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# ECOLOGICAL RESTORATION AND BIODIVERSITY CONSERVATION

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Ecological restoration is the practice of restoring ecosystems in the aftermath of damage or neglect. It is motivated by the observation that there are fewer and fewer undamaged places in the world to conserve. If we want to achieve conservation goals such as biodiversity, sustainable habitats, and the semblance of wild nature, we must deliberately construct, or reconstruct, ecosystems for that purpose.

Ecological restoration is closely connected with the idea of historical fidelity, that is, the idea that we should be as faithful as possible to an ecosystem's own past when restoring that ecosystem. The demand for historical fidelity raises a series of philosophical questions and challenges. First, can we ever truly restore nature, or are we always just manufacturing artificial imitations of it? Second, is there any non-arbitrary way to select a historical baseline for restoration projects? Third, if we could, in principle, construct an ecosystem that satisfies all of our other conservation goals such as biodiversity and sustainability, but that does not exhibit fidelity to any past, wouldn't historical fidelity be irrelevant?

Another question that should be raised here is, how does ecological restoration relate to biodiversity conservation? Are these two goals tightly interwoven? That is, should we think of ecological restoration as a *means* to biodiversity conservation? Or are these goals independent of one another? Is it possible for these goals to conflict? And when they do conflict, which one should we prefer?

The following has six parts. In the first section, I will explicate the idea of ecological restoration, with emphasis on the idea of historical fidelity. In the second, I will enumerate some of its benefits. In the third, fourth and fifth sections, I will raise, and respond to, the three philosophical challenges noted above. In the concluding section, I describe how ecological restoration relates to other conservation goals, specifically, biodiversity conservation.

## What is ecological restoration?

Ecological restoration is, most broadly, the attempt to restore, recreate, or reconstruct ecosystems in the aftermath of damage or neglect. Although many people have attempted to define precisely what "ecological restoration" means, few definitions have been universally acknowledged (see Higgs 2003: 107–110, for an overview of such attempts). In the following, I'll adopt the definition most recently given by the Society for Ecological Restoration (SER) as, "the process

of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed."[1] The practice of ecological restoration is largely motivated by the rapid disappearance of habitats that have been only minimally transformed for human use. Simply put, we are running out of places to conserve.

"Restoration" can refer either to a process or to a product, though the SER definition emphasizes process. As a *process*, it refers to a special kind of activity carried out by groups of people. As a *product*, it can refer to the outcome of that activity, namely, a restored ecosystem. There is also a difference between "restoration ecology" and "ecological restoration." Restoration ecology is a science; more specifically, it is a sub-discipline within environmental management devoted to the practice of ecological restoration. Restorations differ greatly in spatial scale and in terms of the sheer magnitude of intervention they entail. Large-scale restoration efforts may include procedures such as the removal of relics of recent human activity, reintroduction of native species, reconstruction of soils, redirection of waterways, sediment dredging of lakes, controlled burns, and so on.

A theme that runs through most of the proposed definitions of "restoration" is the idea of *historical fidelity* (Higgs 1997, 2003). Historical fidelity is the idea that we ought to make the ecosystem resemble the way it was in the past. We should be faithful to that ecosystem's own history. Moreover, historical fidelity is not about making a given ecosystem resemble just any past ecosystem. Rather, it has to do with being faithful to the past of that very ecosystem or place. (The point is obvious when we think of restoring a house or car.) The practice of re-creating English gardens in colonial-era India was not an instance of historical fidelity in this sense, though it does exhibit fidelity to some historical state.

Achieving the goal of historical fidelity can be very costly, knowledge-intensive, and labor-intensive, depending on how seriously we take it. That is because it may be difficult to assess what exactly the past ecosystem was like. In these cases, we must rely on sources of data such as paleontology, comparative data, and photographs or oral history (Desjardins 2015: 88). This is a cost-intensive and labor-intensive process, so it requires some philosophical justification.

