

ARTICLE: ECOSCAPES: THE FUTURE OF PLACE-BASED ECOLOGICAL RESTORATION LAWS

2012 - 2013

Reporter: 14 Vt. J. Envtl. L. 494

Length: 27504 words

Author: *Anastasia Telesetsky* *

* Associate Professor, University of Idaho, Natural Resources and Environmental Law Program.

LexisNexis Summary

... This paper acknowledges the key role that private actors have played in promoting large-scale landscape/seascape (ecoscape) management and then calls for a more active role by state governments in investing in ecoscape-based restoration. ... While restoration is touted in policymaking as a viable environmental strategy, few proponents dare to mention that effective restoration will require an experimental approach to restoration sites that may not deliver success without some trial-and-error in applying untested restoration practices. ... Remediation and Restoration Orders In addition to the national and regional restoration laws that largely promote remediation or mitigation efforts in case of threatened damage, there are also court orders that require remediation and restoration efforts by parties that have already damaged the environment. ... Restoration of ecosystem services involves intentional efforts to return an ecosystem through total restoration, rehabilitation, remediation, or reclamation to some condition where the ecosystem is capable of delivering ecosystem services that are equivalent to the services delivered before the ecosystem became degraded. ... While landscapes may be dynamically changing environments and novel ecosystems are emerging all of the time, the concept of ecoscape thinking provides a motivation for restoration because it focuses human attention, including our system of laws, on our relationship with the larger environment and on our role in recovering rapidly disappearing places. ... As a result, ecoscapes can expand and shrink in order to respond to the level at which humans are willing to commit to restoring ecosystem functions. ... Focusing largely on ecological values rather than socio-ecological values diminishes the importance of governance to the success of large-scale restoration projects. ... This increase reflects the importance of large landscapes and seascapes for communities because these areas are managed with the conservation of nature as the goal it that conservation provides economic, social, and ecological benefits. ... States should immediately focus on restoring connectivity in order to restore threatened ecological functions If we are to attempt to maintain ecological processes at a landscape level, it will be essential to restore better connectivity, which is defined as the "degree to which a landscape facilitates movement of species, population, and genes among resource patches, from ecological to evolutionary time scales."

Highlight

ABSTRACT

In the course of a single human lifetime, we are collectively experiencing ecological collapse as fish stocks plummet and deforestation remains rampant. Legal scholars have focused intensely on causation for these collapses, but little has been written in the legal academy about what States are doing after they have failed to prevent ecological damage.

This paper examines the current practices of state-mandated environmental restoration, which include primarily mitigation efforts and ecosystem service revival. Remedial mitigation and an emphasis on ecosystem services, however, are not sufficient to restore ecosystem functions that are essential for the survival of landscapes.

This paper argues instead for a large landscape approach to environmental restoration. Focused on the inherent value of distinct landscapes to people, this paper introduces the concept of the "ecoscape" as an alternative to the current inadequate regime of piecemeal restoration. An "ecoscape" is a landscape or seascape that transcends political boundaries and, instead, creates boundaries based on sustaining ecological functions and on protecting human needs for living landscapes. Because they are place-based rather than politically bounded, ecoscapes offer new large-scale opportunities to restore the environment. Psychologically, humans are directly motivated to restore places that are important for the quality and nature of lives and tapping into this motivation can have benefits for all species.

This paper acknowledges the key role that private actors have played in promoting large-scale landscape/seascape (ecoscape) management and then calls for a more active role by state governments in investing in ecoscape-based restoration. If some degree of ecoscape thinking is not facilitated by our governance systems, further ecosystem collapse will come at our own peril.

"[I]t is even more apparent today than it was during the early part of the twentieth century that the environmental and social problems need to be addressed from an interdisciplinary and large-scale perspective."

Eugene Odum ¹

Text

[*495] INTRODUCTION

In laboratories and environmental think tanks, there are bold genetic pioneers who believe it is technically possible to bring back extinct species, such as the passenger pigeon and the New Zealand moa. ² Yet, until we can reliably bring back extinct species and re-engineer fragmented habitats into functioning landscapes, it is fair to conclude that humans are not capable of relying on futuristic technologies to restore landscapes, waterscapes, and seascapes. ³ Given the environmental pressures on the planet, we collectively have three stark options. ⁴ We can completely cease and desist in our extractive and polluting activities, which would lead to a further downward spiral in the current economy. We can carry on pursuing the status quo, leading to bleak future scenarios of environmental collapse. ⁵ Or, we can attempt to interrupt the status quo by reimagining our troubled relationships with the places where we reside and systematically restore ecologically degraded places so that they can sustain their ecological [*496] function. ⁶ While this last option is not easy to implement, restoration is the only viable long-term option to address the magnitude of human impacts on the environment.

This paper makes a modest contribution to a lively debate about how to re-imagine our relationship with the places that shape us as individuals, communities, and nations by focusing on how to bridge the gap between social governance and ecological landscape restoration. Law plays a critical role in the implementation of restoration science because it is through the mechanisms of law that we individually and collectively decide how our landscapes should function and which species, ecological processes, and geographical features will survive from generation-to-generation.

