

THE BIODIVERSITY CRISIS, BIODIVERSITY HOTSPOTS, AND OUR OBLIGATIONS WITH RESPECT TO THEM

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Abstract: This essay argues that we have a duty to protect biodiversity hotspots, rooted in an argument about the wrongful imposition of risk and intergenerational justice. State authority over territory and resources is not unlimited; the state has a duty to protect these areas. The essay argues that although biodiversity loss is a global problem, it can be tackled at the domestic level through clear rules. The argument thus challenges the usual view of state sovereignty, which holds that authority over territory, resources, and migration (all of which are connected to the protection of biodiversity hotspots) is unlimited.

KEY WORDS: biodiversity loss, biodiversity crisis, territorial rights, state sovereignty, wrongful risk-imposition, intergenerational justice

I. INTRODUCTION

In this essay, I defend at least one set of obligations aimed at addressing the current global crisis of biodiversity loss. The influential environmental and scientific nongovernmental organization (NGO) Global Safety Net advocates this obligation to protect biodiversity hotspots. I argue that this obligation sets limits on the authority of states over their own territory. In particular, I argue that states, as collective analogues of “we,” have a moral responsibility to preserve biodiversity hotspots. I then consider how to address challenges of noncompliance with respect to that obligation.

This proposal does not represent a full account of our obligations with respect to land and stabilizing the climate, which are beyond the scope of this essay. It may be that, in addition to the obligation to protect biodiversity hotspots, there are distributive justice reasons for rich states to engage in other practices, such as re-wilding, or obligations of rich countries to transfer money to poorer states to help them meet their obligations. The first is not the subject of this essay; the second is touched on briefly. The focus on biodiversity hotspots rather than, say, re-wilding can be justified on the grounds that it is urgent at least to protect what we have and that arguments

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against destruction may be different from arguments justifying obligations to engage in positive actions to address biodiversity loss.

In some respects, the argument of this essay to limit the authority of states could be interpreted as extending a project initiated by many people interested in human rights. The trajectory of environmental protection, I hope, will be similar to that of human rights, which aimed to limit state sovereignty so as to ensure that human rights are protected. The twentieth century witnessed increasing acceptance of a human-rights-protection norm that set moral limits on state sovereignty, so the twenty-first century could plausibly be the era when we recognize the importance of limiting a state's authority over its territory to protect the environment (where this is appropriately related to human, and possibly animal, interests). This essay takes up one component of this argument, arguing that Global Safety Net identifies places of importance to biodiversity, which is necessary to institutionalize constraints on state action, particularly with respect to zoning, migration, resource extraction, and development in biodiversity hotspots. This is also justified in terms of how we should think about the terms of human interaction with Earth. A further aim is to argue that while the biodiversity crisis is global in scope, the solution to that crisis may not initially involve the creation of a global institution. Rather, the problem could at first be tackled through institutionalizing limits on state authority in many different states, similar to the human-rights-protection trajectory.

To make this case, I argue:

- (1) We are currently in a global crisis of biodiversity loss.
- (2) There are many losses (for humans and animals) connected to the loss of biodiversity, but one that most directly connects to our accounts of justice and responsibility is the argument that biodiversity loss is a wrongful imposition of risk on present and future people.
- (3) If states are wrongfully imposing risks on present and future people, it would normally follow that they have duties to stop imposing risks and, instead, regulate the use of land and resources to avoid imposing harm. This means that state authority over territory is limited in scope, even though states are sovereign within the geographical area of their authority.
- (4) The scope-limitation argument applies most clearly and directly not to biodiversity loss in general, but to the destruction of biodiversity hotspots.
- (5) There are further epistemic and institutional reasons to focus on obligations to protect biodiversity hotspots.

I then turn to how these obligations can be realized in practice. In this context, I hold:

- (6) Biodiversity loss ought to be protected principally at the domestic level.
- (7) Not only would this be more efficacious, but working through domestic and treaty processes to protect biodiversity hotspots is also necessary to justify a more aggressive (that is, coercive) approach to punish biodiversity-destructive behavior.

II. BIODIVERSITY LOSS IS A GLOBAL CRISIS

It is widely accepted among scientists that we are in the throes of a crisis of biodiversity loss as well as human-induced global climate change, produced largely by the burning of fossil fuels. This has been repeatedly emphasized in numerous reputable scientific studies since 1990, when the Intergovernmental Panel on Climate Change (IPCC) produced an authoritative report on the risks of human-induced climate change and the potential harms resulting from carbon pollution that will lead to premature death and rights-deficits of millions of people now and in the future.¹ Biodiversity loss is a crisis in the sense that we are facing a disaster, but we still have an opportunity to contain or avoid its worst effects.

The crisis we face is global in at least the following two senses. First, it is happening all across the globe. We are in an era of mass extinctions in the oceans; in the moderate climates of the economically developed world; and in tropical rainforests, which are being cut down at an extraordinary rate. In 2010, a survey of almost two hundred experts on vertebrate land animals analyzed the status of all 25,780 known species; one-fifth were confirmed as threatened with extinction and, of these, one-fifth were stabilized by concerted conservation efforts.²

Amphibian, butterfly, and coral populations have also suffered catastrophic decline in living memory. The exact rate of these extinctions is unknown, since we do not know how many types of plant and animal species exist on Earth, as new species are discovered all the time. However, we can assume that newly discovered species have evolved over millions of years, so the relevant fact is the rapidly increasing number of species that become extinct or are threatened with extinction. On the issue of how much extinction is happening today, "researchers generally agree that it is catastrophically high, somewhere between one thousand and ten thousand times the rate before humans began to exert a significant pressure on the environment."³

It is also a global crisis in a second sense. The loss of a biodiverse ecosystem such as the Amazon rainforest, for example, or numerous biodiverse

¹ WMO and UNEP, *Climate Change: The IPCC 1990 and 1992 Assessments* (Canada: IPCC, 1992), https://www.ipcc.ch/site/assets/uploads/2018/05/ipcc_90_92_assessments_far_full_report.pdf.

² Edward O. Wilson, *Half-Earth: Our Planet's Fight for Life* (London: Liveright Publishing, 2016), 55–56.