I'll put the point mare sharply: suppose (even hypothetically) that we could design an ecosystem that satisfies various goals such as enhancing biodiversity, sustainable land-use, wildlife habitat, educational and other social and cultural benefits, and so on, but that is entirely unprecedented for that region. The phased reconstruction of Governor's Island, a small island just south of Manhattan, comes to mind (see Garson 2014). In the early twentieth century, Governor's Island was a landfill for debris generated by the construction of Manhattan's subway system. In the 1960s it was given to the Coast Guard to serve as a residential base, but by the turn of the century the island served no meaningful conservation or recreation purpose. Recently, the Governor's Island Trust – a city-funded non-profit group – started to implement a massive reconstruction project. The flat, barren landscape will be outfitted with rolling hills. (The demolished remains of the Coast Guard buildings will provide the infrastructure for the hills.) Non-native plants and shrubs will be planted along the perimeter of the island. These plants were chosen partly to enhance marine biodiversity and partly to withstand the effects of climate-change induced sea-level rise. A network of thin, paved paths will traverse the island for cyclists and joggers. The idea of historical fidelity played no role in the design or implementation of the plan, yet the plan, once fully implemented, will serve a number of valuable goals. Some ecologists are vocal advocates for just this sort of novel ecosystem construction (e.g. Hobbs *et al.* 2009).

Presumably, the advocate of ecological restoration would object to this practice becoming a norm or ideal for environmental management. But why? What *additional* value is bestowed on a place or an ecosystem when it exhibits fidelity to its own past? Is historical fidelity just an

expression of collective nostalgia (which need not be a bad thing)? Or can we give it a deeper justification?

Before I move on, I wish to address one definitional wrinkle. Some scientists use the term "restoration" very broadly, to refer to any sort of intensive habitat modification, regardless of whether it achieves fidelity (Hobbs and Cramer 2008: 40, suggest such broad usage). Sarkar (2011: 337, 2012: 139) claims that this broad usage is typical among practitioners. The question of how frequently, or infrequently, scientists use this broad sense of "restoration" is a sociolinguistic claim that I am not prepared to assess. Moreover, I think the attempt to substantiate that claim (that is, that this broad sense of "restoration" is typical in the field) would lead to difficult interpretive problems (Garson 2014). At any rate, in the following I will always use the term "restoration" to designate a project that centers around historical fidelity, and I will use the term "reconstruction" (following Sarkar 2011) for the broader category, that is, to denote any sort of beneficial habitat modification. The more interesting question is: why should we restore ecosystems?

## Why is ecological restoration valuable?

There are two kinds of benefits associated with restoration: the benefits associated with the *product* of the restoration (the restored ecosystem), and the benefits associated with the *process* of restoration (the human activity). The benefits of the product can be vast and fairly obvious. They include goals such as promoting wildlife habitat, biodiversity, and the sustainable harvesting of "natural capital" (Aronson *et al.* 2007). This is particularly so if an ecosystem's ability to provide such goods has been crippled by damage or harm. Psychologically and socially, restored ecosystems may provide greater opportunities for education, entertainment, research, and the interaction of people with nature.

The practice of restoring ecosystems can promote values such as community, volunteerism and teamwork, particularly in small-scale, local restorations. It can also provide opportunities for education, and for exposing people to nature. I'll give examples of both sorts of benefit.

First, there are clear benefits associated with the product of restoration, that is, having restored ecosystems. On April 20, 2010, the Deepwater Horizon drilling rig exploded off the Gulf of Mexico. The explosion caused the release of over 200 million gallons of oil into the Gulf Coast, and jeopardized livelihoods of entire communities, particularly along the Mississippi-Louisiana coast.[2] In the wake of that spill, President Barack Obama made several speeches calling for the "restoration and recovery" of the Gulf Coast and calling on oil giant BP (to whom the rig was leased) to pay a large part of it.[3]

Interestingly enough, the president used that opportunity to promote a restoration plan that the White House had been designing even *prior* to the spill.[4] As he emphasized in those speeches, the rig explosion was only the latest in a series of environmental insults to the US Gulf Coast carried out for over a century. Much of the harm to the region has come from anthropogenic modification of the Mississippi River. These modifications include dredging – artificially deepening the river by extracting silt from the riverbed – and the construction of levees that prevent occasional flooding of the river. Dredging and levee construction have the effect of destroying wetlands along the banks of the river.

The restoration plan that the president promoted – the "Roadmap for Restoring Ecosystem Resiliency and Sustainability" – enumerates at least six different benefits of restoration (that is, the benefits of having a restored ecosystem). These include: flood and storm protection for coastal residents; biodiversity conservation; reduction of potential impacts of climate change (particularly sea level rise); commercial fishing; aesthetic and recreational value; and preservation

of the cultural legacy of coastal communities. Among the main mitigation practices are the "beneficial use of dredged materials," that is, transporting sediment dredged from the river directly to the wetlands, and diversions, which include breaches that permit the waters of the river to enter adjoining wetlands and replenish them directly.