Yet, in spite of the importance of this topic, there are only a handful of articles and books that address the legal challenges inherent in addressing landscape/waterscape/seascape restoration (hereinafter referred to as "landscape" resto-

¹ Eugene P. Odum, *Landscape Ecology of the Future: A Regional Interface of Ecology and Socioeconomics in INTEGRATING LANDSCAPE ECOLOGY INTO NATURAL RESOURCE MANAGEMENT* 461, 462 (Jianguo Liu & William M. Taylor eds., 2002).

² John Brockman, *To Bring Back the Extinct: A Conversation with Ryan Phelan*, EDGE (Aug. 28, 2012), [normval="http://edge.org/conversation/to-bring-back-the-extinct">http://edge.org/conversation/to-bring-back-the-extinct](http://edge.org/conversation/to-bring-back-the-extinct).

³ Landscape refers in this paper to the dynamic relationship between terrestrial ecosystems as marked by flows of energy, nutrients, and species across time and space. Water scapes and sea scapes refer to freshwater and marine water ecosystems respectively. Richard T.T. Forman, *An Ecology of the Landscape*, 33 BIOSCIENCE 535 (1983).

⁴ Johan Rockström, et al., *Planetary Boundaries: Exploring the Safe Operating Space for Humanity*, 14(2) ECOLOGY & SOC'Y 32 (2009), [available at normval="http://www.ecologyandsociety.org/vol14/iss2/art32">http://www.ecologyandsociety.org/vol14/iss2/art32](http://www.ecologyandsociety.org/vol14/iss2/art32).

⁵ A two degree Celsius increase in temperature is predicted to expose up to thirty percent of species to risk of extinction, bleach most corals, and increase flood and storm events. ORG. OF ECON. COOP. AND DEV., (OECD) ENVIRONMENTAL OUTLOOK TO 2050, at 24 (2012), [available at normval="http://www.keepeek.com/Digital-Asset-Management/oecd-environmental-outlook-to-2050_9789264122246-en">http://www.keepeek.com/Digital-Asset-Management/oecd-environmental-outlook-to-2050_9789264122246-en](http://www.keepeek.com/Digital-Asset-Management/oecd/environment/oecd-environmental-outlook-to-2050_9789264122246-en).

⁶ Ecological function refers to physical conditions and ecological processes that are essential for an ecosystem to function including for example water flows and nutrient cycling.

ration) in order to adapt to the Anthropocene Era.⁷ This is a paper operating on two scales. With a focus on landscape restoration, this is a big picture paper that focuses on how we can restore threatened ecological connections and functions across landscapes by shifting the focus of our political decision-making about the environment to the appropriate large ecological scale. Simultaneously, the paper is a small picture paper because it focuses attention on how the social mechanism of law might operate to protect our experiences as place-bound species that derive shared meaning from living in particular types of places.

This paper is based on two assumptions. The first assumption is that humans are not, by nature, anarchic. We strive for order and seek at least momentary stability and predictability. Many of us fear rapid change and prefer a more graduated approach. In other words, we are genetically prone and culturally motivated⁸ to appreciate the values of group governance. As a result, we attempt to govern our collective environment through shared social mechanisms such as laws. The second assumption is, that in spite of the positive potential and inherent tragedies of globalization, humans are largely place-based and develop attachments to specific places. Regardless of our cultural upbringing, we identify with physical landscapes and [*497] understand who we are as individuals and communities in relationship to specific landscapes.

Combining these assumptions with the emerging debate over how to mainstream restoration into long-term sustainability law and policy,⁹ this paper introduces the concept of an ecoscape as an approach to protect social and environmental values within and across large landscapes. Much has been written about the importance of landscapes.¹⁰ Recently, there is an increasing amount of interest in bioregions¹¹, ecoregions,¹² and landscape conservation cooperatives.¹³ While each of these ideas contributes to the progress of ecological restoration as a viable scientific concept, an ecoscape¹⁴ is the next step in reimagining our relationship with places because it focuses not just on conceptualizing the scientific and ecological criteria associated with landscapes but also on furthering trans-political boundary governance.¹⁵

⁷ See, e.g., ROBERT W. ADLER, RESTORING COLORADO RIVER ECOSYSTEMS: A TROUBLED SENSE OF IMMENSITY (2007); Alyson C. Flournoy, *Restoration Rx: An Evaluation and Prescription*, 42 ARIZ. L. REV. 187, 187 (2000); Joseph L. Sax, *The New Age of Environmental Restoration*, 41 WASHBURN L. J. 1, 1 (2001); A. Dan Tarlock, *Slouching Toward Eden: The Eco-Pragmatic Challenges of Ecosystem Revival*, 87 MINN. L. REV. 1173, 1173 (2003); Sandi Zellmer & Lance Gunderson, *Why Resilience May Not Always be a Good Thing: Lessons in Ecosystem Restoration from Glen Canyon and the Everglades*, 87 NEB. L. REV. 893, 894 (2008).

⁸ This paper makes no assumptions about whether culture drives genetic changes or genes create culture but leave those interesting debates to sociobiologists and cultural evolutionists.