³ Edward O. Wilson, *The Future of Life* (New York: Alfred A. Knopf, 2002), 99.

ecosystems at roughly similar times, would have significant deleterious effects on everyone on Earth, not just in the places where they occur. Such places are of universal value, in the sense that everyone on Earth has an interest in maintaining (at least some degree of) biodiversity and protecting the natural world.⁴

We should not presume that we will solve the biodiversity crisis, in which case we will likely adapt to the world that remains. The remaining world will be impoverished in many ways, compared to the natural world we have now and compared to the natural world one hundred or five hundred years ago. There is no guarantee that collective action problems will be solved or that some of the worst effects of this crisis will be averted. However, I write this essay in the hope that we can solve it, advancing a proposal for the preservation of biodiversity hotspots that could go some way toward meeting our environmental (or biodiversity-specific) obligations.

Before I proceed, a caveat is in order about the relationship between the problems of climate change and biodiversity loss. On the one hand, these are clearly distinct phenomena that come apart in certain instances and should be treated separately. For example, one could tackle climate change in part by planting a kind of tree engineered to have root systems that capture immense quantities of carbon, but mass plantings of such trees would not be in accordance with biodiversity requirements. On the other hand, one could be interested in preserving distinct species or fragile ecosystems in areas that are not crucial to the climate change crisis.

It is true, though, that in many respects the two problems are interrelated. Many ecosystems would be unable to adapt to a global average temperature rise over 1.5 degree Celsius, thus leading to ecosystem collapse and catastrophic biodiversity loss.⁵ In addition, many of the areas that are most abundant in terrestrial animal and plant species are also crucial to climate stabilization.⁶ The same places that are key to preserving plant and animal species would, if conserved as natural places, have co-benefits for climate change. Global Safety Net has a method for identifying and mapping such places as well as measures for biodiversity and carbon sequestering. This methodology enables my essay to focus on the biodiversity crisis while recognizing its interconnections with climate change.

III. BIODIVERSITY LOSS IS A LOSS FOR US, ANIMALS, AND FUTURE GENERATIONS

Most arguments for the need to protect biodiversity emphasize its instrumental value for humans in addition to its intrinsic value where there is no

⁴ For a parallel argument, applied to World Heritage Sites, see Cécile Fabre, "Territorial Sovereignty and Humankind's Common Heritage," *Journal of Social Philosophy* 52, no. 1 (2021): 17–23.

⁵ Eric Dinerstein et al., "A 'Global Safety Net' to Reverse Biodiversity Loss and Stabilize Earth's Climate," *Science Advances* 6, no. 36 (2020), <https://www.science.org/doi/10.1126/sciadv.abb2824>.

⁶ Dinerstein, "A 'Global Safety Net'," 2; David M. Olson and Eric Dinerstein, "The Global 200: Priority Ecoregions for Global Conservation," *Annals of the Missouri Botanical Garden* 89, no. 2 (2002): 199–224.

direct human interest at stake. If disaster is looming, then it is incumbent on us to reflect on the nature of that disaster.

One important strand of argument for the protection of biodiversity focuses on the interests served for human beings by flourishing and resilient biodiverse ecosystems. Economists try to price ecosystem services that are lost through degradation of ecosystems; that is, they calculate a dollar amount to determine the kinds of benefits that human populations get, free of charge, from the endangered living natural environment. This is often applied to the ocean, where fisheries in many areas have entirely collapsed, such as the western Northern Atlantic Ocean, large portions of the Caribbean Sea, and the Black Sea. This also happens on land; a clear example is the forested areas of the Catskill Mountains that used to provide exceptionally clean water, protection from erosion, and flood control to New York City. Destruction of that watershed through extensive logging and creation of low-value fields has led to immense capital costs to replace what was lost. It has cost billions of dollars to build purification plants and construct runoff drains and revetments and millions of dollars annually to maintain what used to be provided to New York City for free.⁷ Even in these limited monetary terms of ecosystem services, the benefits of converting the mountains to fields are vastly outweighed by the benefits to humans that would have been had by maintaining that ecosystem. Such examples could be multiplied many times. Although the attempts to measure, even in an approximate way, what is lost are often criticized by deep ecologists, they do at least show that the losses in many cases greatly outweigh any benefits to be had from such destruction.

Another strand of argument for protecting biodiversity concerns the potential medicinal value for humans of preserving diverse genetic species. The literature on this is often associated with "bioprospecting," which is often practiced in a way not necessarily fair to those parts of the world containing the most biologically diverse life. This could, however, be done in a fairer way and with a lighter environmental footprint. The basic idea here is that many discoveries of useful pharmaceuticals or disease-resistant plants begins not from basic research into molecular biology, but from screening plant and animal samples for certain effects. As an example of the almost serendipitous nature of bioprospecting, consider the random sample of an obscure fungus in Norway's mountainous region that turned out to suppress the human immune system, with immense potential for important medical uses.⁸ The destruction of plant and animal species would

⁷ Wilson, *The Future of Life*, 106–8.

⁸ Wilson, *The Future of Life*, 121. A more telling example of the problem concerns plant and animal samples deposited in the Harvard University Herbarium for identification and research from a small corner of Borneo, which turned out, on screening, to provide, in their words, "100 percent protection against the cytopathic effects of HIV-1 infection," having "halted HIV-1 replicaton." It would not cure the disease, but it could stop the development of symptoms in HIV-positive patients. However, once that was found out, collectors returned to the original site; they found that the original tree was gone and that similar trees in the same swamp forests

cause us to lose such opportunities to harvest genetic material useful for human beings.

To some extent, this understates the argument. There is an element of incalculable losses because, once gone, a species is gone forever. Many of us have an intuition that there is something beautiful and wonderful about such places and species that is difficult to express because it does not relate to whether these places or species are valuable to us. Many indigenous groups in the Americas and Australasia are associated with the belief that there is intrinsic value in the natural world. Their ontology of land and its value emphasizes the relationships between humans and animals or plant life, the importance of sustaining such places, and the ideas of stewardship and interconnection rather than thinking of the natural world in instrumental terms as natural resources.⁹ Although Western political thought is particularly inept in articulating such views, with its vocabulary of rights rooted in an anthropocentric view of value, the sense that the natural world is intrinsically valuable is expressed in deep ecology and environmentalist moral and political thought. This view, rooted in a deep sense of wonder and gratitude for the abundance and beauty of the natural world, is experienced not only by children and appealed to in mystical religions, but also often by adults who express it in literature, in music, around campfires, and by gazing at the stars.¹⁰ The loss of a species that has taken millions of years to evolve and uniquely inhabits its ecosystem, is a loss not only for the members of that species and other interconnected species, but of intrinsic value.

