Braiding three-stranded conservation

Kent H. Redford

Nine thousand years ago in south-eastern Turkey at a place now called Göbekli Tepe, humans using stone tools cut T-shaped pillars out of the bedrock and erected ceremonial houses. They lived off hunting and gathering and showed a deep relationship with the natural world, manifested by decorating their houses with bucrania, animal statues and painted hunting scenes. Domestication of sheep, goats, cattle, pigs, einkorn wheat and barley—components of the Neolithic Revolution—was in their near future, a feat that when accomplished around the world, forever changed the trajectory of human history.

Many believe that human domestication of wild plants and animals was enabled by a change in the Earth's climate—specifically, the advent of a relatively mild, stable climate starting c. 10,700 years ago. This extended period of climate stability, called the Holocene, set the stage for the rise of modern civilizations and the attendant large-scale human impacts on nature.

Millenia later, rising from increasing concern about human impacts on the natural world, the 20th century saw the rise of environmentalism in the 1960s, the Earth Summit in Rio de Janeiro in 1992 and the subsequent launching of the modern conservation movement. Experience of the relative stability of the Earth's climate in the Holocene was perhaps a contributor to conservation's implicit operating assumption of the existence of a constant past to which ecological systems could be returned if human destruction and degradation could be reversed.

We are at an inflection point in humanity's relationship with nature perhaps as profound as that faced by the people of Göbekli Tepe. Emerging work is showing that the world is being changed in profound ways that challenge our too-common assumption of a stable past to which, with the proper tools, we assume systems can be returned. Three examples illustrate the extent to which global change is forever impacting the world in which we practice conservation. Firstly, the biodiversity conserved in protected and conserved areas depends on the persistence of the climates present in those areas, yet predictions are that as a result of global warming of 2 °C above preindustrial levels, 24% of these protected lands will no longer have their present climates, with clear knock-on effects on their effectiveness (Parks et al., 2022). Secondly, novel ecosystems, those containing combinations of species and ecological interactions never seen before, could occupy over 50% of the land surface by 2100, forever changing the biodiversity of protected areas (Ordonez et al., 2024). Thirdly, by 2050 as many as 200 million people worldwide may need to relocate because of climate-change-induced shifts in weather patterns, with changes to the human communities in and adjacent to protected and conserved areas (Gaynor, 2020).

In this world of global change, conservation must change. The majority of tools we have developed were based on the assumption of reversibility, a holdover from the departing Holocene. Jasanoff (2015) introduced the concept of sociotechnical imaginaries that she defines as 'collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology'. So now we are stuck on this Holocene imaginary, one that the conservation community developed and succeeded in implanting in the imaginations of cultures around the world. We are stuck in a path dependency—a situation in which preceding steps in a particular direction induce movement in the same direction even if other options are better. Our Holocene imaginary is clearly no longer fit for purpose in a world of global change where we find ourselves trapped by the assumption that we can return the world to a prelapsarian past. We must develop a new, post-Holocene imaginary that can equip us with ways to help save nature in our changed and changing world.

We cannot continue deploying only current mainstream tools and approaches and expect better outcomes than we have achieved in the past. We need new tools and approaches to braid with those in hand. Conservation must braid together three strands to achieve a robust approach to a changing world. Firstly, we must improve what we are already doing that is working, but not as fully as it might. Secondly, we must actively extend what we're already doing, in ways that deliver new and better conservation results. Thirdly, we must innovate and develop novel tools—testing, evaluating and deploying ideas and techniques that are qualitatively different from existing tools.

To illustrate these three approaches, each is considered in turn. Improving refers to existing approaches, and includes creating and managing more effective and equitable conservation areas, and resilient ecosystem restoration (Sutherland, 2019). Extending is about modifying existing methods, and includes efforts such as assisted gene flow to save Florida's elkhorn corals from local extirpation as a result of ocean warming (Baker et al., 2025) or application of probiotic bacteria to increase survival of bats infected with white-nose syndrome (Hoyt et al., 2019). Innovating refers to approaches that are only now being

Email: redfordkh@gmail.com
Archipelago Consulting, Portland, Maine, USA

This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 11 Nov 2026 at 12:26:37, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0030605326102907

developed or conceived, and is perhaps best captured in proposed synthetic biology modifications such as using cloning for genetic rescue of black-footed ferrets (Novak et al., 2024) or consideration of epigenetic modifications as part of human-assisted evolution (cf. Balard et al., 2024). But it also includes addressing challenges whose configurations are only starting to be seen, such as how to calculate future conservation value (Redford & Dudley, 2024), how to incorporate future climates and novel ecosystems in the protected area estate, or developing new models for incorporating biodiversity values. These approaches are overlapping in some of their manifestations (Redford & Adams, 2021) but they currently represent efforts that are, or could be, promulgated by largely different constituencies.