⁹ Current discussions of restoration in the context of environmental policy tend to be largely prescriptive without providing guidance about what might constitute a successful restoration effort. Parties know that they should restore habitat and species but there is no direction about how to achieve these prescriptive goals. United Nations Conference on Sustainable Development, G.A. Res. 66/288, U.N. Doc. A/RES/66/288 (Sept. 11, 2012), available at <http://www.uncsd2012.org/thefuturewewant.html> (Paragraph 40 reaffirms Principle 7 from the Rio Declaration: "We call for holistic and integrated approaches to sustainable development that will guide humanity to live in harmony with nature and lead to efforts to restore the health and integrity of the Earth's ecosystem"; paragraph 135 calls for "restoration of safe and green urban spaces"; paragraph 154 in the context of employment for the "green economy" calls for public investments in "restoring natural resources and ecosystems"; paragraph 158 calls for States to "restore the health, productivity and resilience of oceans and marine ecosystems"; paragraph 168 calls for restoration of fish stocks (emphasis added)).

¹⁰ See, e.g., RESILIENCE AND THE CULTURAL LANDSCAPE: UNDERSTANDING AND MANAGING CHANGE IN HUMAN-SHAPED ENVIRONMENTS 5 (Tobias Plieninger & Claudia Bieling eds., 2012) (discussing human interaction and its influence on landscapes and the environment in general).

¹¹ See, e.g., BIOREGIONALISM (Michael V. McGinnis ed., 1999).

¹² ROBERT G. BAILEY, ECOREGION-BASED DESIGN FOR SUSTAINABILITY (2002).

¹³ U.S. DEP'T OF INTERIOR, LANDSCAPE CONSERVATION COOPERATIVES: FREQUENTLY ASKED QUESTIONS (2012), available at <http://www.doi.gov/lcc/upload/LCC-FAQs-Final-2012.pdf>.

¹⁴ The term "ecoscape" will be defined in Part III. "Ecoscape" is a broader concept than simply a "cultural landscape" where human interests are foregrounded. The idea of ecoscapes also prioritizes human efforts but focuses specifically on how humans can use their governing influence over the landscape to protect socio-ecological systems through ecosystem restoration processes.

¹⁵ Governance in this paper refers to "activities backed by shared goals that may or may not derive from legal and formally prescribed responsibilities and that do not necessarily rely on police powers to . . . attain compliance. Governance . . . is a more en-

Part I of this paper addresses the ecological impacts that motivate the current impulse for restoration activities. Part II of this paper defines ecological restoration and explores three different ways it has been incorporated into national law and policy. Part II also explains how each of [*498] these approaches focuses on only one temporal quality of the restoration debate, largely to the exclusion of larger ecological concerns. Finally, in Part III, the “ecoscape” is offered as a place-based concept for bridging the governance gap between political action and declining ecological systems. This final Part also proposes a selection of government-initiated policy changes that would advance the idea of ecoscape thinking by restoring ecological connectivity across currently fragmented large landscapes.

I. ENTERING THE ANTHROPOCENE: THE CONTEXT FOR RESTORATION

While we have been reshaping landscapes for millennia, it is only recently that the human hand and footprint has become ubiquitous across all ecological categories from species to communities to ecosystems to landscapes. We may be on the brink of entering the Anthropocene, the first geological epoch to be marked by the sheer extent of human impact on earth systems, thus we must reimagine our relationship to the land because we are both part of the problem and solution to our environmental challenges.¹⁶ As tropical ecologist Daniel Janzen argued eloquently in an editorial in *Science*, “there is no footprint-free world” and “[t]he question is not whether we must manage nature, but rather how shall we manage it by accident, haphazardly, or with the calculated goal of its survival forever?”

In 2000, the United Nations Secretary-General Kofi Annan commissioned the Millennium Ecosystem Assessment enlisting almost 1,400 scientists and experts to determine how humans have been impacting the environment.¹⁷ After several years of intensive evaluation, scientists concluded that humans have disrupted ecosystems at an unprecedented rate in the past fifty years.¹⁸ While this overall conclusion was discouragingly predictable, the underlying studies remain startling if we take into consideration the quantitative magnitude of change.

[*499] Beginning with the terrestrial ecosystems, forest systems continue to be damaged. While there has been an overall improvement from the 1990s when sixteen million hectares were converted annually from primary forest to agricultural uses or destroyed by natural causes, the Food and Agricultural Organization found thirteen million hectares were lost per year between 2000 and 2010.¹⁹ Humans have continued to leave their imprint on forests. In fact, the acreage of primary old-growth forests, which account for thirty-six percent of total forest area, has decreased by more than forty million hectares since 2000, due largely to logging and other human pursuits.²⁰ National statistical data reflecting increases in forest cover may mask the effects of primary forest depletion replaced by expanded plantation forests.²¹

compassing phenomenon than government. It embraces governmental institutions, but it also subsumes informal, non-governmental mechanisms whereby those persons and organizations within its purview move ahead, satisfy their needs, and fulfill their wants.” James N. Rosenau, *Governance, Order, and Change in World Politics*, in GOVERNANCE WITHOUT GOVERNMENT: ORDER AND CHANGE IN WORLD POLITICS 1 (James N. Rosenau & Ernst-Otto Czempiel eds., 1993).

