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PAPER

Reparations for environmental degradation and species extinction: a moral and ethical imperative for human society

John Cairns, Jr.*

Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA

ABSTRACT: While the history of reparations within *Homo sapiens* is lengthy, only recently has the concept been applied to events that have caused degradation or damage to natural systems. Some effects have been unmistakable, even to the untrained eye, and reparations have been made in a short temporal span. However, what should be done about ecological damage that has occurred incrementally over large temporal or spatial spans? If all parties involved are no longer living (e.g. slavery, colonialism), should the descendants of one group, who had nothing to do with the situation and are individually innocent, pay descendants of the other, who did not suffer directly? Degradation of the planet's ecological life support system will cause all humans to suffer, directly or indirectly, regardless of the degree to which they contributed to the damage. Repair of ecological damage is an act of enlightened self-interest, as well as an ethical imperative. Although current events may make restoring the planet's ecological life support system seem futile, even irrational, the forces of destruction cannot exceed those of restoration for a substantial period of time without resulting in severe disequilibrium, whether societal or ecological. The only long-term hope for the human species — sustainability — is a constructive, compassionate approach. Regardless of what happens to humankind, it is probable that some species will survive until the sun fails. Even if the human species does not, it seems ethical to make an exit that is notable for acts of compassion rather than acts of rage and revenge.

KEY WORDS: Environmental reparations · Sustainability · Ecological restoration · Ecological life support system · Ecological damage · Eco-ethics

Be the change you want to see in the world. Mahatma Gandhi

No raindrop feels it is responsible for the flood. Folk saying

INTRODUCTION: UNDERSTANDING REPARATION

Reparation generally refers to making amends for some wrong/injury by restoring or repairing, by which the injured individual/group is recompensed for real or imagined damage by the individual/group perceived as causing the damage. It also refers to monetary compensation; this meaning is applied exclusively to humans as a consequence of acts of war, and so forth. This particular definition, then, is applicable in the context of damage to natural systems caused by humans.

The United Nations convened a global conference on racism in Durban, South Africa in the latter part of 2001. Given African colonial history, one might reasonably expect a discussion of reparations for colonialism and slave trade to be central to the conference's agenda (Clark 2001)[1]. Clark (see footnote 1) notes that, as an antiracist white American, he had been accustomed to thinking of race and race privileges in terms

[1]See Clark K (2001) The global privileges of whiteness. Monkey Fist, available at www.monkeyfist.com/articles/764

*Email: jcairns@vt.edu

of the American experience. However, he reports that radical black thinkers such as Delany, DuBois, James and Fanon have always understood that a white supremacist power structure is a *global* structure. White privilege is a global privilege, backed by a global ideology of 'white supremacy'. It must be recognized, understood, and opposed globally. This mindset is an interesting context in which to examine the relationship of *Homo sapiens* with the 30+ million other species sharing the planet. Present attitudes toward other life forms are as Clark (see footnote 1) notes about race and racism — a mixture of self-congratulation and defensiveness. In evolutionary and geological time frames, major human power over other species is a relatively new development. Until humans developed primitive technologies, they were not a particularly dominant species and lived in fear of predators such as large, powerful animals that could do much damage to a comparatively defenseless human. It is quite clear that human ancestors have been responsible for the extinction of many species, including the megafauna of the Americas and many islands and continents. Undoubtedly, the development of technology and the concomitant domestication of a small number of plants and animal species increased the security of humans in terms of food, shelter, warmth, and protection against the vagaries of nature and the losses to other previously more powerful species.

Racism is a consequence of both power and a sense of superiority that has enabled humans to dominate the planet and affect the distribution of economic, political, and cultural power. This set of beliefs may have had its genesis in the relationship of humans with other life forms on this planet (i.e. speciesism).