IV. THE DUTY TO PROTECT BIODIVERSITY

The arguments in the previous section show that there is immense value in biodiversity and that our current practices are short-sighted because we are losing great value for the sake of relatively small or no gains. They also show that the losses are likely to be much greater than the gains; the extinction of species and destruction of ecological areas are permanent, so we cannot know the full extent of the losses over many generations as areas are destroyed and species become extinct. Practices that lead to biodiversity loss are not in our collective interest, which may convince some that we have a duty to protect biodiversity. While it is widely recognized that governments have a general duty to act in our collective interest and steer us

did not provide extracts that were effective against the virus. This incident is discussed in Wilson, *Future of Life*, 122–26.

⁹ See Aimée Craft, *Breathing Life Into the Stone Fort Treaty: An Anishinabe Understanding of Treaty One* (Saskatoon: Purich Publishing Limited, 2013); Robin Wall Kimmerer, *Braiding Sweetgrass* (Minneapolis, MN: Milkweed Editions, 2015); Veldon Coburn and Margaret Moore, "Occupancy, Land Rights, and the Algonquin Anishinaabeg," *Canadian Journal of Political Science* 55, no. 1 (2022): 1–18.

¹⁰ Thanks to Michael Luoma for pressing me to articulate this thought.

through crises, this does not show that there is a general moral duty to preserve biodiversity—at least not on the usual understanding of how duties are generated. This is because we do not normally think that we are obligated to protect everything of actual or potential value. Moreover, the second argument above focuses on the loss of an opportunity rather than something that is absolutely forbidden, such as harming others. If we live in a less genetically diverse world, there will probably be fewer opportunities for creating medicines or other things of value, but the loss of opportunities is not the same as a harm to people.

In this section, I will consider two arguments for why we have a moral duty to act in ways that preserve biodiversity. I will show that these arguments apply most compellingly to what I will argue are “biodiversity hotspots,” a technical phrase that identifies areas of high biodiversity, significant carbon sequestering capacity, and rare species (in a sense to be explained).

The first argument here contends that what makes actions leading to biodiversity loss wrongful is that it violates our duties of intergenerational justice, which plausibly involve leaving the next generation in a situation as well off or better off than our own generation. The second argument translates the kinds of considerations noted above in the language of wrongful risk-imposition, which we normally think of as a constraint on human action. In both cases, I will argue that the arguments do not work well with the notion of biodiversity, where that implies that we have obligations to protect and promote all kinds of biodiversity, but it does work well when applied to biodiversity hotspots.

Let’s consider the intergenerational justice argument. This argument goes beyond the generally accepted idea that we have duties of distributive justice to people living at the same time. It contends that there are also obligations of intergenerational justice, in which the wrong consists in the violation of a duty of justice to future generations (of humans). The central thought is that we have duties to leave future generations at least as well off as we were. John Locke captures this intuitive thought in his claim that appropriation of resources in the natural world is acceptable or legitimate as long as it leaves “enough, and as good, ... for others.”¹¹ John Rawls, in his description of intergenerational justice in *A Theory of Justice*, argues that societies have a just savings rate, whereby developing economies have an obligation to save for the future and developed just societies have a duty to maintain the status quo by leaving future generations with what is necessary to realize justice themselves.¹² If we think that there are intergenerational obligations, then we could incorporate concern for biodiversity into

¹¹ John Locke, *The Second Treatise of Government*, in *Political Writings*, ed., David Wootton (1689; repr., New York: Mentor Books, 1993), 277.

¹² John Rawls, *A Theory of Justice* (Cambridge, MA: Harvard University Press, 1971), 284–93.

our overall account of justice by conceiving of actions that contribute to biodiversity loss as violations of a duty of justice.

A problem usually besetting arguments that situate environmental obligations in a theory of intergenerational justice is that whatever metric is employed for what we should pass on to the next generation—whether sufficient or equal opportunities, resources, or welfare—fails to pick out environmental goods as critical in what we need to pass on to the future. Why not just ensure that future people can enjoy the same number and value of opportunities as we have now, even if those opportunities are different from the ones we might enjoy today? Why not ensure that future people are as happy, have as much welfare as present people? If we accept this line of argument, however, we fail to single out environmental goods at all. People might learn to get the same enjoyment from swimming in chlorinated pools as in clean fresh water lakes, to enjoy plastic trees as much as real ones, the piped-in sound of rushing water rather than a real babbling brook, or value computer game opportunities more than the opportunity to interact with the natural world.

Let us turn to the wrongful risk-imposition argument. Following Henry Shue,¹³ we could argue that in addition to individual responsibility to avoid harming others, powerful state actors (that is, territorial states) also have a responsibility to avoid policies that cause harm, where the prohibited harm:

- (a) contributes substantially to harming vulnerable people (typically, people living outside the territory of the state that controls the policy or outside the time frame of the regime that controls the policy);
- (b) harms a vital human interest such as physical integrity, life, and human rights; and
- (c) an alternative policy is available.¹⁴

¹³ Henry Shue, *Climate Justice* (Oxford: Oxford University Press, 2014), 12.

¹⁴ One might object that this raises the spectre of the non-identity problem. This is the problem, outlined by Derek Parfit, *Reasons and Persons* (Oxford: Oxford University Press, 1984), chap.16, that the future people whose situations are made bad by a state's land and environmental policies are, for the most part, people who would not have existed in the absence of the policies. This is because large-scale government policies can have implications for the population as a whole, including what labor opportunities exist, in which industries, in which locations, etc., which affects who meets and procreates with whom, with ripple effects down the generations. This means that the victims of anticonservation policies would not have existed (presumably, with lives that are worth living) without the policies that caused the adverse conditions that mark their lives. Hence, we get the question, "On what grounds can we claim the policies harmed them?" Henry Shue, "Human Rights, Climate Change, and the Trillionth Ton," in *The Ethics of Global Climate Change*, ed. Denis Arnold (Cambridge, MA: Cambridge University Press, 2011), 293, implicitly rejects this as a problem; whether we know who the future individuals will be, we know that humans will be entitled to human rights and that these rights are invariant. More recently, Jeff McMahan, "Climate Change, War, and the Non-Identity Problem," *Journal of Moral Philosophy* 18, no. 3 (2021): 226, argues, through a series of ingenious examples, that a more defensible line is that "it is morally objectionable to cause less well-off people to exist when one could cause different, better-off people to exist instead."