There are also benefits associated with the practice of restoring ecosystems. These benefits are particularly evident in the context of small-scale, local restoration projects that rely heavily on volunteer help. One example of the community benefits of restoration is "prairie restoration day," a venture supported by the Sierra Club, which gives inner-city adolescents the opportunity to participate in prairie restorations. In 2009, the Illinois chapter of the Sierra Club brought fifteen teenagers to Theodore Stone Forest Preserve and taught them to identify and safely cut down invasive European buckthorn trees. Most of the teenagers were from South Lawndale, a primarily Latino neighborhood plagued by the city's oldest coal-burning power plants and a near-absence of green space for children. In this case, restoration primarily served the value of exposing young people to the natural world and cultivating a sense of responsibility for it.[5] Such examples have led theorists such as Eric Higgs (1997; also see Light and Higgs 1996) to claim that community participation should be considered a *criterion* of a good restoration, in addition to more "technical" criteria such as fidelity and sustainability.

Another example of the benefits of the practice of restoration is the restoration of Tiritiri Matangi Island of New Zealand (see Craig and Vesely 2007). Once forested, Tiritiri Matangi was partially cleared by Maori settlers in the sixteenth century, and then farmed intensively in the mid-nineteenth century when it was taken over by British colonists. In 1971, the government decided to allow the land to regenerate "naturally," but after a decade, few changes took place. In 1984, a restoration plan was implemented which involved reconstruction of forests and reintroduction of select bird species.

From its inception, one of the project's main goals was to encourage public support and to reconnect urban communities to their natural heritage. To that extent, the restoration was wildly successful; the opportunity to plant trees and observe endemic and newly introduced species drew so many volunteers that it became necessary to ration the number of seeds each person could plant. A volunteer organization, Supporters of Tiritiri Matangi (SoTM), started in 1987 and has become the largest supporter of the island. The island now draws an estimated 35,000 visitors annually, primarily from Auckland.

In short, there is little question about whether restorations can sometimes be beneficial. (There is another question here regarding how seriously these projects took the goal of historical fidelity. Certainly, historical fidelity played some role in guiding these projects, even if the projects gave themselves much more creative leeway than historical fidelity, rigidly adhered to, would allow.) To the extent there is a deep philosophical question here, the question has to do with whether comparable benefits could not be achieved in some other way, one that involves less money and time. I will examine this prospect in the last section.

## Is ecological restoration a big lie?

Some philosophers think that the very idea of ecological restoration, or "nature restoration," more generally, contains an inherent contradiction. (That is why Katz [1992] called it the "big lie.") They also think that, once we see the contradiction, we will no longer be disposed to attach much value to such projects.

The argument is almost deceptively simple, though there are minor variations on it. I'll rely on Katz's (1992) influential version of the argument. There are actually two parts to the argument. First, what makes something "natural" is the fact that people haven't designed it for

anything. This lack of being designed for something is what makes something a piece of nature. It is what distinguishes a rock from a paperweight, or a sheet of Arctic ice from a laptop projector. As soon as people start to modify or manipulate something for their own purposes, it becomes an artifact and is no longer natural. This is true even if their purposes are beneficial. So, "nature restoration" is a contradiction in terms. All we can ever do is produce more artifacts.

The second part of the argument tries to show that artifacts are less valuable than the pieces of nature they replace. A natural system that has been damaged by human activity, say, flooding caused by climate change, is still a piece of nature. It has not been deliberately designed or engineered by people, so it is still better than an artificial ecosystem. In short, since restored ecosystems are artifacts, and artifacts are not as valuable as the natural states they replace, we should generally avoid restoring ecosystems.

Why are natural states so much better than artifacts? Theorists have different views here. In Katz's view, the reason is that nature that has not been designed by humans is autonomous, in the sense that it is free of human domination (Katz 1992: 239; also see Katz 2010). In one expression of this view, he uses the Kantian distinction between an end-in-itself rather than a means to an end. When humans restore nature, they redesign the natural world to serve human purposes (even benevolent ones). They thereby change its moral status from being an end-in-itself to a means to some human end (Katz 1993: 230).

