



"THE ANTHROPOCENE", ECOSYSTEM MANAGEMENT, AND ENVIRONMENTAL VIRTUE¹

"EL ANTROPOCENO", LA GESTIÓN DE LOS ECOSISTEMAS Y LA VIRTUD AMBIENTAL

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ABSTRACT:

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In this article I consider contrasting views on the implications of rapid, macroscale anthropogenic change for environmental ethics, particularly ecosystem management, species conservation, and environmental virtue. I begin by reviewing the Anthropocene debate, which has become a primary point of discourse on whether we ought to embrace a more interventionist stance regarding ecosystem management and species conservation. I then discuss the challenges posed by rapid ecological change to predominant ecosystem management and species conservation practices. I argue that these challenges notwithstanding, we ought not go all in on interventionist management, even as novel conservation and management techniques can be justified in particular cases. It is possible to adopt a more forward looking normative stance, without licensing robust interventionism. Finally, I discuss the implications of this for some environmental virtues.

RESUMEN:

Palabras clave:

Antropoceno;
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En este artículo considero puntos de vista contrastantes sobre las implicaciones del rápido cambio antropogénico en macroescala de la ética ambiental, con particular referencia a la gestión de los ecosistemas, la conservación de especies, y la virtud ambiental. Comienzo por revisar el debate sobre el "Antropoceno", que se ha convertido en un punto fundamental del discurso sobre nuestra opción de tomar una postura más intervencionista respecto a la gestión de los ecosistemas y la conservación de especies. Finalmente, abordo los desafíos que plantea el rápido cambio ecológico a las prácticas predominantes de gestión de los ecosistemas y de conservación de las especies. Argumento que, no obstante estos desafíos, no debemos apoyar totalmente la gestión intervencionista, ya que nuevas técnicas de conservación y de gestión pueden justificarse en casos particulares. Es posible adoptar una postura normativa más hacia el futuro, sin una caer en el intervencionismo radical. Por último, discuto las implicaciones de esto para algunas virtudes ambientales.

¹ Portions of this article are drawn from: Sandler, R. *Environmental Ethics: Theory in Practice*, Oxford University Press, New York, in press.

1. Introduction

The motivation for environmental ethics is that we –particularly those of us in affluence and positions of power– need to improve our relationships and interactions with the natural environment. We need to see more clearly what in the environment matters and how it matters. Therefore, central to environmental ethics has been identifying the full range of environmental goods and values; determining how to respond to them and consider them in decision-making regarding practices and policies; and challenging entrenched perspectives that are impediments to improvement. The future of environmental ethics involves continuing in this, since environmental degradation, biodiversity loss, wastefulness, cost externalization, social marginalization, ecological exploitation, human chauvinism, techno-faith, and unjust distributions of environmental benefits and burdens remain prevalent.

What is different in this moment are the scope and magnitude of anthropogenic impacts on the natural environment that already exist, as well as the growing realization that in many cases there is no going back to how things were or would have been if they had not occurred. There has always been a nostalgic component to environmentalism and environmental ethics. For example, natural value –i.e. the value of nature independent of human impacts, design and control– has been prominent in environmental thinking. Cultural continuity and maintenance of traditional practices and historical ways of life have been prominent justifications for environmental protections. Ecological restoration, preservation and remediation have been prominent ecosystem management strategies. Overall, the general orientation has been to prevent places from being degraded or modified, and, so far as is possible, undoing anthropogenic impacts that already exist. Character traits that foster and constitute these evaluative and dispositional stances therefore have been widely considered to be important environmental virtues –e.g. humility, appreciation, modesty and historical fidelity.

This backward-looking normative orientation is increasingly being challenged. Proponents of more inter-

ventionist environmental ethics argue that local and global environmental changes –e.g. deforestation, climate change, invasive species, and pollution– are frequently so pervasive and deep that it is not practically feasible to return places to their prior condition or trajectory. Many additionally argue that in order to preserve what is valuable in nonhuman nature –e.g. biological diversity and ecosystem services– we must be proactive and further modify ecological systems by means of such things as ecosystem engineering, assisted relocation and genetic modification. On this forward-looking view, character traits such as creativity, inventiveness, confidence, and ingenuity are considered crucial. Rather than stand still or pine for an impossible ecological past, we must be disposed to take greater control of and responsibility for the ecological future.