In this essay, I do not engage in this debate, nor in the related problem that individual acts of

This political responsibility may be grounded on individual responsibilities not to impose wrongful harm. However, such responsibilities are allocated to the state because state policies and procedures are often responsible for the harm, and thus require a remedial duty, and because the state as a collective actor has more capacity than any individual to solve collective action problems as well as to develop and implement policy decisions.¹⁵ For this reason, individual duties not to impose harm are often (and should be) channeled through the state.¹⁶ This account explains when a setback of interests counts as “wrongful harm.” The harm must (a) be foreseen, (b) set back an important or fundamental interest of the person sufficiently weighty to generate duties on others, and (c) the setback or harm to interests is borne by people who do not benefit from institutionalizing these policies and practices.

The central problem with a risk-imposition argument for explaining our duties regarding biodiversity loss is that it is not clear that any particular case of biodiversity loss will lead to a significant setback of fundamental human interests. Biodiversity loss is scalar; there might be more or less loss and some loss looks likely to be offset by a gain in other kinds of value. Who, after all, is upset by the loss of the smallpox virus, even though the extinction of that virus is itself a permanent loss of a form that enhanced biodiversity? Even when there is some loss, it might be justified in comparison to potential goods of other kinds, such as economic opportunities.

To make good either an argument of intergenerational justice or of wrongful risk-imposition, we must single out biodiversity loss as something that we have special reason to be concerned with. To do this, let’s consider two features of biodiversity loss noted briefly above. First, discussions based on instrumental and intrinsic value often appeal to the fact that the loss of species and habitats is a loss *forever* and that many original, unique, rare species that have evolved over millions of years are threatened with extinction. It is difficult to calculate or know the full extent of that loss over time. Second, and more importantly, the problem of biodiversity loss occurs when whole ecosystems are threatened. Human actions causing this state of

individual persons can rarely be identified with the potentially collectively catastrophic effects of climate change. Although my essay raises the problem and I have not solved it, I defend my side-stepping by noting that no one else has addressed it adequately, by which I mean in a way that also makes sense of the strong intuition we have that there is something wrong about knowingly engaging in behavior that makes future persons worse off than they would otherwise be. In what follows, the discussion of “harm” has a distinct hypothetical or subjunctive component, namely, the lives of people (whoever they are) who exist in the future would be worse than they could be if another set of policies were followed; imposition of risk of harm in such cases is also wrong, in certain conditions.

¹⁵ Peter Singer, *One World: The Ethics of Globalization* (New Haven, CT: Yale University Press, 2002); Kok-Chor Tan, “Just Conservation: The Question of Justice in Global Wildlife Conservation,” *Philosophy Compass* 16, no. 2 (2021).

¹⁶ See Michael J. Green, “Institutional Responsibility for Global Problems,” *Philosophical Topics* 30, no. 2 (2002): 79–95.

affairs include habitat destruction; pollution; overharvesting; introduction of invasive and alien species that displace other species and thereby challenge the ecological integrity of the area; and increased human population, which multiplies all of the above when occurring in key biodiversity hotspots.¹⁷

In places of high or fragile biodiversity, two kinds of effects associated with the destruction of biodiversity help to explain why it is a calamity. One is connected to climate regulation, while another is more straightforwardly connected to biodiversity. The carbon-sequestering function of many biodiverse places is relatively easy to connect to wrongful risk-imposition. Since such places are important to stabilizing the climate, then even if we do not completely know the probabilities of risk, we should err on the side of caution. The biodiversity requirement is sometimes justified on the grounds that areas rich in biodiversity usually also contain high carbon-sequestering capacity, so protecting biodiversity is a proxy for climate stabilization. The harms of climate change are clear: anthropogenic climate change is likely to lead to famine, floods, unpredictable weather events, displacement, and rights-deficits for millions of people in the future, which can easily connect both to injustice toward future generations and to wrongful risk-imposition. It is worth emphasizing here that this does not work in a scalar way, such that every loss of biodiversity is an intergenerational injustice. Problems arise only when there is the destruction of either a very large carbon sink, such as the Amazon, or multiple carbon sinks across the world. We are now in a crisis such that the loss of biodiversity hotspots that stabilize the climate cannot be exchanged for improved opportunities of other kinds, because we can reliably foresee the ways in which this will set back the fundamental interests of future people and impose the risk of wrongful harms on them.

While the climate-stabilization argument is powerful, it does not provide a reason to care about biodiversity loss that is independent of climate stabilization or independent of the fact that preserving biological species is intrinsically good for the beings and species in question.

In order to make sense of wrongful risk-imposition with respect to biodiversity loss, it is important to reflect on the fact that our phenomenological sense of agency and responsibility, which tends to rely on cause and effect, does not accurately reflect the complex interrelated nature of humans' relationship to the natural world. All plants and animals (including humans) on Earth have evolved together. There are complex feedback loops such that the destruction of fragile or biodiverse-rich areas is likely to have significant negative impacts beyond the initial destruction. Most biodiversity loss is caused either by the destruction of habitat, or by the destruction of one species (or success of an alien species), which can have ripple effects on other species and lead to the degradation or destruction of the entire ecosystem. For example, cutting down trees in the rainforest, thus reducing

¹⁷ Wilson, *The Future of Life*, 49–51; Wilson, *Half-Earth*.

the current habitat of plants and animals that live there, may be permanent due to complex feedback loops between particular species and their environment. In addition to the loss of species in the rainforests, the ecosystem itself may be threatened by the loss of some species because, once cut, rainforests are rendered vulnerable to soil erosion by heavy rain; in many cases, this renders them unable to support the kind of life that evolved there over millions of years. The downward spiral is further complicated by other effects. For example, a significant portion of the rainfall in a rainforest comes from the trees themselves, so with fewer trees, rainfall is reduced, which further stresses the remaining trees. Apart from the almost aesthetic loss of unique plant and animal species and habitats, it is clear that the loss is far greater than anticipated, often irreversible, and usually much greater than the gains to logging companies or to plantation owners who then try to grow crops on the formerly pristine forest. The interconnected nature of such places makes environmental goods different from other kinds of goods and explains why the destruction of biodiversity hotspots is likely to be deeply risky.