All three of these approaches require a deepening of the vital change that is occurring in conservation, whilst recognizing the overwhelming importance of equitable practices and incorporating human rights (e.g. Newing et al., 2023). The ways in which global change will alter which humans are living where and in what fashion will further challenge the practices of conservation. The global conservation community appears to be solidly behind the improving approach, but the extending and innovating approaches are being discussed only at the periphery of the field and there is considerable resistance, particularly to the innovating approach (Redford & Adams, 2021).

So, perched at the trailing edge of the Holocene, oppressed by the triple assaults of biodiversity loss, climate change and pollution, we are looking for hope from the powerful creativity and passion that fuels the conservation movement: the same creativity that brought Göbekli Tepe, the Neolithic Revolution and the explosion in human civilizations. If conservation is to work, it needs to build a stronger approach, woven of three strands, not one—alive to innovation yet respectful of what is working now.

Acknowledgements I thank Pamela Shaw and Bill Adams for improvements and Scott Redford for the trip to Turkey.

References

Baker, A.C., Baums, I.B., Davies, S.W., Grottoli, A.G., Kenkel, C.D., Kitchen, S.A. et al. (2025) Proactive assisted gene flow for Caribbean corals in an era of rapid coral reef decline. *Science*, 389, 344–347.

Balard, A., Baltazar-Soares, M., Eizaguirre, C. & Heckwolf, M.J. (2024) An epigenetic toolbox for conservation biologists. *Evolutionary Applications*, 17, e13699.

Gaynor, T. (2020) Climate change is the defining crisis of our time and it particularly impacts the displaced. unhcr.org/us/news/stories/climate-change-defining-crisis-our-time-and-it-particularly-impacts-displaced [accessed 21 January 2026].

Hoyt, J.R., Langwig, K.E., White, J.P., Kaarakka, H.M., Redell, J.A., Parise, K.L. et al. (2019) Field trial of a probiotic bacteria to protect bats from white-nose syndrome. *Scientific Reports*, 9, 9158.

Jassanoff, S. (2015) Future imperfect: science, technology, and the imaginations of modernity. In *Dreamscapes of Modernity. Sociotechnical Imaginaries and the Fabrication of Power* (eds S. Jasanoff & S-H. Kim), pp. 1–33. University of Chicago Press, Chicago, USA.

Newing, H., Fisher, M., Brittain, S., Kenrick, J. & Milner-Gulland, E.J. (2023) How can we advance equitable, rights-based conservation? *Oryx*, 57, 273–274.

Novak, B.J., Gober, P., Bortner, R., Garelle, D., Wright, M., Chuven, J. et al. (2024) First endangered black-footed ferrets, *Mustela nigripes*, cloned for genetic rescue. Preprint publication. biorxiv.org/lookup/doi/10.1101/2024.04.17.589896 [accessed January 2026].

Ordonez, A., Riede, F., Normand, S. & Svenning, J.-C. (2024) Towards a novel biosphere in 2300: rapid and extensive global and biome-wide climatic novelty in the Anthropocene. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 379, 20230022.

Parks, S.A., Holsinger, L.M., Littlefield, C.E., Dobrowski, S.Z., Zeller, K.A., Abatzoglou, J.T. et al. (2022) Efficacy of the global protected area network is threatened by disappearing climates and potential transboundary range shifts. *Environmental Research Letters*, 17, 054016.

Redford, K.H. & Adams, W.M. (2021) *Strange Natures: Conservation in the Era of Synthetic Biology*. Yale University Press, London, UK.

Redford, K.H. & Dudley, N. (2024) Areas of hope: ensuring the conservation of future values of nature. *Oryx*, 58, 273–274.

Sutherland, W.J. (2019) Kaizen conservation? *Oryx*, 53, 397–398.

Note from the Editor—More research from early-career conservationists

As outlined in the Editorial of the previous issue (*Oryx*, 59, 681–682), our call for submissions from first-time authors resulted in over 30 articles being accepted for publication—more than we can fit into a single issue of *Oryx*. Here, we therefore continue the theme of 'Becoming a conservationist'. The seven articles by early-career researchers in this issue cover a broad range of topics: mammal conservation in Costa Rica and Africa, tree conservation and the effects of roads in Brazil, and the online trade in raptors in Pakistan.

Martin Fisher (*martin.fisher@fauna-flora.org*)
Fauna & Flora, Cambridge, UK

This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence CC BY 4.0.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 11 Nov 2026 at 12:26:37, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0030605326102907