In this article I consider these contrasting views on the implications of rapid, macroscale anthropogenic change for environmental ethics, particularly ecosystem management, species conservation, and environmental virtue. In Sections 1 and 2, I review and discuss the Anthropocene debate, which has become a primary point of discourse on whether we ought to embrace a more interventionist stance regarding ecosystem management and species conservation. In Section 3, I discuss the challenges posed by rapid ecological change to predominant ecosystem management and species conservation practices. I argue that these challenges notwithstanding, we ought not go all in on interventionist management, even as novel conservation and management techniques can be justified in particular cases. It is possible to adopt a more forward looking normative stance, without licensing robust interventionism. Finally, In Section 4, I discuss the implications of this for some environmental virtues.

2. The Anthropocene?

A well-informed and comprehensive understanding of the human-nature relationship is crucial to developing a well-justified theory of environmental ethics. It is vital to identifying the full range of environmental goods and values, as well as to defining the extent of

our environmental impacts and agency. These, in turn, inform our environmental responsibilities and accounts of how we can flourish along with nature. Because of this, *if* the human-nature relationship were to radically change, then the perspective from which we ought to think about environmental values, principles and responsibilities *might* need to be revised as well.

As mentioned above, some environmental thinkers believe that such changes are already occurring and that they justify reconsidering our environmental responsibilities and how we approach many environmental problems. Their view is that human impacts on the Earth are now so pervasive and long lasting that we must revise our understanding of the "natural" world and our relationships to it. We must acknowledge that human beings are now (and for the foreseeable future) the dominant planetary force. We need to recognize the roles that human activities play in ecological and climatic systems, and embrace the responsibility of managing them, from the flow of rivers to the composition of the atmosphere.

Other environmental thinkers believe that this is a mistake. On their view, the fact that people have such large and detrimental impacts on the natural world is confirmation of human too-manness and too-muchness. It is the scale of our influence on the natural world that is the problem that needs to be addressed. The way to do this is not by taking more control, but by pulling ourselves back. We must decrease our population and consumption. We must reduce our efforts to design and manage ecological systems and processes as we think they should be. We must ensure that we leave enough resources for other species and spaces for human-independent ecological and evolutionary processes. Extensive intervention into ecological systems is what created our environmental problems. Increasing them further, no matter how well intentioned, is apt to cause more problems and further undermine environmental values.

This disagreement about whether to respond to anthropogenic change with greater intervention or greater restraint is at the heart of the exploding dis-

course regarding the *Anthropocene*, the idea that we have entered a new age in natural history dominated by human activities.

Human impacts on the planet are immense. This is not contested. For example, human beings appropriate approximately 25% of the Earth's primary plant production². Over a third of the terrestrial surface of the Earth is used for agriculture³. Over 90% of global fish stocks are fully or overexploited⁴. Vertebrate populations are estimated to have been reduced by half on average in the past 40 years due to human activities⁵. Human activities generate more reactive nitrogen than do all other planetary processes⁶. Human activities, particularly agriculture, mining and building, move more earth than do all other planetary processes⁷. The atmospheric concentration of carbon dioxide is higher than it has been in millions of years due primarily to fossil fuel use, and this is causing the oceans to acidify as they absorb greater amounts of carbon dioxide⁸. Dams, irrigation, channeling, pumping and floodplain engineering now control or influence the movement of most freshwater and sediment⁹. Synthetic chemicals and waste from human industrial activities permeate terrestrial and aquatic systems and organisms. When considered together, it is clear that human impacts on the environment are pervasive, transformative and enduring. The term "Anthropocene" is often used by scientists and environmental thinkers to highlight the scale of human impacts and power. Referring to our

2 See: Krausmann, F., et al. «Global Human Appropriation of Net Primary Production Doubled in the 20th Century». *Proceedings of the National Academy of Sciences*. 2013; 110(25): 10324-10329.

3 See: FAOSTAT 2014.

4 See: FAO 2014.

5 See: WWF. *Living Planet Report 2014*, WWF, Gland, 2014.

6 See: Galloway, J.N. et al. «Nitrogen Cycles: Past, Present, and Future». *Biogeochemistry*. 2004; 70(2): 153-226.

7 See: Wilkinson, B.H., McElroy, B.J. «The Impact of Humans on Continental Erosion and Sedimentation». *Geological Society of America Bulletin*. 2007; 119(1-2): 40-156.

