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Distancing the Anthropocene: Co-Creating Wildness in an Increasingly Human World

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As Earth moves ever deeper into the Anthropocene epoch, most of its landscapes have been transformed into crop fields, pastures, managed forests, settlements, and other engineered ecosystems and infrastructures that sustain humans.[1] Habitats left unused persist mainly where steep slopes, poor soils, less productive climates, remoteness, and endemic disease still make land use uneconomical.[2]

Over millennia, human societies have become very good at reshaping Earth's ecology to sustain themselves. The sociocultural niche of our species now extends across this planet.[3] In the process, we have diminished, divided, and dispersed the nonhuman world across archipelagoes of remnant and recovering habitats, and immersed them in rising seas of our working landscapes, polluting industries, and warming climates. Even where extensive untransformed spaces still remain, ever more rapid changes in climate are forcing species to move. It should come as no surprise that wild species and wild spaces are disappearing at alarming rates.

Wild spaces unaltered by humans—where they still exist at all—are extremely rare and getting rarer, just as societal demands for wildlife and wildness are strengthening around the world. Without a change in Earth's contemporary anthropogenic trajectory, these living treasures of evolution could largely disappear.

Sustaining nonhuman natures in an increasingly human world is one of the greatest challenges of the Anthropocene. Yet for millennia, and even more

so today, human societies have become increasingly capable of maintaining more and more people on less and less land. By broadening and accelerating long-term trends in agricultural intensification, urbanization, the demographic transition, poverty reduction, and shifting energy systems, there is every possibility to shrink societal transformation of the biosphere, even as human welfare increases through the anticipated population peak later in this century.[4]

Whether human transformation of the biosphere can be reversed remains an open question. Certainly, such a return will be possible only with unprecedented levels of local, regional, and global social ambition, creativity, and effort. It might seem paradoxical, but sustaining wild species in wild spaces free of the relentless pressures of the human world will require every tool in the human sociocultural toolkit. Existing efforts to conserve and restore wild habitats must not only be expanded dramatically—successful restoration of landscapes free of human influence will require a radical redesign of the sociocultural systems and engineered landscapes that sustain us.

Conserving nonhuman nature today demands no less than a global reshaping of the human world. The unprecedented challenge of such an effort is exemplified by two seemingly unrelated proposals. The Half-Earth Project aims to create a globally interconnected conservation reserve covering half of Earth's surface[5]; while designed autonomy seeks to enable nonhumans to live unpressured by humans even deep within the human world, by using artificial intelligence to support nonhuman needs.[6] In thinking through these wildly ambitious visions for reversing the human social construction of nature, new landscapes designed by humans, for nonhumans, come into view.

Sharing Half a Planet

The proposal to conserve half of this planet for all nonhuman life—as envisioned by conservationist Harvey Locke and others in 2013, and prominently promoted by E. O. Wilson in 2016—is likely the most aspirational conservation goal ever.[7] If implemented, it would also represent the broadest and most challenging social and geopolitical project of land reallocation and management in history, with profound implications for food production, land tenure regimes, and land ownership around the world.[8] Implemented poorly, Half-Earth could become the greatest green grab in human history, with the potential to disenfranchise the world's most impoverished and vulnerable people, establish a top-down global regime of land management, impede rural development, and invoke a destabilizing social backlash against conservation from the bottom up.[9]

Yet from a conservation point of view, a global-scale system of interconnected reserves covering half of the surface of this planet is more likely to sustain nonhuman nature into the deep future than any other project yet proposed.[10] With 15 percent of the Earth's land already protected and another 2 percent on the way, the 50 percent target is at least imaginable. To date, lands set aside have typically been deemed undesirable for other uses, an approach that must change as conserved surface area gets beyond about 25 percent, depending on the region.[11] And most importantly, the Half-Earth vision is radically simple, crisp, and clear: a shared biosphere for nonhuman nature can be a better biosphere for us all. Ideally realized simultaneously from bottom up and top down, a Half-Earth movement could rally the broadest segment of humanity ever to invest in the future of nonhuman nature—precisely what is required to achieve such a global mission.