HOMO SAPIENS AS A SMALL-GROUP SPECIES

As Ehrlich (2000) notes, humans have been a small-group species for practically all the time they have inhabited the planet. Advancement occurred first with the agricultural revolution and later with the industrial revolution. These two events made it possible for humans to live in larger groups that were more and more detached from truly wild ecosystems. In these small tribal groups, each person could know every other person fairly well, which was good because one's life depended on this knowledge. During this long period of small-group existence, humans may have been short of material possessions, while their creature comforts such as food, shelter, and warmth were both uncertain and inadequate by present-day standards. The earlier situation has not substantially improved for the millions of refugees, the estimated 1.2 billion people living on the equivalent of US$ 1 per day or less, or even the 3 billion people living on an estimated US$ 3 or less per day. As Ehrlich (2000) notes, humans are increasingly trying to substitute material possessions for non-material relationships, such as a sense of community or a harmonious relationship with the other life forms with which humankind shares the planet.

HUMAN SOCIETY'S RELATIONSHIP WITH NATURAL SYSTEMS

Although a majority of the population claims to favor the environment, natural systems are not flourishing; in most of the world, the rate of ecological damage exceeds that of ecological repair. Caldwell (1972), early on, espoused a sustainable relationship between humans and the biosphere, as did Passmore (1974). Ehrlich (2000) notes that humans are currently present in both large numbers and enormous concentrations, which leads to a 'disconnection by distance' — less concern is given to environmental degradation problems that are perceived as temporally or spatially distant. Even after the agricultural revolution, forest dwellers, peasants and nomadic herders controlled the global resources on which they depended. This situation led to superior husbandry of these resources (e.g. Gadgil 1991, Bawa & Gadgil 1997). On the other hand, Bawa & Gadgil (1997) note that the inhabitants of wealthy countries are able to draw their resources from the entire biosphere. Consequently, they often have little or no knowledge of where these resources come from and, therefore, little informational feedback on the condition or health of the ecosystems supplying these resources. Accordingly, the issues of intergenerational equity, the ethics of the treatment of other species that constitute the ecological life support system and the condition of those humans now alive whose subsistence is dramatically lower than the average for the US and other wealthy countries become increasingly difficult to avoid (Birch 1993, Cairns 1998).

Dubos (1980) notes that writing his book *The Wooing of Earth* turned out to be both sweet and sour. The sweet came from his belief that human beings can improve on nature and, to his knowledge, that they can correct environmental damage by deliberate social action. The sour had two ingredients: human society's propensity to spoil desirable environments, whether of natural or human origin, and fear that nature's mechanisms of recovery may eventually fail to cope with the increasing use and misuse of resources and energy. Dubos acknowledges that he had been happily conditioned by the very humanized environments of the Île de France where he was reared and the Hudson high-

lands in the US where he and his wife owned a once-abandoned farm on which they managed, with some success, a civilized return of the forest. Dubos notes that he still regards these regions as more appealing now than they would be if they had remained in the state of wilderness and he tends to regard, in a similarly favorable way, many other such environments all over the world. Most people probably prefer the humanized environments, although more hardy and adventurous types prefer the few remaining nearly wild areas of the planet.

The degree to which human society can humanize the planet without destroying the integrity of the interdependent web of life that constitutes its ecological life support system is a major question and an important ethical and moral consideration in determining what, if any, reparations should be made as a consequence of degrading natural systems. Dubos (1981) discusses these issues thoroughly; however, Ehrlich (2000) has neatly packaged many issues developed in the years since the Dubos book was published. For the purposes of this discussion, the dependence of human society on ecosystem services and the planet's ecological life support system is crucial. If reparations are endorsed for injustices within human society, humans should at least consider the possibility of reparations for injustices to other life forms that share the planet.

ARE REPARATIONS DESIRABLE?