8 See: NOAA. *What is Ocean Acidification?*, 2015. Retrieved from <http://www.pmel.noaa.gov/co2/story/What+is+Ocean+Acidification%3F>; Tripathi, A.K. et al. «Coupling of CO₂ and Ice Sheet Stability Over Major Climate Transitions of the Last 20 Million Years». *Science*. 2009; 326(5958): 1394-1397.

9 See: Syvitski, J.P. Kettner, A. «Sediment flux and the Anthropocene». *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*. 2011; 369(1938): 957-975.

current time period as "the human age" draws attention to the enormous role that human activities now play in ecological systems and process.

Some scientists have proposed that the human influence on the environment is so deep and permanent that it actually constitutes a *geological transition*. They believe that we have entered a new geological period (either a new epoch or new age within the Holocene) of the Earth's natural history –The Anthropocene– which is *defined* by human power and impacts¹⁰.

Whether we are in the "Anthropocene" in the descriptive senses (one informal and one scientific) discussed above is largely an empirical question *once the definition is fixed*. However, decisions about which concepts and terms to use is not a strictly scientific or empirical determination. Concepts, terms and definitions are often employed because they are thought to be useful, pick out something significant, or convey something important. There is a value-laden component to asking whether we are in a new geological epoch defined by humans. There is no uniquely correct way to break up the geological history of the Earth. Researchers choose to mark differences based not only on empirical facts, but also on what is useful for research purposes and what they believe merits highlighting. The reasons for focusing on the descriptive question of whether we are in a new human dominated geological period are thus partly evaluative and programmatic.

The value-ladenness of the science is evident in the discourse around determining the starting point of the Anthropocene (if it is a new geological period). Among the events researchers have argued for are the agricultural revolution, North-South colonization, the industrial revolution, the post WWII "great acceleration", and the advent and testing of nuclear technologies¹¹. Dif-

ferent starting points focus on different dimensions of human activities –e.g. destructive power, technological progress, and social change– and are in part expressions of what researchers believe should be emphasized.

There is also a value-laden aspect to the term "Anthropocene". The name that is given to something can influence how people think about it and respond to it. Use of "The Anthropocene" has rapidly gained momentum in part because people who study, think, and talk about global ecological change find it to be a convenient way to refer to and emphasize the extent of human influences. But it does more than this. It conveys that the scale of anthropogenic impacts mark an important transition to a different state of the planet, a new "age of humans". It is thus a loaded term, meant to both describe and suggest¹². The term is a confirmation of human power, influence and dominance within ecological, climatic and geological systems. It claims this period of natural history for us; and a formal designation would make it our time of influence, officially. How could we not take control of ecological and climatic systems in that case, when, after all, we already will have been? Is it not better that we design them rationally than destroy them thoughtlessly? The name itself seems to favor the interventionist view that we need to take a more hands-on and active approach toward managing the nonhuman environment.

3. The Anthropocene fallacy

Having a concept that picks out the accumulation of anthropogenic changes and influences on climatic and ecological systems is useful to scientists who study global change. Having a term that highlights the scale of human impacts on the nonhuman environment is rhetorically powerful and evocative. But is "The Anthropocene" a useful concept or term for *ethical* analysis and evaluation?

The extent of human impacts and control is not the same everywhere. Many ecological spaces are now nov-

10 See: Zalasiewicz, J. et al. «The Anthropocene: A New Epoch of Geological Time?». *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*. 2011; 369(1938): 835-841; Waters, C.N. et al. «The Anthropocene is Functionally and Stratigraphically Distinct from the Holocene». *Science*. 2016; 451: 6269.

11 See: Steffen, W. et al. «The Anthropocene: Conceptual and Historical Perspectives». *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*. 2011;

369(1938): 842-867; Lewis, S.L., Maslin, M.A. «Defining the Anthropocene». *Nature*. 2015; 519(7542): 171-180; Waters et al., *op. cit.*

12 See: Moore, K.D. «Anthropocene is the Wrong Word». *Earth Island Journal*. 2013.

el, no-analog or hybrid systems. However, others retain relatively high levels of historical continuity and human independence. Fifteen percent of the terrestrial surface of the Earth is protected and a much larger percentage is ecologically intact and lightly touched by people¹³. This suggests that an all-or-nothing ethical response to "The Anthropocene" is not justified. Or, to put this another way, the ethical challenge is not determining how people ought to respond to "The Anthropocene" –e.g. whether they should be more restraintful or more interventionist. The challenge is determining how people ought to respond to a wide variety of issues and cases involving anthropogenic change, from species conservation to environmental justice. Settling the question of whether or not we are in the Anthropocene does not provide guidance on geoengineering, assisted colonization, ecological restoration, gene drives, scarce resource allocations, or genetically modified crops, either in general or in particular cases.