Some of these negative effects are not reducible to decreasing valuable opportunities. Consider scientific analyses of the loss of wild places that have correlated biodiversity loss—particularly, habitat loss—with the transfer from animals to humans of viruses and pathogens.¹⁸ This relationship has been well documented. The collapse of particular species will frequently have serious adverse effects on the entire ecosystem and can lead to its collapse, because the natural environment constitutes a system where the loss of one species can have multiple effects across a range of plant and animal life in the area. The collapse of ecosystems imposes avoidable, grave risks on human health, due to the complex, systemic relations between organisms in these places and the environment.¹⁹ One such risk is that most new viruses and pathogens are transferred from animals to humans; this usually happens in a context where wild animals are brought into closer contact with humans. Something similar is true of diseases like dengue fever, which is endemic to areas now populated by humans but were once

¹⁸ Francesca Grifo and Joshua Rosenthal, *Biodiversity and Human Health* (Washington, DC: Island Press, 1997); Felicia Keesing et al., “Impacts of Biodiversity on the Emergence and Transmission of Infectious Diseases,” *Nature* 468 (2010): 647–52; Rory Gibb et al., “Zoonotic Host Diversity Increases in Human-Dominated Ecosystems,” *Nature* 584 (2020): 398–402; “How Forest Loss leads to Spread of Disease,” *Science Daily*, April 7, 2020, <https://www.sciencedaily.com/releases/2020/04/200407164947.htm>.

¹⁹ Keesing, “Impacts of Biodiversity”; Carolina Soto-Navarro et al., “Mapping Co-Benefits for Carbon Storage and Biodiversity to Inform Conservation Policy and Action,” *Philosophical Transactions of the Royal Society B* 375, no. 1794 (2020), <https://royalsocietypublishing.org/doi/10.1098/rstb.2019.0128>; Stineke van Houte et al., “The Biodiversity-Generating Benefits of a Prokaryotic Adaptive Immune System,” *Nature* 532 (2016): 385–88;

Kiley Price, “Conservationist: Protecting Nature, an Investment in Our Health,” *Conservation*, May 7, 2020, <https://www.conservation.org/blog/conservationist-protecting-nature-an-investment-in-our-health>.

wild.²⁰ Their rates have skyrocketed in places with high levels of forest destruction by logging, agricultural expansion, and mining. Other diseases, such as Lyme and Lassa virus, have also been directly associated with the loss of wild places.²¹

What, though, counts as *wrongful risk-imposition*? First, we are in the realm of risk because the effects of one's actions cannot be represented as a causal chain, but as probabilistic in form. These actions, permissions, policies, and practices impose a risk of serious harm to others' basic interests; some or most of these harms cannot now be specified in terms of who will be harmed because they will occur in the future.

Although the effect is not certain to obtain, it is just as reasonable to hold the intentional imposition of a risk of harm to be *wrong* as it is to hold intentionally harming someone who is vulnerable to one's power to be wrong. Almost all of our actions have some degree of risk, but accepting a risk oneself is morally different from imposing risk on others. This is even more salient given the nonreciprocal character of the benefits of depredation of these areas and the magnitude and probability of harmful outcomes.²² Whether or not people are wronged by harmful or risk-imposing activities, then, partly depends on whether those vulnerable to the risks can reasonably expect to benefit from those risk-imposing activities as well as the relationship of costs to benefits. This point is implicit in condition (c) above, which specifies that risk-imposition may be acceptable if it is reciprocal. "Reciprocal," in this context, means that the exposure to risk is either outweighed by a greater benefit for that person herself or part of a generally beneficial social practice in which other persons are exposed to the same risk.²³

Consider the simple interactional case of driving, which unavoidably produces some degree of risk to others. When I get behind the wheel, doing so imposes a risk to nearby pedestrians. However, it could be argued that this action is part of a generally beneficial social practice in which everyone is able to move more quickly from A to B. Furthermore, this underlies our globalized and interconnected economy, which, it could be argued, is a net good. What is problematic—because it mirrors an exploitative and one-sided arrangement—is when some persons or set of persons are exposed to risk in order to achieve benefits for others. This is what distinguishes the

²⁰ Here, I am assuming that we cannot address the problem by finding ways of tackling the mosquitoes that carry these diseases.

²¹ Andreas Teuber asks: "If, as we seem to believe, it is wrong to cause another person *harm* without that person's consent, is it wrong to impose a *risk* of harm without consent?" Andreas Teuber, "Justifying Risk," *Daedalus* 119, no. 4 (1990): 236. To be clear, the answer to Teuber's question, which I formulate in terms of three principles, is: "Sometimes."

²² By magnitude, I mean, following Shue, "Human Rights, Climate Change, and the Trillionth Ton," 260–66, a measure of the seriousness of the loss that is risked; probability refers to a measure of the likelihood of that loss occurring.

²³ Sven Ove Hansson, *The Ethics of Risk: Ethical Analysis in an Uncertain World* (London: Palgrave, 2013), 102; see also John Obediek, *Imposing Risk: A Normative Framework* (Oxford: Oxford University Press, 2017).

destruction of biodiversity hotspots from nonwrongful risk-imposition. Those who benefit from the destruction of these biodiversity hotspots—by reaping the benefits of logging, agricultural expansion, or resource extraction—are imposing risks to the interests of future people, who bear the costs. The states that permit biodiversity destruction are complicit in this wrongful risk-imposition.

Note that on both the intergenerational justice argument and the wrongful risk-imposition argument, not just any loss of a plant or animal species can count as intergenerational injustice or wrongful risk-imposition. Only the loss of particular areas—such as where the ecology is especially fragile, biodiversity-rich, or has high carbon-sequestering capacity—can count. It is the destruction of ecosystems that matters for stabilizing biodiversity loss and for carbon-sequestering capacity. These, I argue below, are biodiversity hotspots.

V. A PROPOSAL TO PROTECT BIODIVERSITY HOTSPOTS

This section summarizes and elaborates on a proposal to protect biodiversity hotspots. It also clarifies what counts as a hotspot and why this is important to the institutionalization of scope-limited rights that states have over their territory.

Although there are different ways to identify biodiversity hotspots, in this essay I assume the validity of Global Safety Net's methodology for identifying key areas as well as wildlife and climate corridors between key areas that are crucial to wildlife maintenance. To identify biodiversity hotspots, scientists associated with Global Safety Net's project have applied a number of desiderata that are used to develop a scale to identify areas that should be set aside for conservation. The first aim for classifying these hotspots is to conserve the diversity and abundance of life on earth. The key question here is: "How much does an ecoregion or country contribute to meeting global biodiversity targets?"²⁴ This is a complicated question, but scientists have developed a score along different dimensions, including species rarity (intended to track species that have narrow range or occur in low density) and whether the unprotected areas are sufficiently intact that they have potential for providing a refuge for diverse plant and animal life. The second aim is to enhance carbon storage. Ecoregions are identified according to their capacity to contain high carbon stocks and assist in climate stabilization.²⁵ The third is to provide wildlife corridors on the grounds that connecting the world's remaining intact species habitats enables adaptation and promotes resilience.

