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Commentary

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To Conserve Nature in the Anthropocene, Half Earth Is Not Nearly Enough

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https://doi.org/10.1016/j.oneear.2019.10.009

To conserve the bulk of Earth's ecological heritage across the Anthropocene, setting aside half of Earth's land is just a start. To conserve biodiversity over the long term across an increasingly human planet, conservation must become as integral to the human enterprise around the world as are social and economic development.

Earth's wild habitats and wild species are disappearing at alarming rates, inspiring ever more urgent and ambitious proposals to scale up conservation to levels capable of halting the loss of Earth's remaining ecological heritage.[1,2] The most radically ambitious of all these proposals is the call to set aside half of Earth's surface as an interconnected conservation reserve, first proposed by Harvey Locke as "Nature Needs Half"[3] and later as "Half Earth" by E.O. Wilson[4] with further development by Dinerstein et al.[5] Although Half Earth proposals remain at an early stage of development, their influence on global environmental governance is growing, including calls for a "Global Deal for Nature,"[2] and a call to increase the global protected area target of the Convention on Biodiversity (CBD) from 17% of Earth's land by 2020 (Aichi Target 11) to 30% by 2030 toward the ultimate target of 50% by 2050 as part of the post-2020 Global Biodiversity Framework of the CBD.[6]

Half Earth has already done a great service by drawing public attention to the unprecedented challenges of conserving biodiversity in the Anthropocene and the need to scale up actions and investments to levels commensurate with the scale of these challenges.[2,7] Moreover, from a theoretical point of view, half of Earth's land area could indeed be sufficient habitat to sustain most of Earth's terrestrial biodiversity.[2,4] Nevertheless, there are multiple serious obstacles to success with a Half Earth approach to biodiversity conservation, and even if these can be overcome, there are at least two essential reasons why Half Earth would never be enough to conserve Earth's ecological heritage over the long term across the increasingly human planet of the Anthropocene.

Obstacles

Half Earth proposals would require a global scale of land reallocation and environmental governance without precedent in human history. So far, most of Earth's terrestrial protected area falls within Earth's "easiest" areas to protect, where lands are too arid, cold, steep, or otherwise undesirable and inaccessible for land use.[8] Initial studies have shown that scaling up land demands for conservation to 50% would almost certainly compete with land demands for agriculture, settlements, and other infrastructure, potentially driving up prices for food and land while simultaneously generating a wide variety of social concerns ranging from social justice and land sovereignty to the many challenges of fairly, equitably, and effectively governing a global land area four times the size of Earth's largest nation (Russia).[7,9,10]

Conserving half of Earth's land would require hard decisions about land-reallocation priorities at global, regional, and local scales across diverse stakeholders from farmers, consumers, governments, and conservation institutions to avoid and/or compensate for major tradeoffs between sustaining people and conserving biodiversity both within landscapes and across regions.[7,9] For example, expanding protected areas within grassland and wetland ecoregions, many of which now serve as Earth's most productive farmlands and rangelands, could require displacing agricultural production to less productive ecoregions where more land area would be required to meet existing demands for agricultural production.[9] Given that demands for agricultural production are not likely to decline in the near future and that most land suitable for high-yielding agriculture is now already in use, any further limits to expanding this extent would require further increases in the productivity of existing agricultural lands, limiting losses of agricultural land to settlements and infrastructures and potentially reducing global demands for land overall through dietary shifts and other shifts in global food systems.[7,9]

Despite these and other daunting challenges, existing studies do suggest that it is possible, in theory, to allocate sufficient land, of sufficient habitat quality, to form an interconnected global protected area covering one half of Earth's land ("nature's half") while still supporting sufficient production of food, resources, and settlements to sustain human societies on the "human half," at least for coming decades.[2,7,9] Yet even if the unprecedented operational, political, and economic challenges and social concerns facing a Half Earth implementation were to be fully addressed and overcome, it will still be hard to assess the likelihood of success, especially within a 2050 deadline, without a more detailed strategic description of how such efforts might be implemented at local, regional, and global scales, including basic questions of institutional structures and decision-making policies, economic resources, and political and social support around the world. Most importantly, even with a detailed global implementation plan, complete with sources of economic and political support, the most important question facing the Half Earth proposal will not be answered.