¹⁶ *The Anthropocene: A Man-Made World*, THE ECONOMIST (May 26, 2011), normval=http://www.economist.com/node/18741749?story_id=18741749 >http://www.economist.com/node/18741749?story_id=18741749 (“[E]mbracing the Anthropocene as an idea means . . . treating humans not as insignificant observers of the natural world but as central to its workings, elemental in their force.”); Paul J. Crutzen & Christian Schwägerl, *Living in the Anthropocene: Toward a New Global Ethos*, YALE ENV’T 360 (Jan. 24, 2011), available at normval=http://e360.yale.edu/feature/living_in_the_anthropocene_toward_a_new_global_ethos/2363 >http://e360.yale.edu/feature/living_in_the_anthropocene_toward_a_new_global_ethos/2363 (“To master this huge shift [to the Anthropocene], we must change the way we perceive ourselves and our role in the world . . . [T]eaching students that we are living in the Anthropocene, the Age of Men, could be of great help. Rather than representing yet another sign of human hubris, this name change would stress the enormity of humanity’s responsibility as stewards of the Earth. It would highlight the immense power of our intellect and our creativity, and the opportunities they offer for shaping the future.”); Michael Soulé, *Natives vs. Exotics*, 4 YELLOWSTONE SCI. 9 (1996).

¹⁷ *Overview of the Millennium Ecosystem Assessment*, MILLENNIUM ECOSYSTEM ASSESSMENT, normval=<http://www.maweb.org/en/About.aspx> ><http://www.maweb.org/en/About.aspx> (last visited Apr. 3, 2013).

¹⁸ WALTER V. REID ET AL., ECOSYSTEMS AND HUMAN WELL-BEING: SYNTHESIS 1 (José Sarukhán & Anne Whyte eds., 2005), available at normval=<http://www.unep.org/maweb/documents/document.356.aspx.pdf> ><http://www.unep.org/maweb/documents/document.356.aspx.pdf> [hereinafter MEA].

¹⁹ FOOD & AGRIC. ORG. OF THE U.N., GLOBAL FOREST RESOURCES ASSESSMENT 2010, 100 (2010), available at normval=<http://www.fao.org/docrep/013/i1757e/i1757e.pdf> ><http://www.fao.org/docrep/013/i1757e/i1757e.pdf>.

²⁰ *Id.* at 50.

²¹ REID ET AL., *supra* note 18, at 33.

Arguably, wetland and coastal habitats have fared even worse than forests. William Mitsch and James Gosselink observe that over the course of the past few decades fifty-three percent of United States wetlands, sixty percent of Chinese wetlands, and ninety percent of New Zealand wetlands have disappeared.²² Globally, the world has lost fifty percent of its wetlands.²³ Since 1980, thirty-five percent of the world's mangroves have been lost.²⁴ In some areas, up to eighty percent of the mangrove coverage has been lost due to human development and storm damage.²⁵

At least thirteen percent of the coastal waters in the U.S. are impaired for fishing based on studies of fish tissue contaminants.²⁶ Dead zones in the Gulf of Mexico have increased from approximately 10,000 square kilometers in 1985 to 22,100 square kilometers in 2007.²⁷ Around 400 coastal areas worldwide are now periodically or constantly oxygen-depleted due to fertilizer run-off and sewage discharge.²⁸ Further out towards the sea, ecosystems are silently vanishing. In the Caribbean regions, four-fifths of the coral reefs have disappeared in the past twenty-five years, and remaining reefs are heavily damaged by land-based pollution and overfishing.²⁹ [*500] A similar story of loss threatens Southeast Asia's reefs, with eighty percent of the reefs in the Philippines also under threat.³⁰ Globally, twenty percent of coral reefs have been destroyed.³¹ Industrial fishing fleets are damaging deep-sea habitat by bottom trawling.³² Overexploitation, pollution, and rising temperatures threaten the world's fishery stocks. According to the Food and Agriculture Organization, as of 2009, eighty-seven percent of the world's fisheries are overexploited or fully exploited.³³

Degraded ecosystems have obvious impacts for both human health and welfare, since almost half the population is dependent on fisheries, forests, and agriculture for jobs.³⁴ Scientists estimate that sixty percent of the world's ecosystem services, based on twenty four groups of services identified by the Millennium Ecosystem Assessment, are in the process of being degraded or are being used in an unsustainable fashion.³⁵ Most of this damage has occurred within the lifetime of this generation. In addition to the frequency of these types of reports, what is particularly alarming about this array of statistics is the cumulative nature of global environmental damage. As Janzen intuited in 1998, there

²² WILLIAM J. MITSCH & JAMES G. GOSELINK, WETLANDS 49 (4th ed. 2007).

²³ *Id.*

²⁴ REID ET AL., *supra* note 18, at 2.

²⁵ THE ECONOMICS OF ECOSYSTEMS & BIODIVERSITY: AN INTERIM REPORT 12 (2008), available at [normval="http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/teeb_report.pdf"](http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/teeb_report.pdf)

²⁶ U.S. ENVTL. PROT. AGENCY, NATIONAL COASTAL CONDITION REPORT IV 9 (2012), available at [normval="http://water.epa.gov/type/oceb/assessmonitor/nccr/upload/NCCR4-Report.pdf"](http://water.epa.gov/type/oceb/assessmonitor/nccr/upload/NCCR4-Report.pdf)

²⁷ Nancy Rabalais et al., *Hypoxia in the Northern Gulf of Mexico: Does the Science Support the Plan to Reduce, Mitigate and Control Hypoxia?*, 30 ESTUARIES & COASTS 753, 754 (2007).