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Erle C. Ellis, Jed O. Kaplan, Dorian Q. Fuller, Steve Vavrus, Kees Klein Goldewijk, and Peter H. Verburg, "Used Planet: A Global History," *Proceedings of the National Academy of Sciences of the United States of America* 110.20 (2013): 7978–85.

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Erle C. Ellis, Kees Klein Goldewijk, Stefan Siebert, Deborah Lightman, and Navin Ramankutty, "Anthropogenic Transformation of the Biomes, 1700 to 2000," *Global Ecology and Biogeography* 19.5 (September 2010): 589–606.

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Erle C. Ellis, "Ecology in an Anthropogenic Biosphere," *Ecological Monographs* 85.3 (August 2015): 287–331.

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Ellis, "Ecology in an Anthropogenic Biosphere"; Andrew Balmford, Rhys Green, and Jörn P. W. Scharlemann, "Sparing Land for Nature: Exploring the Potential Impact of Changes in Agricultural Yield on the Area Needed for Crop Production," *Global Change Biology* 11.1 (October 2005): 1594–1605; Jesse H. Ausubel, "The Great Reversal: Nature's Chance to Restore Land and Sea," *Technology in Society* 22.3 (August 2000): 289–301; Marina Fischer-Kowalski and Mark Swilling, *Decoupling Natural Resource Use and Environmental Impacts from Economic Growth* (Nairobi: United Nations Environment Program, 2011); David Tilman, Christian Balzer, Jason Hill, and Belinda L. Befort, "Global Food Demand and the Sustainable Intensification of Agriculture," *Proceedings of the National Academy of Sciences* 108.50 (December 2011): 20260–64.

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Andrew Balmford and Rhys Green, "How to Spare Half a Planet," *Nature*, 552 (December 2017): 175; Eric Dinerstein, David Olson, Anup Joshi, Carly Vynne, Neil D. Burgess, Eric Wikramanayake, Nathan Hahn et al., "An Ecoregion-Based Approach to Protecting Half the Terrestrial Realm," *Bioscience* 67.6 (June 2017): 534–45; Edward O. Wilson, *Half-Earth: Our Planet's Fight for Life* (New York: Liveright, 2016).

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Bradley Cantrell, Laura J. Martin, and Erle C. Ellis, "Designing Autonomy: Opportunities for New Wildness in the Anthropocene," *Trends in Ecology & Evolution* 32.3 (2017): 156–66.

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Dinerstein et al., "A Protecting Half the Terrestrial Realm"; Wilson, *Half-Earth*; Harvey Locke, "Nature Needs Half: A Necessary and Hopeful New Agenda for Protected Areas," *IUCN Parks* 19.2 (2013): 13–22; Erle C. Ellis, "Nature for the People: Toward A Democratic Vision for the Biosphere," *Breakthrough Journal* 17 (2017): 15–25.

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Zia Mehrabi, Erle C. Ellis, and Navin Ramankutty, "The Challenge of Feeding the World While Conserving Half the Planet," *Nature Sustainability* 1 (2018): 409–12.

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Bram Büscher, Robert Fletcher, Dan Brockington, Chris Sandbrook, William M. Adams, Lisa Campbell, Catherine Corson et al., "Half-Earth or Whole Earth? Radical Ideas for Conservation, and Their Implications," *Oryx* (2016): 1–4.

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Dinerstein et al., "A Protecting Half the Terrestrial Realm"; James E. M. Watson and Oscar Venter, "Ecology: A Global Plan for Nature Conservation," *Nature* 550 (2017): 48.

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Ellis, "Nature for the People"; Mehrabi, "Feeding the World."

If Half-Earth were to succeed, what might the terrestrial biosphere of 2100 look like? At this early stage, many important questions remain unanswered. Still, as a shared social project operating across generations of people to reshape, reconnect, and manage dynamic environments worldwide at local, regional, and global scales, the landscapes formed by Half-Earth will most certainly differ from one place to another. In some regions, landscapes may evolve into a binary world of half urbanity and intensive agriculture, half protected reserves. Elsewhere, the old dichotomy between used lands and protected areas may continue to transition into a continuum of strategies for sharing the biosphere, by connecting regional national parks, indigenous reserves, urban green spaces, prairie strips, hedgerows, wildlife bridges, dam removals, and other new experiments in conservation and restoration.[12] In this linked and multivalent assemblage of controlled and wild spaces, Half-Earth would in fact make the Earth whole, through the project of planet sharing—not dividing.