Elliot (1982, 1997) has a different view about the value of nature. In his version of the argument, restored ecosystems are like counterfeit paintings. A counterfeit Van Gogh may have some value or another, but not the same value as the original, even if the original were marred somehow. What gives a Van Gogh painting its inestimable value has to do, in part, with historical facts about it and not just its current-day properties. This point is easy to recognize when we are talking about paintings, but Elliot thinks the same point holds for ecosystems.

He asks us to suppose that we are walking through what we take to be a pristine piece of nature. Suddenly, we discover that a vast corporation constructed the entire ecosystem only years earlier, and even designed the natural feel. (Consider that the nineteenth-century architects of New York's Central Park, Frederick Law Olmsted and Calvert Vaux, designed the Park's North Woods, very deliberately, to convey the impression of wild nature, down to the placement of specific trees and rocks. One encountering the North Woods for the first time, without any knowledge of the history or the mechanics of the park, might think that the architects had simply discovered it that way and had left it alone. There is one stream in particular that runs down a formation of rocks and flows into a pond; engineers can literally turn it on and off with a hidden faucet.) Elliot thinks that we would attach less value to the experience, much as if we discovered that the Van Gogh we were admiring was a fake. Elliot's argument seems plausible to me, though I understand that people have different intuitions about this case.

It might be tempting to dismiss this argument as a philosopher's riddle, one that has little bearing on real conservation practice. But that would be an error. Anti-restorationist arguments have managed to escape from purely academic discourse into the realms of practice and policy. For example, a recent scientific primer on ecological restoration devoted a section to discussing what it calls the "big lie" of restoration (Vidra and Shear 2010: 205). (Although the "lie" that they refer to is not quite what Katz had in mind, the language is obviously borrowed from Katz.) These arguments have also provided a philosophical basis for opposition to specific restoration plans, such as a recent plan to cull lake trout (*Salvelinus namaycush*) from Yellowstone for the purpose of protecting cutthroat trout (*Oncorhynchus clarkii*). According to its critics, given that the supposed "restoration" of the cutthroat habitat requires intensive human management, such a system would no longer be "natural."[6] That shows that worries about the nature/artifact divide run deep in restoration.

Elliot's and Katz's concerns have produced a sizable philosophical literature. There are two main sorts of objections that have been repeatedly raised. The first challenges the sharpness of the distinction between nature and artifact that Katz's argument relies on. After all, aren't humans an evolved feature of the natural world? And don't some non-human animals create artifacts, like beaver dams (e.g. Scherer 1995, Hettinger 2002, Ladkin 2005; see Katz 2002 for a response; Sober 1995 and Ereshefsky 2009 develop similar themes.) Along these lines, some critics think that Katz's argument relies on the sort of dualistic view of the human–nature relationship that we should move beyond, and that we should replace with a more positive, interactionist viewpoint (e.g. Cowell 1993, Jordan 1994, Chapman 2006).

A second response is to accept that the restored ecosystems are artifacts, but to challenge the moral implications of that fact. Artifacts are not always less valuable than the natural states they replace (Lo 1999, Light 2000). Even Katz agrees that "a house is better than a tree or a cave," and "the complex artefactual system we call medical practice is better than letting natural diseases take their course" (Katz 2002: 142). So why can't we say the same about ecosystems? At the very least, one might think that the loss of autonomy is, in part, offset by the kinds benefits of restoration that I enumerated above.

One of the points that Katz's critics have not generally noticed, however, is that Katz's argument rests crucially upon a problematic analysis of the concept of *function* – as in, for example, "the function of the heart is to circulate blood," or, "the function of the pocket watch is to tell time." (Though see Lo 1999, and Siipi 2003, who emphasize the idea of function in their criticism of Katz.) Here, in a nutshell, is his argument. He begins by asking, what is the difference between nature and artifact (p. 234)? What makes one thing natural and another thing artificial? He proposes that the difference between them is that artifacts have *functions* and entities in nature do not. Very specifically, he says that in order for something to have a function, it must have been designed for a purpose (1992: 235). In this restrictive sense of the term, laptops and tables have functions, but trees and organs do not. As he puts it, "natural individuals were not designed for a purpose. They lack intrinsic functions, making them different from human-created artifacts" (1992: 235). He thinks that, even though ecologists sometimes attribute functions to populations, populations do not really have functions because nobody designed them for anything: "[a]lthough we often speak as if natural individuals … have roles to play in ecosystemic well-being … this kind of talk is either *metaphorical or fallacious*. No one created or designed the mountain lion as a regulator of the deer population" (ibid.).