²⁸ Robert J. Diaz & Rutger Rosenberg, *Spreading Dead Zones and Consequences for Marine Ecosystems*, 321 SCI. 881, 926-27 (2008).

²⁹ Michael McCarthy, 'Rainforests of the Sea' Ravaged: Overfishing and Pollution Kill 80% of Coral on Caribbean Reefs, IN-DEP. (July 18, 2003), [normval="http://www.independent.co.uk/environment/rainforests-of-the-sea-ravaged-overfishing-and-pollution-kill-80-of-coral-on-caribbean-reefs-587184.html"](http://www.independent.co.uk/environment/rainforests-of-the-sea-ravaged-overfishing-and-pollution-kill-80-of-coral-on-caribbean-reefs-587184.html)

³⁰ *Id.*

³¹ CLIVE WILKINSON, STATUS OF CORAL REEFS OF THE WORLD: 2004, at 7 (Clive Wilkinson ed., 2004), available at [normval="http://www.icriforum.org/sites/default/files/scr2004v1-all.pdf"](http://www.icriforum.org/sites/default/files/scr2004v1-all.pdf)

³² NAT'L RESEARCH COUNCIL, EFFECTS OF TRAWLING & DREDGING ON SEAFLOOR HABITAT 7 (2002).

³³ FOOD AND AGRIC. ORG. OF THE UNITED NATIONS, THE STATE OF THE WORLD FISHERIES AND AQUACULTURE 1, 8 (2010).

³⁴ U.N. ENVIRONMENTAL PROGRAMME (UNEP), GLOBAL ENVIRONMENTAL OUTLOOK GEO4: ENVIRONMENT FOR DEVELOPMENT, at iv, 4 (2007).

³⁵ REID ET AL., *supra* note 18, at 39.

is no "footprint-free world."³⁶

In response to the speed and scale of destruction, scientists have been calling for changes to "business as usual." Scientists recognize that, "[n]ature in the twenty-first century will be a nature that we make; the question is the degree to which this molding will be intentional or unintentional, desirable or undesirable."³⁷ As the next section will demonstrate, international policymakers are hearing scientists' concerns. For many of these policymakers, restoration is an accepted strategy for long-term ecosystem management. But because there is no singular voice with which scientists speak, certain restoration policy approaches, such as "ecosystem service" markets, are more quickly adopted into established [*501] governance structures than other more holistic place-based approaches, such as the ecoscape system proposed in Part III.

Yet, we substitute quickly implementable policy fixes at our own peril. Restoration will require long-term financial, but also personal, investment. While restoration is touted in policymaking as a viable environmental strategy, few proponents dare to mention that effective restoration will require an experimental approach to restoration sites that may not deliver success without some trial-and-error in applying untested restoration practices. If States continue to pursue the piecemeal legal restoration strategies described in the following section, we may not have the patience to wait for an ecological system to return to a self-sustaining state, or to renew our efforts if first attempts at ecological restoration fail to deliver results by a scheduled deadline.

II. ECOLOGICAL RESTORATION AND CONTEMPORARY PRACTICE

Beginning with the 1972 United Nations Conference on the Human Environment³⁸ and following through the Rio Conference in 1992,³⁹ and the more recent Rio+20 Conference in 2012,⁴⁰ restoration has had a certain hortatory appeal of advancing conservation by repairing the damage from human impacts. The concept of restoration, in its most general expression found within international law, gives humans a chance to collectively do something remarkable to reverse or at least slow seemingly inexorable trends of global decline, degradation, and extinction. In these times, when system-wide environmental statistics about the collapse of fisheries and the disappearance of mangroves suggest that we may be crossing ecological thresholds, restoration is an optimistic call to action to preserve something of the environment as we currently know it. But what is meant by this global call for restoration depends on how you define restoration. The following section reviews some of the definitions commonly circulated within the community of ecological restoration experts.

[*502] A. *What is Restoration?*

There is no internationally agreed upon definition of restoration and few domestic legal definitions for restoration. Filling this gap are definitions built by scientific consensus. In 1990, the Society for Ecological Restoration defined restoration as "the process of intentionally altering a site to establish a defined, indigenous, historic ecosystem" with the goal being "to emulate the structure, function, diversity, and dynamics of the specified ecosystem."⁴¹ This definition fell out of fashion because it relied on a snapshot approach to restoration. As ecologists discovered that ecosystems are not static but subject to dynamic equilibrium and that leaving a site alone could also have restorative effects, there was a need for new definition.

In 1995, the Society for Ecological Restoration (the Society) defined restoration as "the process of renewing and main-

³⁶ Daniel Janzen, *Gardenification of Wildland Nature and the Human Footprint*, 279 SCI. 1269, 1312-1313 (1998).

³⁷ DANIEL B. BOTKIN, *DISCORDANT HARMONIES: A NEW ECOLOGY FOR THE TWENTY-FIRST CENTURY* 193 (1990).

³⁸ Declaration of the United Nations Conference on the Human Environment, U.N. Doc. A/Conf.48/14/Rev.1 (June 16, 1972) (referring to Principle 3, "[t]he capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved.").

³⁹ Rio Declaration on Environment and Development, U.N. Doc. A/CONF.151/26 (Vol. I) (June 14, 1992) (referencing Principle 7 which asserts "[s]tates shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem").