Will an interconnected global protected area covering half of Earth's land be enough to conserve the bulk of Earth's terrestrial biodiversity over the long term across the increasingly human planet of the Anthropocene? For two reasons, the answer unfortunately must be no.

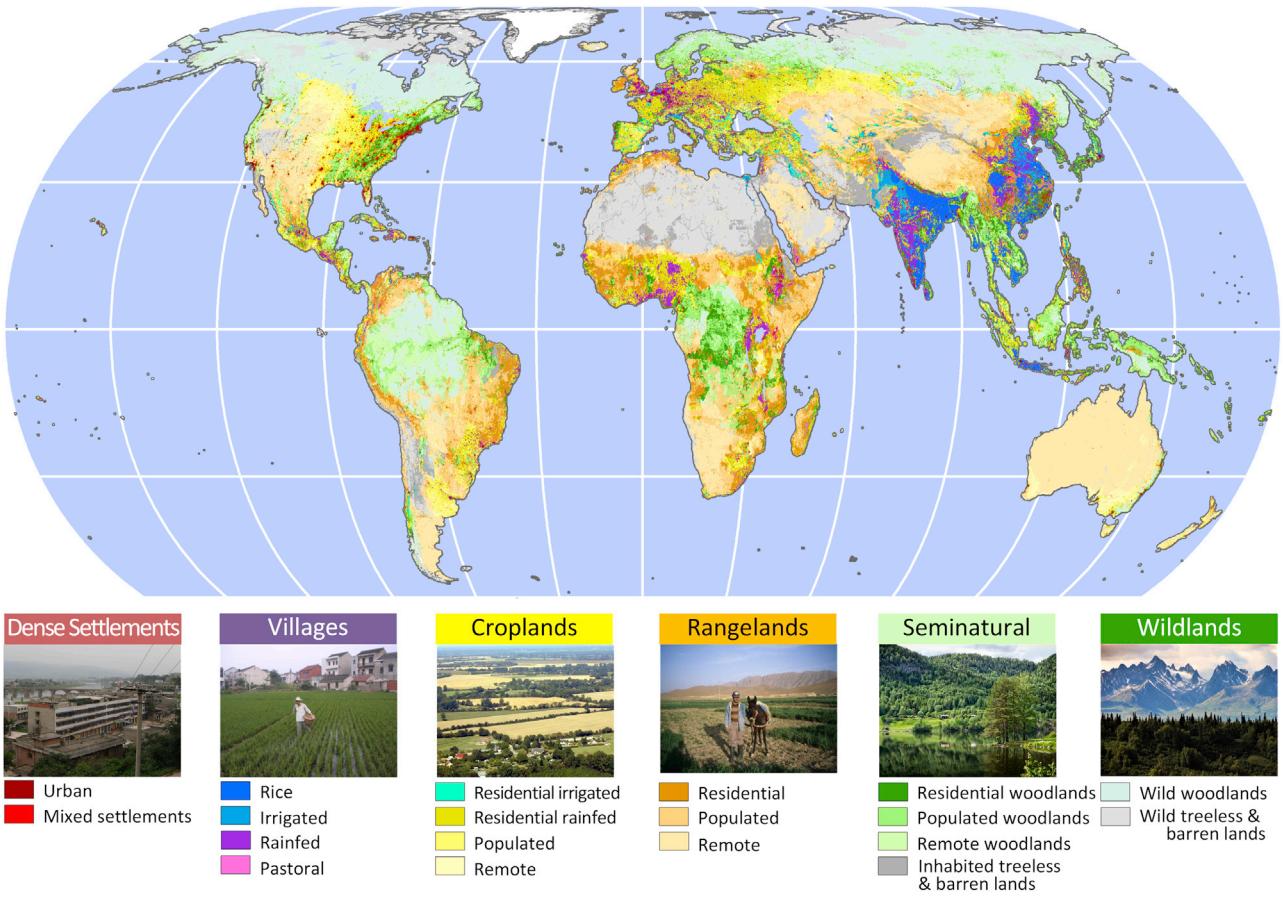

Figure 1. Anthromes
Anthromes cover more than three-quarters of Earth's ice-free land surface.[15] Shown is an Eckert equal-area projection.