People who respond to this question generally fall into four categories: (1) people who believe that human society is dependent on the planet's ecological life support system and would make reparations to restore ecological integrity as an act of enlightened self-interest, (2) people who believe that human creativity, ingenuity, and technology free them from nature's laws (e.g. resource limitations) that constrain other species, but might still make reparations for ecological damage and the extinction of many species as a moral and ethical response, (3) people who acknowledge dependence on the planet's ecological life support system and might make reparations both as a matter of enlightened self-interest and as a moral and ethical responsibility, (4) people who claim that human creativity and technology (plus a few domesticated species) will rescue humans from any catastrophe, feel no ethical responsibility for environmental damage and will do nothing.

Within each of the first three categories, people might decide to take action at levels ranging from highly localized to regional, landscape, political entities, and/or global. Additionally, people might express their response over small or large temporal spans. Finally, some individuals might wish to focus on charismatic species, such as the tiger, rhinoceros, various primates, whooping cranes, and the like, while others may focus on habitats or ecosystems.

Cairns (2001) notes that one way to reduce immigration pressures on environmental refugees is to make things more attractive in the impoverished areas of the world, thus reducing the incentive to migrate. In other words, subsidizing their environments, including ecological repair, would both reduce pressures to migrate and improve the quality of life. The questions remain of whether (1) reparations should be implemented by mutually agreed upon coercion (i.e. laws and taxes) or (2) if this should be left to individual or non-governmental compassion, either of which will require a fairly high consensus on a global ethos or guiding set of values, or (3) whether some persons will say they are only willing to participate in reparations if they are assured that everyone else will be forced to contribute in a comparable fashion, making laws necessary.

The category of decision made and speed with which it is implemented will be strongly, arguably almost entirely for most people, based on the evidence of consequences of inappropriate past actions or present practices. In the US both individual and national indebtedness is quite high and a large number of people already feel they are overtaxed by various levels of government. Individual savings rates are low, and most people feel they have little or no discretionary income. They are unlikely to take the question of environmental reparations seriously unless the perceived or actual consequences are fairly severe. However, since it appears probable that human society will suffer serious consequences for many of its present environmental practices, the question of reparations should not be dismissed entirely.

WHAT FORM SHOULD REPARATIONS TAKE?

If a species has been driven to extinction by humans, there is little that human society can do to make reparations to that species, even if, by some gigantic leap of science, some members might be produced from preserved genetic material. Without the habitat in which the species thrived, it almost certainly would not be self-maintaining and, worse yet, without its natural habitat, it would be a caricature of the living creature that once existed. For example, what reparations could possibly be made by North Americans to the passenger pigeon, driven to extinction both by individual slaughter and habitat destruction? Reparations should be made at the systems level, because of both the close relationship between a species and its habitat and the sheer numbers of

species driven to extinction during the period that *Homo sapiens* has existed.

Perhaps the issue might be more manageable by considering the plight of species, not yet extinct, that exist in trivial numbers, such as the American bison or buffalo. Once on the verge of extinction, its numbers have increased substantially compared to the recent past, but these numbers represent only a fraction of the individuals that existed two centuries ago. The evidence of this remarkable recovery of the species demonstrates persuasively that species are capable of a restoration if they are given protection and suitable habitat. The question then arises: what percentage of the original habitat should be returned as partial reparations for the much larger amount taken from the species? Many species, both plant and animal, that are accustomed to living on prairies as did the buffalo, would benefit by this redistribution of resources. Of course, merely reallocating the space without engaging in a substantial amount of ecological restoration is not likely to provide the desirable result, nor will the desirable result be achieved if the integrity of the restored system is not closely monitored. Monitoring is defined in this discussion as surveillance undertaken to ensure that previously established quality control conditions are being met or, if they are not being met, to immediately initiate corrective actions. In this way, ecological monitoring is viewed much the same as monitoring in an intensive care ward at a hospital or in industrial operations. In short, ecological and biological reparations should be based on explicit goals. Monitoring will validate the degree to which these goals are being met and indicate the need for mid-course corrections if progress is not satisfactory. Giving back even small land tracts for nature preserves can be a very contentious and thorny issue, one in which people's representatives may not always follow the wishes of the majority of citizens. Economic 'progress' and development advocates personally benefit financially from such activities and, consequently, these individuals will devote much time and energy to them. The average citizen has too many obligations to have an intense focus on the environment that is comparable to developers.