Katz's restrictive view about function underpins his argument that restored ecosystems can never be anything more than unnatural artifacts. The idea is that as soon as human beings deliberately modify or manipulate something, they impose a function on it. The thing now has the function of doing whatever it was designed for. As a consequence of this (this acquisition of a function), it loses its membership in the category of natural things, and it becomes an artifact. This is precisely why "restored areas will never be natural – they will be anthropocentrically designed human artifacts" (ibid.).

But I think Katz's argument is mistaken. Katz's view of function seems to have the absurd implication that, say, the heart does not really have the function of pumping blood. Many philosophers of biology believe that parts of individuals, such as internal organs, as well as individuals within an ecosystem, can possess functions, in a literal sense (see Garson 2016, for a critical overview of the functions literature). So I think there is a false premise in his argument. If we do not accept his view of function, then we should not accept the way that he distinguishes nature and artifact. Of course, Katz may have some other way of distinguishing between nature and artifact, one that does not rely on function. If so, that distinction should be spelled out.

## Is ecological restoration arbitrary?

When we decide to restore an ecosystem, we have to select a historical baseline. We have to decide what point in time we wish to reset the ecosystem to. Some people believe that the choice of a baseline is arbitrary (see Callicott 2002, Sarkar 2011). Suppose we agree that we should restore the Gulf Coast, and that historical fidelity matters. We still have to decide how far back to go. Ten years ago, shortly before the rig explosion? A hundred years ago, before the era of levee construction and dredging? How about 500 years ago, before the arrival of European settlers? Or over 15,000 years ago, before the arrival of *Homo sapiens* to North America? There is a kind of arbitrariness here. As Callicott (2002: 412) puts it, "The condition that Dane County, Wisconsin was in at the moment European settlers saw it in the 1840s … is but a snapshot in its ever-changing ecological odyssey. Why seize on that condition as the norm for restoration, rather than its condition at some earlier or, for that matter, later moment?"

The arbitrariness objection is particularly pointed when we reject the idea that there is some sort of equilibrium state that ecosystems naturally return to after they have been disturbed (Callicott 2002). This is an idea that was promoted by the early twentieth-century ecologist Frederic Clements (1916), who compared ecosystems to organisms. Clements argued that just as the fetus naturally moves toward a certain end-point, namely, the mature adult, so too does the ecosystem, once disrupted, move toward a certain end-point or equilibrium which he called a "climax." If that picture of ecosystems were correct, then restoration could be viewed, most favorably, as an attempt to hasten the ecosystem back to this point of equilibrium. In the absence of such guiding paradigm, we are back to the threat of arbitrariness.

In addition to the choice of a baseline, there are other sorts of choices that must be made. Which features should be the target of restoration? If we are to restore the Louisiana Gulf Coast, presumably we do not care very much about restoring the precise shape of the coast as much as we care about, say, its ability to sustain wildlife. What degree of similarity between the current ecosystem, and the baseline, is sufficient before we determine that the restoration has been satisfactory (e.g. Falk *et al.* 2006)? There does not seem to be any principled way to answer these questions. But I will focus on the choice of a temporal baseline.

It seems to me that this arbitrariness is not a serious problem. It would only be a problem if we thought that historical fidelity was the only value that should ever guide restoration projects. (If I asked my stakeholders, "what sort of ecosystem do you want?" and they replied, "one that exhibits historical fidelity!" then I would be at a loss to help them.) Fortunately, historical fidelity is not the only value that guides environmental planning. Other goals include maximizing biodiversity, creating sustainable habitats, creating a sense of wildness, promoting cultural and scientific opportunities, and so on. There is nothing arbitrary about invoking such principles in order to compare the merits of different restoration plans.