Here is a more formal way to put this point¹⁴. It is problematic to infer from this:

- 1) We are in the Anthropocene

To this:

- 2) Therefore, we ought to X (where X is any general behavior type)

It is problematic because either "the Anthropocene" is a strictly descriptive concept, in which case it is invalid to infer from the fact that we are in the Anthropocene (if it is a fact) to a prescriptive conclusion without any additional normative or value premise, or "the Anthropocene" is a normatively loaded concept that smuggles in normativity without sufficient argument for it, in which case the inference commits the fallacy of asserting the conclusion. In either case, the inference is fallacious and the conclusion is not warranted. We might call this the *Anthropocene fallacy*.

13 See: UNEP. *Protected Planet Report 2014: Tracking Progress Towards Global Targets Towards Protected Areas*. UNEP-WCMC, Cambridge, 2014.

14 See: Vucetich, J.A. et al. «The Anthropocene: Disturbing Name, Limited Insight», in: *After Preservation: Saving American Nature in the Age of Humans*, Minteer, B.A., Pyne, S.J. (eds.), University of Chicago Press, Chicago, 2015, 66-73.

Here is one more way to think about this. The Anthropocene is consistent with either of the general responses discussed earlier: greater restraint or greater intervention. Merely being in the Anthropocene does not itself tell us which response is warranted. Other considerations need to be provided to settle the issue. Moreover, as just discussed, a blanket position is not likely to be justified. There is too much divergence in types of systems, social contexts, and operative values. In some cases highly interventionist species conservation strategies might be justified, in other cases more restraintful approaches may be. In some cases highly controlled resource management might be justified, in other cases it might be better to defer to human-independent ecological processes.

If this is correct, then "The Anthropocene" may be a distraction when it comes to environmental ethics. Anthropogenic impacts on the planet are enormous. We need to determine how to respond to them, from global climate change to microplastic pollution. Moreover, we need to be more attentive to how technological power and population growth have changed our relationships to the natural world, as well as our ethical responsibilities to the environment and to other people. However, as discussed at the start of this article, these are precisely the sorts of issues with which environmental ethics is already engaged. Designating "The Anthropocene" does not change the facts about the ecological problems that we face, the types of ethical questions that we must ask, or the values that are operative. Nor does it help make decisions on a case-specific basis.

Imagine that a team of conservationists is trying to decide whether they ought to engage in an assisted colonization for a climate threatened species. To determine whether it is feasible and well justified, they would need a great deal of information about the species, the recipient system, and climate change. They would also need to engage in extensive discussions with local stakeholders and conduct a comprehensive value analysis. But at no point during these processes would the fact that we are in the Anthropocene (if it is a fact) add scientifically relevant information or enhance the ethical analysis or public engagement. If anything, introducing

the Anthropocene discourse would distract from what is germane to making an informed, well-reasoned decision about the case: the empirical facts, people's views, the values at stake, and the normative principles that are operative.

It is possible to consider the ethical significance of macroscale anthropogenic change both in theory and in practice without invoking "the Anthropocene". This has been done throughout the history of environmental ethics with respect to the human-nature relationship, ecosystem management, species conservation, global climate change, ecological restoration, technology adoption, restitutive justice, natural resource management, pollution, genetic technologies, and many other issues. Thus, it may well be preferable to leave the Anthropocene concept and term aside when doing environmental ethics. Even if it is a useful concept in the natural sciences and has rhetorical power in public discourse, it might be more trouble than it is worth in ethical analysis of anthropogenic environmental issues and evaluation of what practices, policies and attitudes we ought to adopt in response to them.

4. Interventionism in species conservation and ecosystem management

In the prior section, I argued that focusing on whether or not we are in a new geological age defined by human activities—the Anthropocene—is not a useful way to approach the question of whether we ought to take a more or less interventionist attitude and approach toward the natural world given large scale anthropogenic impacts. Instead, we must focus on the values that are at stake and how we ought to respond to them both in general and in particular cases. In this section I do this with respect to ecosystem management and species conservation.