ESTABLISHMENT OF WILDLIFE CORRIDORS CONNECTING LARGE NATURAL AREAS

Ecologists know that fragmented ecosystems will not support as many species as could be supported if the fragments were joined into a single unit, or possibly even connected by wildlife corridors. In the US, and presumably in many other countries, local and federal governments have the right of eminent domain that permits them to build roads, power lines and other similar artifacts, such as dams, by commandeering private property. Wildlife corridors could benefit from similar domain, although protests would doubtless be even more vigorous than they are in the other situation. In recent years exercising the right of eminent domain has become increasingly difficult; however, in the long run, human artifacts, such as highways, usually win. If eminent domain is used to 'benefit' the human species (usually at the expense of other life forms), it seems quite reasonable to use it to benefit natural systems, especially since they are in increasingly scarce supply. Cutler (unpubl. data) suggests that it would be beneficial to offer landowners in various watersheds the cost-share benefits, paid riparian easements and other benefits that landowners in some other watersheds enjoy. These offers would constitute a form of reparations by human society for ecological damage in their particular bioregion and, at the same time, if nature were given more protection and help, make that bioregion a better place to live and visit.

The National Research Council (1992) has suggested targets for the percentage of aquatic ecosystems to be restored by the year 2010. The actual percentages are unimportant, although they represent only a tiny fraction of the total of impaired or degraded ecosystems. The point is to start the process of ecological restoration in a small way in each ecoregion and then determine when the process should stop, if ever. Human society should work on these matters at a local level, but integrate the reparation efforts into larger spatial and temporal scales. Once some large-scale degree has been achieved in making reparations on land, it would be well to consider the more difficult problem of the oceans. For those unfamiliar with wildlife corridors and other means of conserving wild species in fragmented landscapes, Newman (2000) provides additional source references.

REPARATION GOALS AND COMPONENTS

A number of factors should be incorporated into establishing reparation goals for environmental degradation and species extinction: (1) Natural systems cannot express gratitude for reparations in the way that one human or society might to another — this inability does not diminish the ethical and moral responsibility of human society for making reparations for damage caused to other life forms. (2) Environmental degradation damages the planet's ecological life support system on which human society is dependent. As a consequence, reparations are merely a matter of enlightened self-interest. (3) Although humans cannot make effective reparations to extinct species, they can

take steps to diminish the rate of species extinction by protecting the integrity of the remaining natural systems and restoring damaged ecosystems at a rate exceeding that of damage. (4) Although ensuring that the rate of ecological restoration matches that of ecological damage is a desirable goal, it does not constitute reparations in any meaningful sense of the word. (5) Reparations in the form of ecological restoration should have explicitly stated spatial, temporal, and bioregional components. (6) Extensive restoration monitoring to ensure that previously established goals are being met is essential to the implementation and improvement of a reparations strategy.

In most bioregions, using 20 years as a time frame for ecological restoration should, in most cases, enable environmental professionals to separate trends in recovery from natural variability of the system. Ecosystems will have varying time frames, which can be adjusted according to unique local conditions (e.g. National Research Council 1992).

The National Research Council (1992) used a variety of data sources to estimate both the number and percentage of river miles damaged and the percentage of lakes and wetlands suffering ecological damage. Establishing a goal of restoring 10 % of the damaged ecosystems within a 20-year time frame should enable environmental professionals to take advantage of economies of scale. Additionally, large restored ecosystems are more likely to become self-maintaining than restored fragments. Finally, this percentage is sufficiently large so as to facilitate one or more major restoration projects in each bioregion, which will have the advantage of serving as demonstration projects, increasing regional literacy in ecological restoration, and being a source of local and regional pride. Using the increments mentioned above, it would take a century to restore 50 % of the damaged ecosystems to some degree.