⁴⁰ See United Nations Conference on Sustainable Development, *supra* note 9 (reaffirming the Rio Principles and commitment to implement a sustainable plan).

⁴¹ Eric Higgs, *What is Good Ecological Restoration?*, 11 CONSERVATION BIOLOGY, 338, 340 (1997) (citing 1990 Minutes for the Annual Meeting of the Board of the Director, Society for Ecological Restoration).

taining ecosystem health.”⁴² While this definition provided more flexibility in terms of achieving restoration goals, it was largely aspirational since there was no specific definition of “ecosystem health.” Today, the Society of Ecological Restoration defines restoration as “[e]cological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.”⁴³ The Society provides a very detailed description of what constitutes recovery:

An ecosystem has recovered--and is restored--when it contains sufficient biotic and abiotic resources to continue its development without further assistance or subsidy. It will sustain itself structurally and functionally. It will demonstrate resilience to normal ranges of environmental stress and disturbance. It will interact with contiguous ecosystems in terms of biotic and abiotic flows and cultural interactions.⁴⁴

[*503] The Society provides multiple attributes of restored ecosystems including that:

The restored ecosystem is self-sustaining to the same degree as its reference ecosystem, and has the potential to persist indefinitely under existing environmental conditions. Nevertheless, aspects of its biodiversity, structure and functioning may change as part of normal ecosystem development, and may fluctuate in response to normal periodic stress and occasional disturbance events of greater consequence. As in any intact ecosystem, the species composition and other attributes of a restored ecosystem may evolve as environmental conditions change.

While this 2004 definition inclusively emphasizes both biotic and abiotic resources, there is something missing from the definition in terms of connecting the ecologically defined world that is the subject of scientific investigation to the socially constructed world where governance resides--in other words, connecting the worlds of science and law. While it may seem on one level that ecologists should not be venturing into the practice of law by proposing definitions with socio-legal implications, it ignores the fact that restoration is inherently a human-centered practice. To the extent that ecologists propose definitions of restoration, the social component must be highlighted as a key operational component of the definition.

Even if we want to erase our hand from processes that are meant to be “natural,” a failure to acknowledge humans and their governance systems as social agents is counter-productive to furthering the self-sustaining goals of restoration. Few areas are free of human interventions; deep-sea bed mining is coming closer to an economic reality and the Sahara desert may someday sport solar arrays connected to global power-grids. When we acknowledge that humans will be making the decisions about what to restore and how to restore it, then we can begin to understand that technology alone will not ensure effective ecological restoration. While it might be technically possible to achieve certain restoration outcomes through science and engineering, these results could be as easily reversed through partisan politics and self-interested governance. Restoration requires both technical experimentation and social commitment.

What is important is that restoration as a term expresses a socio-ecological process. In its work, the SER already identifies two types of landscapes: a natural landscape “that is self-organizing and self-maintaining” and a cultural landscape “that has developed under the joint [*504] influence of natural processes and human-imposed organization.”⁴⁵ What is needed to complete the SER definition is a recognition that the long-term success of ecological restoration depends on both socially constructed ideas of large landscape and socially constructed tools of governance.

The need for ecological restoration must be embedded in a landscape that is at once both natural and cultural. We may think of certain nature reserves as natural landscapes, but in reality, they are simultaneously natural and cultural landscapes. Most “natural” spaces are part of larger political geographies criss-crossed by sometimes parallel and sometimes conflicting law and custom that continue to survive because of global, national, or community decision-

⁴² *Id.*

⁴³ SOCIETY FOR ECOLOGICAL RESTORATION INT’L SCI. & POLICY WORKING GRP, SER PRIMER ON ECOLOGICAL RESTORATION § 2 (Oct. 2004), available at normval="http://www.ser.org/resources/resources-detail-view/ser-international-primer-on-ecological-restoration"><http://www.ser.org/resources/resources-detail-view/ser-international-primer-on-ecological-restoration>.

⁴⁴ *Id.* § 3.

⁴⁵ *Id.* § 4.

making. While a project of returning a single meadow to a level of ecological function is important as a step in the process of environmental restoration, these projects will ultimately fail to address the larger landscape concerns of connectivity unless they are connected systematically and deliberately across artificial and political boundaries.⁴⁶ Not requiring a larger degree of connectivity among restoration efforts means that an isolated restoration project is just a temporary success in a losing venture.

The current approach to restoration consists of too many small successes with no strategy for linking these successes into a larger self-reproducing governance approach. The following section explains why existing restoration approaches are too fragmented or too focused on commodification to succeed as strategies for meeting the challenges of the Anthropocene epoch. As Part III will argue, governments need to reassess our current governance schemes of large landscapes and seek extensive public investment immediately in sustaining ecological functions at landscape levels that are large enough to be ecologically meaningful.

B. Restoration and Domestic Law and Practice: The Three Spirits of Environmental Restoration

In Charles Dickens' classic *A Christmas Carol*,⁴⁷ the protagonist, Ebenezer Scrooge, is visited by the Ghost of Christmas Past, the Ghost of Christmas Present, and the silent Ghost of Christmas Yet to Come. While Dickens' book was about the foibles of human nature and not about nature per se, his metaphor of temporal ghosts provides a useful lens for thinking about contemporary restoration practices. While this article's primary [*505] objective is to highlight the need for identifying socio-ecologically large places across the globe and facilitating governance for ecoscale-level restoration, this section focuses on the existing law and policy practices associated with restoration.