Previews of future Half-Earth landscapes have emerged through social collaborations between private and public stakeholders at the local, national, and regional levels in transnational initiatives like the Yellowstone to Yukon Conservation Initiative,[13] the Convention on Biological Diversity, the World Business Council for Sustainable Development's report on landscape connectivity,[14] Natura 2000,[15] and many others. The scientific, technical, and social capacities needed to establish and sustain high-quality, transcontinental habitats are challenging in themselves, requiring diverse creative solutions. Yet the ultimate key to sharing the biosphere with nonhuman nature is to make such efforts valuable enough to people that they will support wild nature into the unforeseeable future.

Designing Wildness: Reversing the Social Construction of Nature

The pressures of human societies are an inevitable obstacle to creating and sustaining wild spaces for nonhuman nature. Even in designated nature conservation areas, human influence is pervasive and ever present, from species invasions to nutrient enrichment, altered fire regimes, and pollution, including anthropogenic light and noise. Infrastructures—from roads and dams to cities, croplands, canals, and ditches—divide and isolate nonhuman populations and challenge both migration patterns and daily movement, limiting habitat, breeding possibilities, and posing other problems potentially leading to extinction. Even just the intermittent presence of humans and domesticated animals (pets and commensals like rats) can affect food and water availability (influenced by bird feeders, boreholes, cornfields, garbage dumps, among others), profoundly shaping the conditions under which wild species live and evolve. Without intending to, we have greatly enhanced populations of anthropophilic species like raccoons, sparrows, and *Ailanthus* while making life nearly impossible for anthropophobes like cougars, gorillas and the California condor. Human alteration of the nonhuman world extends far beyond our intentions and even our awareness.

In the face of such insidious pressures, wildlife conservation efforts increasingly require intensive human management, from culling, spraying, and exterminating invasive species to reintroducing others, as well as continuous monitoring, controlled breeding, soil remediation, translocation, and fencing. These interventions obviously constitute human alteration of ecological patterns and processes, and much has been learned the hard way about the negative consequences of such control. For example, large-scale wildfires and harm to fire-dependent species were long produced through well-intended efforts at fire suppression.

The urge to control the nonhuman world is potent and enduring. Indeed, must one simply stand by when fire, common weeds, or rats threaten to burn up, overrun, feast on, or otherwise endanger the rarest of species? What should be done about the dangerous carnivore that has just consumed a treasured pet? And who gets to decide? The social-ecological tradeoffs and inadvertent consequences inherent in managing wild species in wild spaces create some of the most complex and wicked problems imaginable.[16]

Engaging human sociocultural connections with nature will always be fundamental to successful efforts to care for the nonhuman world.[17] On the other hand, these connections incorporate the equally deep human need to control and shape nature to fit expectations and desires, even among the most well-informed scientific managers. Despite best intentions, efforts to manage ecological complexity regularly yield negative or unintended outcomes, no

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Kathy MacKinnon, Harry Jonas, Nigel Dudley, Marc Hockings, Dan Laffoley, David MacKinnon, and Stephen Woodley, eds., *Guidelines for Recognizing and Reporting Other Effective Area-Based Conservation Measures*, version 1 (draft), (Gland: International Union for Conservation of Nature World Commission on Protected Areas, 2018), 26.

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Charles C. Chester, "Responding to the Idea of Transboundary Conservation," *Journal of Sustainable Forestry* 17.1–2 (2003): 103–25.

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Sasha Alexander, Anais Blasco, Ettore Capri, Ehsan Dullo, Douglas Jeroen, Natalia Estrada-Carmona, Roberta Iley et al., *Landscape Connectivity: A Call to Action* (Geneva: World Business Council for Sustainable Development, 2017).

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Vanya Simeonova, Irene Bouwma, Edgar van der Grift, Carlos Sunyer, Lola Manteiga, Mart Külvik, Monika Suškevičs et al., *Natura 2000 and Spatial Planning* (Brussels: European Commission, 2017), http://ec.europa.eu/environment/nature/knowledge/pdf/Natura_2000_and_spatial_planning_final_for_publication.pdf.