Natural capital (e.g. Hawken et al. 1999), the basis of other types of capital on which human society depends, furnishes ecosystem services and other benefits. Natural capitalism recognizes the critical interdependency between the production and use of human-made capital and the maintenance and supply of natural capital. The traditional definition of capital deals with accumulated wealth in the form of investments, factories and equipment. In actuality, an economy needs four types of capital to function properly: (1) human capital in the form of labor and intelligence, culture, and organization, (2) financial capital, consisting of cash, investments, and monetary instruments, (3) manufactured capital, including infrastructure, machines, tools, and factories, and (4) natural capital that is made up of resources, living systems, and ecosystem services. Arguably, the most effective means of making reparations at the systems level is the restoration and accumulation of natural capital. Although the restoration of natural systems is not dependent on familiarity with this concept, it is a useful metaphor to enable those not well acquainted with restoration ecology to relate it to the concept of capitalism with which the average person feels more comfortable.

It is essential to articulate values, ethos, and ethics that can effectively replace economic preferences. Additionally, all of these should be equally effective for both short- and long-term perspectives. Consequently, the estimate of a century time frame does not seem excessive, although human society will want to make course corrections, adjustments and the like depending on information gathered in the various stages.

ESTIMATING REPARATIONS COSTS

Because of extensive anthropogenic damage done to the environment, initial reparation costs will be high. In many cases, substantial quantities of toxic materials will have to be removed, species will have to be assisted in recolonizing the damaged ecosystem, and the like. With each additional area that acquires a naturalistic community of plants and animals, natural recolonization of nearby damaged areas inevitably will be increased. Therefore, one of the most expensive portions of ecological restoration, namely assisting species to recolonize, will be less and less necessary as the restoration proceeds. As the number of naturalistic communities increases and their distance from damaged ecosystems decreases, ecological restoration can be left more and more to natural processes once the hazardous condition of the site have been eliminated or reduced. The establishment of wildlife corridors between natural areas, most of which will inevitably pass through damaged ecosystems, will increase markedly the likelihood of natural recolonization.

The most publicly understood portion of any reparation is likely to be the actual process of ecological restoration, while the most likely costs to be ignored or underestimated are those of monitoring the restoration process (Holl & Cairns 2002). It is essential to establish restoration goals before any restoration is implemented and to establish monitoring guidelines, quality control criteria and standards, and conditions that will provide an early warning that restoration goals and objectives are not being met. Finally, once these goals have been achieved, it is essential to establish a monitoring system, often using the same criteria used in the restoration process but at a lower frequency and number of endpoints to confirm that the system is healthy or to provide early warning when it is not.

AVOIDING MIXED-USE NATURE PARKS

When a local government obtains an ecologically interesting tract of land, often it is tempted to turn the land into a mixed-use park that typically has features desirable to both the local citizenry and financial interests, but is not a nature park. In making reparations for environmental damage, including loss of species habitat and the like, the concept of a nature park should be based on protection and respectful observation of wildlife, environmental education, and contemplation of nature. The Brown Farm nature park (Browder et al. 2000) in the town of Blacksburg, Virginia, US, is an excellent illustration of the problems likely to be faced by any area attempting a design with nature driven primarily by ecological principles rather than those of active human recreation (e.g. football fields, soccer fields, baseball diamonds, and the like). The Brown Farm site has 169 acres supporting 12 different ecosystems along Toms Creek. Citizens made their views clear on the future of Brown Park in a meeting in November 1999 (a two-day workshop attended by about 500 Blacksburg residents); 80% of the citizens preferred nature preservation, environmental education and passive recreation. The following January, the town sponsored a second public meeting to poll citizen reaction to three proposed plans for the park. Of the 243 comments collected from residents, 64% favored a nature park plan without any playing fields or active recreation. A compromise closely resembling the master plan of mixing both a nature park and active-use elements was rejected by citizens by a 3:1 margin. Browder et al. (2000) made the following recommendations regarding the Brown Farm Park decision: (1) Reduce the number of structures, trails and parking spaces. Does a nature park require four lots with 270 parking spaces? (2) Keep all parking away from streams and open water by placing most parking at the park's perimeter. (3) Do not create a new lake or pond. (4) Eliminate the 30-acre area for active recreation and reserve a smaller area for potential future recreation, not necessarily active. (5) Specify a process by which decisions about development of this reserve area involve citizen participation. (6) Establish a working group for the Brown Farm Park, composed of knowledgeable citizens, to review the park's final master plan. (7) Develop guidelines for park use, program development, and vegetation/ecosystem restoration and management.

