article is available at https://www.webofscience.com/api/gateway/wos/peer-review/10.1002/2688-8319.12311.

DATA AVAILABILITY STATEMENT

None.

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