The historically predominant approach to ecosystem management and species conservation is place-based or *in situ*. The primary place-based strategies are:

- *Establishing Parks and Reserves*: Designating ecological spaces where external stressors, such as pollution, extraction and recreational use, on

nonhuman species populations and their habitats are eliminated or reduced.

- *Ecological Restoration*: Actively assisting in the recovery of degraded spaces, including their species compositions, to some approximation of what they were or would have been absent anthropogenic impacts.

Most theories of environmental ethics are supportive of these management strategies to at least some extent, since they generally protect and promote a diverse range of environmental values – e.g. natural-historical value, the worth of nonhuman organisms, ecosystem services, cultural value, ecological integrity, and aesthetic value. However, macroscale anthropogenic change, and climate change in particular, can pose serious challenges to the effectiveness of and justification for place-based conservation.

The distinctive features of anthropogenic climate change are the increased magnitude, rate, and uncertainty of climatic and ecological change in comparison to the recent geological past. There has always been ecological change, and species populations have always had to adapt or else go extinct. However, the greater the rate and magnitude of change the more difficult is adaptation. Many species populations are dependent upon environmental conditions that may no longer obtain in their current and historic ranges. This means that the traditional place based conservation strategies—creating protected parks, designating critical habitats, and engaging in ecological restorations—are not going to be as effective as they have in the past. It is not possible to preserve coral reefs and the species that depend upon them by designating their locations marine sanctuaries when increases in ocean temperatures due to climate change and ocean acidification due to elevated atmospheric levels of carbon dioxide are the causes of coral declines. It is not possible to preserve American *pika* populations in the western United States or cloud forest orchid populations in Costa Rica by protecting the mountain tops where they live, when climatically altered temperature and precipitation patterns and not local land uses are the threat to them. Place based con-

servation strategies depend upon the relative stability of background climatic and ecological conditions. Global climate change disrupts that stability. To the extent that it does so in a particular location, place based preservation strategies for the at risk species that are there are less viable.

As with place-based protection, anthropogenic climate change undermines traditional ecological restoration as an effective ecosystem management strategy. The difficulty for ecological restoration, given global climate change (particularly in combination with other deep ecological changes), is that the ecological past of a place is a less good approximation of its ecological future than it has been in recent history. Therefore, historical ecosystems (and associated reference conditions) will in general be less good proxies for ecological integrity, and native species less good proxies for what is ecologically beneficial or suitable. Too strong a commitment to historicity could actually be a form of insensitivity to ongoing ecological changes.

How widespread and large is this effect likely to be? It of course depends upon the magnitude and rate of anthropogenic change. The background or historical rate of extinction is thought to be less than one species per million per year or 0.000001% annually¹⁵. On most estimates, there are 10-20 million eukaryotic (plant and animal) species. Thus, a "normal" number of extinctions would be less than twenty extinctions per year. However, the current extinction rate is already hundreds or perhaps even thousands of times higher than the background rate due to human-related activities, such as habitat destruction, extraction, pollution, and introduced species¹⁶. Moreover, global climate change is expected to dramatically increase extinction rates still further. One study found that 24-50% of bird species, 22-44% of amphibian species, and 15-32% of coral species have traits that make them "highly vulnerable" to

climate change¹⁷. Other studies have projected that 15-37% of species will be committed to extinction by 2050 on mid-level climate change scenarios, with significantly increased extinction rates even on optimistic future emissions scenarios¹⁸. These studies have led some researchers to argue that the Earth is on the cusp of what could be the *sixth mass extinction* of the past half billion years. Whether we are entering an extinction event of that magnitude is uncertain and contested. Nevertheless, there is general agreement that global climate change will dramatically increase ecosystem transitions and species extinctions and that if it is not aggressively mitigated it will result in a very large and widespread (and perhaps even mass) extinction event, which could precipitate ecological collapses and disruptions of the ecosystem processes on which people depend.

This, then, is the dilemma. On the one hand, macro-scale anthropogenic impacts, particularly when driven by global climate change, will dramatically increase the rate of ecological transition and the number of species that are at risk of extinction. On the other hand, macro-scale anthropogenic impacts, particularly when driven by global climate change, appear to undermine the effectiveness of and justifications for place based conservation and traditional management strategies.