Here is one way of thinking about it. Historical fidelity sets a preliminary filter on the sorts of plans that are worth considering. In other words, when we set about restoring an area, we first contemplate all of the different historical baselines we could plausibly restore to (e.g. one century ago, five centuries ago, several thousand years ago…). This will give us a large set of potential baselines. Once we have these plans in mind, we then apply other values, such as biodiversity, and so on, to decide which baseline is the best. Restoring the Gulf Coast back to the way it was before the last glacial period would amount to submerging it in the ocean. This would be bad for biodiversity (though perhaps not so bad for marine biodiversity) and bad for human livelihood, so we should reject it.

Callicott attempted to formulate more principled guidelines regarding the choice of a baseline. He alludes to hierarchy theory in ecology and notes that ecological processes can be sorted into different temporal "scales" (Holling 1992), in particular, the microscale, mesoscale, and macroscale. Each scale is marked off by a certain sort of recurring ecological event. Processes such as vegetation growth and soil erosion can be measured over days and years (microscale). Processes such as speciation and the movement of continents are measured in millennia (macroscale). Somewhere in between, there is a third group of processes, the "mesoscale." These processes can be marked off by the regularity of disturbance regimes, which are measured in centuries: "…for coastal environments we might measure ecological time by the periodicity of disturbance by hurricane-force winds; for riparian environments by the periodicity of floods of various magnitudes, from seasonal fluctuation to the hundred-year flood cycle; for upland forests and grasslands, ecological time might be measured by the frequency of fire" (p. 414).

When we think about possible historical baselines, there are different temporal scales we may have in mind. Callicott thinks that we should generally prefer mesoscale-level timescales, and we should think about restoration in terms of centuries, rather than decades or millennia. His argument is that this scale coheres best with conventional restoration planning, and it coheres well with our current way of distinguishing native and non-native species. To my understanding, this is the main argument he gives for preferring the mesoscale level when thinking about restoration, namely that it provides a scientific justification for "the classic norms of ecological restoration" (p. 415), and in particular its preference for native over non-native species when it comes to restoration. This would exclude certain time scales, such as the attempt to recreate late-Pleistocene conditions in North America.

So, there is nothing inherently arbitrary about the choice of a historical baseline. There can be very good reasons for selecting one over another. The deeper question here is simply this: why should we care about historical fidelity at all, if comparable benefits can be achieved without it?

## Is historical fidelity worth pursuing?

Sarkar (2011, 2012) develops an argument against historical fidelity, which I call the "replacement" argument. The idea is that, if we reflect on the reason we care about historical fidelity, we will see that it has an overtly instrumental character. For example, one might prefer historical fidelity because one believes that the past ecosystem was more self-sustaining than the present one. If so, then self-sustainability is ultimately what that person is after. If sustainability could be achieved through the construction of a novel ecosystem that bears little resemblance to the past, then the value of fidelity would drop out as irrelevant.

To give another example, one might prefer historical fidelity because one believes that, in the past, people had more meaningful interactions with the natural world. But in that case, what one is ultimately after is a more meaningful interaction with the natural world. If one could achieve this in some other way (for example, by taking up gardening or hiking), then, again, fidelity would become irrelevant. So fidelity is always a kind of placeholder for something else, something that matters to us in a more ultimate way.

Simply put, the replacement argument says that, when one appeals to the value of historical fidelity in the context of conservation planning, one can always appeal to some other goal instead, and doing so would not diminish, at all, the overall (expected) value of the conservation project. Sarkar is not against historical fidelity, per se. But he thinks we should recognize its instrumental character and not "deify" it as if it has some inherent value, independently of

the goods it helps us to obtain. That also means that, if we come up with some alternate way of achieving conservation goals for a certain area, one that does not exhibit historical fidelity, we should be open to pursuing that.

How can we respond to this challenge? One argument is to say that, conceptually speaking, historical fidelity has merely instrumental value, but that practically and empirically speaking, it is difficult to achieve those other goals (biodiversity, and so on) without, in fact, recreating the past. I think this would be a difficult argument to sustain. First, we often do not have very much information about what the past ecosystem was like, but, at least sometimes, we achieve our goals (biodiversity, and so on) well enough without it. Moreover, presumably as our knowledge grows and our technology advances, we will have a better ability to construct entirely novel ecosystems that successfully promote a range of conservation goals.