²⁴ Dinerstein, "A 'Global Safety Net,'" 2.

²⁵ Emma Martin et al., "Southern Anatolian Montane Conifer and Deciduous Forests," *One Earth*, 2020, <https://www.oneearth.org/ecoregions/southern-anatolian-montane-conifer-and-deciduous-forests/>.

Through this methodology, fifty ecoregions across the globe have been identified that are currently unprotected but contribute most in their natural state to biodiversity protection and climate stabilization, largely through carbon storage. These biodiversity hotspots typically exist within states; they can coexist alongside human activity outside the areas and, in some cases, some human activity within them. Some examples are the Central Range Papuan Montane Rainforests, the Sulawesi Lowland Rain Forest in Australia, the Taimyr-central Siberian Tundra, the Napo Moist Forest, and the Somali Acacia-Commiphora Bushlands and Thickets.²⁶ Relying on this method for determining biodiversity hotspots has several advantages. The most important is that it is based on plausible, normatively justifiable goals, including, but not limited to, climate stabilization.²⁷ However, since I am here interested in ecological resilience as well as the broader normative question of the obligations each country possesses with respect to its own territory, the Global Safety Net project helpfully yields hotspots in diverse areas *across the globe* (though tropical rainforests still score very high).

The three considerations used to identify biodiversity hotspots are germane to wrongful risk and wrongs connected to a violation of intergenerational justice. They identify places where destruction is most likely to harm the ecosystem, thus posing a risk to humans and other species, and would have serious effects on the climate (which itself can pose risks to ecological systems). The clear implication of the above argument is that all states have a duty to protect biodiversity hotspots. The most likely way to protect them is to regulate human activity with respect to them, including prohibiting some parts of the state or civil society from engaging in action that may threaten such places.

Clear identification of specific areas is necessary to reduce epistemic uncertainty about wrongful action. To see this, consider the distinction between options that are required, those that are permissible, and those that are impermissible.²⁸ Within each of these categories, it is safe to say that there is significant moral variation. Some permissible actions are not optimal; they are permitted or allowed, but could be criticized along a number of dimensions. For example, it may be permissible to give time and money to an organization like the Boy Scouts, which may have some benefits for its members, but may be criticized because (a) the Boy Scouts has had a history marred by homophobia, particularly in its membership rules, and (b) the

²⁶ Dinerstein, "A 'Global Safety Net'," 5, Table 2.

²⁷ Focusing solely on question 2 regarding carbon-sequestering capacity, without the interpretive qualifier of how to understand biodiversity in question 1 and the need to promote ecological resilience, which is the goal implicit in question 3, would result in identifying biodiversity hotspots in tropical regions only. This is because although tropical rainforests "cover only about 6 percent of the land surface, their terrestrial and aquatic habitats contain more than half the known species of organisms." Wilson, *The Future of Life*, 59.

²⁸ See Jeremy Waldron, "A Right to Do Wrong," *Ethics* 92, no. 1, (1981): 21–39.

money could be spent better by giving directly to extremely needy people.²⁹ Nevertheless, we may think that it is permissible for individuals to make nonoptimal choices and, indeed, choices that could be morally criticized, at least along some dimensions. The field of options available to individuals ought to exhibit some moral variation if individuals are to exercise autonomy and not simply be forced to be virtuous. This is not the same as having a right to do wrong, but it does mean that—if we are to preserve autonomy—we need to be sensitive to individual choice over a range of options.³⁰

This holds true for the state's right over resources, which, like individual rights, are grounded in the value of self-determination (albeit in this case, collective self-determination) and similarly constrained by something like a no-harm principle. In many cases, the state (or the people in the state) make decisions over land use that may involve some goods, like jobs or economic opportunities, but at some environmental cost. It is likely that any decision about resource extraction will involve some loss of habitat and some pollution, which will ultimately impact ecological resilience and biodiversity.

In many cases, both in terms of individual choices and state decisions about land use and resources, options are situated in the permissible but not optimal range. We also often understand when an action is morally good, right, or altruistic, though we ought to be loathe to require this of individuals, at least if we value autonomy. Much of the "action," so to speak, occurs in the middle range where it is not clear that there is significant harm or violations of people's rights; in such cases, we are reluctant to interfere because we recognize that interfering in people's autonomy is a serious business. If we know that a right is being violated—for example, someone is being tortured—we would have a duty to stop it, but many cases are much more ambiguous than that. This is likely to be true in cases of state policy over resources. We are often not in a position to determine whether the threat is sufficiently significant to prohibit resource extraction, though we know that many actions involving resources (for example, building a logging road in forested areas or approving a mining site) may well have deleterious consequences for the environment, especially when combined with other similar actions. This epistemic uncertainty is especially likely to obtain when dealing with complex biological and ecological processes that ultimately contribute to biodiversity loss, but are not direct and were not directly intended.

All this means that, in the absence of specifying the kind of place where the risk of harm is high, the state's right to jurisdiction over controlling resources and migration is likely to yield a permissive judgment, because, in each particular instance, it will be covered by the general right to

²⁹ It could be argued that giving money could be permissible, even if the Boy Scouts still had homophobic membership rules, depending on the balance of goods achieved by that organization.

³⁰ Renee Jorgensen Bolinger, "Revisiting the Right to Do Wrong," *Australasian Journal of Philosophy* 95, no. 1 (2017): 51.

resources. The importance of having a scientifically and normatively justified metric that yields a set of biodiversity hotspots is to indicate that such places are not covered by that general right, and we thus have a duty to conserve them. We might adopt conservationist principles in other cases and other places, too, but it helps to address epistemic uncertainty and make available to us a general class of areas—that is, biodiversity hotspots—that ought to be protected. It may still be the case that different countries will secure their protection differently, but this approach nevertheless helps to identify a clear case of wrongful action.