In response to this situation, many conservation biologists have begun to argue for novel, more "hands on" approaches to species conservation and ecosystem management, such as assisted colonization, rewilding, ecosystem engineering, conservation cloning, gene drives, and deextinction¹⁹. What these strategies have in common is that they involve designing and engineering organisms and ecological systems. Therefore, they seem antithetical to commitments, such as native species prioritization and historical fidelity, that have traditionally characterized conservation biology and continuity-

15 See: Baillie, J.E., et al. *A Global Species Assessment*, IUCN, 2004; De Vos, J.M. et al. «Estimating the Normal Background Rate of Species Extinction». *Conservation Biology*. 2015; 29(1): 452-462; Ceballos, G., et al. «Accelerated Modern Human-induced Species Losses: Entering the Sixth Mass Extinction». *Science Advances*. 2015; 1: 5.

16 See: De Vos, et al., op. cit; Ceballos, et al., op. cit.

17 See: Foden, W.B., et al. «Identifying the World's Most Climate Change Vulnerable Species: A Systematic Trait-Based Assessment of all Birds, Amphibians and Corals». *PLoS ONE*. 2013; 8: 6.

18 See: Thomas, C.D., et al. «Extinction Risk from Climate Change». *Nature*. 2004; 427: 145-148; IPCC. *Climate Change 2007: Synthesis Report*, IPCC, Geneva, 2007.

19 See: Hoegh-Guldberg, O., et al. «Assisted Colonization and Rapid Climate Change». *Science*. 2008; 321: 345-346; Donlan, J., et al. «Re-Wilding North America». *Nature*. 2005. 436: 913-914.

oriented ecosystem management. Rather than deferring to where species are now and how they are now, they involve putting them where people think they ought to be in the future and modifying them to how people think they need to be in the future.

The case for assisted colonization, re-wilding, conservation cloning, and other interventionist conservation and management strategies is that if we cannot accomplish species conservation with the traditional ecosystem management paradigm, then we ought to give up the paradigm. On this view, anthropogenic climate change is the final "nail in the coffin" of park and reserve approaches to ecosystem management, since they are "mismatched to a world that is increasingly dynamic"²⁰. Proponents of interventionism believe that unlike park and reserve conservation, which is doomed to mitigating and documenting loss, these strategies provide an optimistic, creative, and hopeful agenda for conservation under conditions of rapid anthropogenic change²¹.

Three types of concerns frequently arise regarding more interventionist species conservation strategies. One is that human interventions into ecological systems are the cause of ecological degradation and the species extinction crisis in the first place. Global climate change is not intentional. But it illustrates that our actions very often have significant and detrimental unintended consequences. Moreover, many of our other ecological interventions, such as introducing species and clearing forest for agriculture, have been both intentional and ecologically destructive. Proponents of interventionism might respond that these novel interventions will be done for the good of nonhuman species and the biotic community, rather than for human interests. However, even granting this, challenges remain. After all, people will be choosing which species and functions to prioritize, and well-intentioned interventions often have unintended impacts. On this view, the interventionist

outlook is *hubristic*. It involves an overestimation of our ability to predict and control the consequences of our alterations of complex ecological and biological systems.

A second concern is that even if the interventions are successful –e.g. species are translocated and established without becoming ecologically problematic– what is most important about them is not preserved. Many of the types of value that species possess are tied to their ecological and evolutionary relationships. Moving species outside their historical ranges, engineering new systems, and reintroducing long extinct species do not maintain or reestablish those relationships. Therefore, when value is tied to ecological and historical properties, such as ecosystem function and independence from human design, interventionist approaches to species conservation might preserve the species without preserving their value

A third concern is that interventionist conservation strategies are something of a distraction. On some projections, there will be tens of thousands of species extinctions per year within a few decades. However, these strategies typically focus on only one or a few species at a time. They cannot scale to the magnitude of the problem. At most, they might enable us to forestall the extinction of some of the species that people care most about. But we should be concerned about the extinction crises as a whole and the ecological collapse that it might precipitate. What is needed are conservation strategies that capture large numbers of species, in the way that parks and reserves have. Furthermore, most interventionist conservation strategies do not address the causes of species extinctions– e.g. climate change, habitat destruction, pollution and over-extraction. They are reactive. What is more, they might perpetuate the false view that there are ways to deal effectively with the extinction crisis, thereby functioning as a moral hazard that fosters inaction on the causes of extinction. On this view, conservation cloning, gene drives and deextinction are amazing techno-scientific achievements, but they are not the sort of "solutions" that we need for the crisis we face.