This illustrative case history is almost certainly not unique when ecological considerations are dominant. The Brown Farm was, at one time, a disturbed ecosystem (i.e. a working farm). Abandoning the agricultural processes permitted significant ecological recovery to occur unassisted in a relatively short time period. To the proponents of soccer fields and the like, the farm is an 'unused space', meaning that it is not used for active human recreation. The farm, however, is heavily used by species of plants and animals, and it is one of the few areas easily accessible to town residents that contains significant numbers of species not found abundantly in the town (e.g. otters). The major lesson to be learned from the Brown Park saga is that, even when a disturbed ecosystem undergoes natural recovery, a battle may occur between those who wish to displace a recovered natural system with human artifacts and those who wish to have a fragment of a natural system easily accessible to local citizens. That this battle is occurring in a university town makes it abundantly clear that education alone is not the key to either making reparations for damage to natural systems or protecting natural systems.

HOW MUCH SPACE SHOULD BE ALLOCATED TO NATURAL SYSTEMS?

With the human population still growing and affluence at historically high levels, the worst possible case situation is that humans will continue to displace natural systems until the ecological life support system no longer functions as it should. Typically, the rate of social change has lagged far behind that of technological development and the new conditions that are inevitable consequences of almost every form of exponential growth. The allocation of a specific percentage of Earth's surface to natural systems will depend primarily on three factors:

(1) How much space is essential to maintain the level of natural capital and the delivery of ecosystem services on which human society depends? The information available to answer this question is simply not adequate. What is abundantly clear is that, if current practices continue, some major ecological threshold will be crossed, placing ecosystems in disequilibrium and, consequently, destabilizing human society. The likelihood of crossing such a threshold is not only possible but also highly probable. Worse yet, the information feedback on such issues as species impoverishment, condition of natural systems, and degradation rate of natural systems is inadequate to make a precise judgment. Prudence dictates that much more ecological restoration be carried out as reparation for environmental degradation and that the rate of impoverishment or loss of natural systems be dramatically reduced.

(2) Even if the threshold were known, human society would still have to decide how much of a safety factor to allow so that chances of accidentally cross-

ing the threshold would be diminished. The use of safety factors is generally accepted for elevators, bridges, automobiles and other human artifacts. In fact, the American Society for Testing and Materials determines such thresholds for manufactured goods, and human society develops safety factors to reduce the probability of risks or hazards developing because of unusual conditions or weaknesses in the data upon which the threshold was estimated. Taking such precautions has not proven popular where environmental conditions are an issue because understanding the consequences of not using such measures requires a level of ecological literacy that is still uncommon in the general population or among most world leaders. Nevertheless, if society employs such practices for the products of technology, surely it is reasonable to do so to protect the planet's ecological life support system from being impaired by this technology.

(3) To what degree should human society acknowledge an ethical and moral responsibility for other life forms beyond that essential to the maintenance of the ecological life support system on which society depends? Since society is so protective of the economic system, it is well to remember that non-human societies have economic systems as well (e.g. Tullock 1994). Most of these are much older than the human economic system and, presumably, most are vulnerable to stresses caused by anthropogenic activities.