VI. COMPARATIVE SUPERIORITY OF A BIODIVERSITY HOTSPOT PROPOSAL

Many of the arguments discussed here in relation to the value of biodiversity, wrongful risk-imposition, and intergenerational justice could apply to a range of proposals aimed at protecting biodiversity. In this section, I argue that the Global Safety Net project proposal with respect to multiple biodiversity hotspots around the world is superior to other proposals—such as the “half-Earth” proposal³¹ that half the Earth should be set aside as wilderness—because it avoids some of the problems that plague other proposals.

The half-Earth proposal notoriously raises important distributive justice questions, such as “Which half?” That proposal focuses straightforwardly on maximal biodiversity, which, in its more persuasive versions, is equivalent to the protection of biodiversity hotspots, but, without the metrics argued for above, would end up justifying protection in poorer, tropical countries and let richer countries mainly in temperate climates “off the hook” from protecting their own biodiversity. This leaves them open to both hypocrisy and unfairness charges.

Let’s consider the hypocrisy charge.³² The usual version of a hypocrisy charge targets developed Western countries’ support for robust environmental norms after they have significantly contributed to biodiversity loss and anthropogenic climate change in the course of their own economic development. The underlying concern is that these rich countries have no moral standing to generalize these requirements, because they have not had to share the burden of loss of opportunity costs that are attached to environmental protection.

There are, though, related hypocrisy and unfairness charges lurking here that are not historical in form. There is something hypocritical and unfair about developed economies in temperate climates (such as Europe, Japan, and North America) seeking to ensure that biodiversity hotspots in *other* countries are protected from development, while not sharing the burden

³¹ See Wilson, *Half-Earth*.

³² See Shmuel Nili, “‘Waving the Banner of Democracy’: Democratic Sanctions and Three Hypocrisy Puzzles,” elsewhere in this volume, for an excellent discussion of hypocrisy.

themselves.³³ Those countries are imposing an obligation and costs on poorer countries, which are mainly subtropical or tropical and therefore areas of high biodiversity, that they are unwilling to bear themselves. By costs, I do not merely mean the monetary costs of protection, but also opportunity costs (such as forgoing economic development) and political costs (such as imposing possibly unpopular constraints on members of their own populations).

The charges stick, even if countries in the developed West are prepared to pay a surtax or cost to assist poorer countries to protect these areas (which I hold is also justified). They stick because such behavior reinforces the economic gap between the two, a gap which is the result of wrongful prior economic development that imposes opportunity costs on poorer countries. They also stick because the political costs of constraining one's own population would be felt exclusively by the developing world in cases where biodiversity hotspots are confined to tropical and subtropical regions.

The most obvious answer to the question of which half of the Earth should be preserved for wildness flows from the problem we want to solve. If we are trying to maximize biodiversity or minimize biodiversity loss, we should protect the most biodiverse places. While that makes sense, the methodology adopted by the biodiversity hotspot proposal is not only normatively comprehensible, but also yields the result that many different states all over the world are required to meet the minimum obligation to protect biodiversity hotspots in the area that they control. This is an advantage over the half-Earth proposal.

One could say that the half-Earth proposal is not wedded to maximizing biodiversity. There is no necessary connection between the half-Earth slogan and the interpretation that protection should take place only in developing countries. However, to avoid the problem that only tropical or subtropical places would be singled out, proponents would need to adopt desiderata for selecting such places that mirror, or are at least very similar to, the biodiversity hotspot proposal I advocate. In that case, the slogan is different, but the substantive proposal is the same.

VII. INSTITUTIONALIZING BIODIVERSITY HOTSPOT PROTECTION

The clear identification of biodiversity hotspots is important to their institutionalization, which, at least in the first instance, I argue, must occur in the domestic constitutional processes of states. One reason why this needs to be institutionalized in domestic processes is because we live in a world of multiple territorial states that have jurisdictional authority to regulate the main drivers of biodiversity hotspot destruction: logging, mining, other forms of resource extraction, settlement, hunting, agriculture, and so

³³ See Tan, "Just Conservation."

on. Placing clear limits on these activities is crucial to preserving such places effectively. Tasking each state with protecting its hotspot(s) is key to developing a general norm with respect to biodiversity hotspot protection.

Making states responsible in the first instance is not sufficient, though, since biodiversity hotspots spill over boundaries. Interstate cooperation is also needed to effectively protect such places. This means that we have a duty to enter into and press for treaties that will protect biodiversity hotspots around the globe.

Domestic constitutional protections and treaty guarantees will also help to create general acceptance of norms regarding biodiversity hotspots, reducing room for making excuses. As Jeff McMahan has shown in relation to just war, there are various forms of and degrees of responsibility.³⁴ The degree of a person's or an institution's responsibility for imposing a wrongful threat on others may vary with the significance of excusing conditions that may apply to the agent's action. The more an agent is excused, the less responsible that agent is for wrongful harm.

We commonly distinguish, at the agential level, between three categories of excuse: duress, diminished responsibility, and epistemic limitation.³⁵ There are no interesting applications of the duress condition to this case, but the other two categories of excuse may apply. Let's begin with diminished responsibility. In just war theory, diminished responsibility is usually interpreted as referring to diminished decision-making capacity. In the context of biodiversity protection, it refers to diminished capacity for action, which may arise in cases where the state is incapable of acting in the sense that it lacks the institutional capacity to implement policies that protect its rainforests against predators. Biodiversity hotspots can be degraded not only by active and culpable action, but because the state cannot discharge its obligation to protect them. The capacity condition is scalar and can be different at different times, with respect to different things. The greater the diminution of capacity, the stronger the excuse (or reduction of culpability) for the wrongful threatener. To avoid excuse on this front, it is necessary for rich countries to come to the aid of poor countries and partially discharge their obligations by helping to pay for the protection of biodiversity hotspots, including replacing lost opportunities when biodiversity protection does not occur. Reduced capacity, in the sense described above, gives rise to third-party duties of assistance to the burdened state, on the part of other territorial rights-holders (states), to help protect these hotspots. Such duties might include improving the technological and communication links central to effective governance of such areas to secure more effective governance institutions, with the sole aim of ensuring that there is an institutional structure that can effectively protect biodiversity hotspots.

³⁴ Jeff McMahan, *Killing in War* (Oxford: Oxford University Press, 2009).

³⁵ McMahan, *Killing in War*, 115–22.