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Ruth DeFries and Harini Nagendra, "Ecosystem Management as a Wicked Problem," *Science* 356 (2017): 265–70.

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Ellis, "Ecology in an Anthropogenic Biosphere"; Edward O. Wilson, *Biophilia*, (Cambridge, MA: Harvard University Press, 1984).

matter the scope of human individual and social intelligence brought to bear on the process.

But what if another form of nonhuman intelligence could be engaged in the curation of nonhuman natures? With the concept of designed autonomy, landscape architect Bradley Cantrell, environmental scientist Laura Williams, and I have proposed to go beyond human intelligence to better sustain wild spaces within an increasingly human world.[18] With deep reinforcement learning technologies, computational systems are gaining capacities to solve ever more complex problems. By engaging this unprecedented capability, it may yet be possible to surpass human curatorial limitations to design a more distanced authorship in the creation and care of wild spaces for nonhuman life.[19] To accomplish this, a conceptual design for a "wildness creator" replaces human curatorial interactions with responsive technologies (sensing, monitoring, robotics) guided by an artificial intelligence that has learned to assist the nonhuman species and spaces in its care through its own observations and experiences, rather than through human programming. Thus removed from (limiting) management priorities defined by humans, the wildness creator derives its specific priorities from an evolving computational intelligence emergent from direct interaction with nonhuman species and environmental processes. While the construction of such autonomous systems may exceed societal technological capacities for at least another decade, the potential for coupling deep reinforcement learning with constant real-time observation, feedback, and experimentation could offer novel solutions outside conventional conservation strategies.

Acoustic monitoring has already been combined with machine learning to sense the activities of rats preying on endangered island birds, and bird population recovery subsequent to rat removal. Coral reef invasion by the corallivorous crown-of-thorns starfish (COTS) is currently being controlled by submarine drones that use imaging and machine learning. After identifying COTS for eradication, the drones inject them with toxins.

Considering the potential for designed autonomy in creating wild spaces, the story of the "Lions of Los Angeles"—cougars that even now successfully navigate the human world of Southern California—is an important example.[20] Hiding in the shadows, traveling at night, and narrowly avoiding death by vehicle collision, a small population of cougars is learning how to survive and reproduce among humans. Designed autonomy engaged in improving cougar habitat and conservation would amplify existing efforts to assist cougar movement through landscapes using bridges and other corridors. Through continual monitoring of cougar activity (movement, feeding, reproduction), new means of reducing conflict between cougars and humans (their livestock and pets) may be found, such as encouraging cougar movement through less conflictive spaces, or by discouraging people and livestock from nearing cougar spaces—in real time. These examples only scratch the surface of what could become routine if advanced artificial intelligence is empowered to sustain nonhumans embedded within the human world.

Distancing the Anthropocene

Reshaping nature has always been a human social project; most of the biosphere already bears the fingerprints of ancient and ongoing social change. Yet even as the human species today is increasingly globally interconnected and interdependent, with a stabilizing population and rising welfare, new levels of social cooperation are needed to serve the interests of all species, not only humans.

It is time to redesign the human world to empower the natural world once again. To do so we must first discard outdated sociocultural conceptions of nature as being somewhere else by welcoming the nonhuman world into ours.[21] Efforts to create enough space for nonhuman nature to continue its evolution beyond ours must become part of everything we do. And the challenges have never been greater, demanding shared social projects of unprecedented scale and the most powerful design tools ever developed. Ultimately, in distancing our authorship of the nonhuman world, we might redefine this human epoch for the better.

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Cantrell, B., L. J. Martin, and E. C. Ellis. 2017. Designing Autonomy: Opportunities for New Wildness in the Anthropocene. Trends in *Ecology & Evolution* 32:156-166.

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Charles Waldheim, "Strategies of Indeterminacy in Recent Landscape Practice," *Public* 33 (Spring 2006): 80–86.

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Dana Goodyear, "Lions of Los Angeles," *New Yorker*, February 13 & 20, 2017, https://www.newyorker.com/magazine/2017/02/13/lions-of-los-angeles.

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Ellis, "Ecology in an Anthropogenic Biosphere"; Ian Jared Miller, *The Nature of the Beasts: Empire and Exhibition at the Tokyo Imperial Zoo* (Berkeley: University of California Press, 2013).