Protected Areas Are Not Enough

Designating half of Earth's land as protected areas will not, in itself, ensure the conservation of most of Earth's biodiversity because protected areas conserve biodiversity only to the extent that their management and governance are supported by adequate and sustained investments and buy-in from stakeholders, including local people, together with other essential political, economic, and social supports.[11,12] Already, many protected areas remain "paper parks," protected only in name without adequate support to conserve biodiversity in the face of competing demands from loggers, miners, poachers, fuel collectors, farmers, and other land users, together with other social and environmental pressures ranging from pollution to climate change to species introductions and invasions, which degrade the capacities of protected areas to conserve biodiversity.

Protected area targets, 50% or otherwise, are insufficient in themselves to serve as indicators of conservation effectiveness. Worse still, when protected area targets are increased faster than growth in investments and governance capacities, these increases only spread conservation resources thinner and thinner, thereby reducing conservation effectiveness overall. Rather than saving biodiversity, overambitious protected area targets can actually accelerate losses of biodiversity.[11] Moreover, not all areas require biodiversity protections to conserve their biodiversity, and not all areas have biodiversity in need of protection.[8,12] All too often, protected area targets are met by "protecting" areas without current threats to biodiversity, including remote areas and lands less desirable for development, such as deserts, ice fields, and unsuitable terrain, because this is relatively straightforward and inexpensive, even though such areas might have little to no effect on biodiversity conservation overall.[8,12]

Yet with all their limitations, networks of interconnected protected areas will continue to be critical for biodiversity conservation and should remain core components of regional and continental biodiversity conservation strategies, especially when accompanied by existing and new area-based approaches for conserving biodiversity within working landscapes, restoring degraded lands, and a variety of "other effective conservation measures."[13,14] But protected areas alone will never be enough to conserve biodiversity across the anthropogenic terrestrial biosphere of the Anthropocene.

The Human and Natural Worlds Are Inseparable

The ultimate reason why protecting Half of Earth's land will never be enough to conserve most of Earth's biodiversity is