ILLUSTRATIVE QUESTIONS REGARDING REPARATIONS

(1) If restoring natural capital is crucial to human society, to what extent should this be left to natural processes?
(2) If active human intervention seems justified, what forms should it take?
(3) Will excessive human intervention result in ecosystems markedly differing from those primarily resulting from natural processes?
(4) If species used to recolonize a damaged site are removed from another habitat, will that habitat be damaged?
(5) Can an estimate be made of the time required for each option (i.e. natural processes versus human intervention)?
(6) Is the difficulty of both natural recolonization or transport of appropriate species to the damaged site a major problem?
(7) Is the goal a naturalistic assemblage of species or the species in the predisturbance community?
(8) If the goal is a naturalistic community, what attributes are essential and/or desirable?
(9) If the goal is a predisturbance community, what difficulties might be anticipated in reestablishing native species?
(10) Are hazardous materials or some other obstacles to recolonization present? If so, what should be done about them? Two obvious choices are removal of the hazardous materials or recolonizing with species tolerant to them, if available.
(11) If a naturalistic community is established with species not indigenous to the area, are these likely to be invasive and displace indigenous species elsewhere?
(12) What organization is responsible for monitoring the ecological integrity of the restored area?
(13) Does the responsible organization have the authority to take immediate corrective action if the restored system is endangered or degraded?
(14) Are adequate funds available to implement monitoring and corrective actions?
(15) How much of all of the above can be entrusted to volunteers?
(16) Is the restored system likely to be self-maintaining? If not, what steps should be taken to maintain the degree of restored ecological integrity?

CONCLUSIONS

Reparations for environmental degradation and species extinction will benefit both natural systems and human society and are indeed a moral and ethical imperative for human society. If the reparations take the form of ecological restoration, by increasing the percentage of naturalistic communities of plants and animals and decreasing the number of damaged ecosystems, the process will benefit human society by providing increased natural capital and ecosystem services, other life forms by increasing habitat necessary for survival, and future generations of the human and other species by making the relationship between human society and natural systems more mutualistic than it now is. There are major obstacles to making effective reparations for environmental degradation. Some illustrative examples follow:
(1) Many humans regard areas without human artifacts as 'unused areas', neglecting to honor the fact that they are essential to the survival of other life forms.
(2) Some people will always attempt to establish human artifacts (such as playing fields) in natural areas set aside for human contemplation of nature and attempt to call them nature parks because fringe areas 'will still be available for birds and wildlife'.
(3) A majority of the citizens' wishes to have more natural systems will not easily weaken the resistance of elected officials to protect these areas, since their eco-

nomic value is not easily demonstrated. As Myers with Kent (1998) notes, there are huge numbers of lobbyists and huge amounts of money spent to lobby for economic development, typically at the expense of natural systems.

It seems unlikely that humans could eliminate all species and all natural systems without wrecking human society in the process. Human intelligence guided by reason should enable the development of an environmental or ecological ethos (a set of guiding beliefs) that would lead to a more reverent attitude toward other life forms and the development of a mutualistic, rather than damaging, relationship. Reparations for environmental damage would be a beginning in the development of a mutualistic relationship between human society and natural systems and a gift to the descendants of both humans and other life forms.

In more general terms, this choice is between biophilia and biophobia. Doubtless, most readers will regard the latter as too strong a word. However, if natural systems could speak, they might assert that human society is damaging their ecological integrity at an unsustainable rate and driving to extinction many of the species that inhabit what remains by fragmentation, persistent toxic chemicals and the threat of global warming. Damaging natural systems is not the path to serenity and happiness. Human society needs to reevaluate its relationship with the interdependent web of life of which it is a part. If it then regrets previous actions regarding natural systems, the first remedial step should be reparations in the form of ecological restoration.

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