Moreover, critics of interventionism believe that the dismissal of place-based park and reserve management

20 Camacho, A.E., et al. «Reassessing Conservation Goals in a Changing Climate». *Issues in Science Technology*. 2010. 26, 21. See: Donlan, et al., *op. cit.*

21 See: Donlan, J., et al. «Pleistocene Rewilding: An Optimistic Agenda for Twenty-First Century Conservation». *The American Naturalist*. 2006. 168(5): 660-681; Brand, S. «The Dawn of De-extinction: Are You Ready?». *TED Talk*, 2014; Ackerman, D. *The Human Age: The World Shaped By Us*, Norton, New York, 2014.

is too hasty. Although anthropogenic climate change diminishes the effectiveness of parks and reserves for preserving particular species, species assemblages, and ecosystems, they maintain comparatively high ecological (including species preservation) value when measured against non-protected areas²². Protected areas and corridors provide some adaptive space and more adaptive possibilities for populations and systems. Moreover, more biodiverse places, often the target of protection, are likely to have more species with sufficient behavioral and evolutionary adaptive potential to meet the adaptation challenge of global climate change. Therefore, identifying and protecting biologically diverse and rich habitats (including diverse physical environments), wildlife corridors and ecological gradients, and promoting landscape permeability continue to be well justified under conditions of global climate change²³.

Another reason for not giving up on parks and reserves is that, under conditions of rapid ecological change, they are conducive to accomplishing goals other than species conservation. For example, protecting and lightly managing areas often is an effective approach to maintaining ecosystem services (e.g. clean water, storm surge protection, and carbon sequestration), particularly when measured against non-protected areas. Moreover, lightly managed spaces will continue to have value as places where ecological and evolutionary processes play out comparatively independent of human intention, design, and manipulation. Therefore, natural value, historical value, and the worth of wild organisms continue to be supportive of park and reserve based management. Under conditions of rapid ecological change, place-based protection, rather than being valuable for maintaining a space largely as it is, is valuable for the processes of change that occur –e.g. human independent adaptation and reconfiguration. This requires changing expectations for what these approaches can

accomplish. It may also require shifting management practices appropriately –e.g. deemphasizing historicity in assisted recovery, placing less priority on nativeness, and refraining from intensive efforts to prop up dwindling populations or communities (when it is associated with climate change driven ecosystem change). In these ways, it is possible to reduce environmental nostalgia, without increasing environmental intervention.

5. Environmental virtue under conditions of rapid ecological change

In the previous section, I suggested that there is an alternative response to macroscale anthropogenic change besides fully embracing interventionism. One that is not overly nostalgic for a past that is impossible to recover, but also does not fully claim the natural world for human responsibility and control. It is possible to recognize the significant challenges that anthropogenic change often poses for accomplishing backward-looking environmental goals through traditional management practices, without accepting full licence for further anthropogenic ecological modifications. Such an approach involves measured acceptance of interventionist strategies to conserve certain high value species under certain conditions, but does not embrace them as robust approaches to conservation²⁴. It also involves frequently pulling ourselves back in order to leave space and opportunities for ecological systems and evolutionary processes to find their own way, instead of designing or influencing them as we think they ought to be.

On this approach, character traits such as *openness* toward the ecological future, *accommodation* of human-independent processes in determining that future, and *appreciation* of new ecosystem arrangements (even if they are partly anthropogenic) are crucial to good ecological engagement and management. These attitudes involve cultivating sensitivity and appropriate responsiveness to the value of biotic systems and living

22 See: Gray, C.L., et al. «Local Biodiversity is Higher Inside than Outside Terrestrial Protected Areas Worldwide». *Nature Communications*. 2016; 7.

23 See: Barnosky, A. *Heatstroke: Nature in an Age of Global Warming*, Island Press, Washington, 2009; Wapner, P. *Living Through the End of Nature: The Future of American Environmentalism*, MIT Press, Cambridge, 2010; Rands, M., et al. «Biodiversity Conservation: Challenges Beyond 2010». *Science*. 2010; 329: 1298-1303.