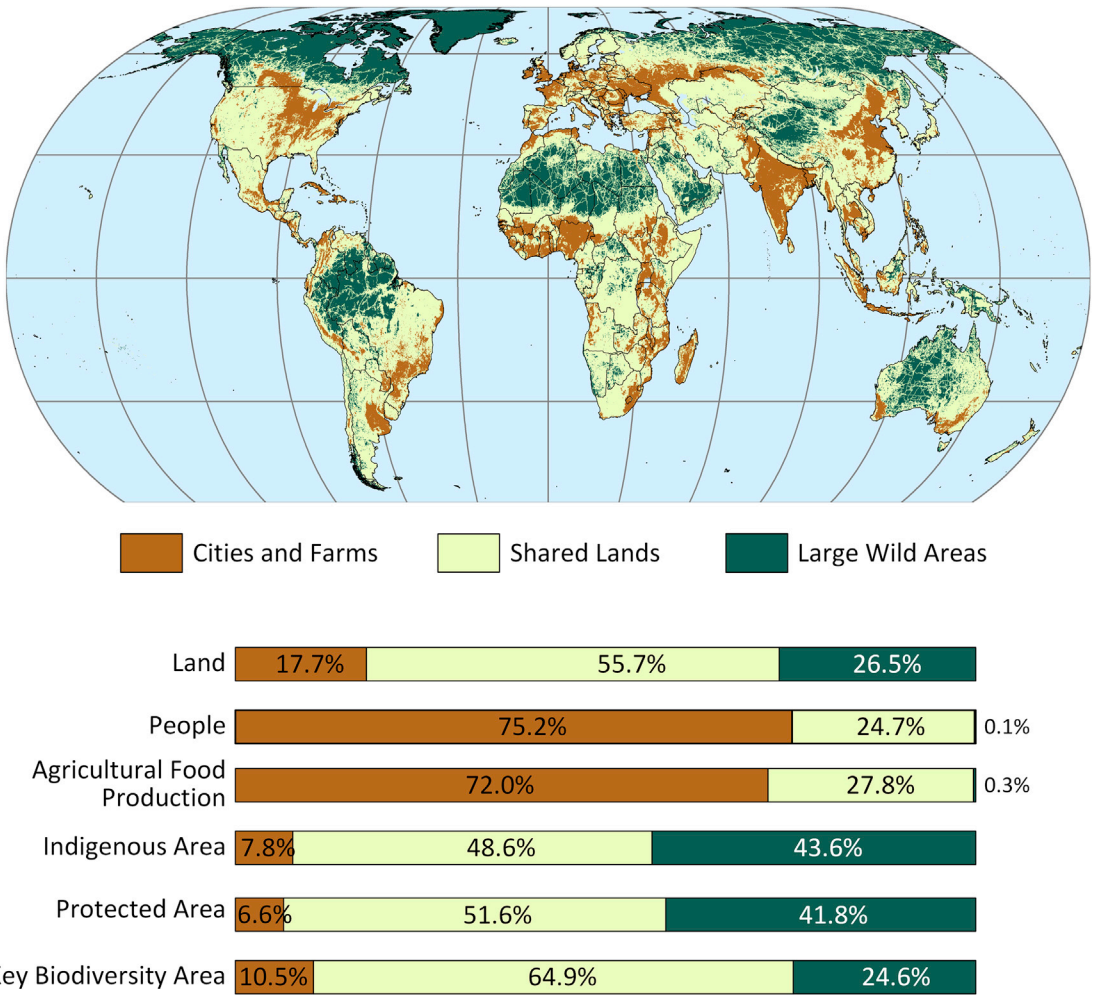

Figure 2. The Three Global Conditions

Shown are the Three Global Conditions for Biodiversity Conservation and Sustainable Use (3C)[18] and the relative global share of each condition in terms of total land area (2015), human population (2015), percentage of area protected (2018), key biodiversity areas, food calories produced by farming and ranching (2017), and percentage of global area under indigenous management or tenure (2017). All analysis is based on Locke et al.[18] Shown is an Eckert equal-area projection.

that the natural and human worlds cannot be separated. Envisioning one half of this planet reserved for "nature," with the other half sustaining a thriving humanity, does have some redeeming qualities. Visions such as Half Earth could help to spread a widely popular prosocial and pro-environmental message that sharing this planet fairly between people and nature is good for both while also highlighting the massive scale of ambition and effort needed to conserve Earth's natural heritage into the deep future.

If there were indeed a practical way to separate Earth's land into two distinct halves, one "human" and the other "natural," and if Earth's climate were not changing rapidly, a Half Earth conservation project might actually be capable of conserving most of Earth's biodiversity. The problem is that there is a huge gap between this vision and conditions now prevailing across the planet now and for the foreseeable future.

Although only about one-half of Earth's land is now used directly for agriculture, forestry, settlements, and other human infrastructures, most of this "human half" is not separated in space from "nature" but rather consists of landscape mosaics where more intensively used lands intermingle with patches of remnant, recovering, and lightly used habitats that form the anthromes that now cover more than three-quarters of Earth's terrestrial surface (Figure 1).[15] Moreover, the ecological influences of the human world do not stop at the edges of our engineered landscapes and infrastructures. Although many wild species and wild habitats have long sustained themselves in fragments embedded within intensively managed agricultural landscapes and even in some of Earth's densest cities, the viability of many others is threatened, even in the most remote of wildlands, by a single incursion of poachers, pollution, rats, cats, and other fellow travelers of the human world.[15,16]

The challenge of conserving biodiversity within the working landscapes of anthromes,[17] and even within Earth's last remaining wildlands, is compounded by the need for species to move across continents as the climates and moisture regimes to which they are adapted are shifted toward the poles and toward other

suitable environments by rapid anthropogenic changes in climate.[1] For many species, staying put means certain extinction, but the perils of emigration might be no less hazardous as a result of the many barriers to safe travel imposed by farmlands, roads, cities, and other human infrastructures that now crisscross the continents. The future of the natural world now depends on how effectively the human world can sustain enough space and mobility for nonhuman species and habitats to thrive within, between, and across Earth's increasingly dynamic anthropogenic biosphere.