With a nod to Dickens' famous spirits, the first sub-section describes the spirit of "restoration past" as one approach to restoration that is committed to bringing back extant species through revegetation, reintroduction of historical species, and other creative proposals to recreate historical ranges. The second sub-section examines the spirit of "restoration present" as the summation of practices of mainstreaming restoration as a practical component of environmental site planning and environmental damage compensation by providing either on-site or off-site remediation for harm to a site. The third sub-section describing the spirit of "restoration yet to come" explores a concept of restoration that has not yet been fully implemented but is frequently invoked in public discourse. It refers to the prioritization of restoration for "ecosystem services" including various largely human-centered provisioning, supporting, regulating, and cultural services. The challenge that will be discussed with this last vision of restoration is whether it is sufficient to adopt an ecosystem service approach to restoration when it focuses only on meeting human needs. Or in pursuing this approach, do we end up commoditizing restoration and losing ecological values that are not fungible?

1. Restoration Past: Restoration as Historical Reconstruction

One of the assumptions about restoration is that restorers of ecosystems must be able to locate in time characteristics of the place they intend to revive. After all, restoration is intended to be a reflexive process that brings us back to a "better" state than the one we are currently residing within. For some restorers, this means bringing the landscape back to a mythical point that no longer exists but must be imaginatively reconstructed. Restoration ecologist Eric Higgs recognized the futility of true historic restoration when he wrote "[t]here is no original condition for an ecosystem in any meaningful sense; one cannot fix a specific point in time."⁴⁸

In spite of historical restoration being a practical exercise in imagining the way things might have been, there are government funded projects underway to revive certain lost historical aspects of ecosystems in order to support the contemporary cultural activities of indigenous groups. For example, in the United States, National Park Service managers in a burst of [*506] reparative gardening⁴⁹ are reviving indigenous landscapes with the rebuilding of Native Hawaiian fish ponds that had eroded and trimming of brush engulfing pinyon pines in Death Valley.⁵⁰ These projects tend to be small and isolated.

⁴⁶ See *infra* 48-49 (stating that restoration projects are unsuccessful unless such projects comprehensively incorporate involvement from both private and government entities).

⁴⁷ CHARLES DICKENS, *A CHRISTMAS CAROL (AND OTHER CHRISTMAS BOOKS)* (Robert Douglas-Fairhurst ed., Oxford University Press 2006) (1843).

⁴⁸ ERIC HIGGS, *NATURE BY DESIGN* 38 (2003).

⁴⁹ MARCUS HALL, *EARTH REPAIR: A TRANSATLANTIC HISTORY OF ENVIRONMENTAL RESTORATION* 212-16 (2005).

⁵⁰ Dave Egan & M. Kat Anderson, *Special Issue: Native American Land Management Practices in National Parks*, 21 *ECO-*

The reintroduction of species that no longer occupy their larger historical range is far more controversial among communities than cultural landscape restoration. A number of species have been reintroduced into areas where they were once resident including condors in the United States, rhinoceroses in Nepal,⁵¹ and Arabian oryx in Oman and Jordan.⁵² In 1999, the World Conservation Union published guidelines on species reintroduction and observed that care must be taken where animals are introduced, and to the extent that the reintroduced animals are too dangerous "removal or destruction of the released individual should be considered."⁵³ The reintroduction of large predators has, in particular, generated a fury of public outcry. For example, reintroducing the grey wolf in Idaho⁵⁴ has pitted national environmental groups against local communities, some of whom view the restoration efforts as threats to their ranching livelihoods. The visceral reactions elicited among these groups indicates a continuing disconnect between ecological needs of keystone species and social governance systems.⁵⁵

Even though attempting to resurrect environmental conditions from a bygone time remains an exercise in restoration fiction, there are a number of private programs that are pursuing radical rewilding by introducing species that have been extinct from a range for a long period of time in hopes of restoring historic ranges and possible historic landscapes. For example, the Rewilding Institute has been reintroducing Bolson tortoises onto private ranches in the American Southwest. Once found in New Mexico, this animal's only native range today is in a small portion of the Chihuahuan desert. In addition to these more pragmatic ideas of extending species range, the Rewilding Institute has also entertained the idea of [*507] Pleistocene Megafauna Rewilding with the provocative proposal to introduce elephants, lions, and tigers on the North American continent in hopes of creating new ranges for threatened animals by attempting to fill historic niches within the Northern American landscape once occupied by mastodons and saber-tooth tigers.⁵⁶

In the Netherlands, conservation groups are experimenting with a large historical landscape restoration project. The Oostvaardersplassen is a 6,000 hectare Dutch nature reserve where scientists have reintroduced ungulates to maintain open grasslands in order to create conditions for animals and plants that have largely disappeared under the impact of farming.⁵⁷ Conceived of as a "large, natural functioning area . . . where natural processes get the chance to evolve,"⁵⁸ the Oostvaardersplassen is controversial as a restoration project because it has allowed for natural processes such as malnutrition to claim large numbers of introduced species. The sustainability of the project is open to some question given that the project operates entirely within fenced in parameters.