Another sort of argument is a precautionary one (Desjardins 2015: 81). In some cases, such as the Louisiana Gulf Coast, we have good reasons to think that the past ecosystem functioned very well (that is, immediately before the era of mass dredging and levee construction). We cannot be entirely sure that a novel ecosystem, one entirely unprecedented, will work as well, because there are just too many uncertainties. Sometimes our attempts to transform ecosystems in entirely novel ways prove disastrous. It is probably safest just to recreate, as well as possible, the way things were in the past. Note that this precautionary argument, strictly speaking, does not contradict Sarkar's view. Sarkar's view is that historical fidelity merely has an instrumental character (in this case, it is instrumental to promoting a well-functioning ecosystem). But this precautionary argument, if it is correct, provides some justification for the idea that historical fidelity should be a default mode of environmental planning.

I think the precautionary argument is a reasonable one. However, in some cases we should note that the same sort of reasoning would lead to the opposite conclusion, namely, that we should not restore an ecosystem, because we know, given changed ecological conditions, that the past will *not* work. The reconstruction of Governor's Island, noted above, is a good example. In this case, the design team that is leading the reconstruction chose not to replenish the island with historically native vegetation, because that vegetation would not be able to withstand the effects of sea-level rise due to climate change. Instead, they decided to plant non-native but salt-resistant vegetation.

It seems to me that in order to assess Sarkar's argument, we must reflect on our reasons for attaching value to any of the traditional conservation goals, such as biodiversity or wild nature. Why does biodiversity matter? Why does wild nature matter? Sarkar's own view is a broadly human-centered one, which is based on what he calls "transformative power" (Sarkar 2012: 51). This is loosely related to Bryan Norton's (1984) "weak anthropocentrism." The idea is that what confers value on biodiversity is its power to shape, or transform, human values. This is not the claim that biodiversity has value because people value it. It is to say that biodiversity matters because encounters with biodiversity have the power to change the things we value. He thinks that, as a rule, we ought to protect things that have this effect on us.

But if transformative power is the source of biodiversity's value (or the value of wild nature), why should we not say the same thing about historical fidelity? Can't the process of restoring nature have a transformative effect on people? In other words, I do not see the reason for treating its value as secondary to the value of biodiversity, rather than on a par with it. At the very least, the question should not be "is historical fidelity valuable?" The question should be "does historical fidelity have the same sort of value as other conservation goals such as biodiversity or wild nature?" In order to answer this question well, we must think deeply about the source of biodiversity's value itself.

Sarkar (2014) thinks that it is implausible that restored ecosystems, generally, possess transformative power. But I think it is more plausible when we consider that there are two different ways that restoration can have transformative power. First, the product of an ecological restoration can have transformative power. But perhaps more importantly, the process of restoration, that is, the activity of restoring ecosystems, can have transformative power, particularly in the context of small-scale or local restorations. For example, the reason that the restoration of New Zealand's Tiritiri Matangi Island was so successful – judged in social terms – was not just that it gave people an opportunity to interact with nature in some way or another. Rather, the process of restoration gave participants the sense that they were connecting with an important part of their national heritage. That has a distinctive psychological quality, which Higgs (2003) describes as bringing about "narrative continuity." Of course, that argument is most effective in the context of small-scale restoration projects that rely on volunteer help. It would not be as applicable to a massive restoration such as the restoration of the Gulf Coast. In those cases, it is probably better to rely on precautionary arguments in order to justify historical fidelity.

## Ecological restoration and biodiversity

I have already implicitly stated my view about the relationship between ecological restoration and other goals, such as biodiversity conservation, but I will take a moment to explicate it. First, there is no conceptual or logical relation between biodiversity and ecological restoration. A restored ecosystem can, in principle, be less diverse than a current one, and a novel ecosystem, one that bears little resemblance to the past, might be more diverse than an existing one.

I see the two values as having comparable status, among other values such as sustainability and wild nature. They should all, jointly, play a role in designing conservation projects. There are rigorous and formal models that allow decision-makers to incorporate multiple values into conservation planning (or "multi-criteria analysis" – see Sarkar and Garson 2004, Moffett and Sarkar 2006). Such models allow decision-makers to consider several different values, or constraints, simultaneously when ranking potential conservation plans, such as biodiversity, wildlife habitat, and socio-cultural opportunities or costs. I think historical fidelity is best understood as one among other such constraints. In some cases, such as the reconstruction of Governor's Island, that constraint may be minimized or trumped by the collective importance of the other criteria. Historical fidelity is a defeasible goal, but not one that should be dispensed with entirely.

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## Notes

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