One Earth, Three Conditions

The intermingling of the human and natural worlds differs profoundly across the planet, with some areas remaining largely untouched by intensive human use of land and others almost completely transformed by current use. As a result, the opportunities and challenges for biodiversity conservation can also differ profoundly among regions and nations. To successfully negotiate toward shared global efforts to conserve biodiversity across the biosphere, a critical first step is to recognize these differences in social and natural conditions within and across nations and regions so that responsibilities and investments in conservation can be shared fairly and effectively across the human world.[18]

In an effort to aid negotiations toward more ambitious and effective global conservation targets, a new global framework has been developed for just this purpose: the Three Global Conditions for Biodiversity Conservation and Sustainable Use (3C; Figure 2).[18]

The 3C framework is based on the principle that biodiversity conservation must be implemented effectively across Earth as a whole. This means that even cities and farmlands (condition 1)—the 18% of Earth's land surface where most people live and most food is produced—are valuable not only for sustaining people but also for conserving biodiversity. In condition 1, where most of the landscape is managed to sustain people, reallocating large areas of land to protected areas is rarely the most effective conservation strategy. Yet people can still achieve high levels of biodiversity conservation by restoring and protecting endangered species and habitats, by implementing highly productive, wildlife-friendly farming practices, by developing dense green cities designed for healthful and desirable urban lifestyles, and by facilitating low-conflict wildlife habitation and mobility through wildlife corridors, bridges, tunnels, and other conservation measures.

Entirely different strategies are optimal for the 26% of Earth's land that still remains in large wild areas (condition 3). In condition 3, human alterations of landscapes are at their lowest level, and more conventional large-scale protected area strategies could be applied across entire regions with the help of stricter regulations on new land uses, habitat losses, and habitat fragmentation; infrastructure design standards and retrofitting to facilitate wildlife mobility; and indigenous and community land sovereignty.

Perhaps the greatest conservation opportunities of all reside within the shared landscapes that now cover nearly 56% of Earth's land (condition 2). In shared landscapes, where less than half of land is composed of settlements and intensive agriculture, the remainder is composed of land uses with very high potential to conserve biodiversity, including forestry, extensive grazing, and other low-intensity land uses, together with substantial extents of recovering and remnant habitats. Not only are shared landscapes the most extensive of the three conditions, but they also include more key biodiversity areas per unit area of land, together with greater absolute areas of protected and indigenous lands (Figure 2). In shared landscapes, the full range of opportunities for both conservation and sustainable development—from extensive regional protected area networks to conservation-friendly farms and cities—is on the table.

Conserving One Earth

Human societies will continue to shape nature on this planet for the foreseeable future. Competing demands for land to sustain human societies, and the human influences emanating from these lands, will continue to be central conditions within which conservation must act at every scale from local to global.

Even if it were possible, dividing this planet equally between separate human and natural worlds would guarantee no better future for either. The key to effective long-term conservation of Earth's ecological heritage is to bring the human and natural worlds together through shared efforts to shape a better future for both within the ever more entangled human-natural planet of the Anthropocene. To make this work, conserving nature will need to become as deeply ingrained within every aspect of the human enterprise as are the social, political, and economic concerns and aspirations that continue to motivate people to shape this planet. Whether building a superhighway or protecting a large-scale wilderness area, conservation will need to be at the core of all design, planning, and implementation and will need to be as good and desirable for people as it is for the rest of nature.

Sharing the surface of this planet fairly between the human and natural worlds is a vision that demands serious consideration by anyone who cares about conserving life on Earth as we know it. The scale of the conservation challenge is indeed at this level. But visions of half a planet reserved for nature can be only just a beginning. The challenges ahead demand even greater ambition and foresight for us to work together across our many diverse societies and cultures to shape a terrestrial biosphere in which the non-human world can thrive together with us across the Anthropocene.

DECLARATION OF INTERESTS

E.E. is an advisor to the Nature Needs Half movement and a senior fellow of the Breakthrough Institute.

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