Another category of excuse—epistemic limitations—also may apply. These can only be overcome with clear areas of wrongful action and lines of responsibility attached to the state. This is where clear, institutionalized protections for biodiversity hotspots is crucial. Epistemic limitations, like diminished capacity, is scalar. Knowledge of the harms that one is committing can be more or less, so epistemic deficiencies can be to a greater or lesser extent. In cases where the agent (the state) knowingly imposes or threatens to impose a wrongful risk on others, it is acting wrongfully and is fully culpable for its actions. However, in our current international order, which is based on the state sovereignty principle recognizing territorial rights (at least in international law) that permit states to develop and regulate their areas as they see fit, states are furnished with at least a partial excuse for such actions.

While scientific evidence about the relationship between biodiversity loss and wrongful risk-imposition is clear, indeed overwhelming, it may be reasonable for people—both individuals and political leaders—still to believe that they have a moral permission to “develop” such areas for the good of the people in their community. This belief may be held for two reasons. One is that because the causal nexus in climate and biodiversity cases is so complicated, it may not be clear to many people how these actions and these policies cause harm. Unlike in the standard case of culpable harm, the destruction of one biodiversity hotspot will probably not itself cause significant harm to the climate or to future generations’ opportunity prospects. However, the effect of multiple ecological deaths, which is what we are now experiencing, will do so. This threshold nature of destruction for ecological resilience and climate change makes it more difficult for individuals to see how their actions cause wrongful harm; it fails to capture the phenomenological experience of agency where a person’s actions are directly related to the consequences.

The second reason, which is more pertinent to the argument about using soft power to alter institutional incentives, is that it is reasonable for people operating within accepted institutional structures to assume that, as long as they are abiding by the rules, they are not doing wrong. Our current international order does nothing to clarify the wrongful nature of the destruction of biodiversity hotspots. To make it clear, there should be explicit rules in the international system establishing the wrongful and illegal nature of such actions. It would then not be necessary for individual governments and individual citizens to analyze the climate and biodiversity science to conclude for themselves that such action is wrongful. While we might be reluctant to endorse the equivalent of an epistemic “get out of jail free” card, since people do have obligations to make themselves aware, it is also reasonable for people to operate within accepted institutional structures. Therefore, it is incumbent on us to establish domestic institutions aimed at protecting biodiversity hotspots, pressing for international treaties, and changing international rules so that the excusing condition does not apply.

VIII. NONCOMPLIANCE

A critic might complain that it is all very well to argue that states' rights over their territory have limits, that it is wrong to destroy universally valuable biodiversity hotspots, and we should help prevent wrongful harm (including climate change and ecological destruction). However, *who* is to ensure and *how* can we ensure that China, Russia, the United States, Brazil, Indonesia, or Ecuador preserve their biodiversity hotspots? We live in a global order comprised of states with sovereign authority over their territory and we do not have a clear mechanism to enforce these important duties. Does my argument empower other biodiversity-respecting states or international organizations to coercively take over such hotspots and protect them? This conclusion does not follow from the argument developed here. It requires additional argumentation to ensure that domestic and treaty processes are in place, soft power is being deployed, and there is a generally accepted norm against destroying biodiversity hotspots.

Additional argumentation involves examining the conditions for justified use of force. One plausible condition for the use of coercive force is a *necessity* condition. This requires us to show that no other option was available, so coercion is a last resort. Here, though, the problem is that other options have not been tried. The current world order has not implemented sanctions against destructive states, nor has it applied a carbon market that includes protection of biodiversity hotspots as among elements that should be priced. This means that armed intervention would, at the moment, fail the "last resort" test.

A second condition on the use of force is a *success* condition, which requires us to consider which means is likely to be more successful in achieving the desired goal of protecting biodiversity. It is highly unlikely that the best means generally involves armed violence. If Russia fails to protect the West Siberian Taiga, for example, it is difficult to see how invasion would be justified, given the costs, which probably includes the threat of initiating a nuclear war that would also be destructive to the planet. Even with respect to smaller states that lack nuclear weapons, the biodiversity proposal (which should be institutionalized) presupposes a rule-governed order. Exceptions to the rule (such as infringements on state sovereignty) can only be consistent with a rule-governed order if they are themselves implemented in accordance with general procedures and principles.

The third condition is a *proportionality* condition; here, the use of violence could be justified if it was necessary to realize a powerful good. It is possible that this condition could be met. Such a case would involve an ecologically destructive state intent on completely destroying a place in such a way that it will have catastrophic effects on the rest of the world. In this case, armed force cannot be ruled out. However, in the absence of a necessity condition and the prior use of soft power, this would be a suboptimal result, in which

both invaded and invader (and bystanders) are culpable to varying degrees for the environmental damage and consequences thereof.

All this shows that my essay's argument does not translate directly into justifying armed intervention to dismantle ecologically destructive states. Even if invasion is not an option, the recognition that a state has no moral authority to do what it pleases in such places has significant implications, including directing each state (the collective analogue of "we") to do what they can in their own geographical domain. People who agree on the norms in question could also act in a coordinated way through their individual states, perhaps implementing a version of carbon trading that takes into account (in computing the costs of carbon) the need to protect biodiversity hotspots. This recognition also directs us, when acting through our states, to use soft power—such as economic leverage, sanctions, and pressure to secure a Treaty on Biodiversity Hotspots along the lines articulated by Global Safety Net—with the aim of preserving such places. Even without a global treaty, wealthier countries ought to contribute to an international scheme that helps to offset the (direct and indirect) costs of conservation, especially given that some of the largest biodiversity areas are in relatively poor countries.³⁶

IX. CONCLUDING THOUGHTS

I have argued that we have a duty to protect biodiversity hotspots, because their destruction wrongfully imposes risks on others and violates commonly held strictures of intergenerational justice. This argument includes a proposal to protect biodiversity hotspots using the methodology developed by Global Safety Net to identify them. Although this duty stems from recognizing the global nature of the problem of biodiversity loss and the universal value of biodiverse places, this duty should initially be institutionalized domestically. We should also work toward treaties on biodiversity and create institutions to support poorer states in protecting their own biodiversity.

This may seem a weak conclusion, but I hope that my argument will contribute to a more general recognition that state authority over territory is limited by environmental obligations. Our obligation to protect biodiversity hotspots is a clear case of this.

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³⁶ Chris Armstrong, "Sharing Conservation Burdens Fairly," *Conservation Biology* 33, no. 3 (2019): 554–60; Alejandra Mancilla, "Shared Sovereignty over Migratory Natural Resources," *Res Publica* 22, no. 1 (2016): 21–35.