24 See: Sandler, R. «The Ethics of Reviving Long Extinct Species». *Conservation Biology*. 2013; 28: 354-360; Sandler, R. «The Value of Species and the Ethical Foundations of Assisted Colonization». *Conservation Biology*. 2010; 24: 424-431; Sandler, R. *The Ethics of Species*, Cambridge University Press, Cambridge, 2012.

things that are the successors or beneficiaries of rapid ecological change –i.e. for the species that thrive and species assemblages that emerge– even if they are not the ones we would have preferred or prioritized. The human independent ecological and evolutionary processes that produced what is valued now will continue, and over time will generate new species populations, communities, and systems. These attitudes may also involve developing new ways of conceiving of, relating to, and valuing nature, naturalness and wildness, as well new conceptions of ecological integrity and sustainability (both ecological and ecosocial) that are suited to rapid rates of change, high levels of contingency and unpredictability, and human influenced climatic and ecological background conditions²⁵. The salience of related attitudes, such as *flexibility*, *tolerance*, and *restraint*, are also amplified, given the uncertainties involved with the ecological future and the rate at which ecological change will occur²⁶. So, too, is the salience of *patience*, since ecological transitions, the reconfiguration of systems, and the evolution of populations may not occur or abate on the time scale that we might prefer.

For some species and species communities, the most justified response to their inability to meet the challenge of adaptation may not be to engage in highly interventionist activities to preserve them in nature, but to let them go. The costs and risks associated with attempting to maintain them might be too high; the relationships that are the basis of their value may be lost; and the attitude that we can engineer their continued existence as they were may be hubristic and ecologically insensitive. (However, as discussed above, less interventionist approaches to increasing their adaptive capacity so that they might better meet the challenge of adaptation are justified, and interventionist strategies may be justified in

some cases.) Elizabeth Kolbert captures this when relaying her conversations with researchers working on amphibian conservation in Panama. "Everyone I spoke to at EVACC [the El Valle Amphibian Conservation Center] told me that the center's goal was to maintain the animals until they could be released to repopulate the forests, and everyone also acknowledged that they couldn't imagine how this would actually be done. "We've got to hope that somehow it's all going to come together", one herpetologist tells her. "We've got to hope that something will happen, and we'll be able to piece it all together, and it will all be as it once was, which now that I say it out loud sounds kind of stupid". According to another researcher, "The point is to be able to take them back, which every day I see more like a fantasy"²⁷.

For this reason, the significance of *reconciliation* is increased under conditions of global climate change. Reconciliation, in environmental contexts, is the disposition to accept and respond appropriately to ecological changes that, though unwanted or undesirable, are not preventable or ought not be actively resisted. Reconciliation has always been relevant to ecological practice. Even independent of global climate change, ecosystems are always dynamic, and individuals, species, and abiotic features are always coming into and going out of existence. Good ecological engagement and practice require accepting and not resisting too strongly such changes and losses. The increased rate and magnitude of ecological change and loss associated with global climate change makes reconciliation still more necessary.

Reconciliation is not indifference. Species are rapidly going extinct, ecological relationships are being disrupted, and human activities are the cause. We are responsible for an enormous loss of value in the world. *Recognition* of the magnitude of the loss and *remorsefulness* for our contributions to it are appropriate. The fact that we are now at the point that we often should not actively aim to prevent some losses or attempt to restore or replace what is lost, and instead need to reconcile ourselves to them, is tragic.

25 See: McKibben, B. *Earth: Making a Life on a Tough New Planet*, Henry Holt and Company, New York, 2010; Wapner, *op. cit.*; Thompson, A. «Radical Hope for Living Well in a Warmer World». *Journal of Agriculture and Environmental Ethics*. 2010; 23(1): 43-45; Thompson, A., Bendik-Keymer, J. *The Virtue of the Future: Climate Change and the Challenge of Restoring Humanity*, MIT Press, Cambridge, 2012.

26 See: Sandler, R. *Character and Environment*, Columbia University Press, New York, 2007; Van Wensveen, L. *Dirty Virtues*, Humanity Books, New York, 1999; Sandler, R., Cafaro, P. *Environmental Virtue Ethics*, Rowman and Littlefield, Lanham, 2005.

27 Kolbert, E. *The Sixth Extinction: An Unnatural History*, Henry Holt, New York, 2014, 14-15.

6. Conclusion

This article has explored the significance of macro-scale ecological change for environmental ethics, particularly with respect to goals, strategies and attitudes regarding ecosystem management and species conservation. I have argued that nostalgic ecosystem management goals and strategies are often undermined by rapid and deep anthropogenic change. However, this does not immediately imply that we ought to embrace ecological interventionism and the character traits associated with it. There is another possible forward looking attitude, one that continues to recognize the value of human-independent ecological and evolutionary processes, accepts occasional interventions in certain types of cases, but also calls for patience, reconciliation, openness, accommodation and restraint with respect to the ecological future.

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