Notably, these more ambitious historical restoration projects take humans out of the "rewilded" landscape. As these projects are being conceived, humans are not part of the ecological system that these projects attempt to revive, but instead merely ghosts in the machine. The Glen Affric National Nature Reserve in Scotland with its Caledonian pinewoods also demonstrates why this approach of writing humans out of the landscapes may be problematic in practice. Research by paleo-ecologists indicates that Scotland was originally a habitat for open deciduous woods like birch, alder, and willow interspersed with grasslands rather than the now iconic Scottish highlands mix of pinelands and heather.⁵⁹ However, civil society groups today are not engaged in restoring mixed woods but rather in pursuing a 600 square mile woodland restoration area that will restore pinewoods as one of the baseline species in order to

LOGICAL RESTORATION 246 (2003).

⁵¹ Esmond B. Martin & Lucy Vigne, *Nepal's Rhinos--One of the Greatest Conservation Success Stories*, 21 PACHYDERM 10, 10, 25 (1996), available at normval="http://african-elephant.org/pachy/pdfs/pachy20.pdf#page=13"><http://african-elephant.org/pachy/pdfs/pachy20.pdf#page=13>.

⁵² Jessica Hume, *The Arabian Oryx Returns to Jordan*, THE NAT'L (Jul. 31, 2009), normval="http://www.thenational.ae/news/uae-news/the-arabian-oryx-returns-to-jordan"><http://www.thenational.ae/news/uae-news/the-arabian-oryx-returns-to-jordan>.

⁵³ INT'L UNION FOR CONSERVATION OF NATURE AND NATURAL RES., IUCN GUIDELINES FOR RE-INTRODUCTIONS 5, 9 (1998), available at normval="http://www.iucnsscrg.org/download/English.pdf"><http://www.iucnsscrg.org/download/English.pdf>.

⁵⁴ *Wolf Management/Status Timeline*, IDAHO DEP'T OF FISH & GAME (Mar. 31, 2013), normval="http://fishandgame.idaho.gov/public/wildlife/wolves/?getPage=161"><http://fishandgame.idaho.gov/public/wildlife/wolves/?getPage=161>.

⁵⁵ Some of the socio-ecological disconnects implicit in the program were addressed by payments administered by environmental non-profits to impacted stock owners.

⁵⁶ C. Josh Donlan et. al., *Pleistocene Rewilding: An Optimistic Agenda for Twenty-First Century Conservation*, 168 AM. NATURALIST 660-81 (2006).

⁵⁷ Frans Vera, *Large Scale Nature Development*, 20 BRITISH WILDLIFE 28, 34 (2009).

⁵⁸ *Id.* at 36.

⁵⁹ Althea Davies, *Paleoecology, Management, and Restoration in the Scottish Highlands*, in RESTORATION AND HISTORY:

provide for a pinelands landscape.⁶⁰ If the project is to be historically accurate, should the Scottish people be expected to remove the familiar heather and the pine stands in order to return to an earlier habitat, or is it sufficient to seek to conserve what a community believes represents a culturally relevant [*508] baseline? In other words, whose timeline matters? Even if one could technically achieve historical restoration objectives, are these projects desirable given that adjacent ecological communities of species may have changed sufficiently so that any historic restoration project would be a lone incompatible island in a sea of change? Maintaining the product of historic restoration projects might require constant inputs of labor and resources because times have changed and will keep on changing.⁶¹

Given that these projects depend on human intervention and potentially on a relinquishment of human physical safety in the case of a true Pleistocene Megafauna Rewilding, this form of domestic restoration peddles a romantic vision of a pre-human universe. While there are few practitioners of truly "historical" restoration, this "resurrection" aspect of domestic restoration has some appeal with some scientists as a goal. For example, Ryan Phelan and Stewart Brand, in their "Revive and Restore" project, are to use genomic editing to bring back extinct species such as the Passenger Pigeon.⁶² There is, however, little legal support for these projects. While there are requirements to conserve and preserve species that are on the brink of extinction, there are as yet no legal requirements to restore species that have gone extinct. The lack of broader social support for these sorts of projects might not necessarily come from the technological innovation inherent in some of these proposed projects, but might also be the product of a lack of interest. The species that we have already lost are not part of our lived experiences with the landscape.

Restoration as historical reconstruction will remain a marginal enterprise outside of most legal frameworks. While historical restoration may be accepted in limited situations to address cultural needs of certain groups or as a technical challenge for science, the practice is unlikely to gain broad public traction as a viable restoration strategy. It is both literally and figuratively "restoration past."

[*509] 2. Restoration Present: Restoration as Remediation, Restitution and Project Mitigation

Restoration is a relatively well-accepted idea for post-project mitigation that is required in response to either an environmental impact analysis or a court restoration order. Private entities that benefit from damaging the environment are expected to either replace environmental values on site or to offset damages through investment in offsite habitats. In addition to project-by-project mitigation to restore damaged ecological values, there are a number of both privately administered and state-led restoration efforts motivated by legal remediation requirements under remediation laws or court orders.

a. Remediation Laws

Remediation is not the same as restoration, but in community discourse, the idea of returning some ecological value to a site by cleaning or removing contaminated soil may have become synonymous with site restoration since the site may once again be "useable" particularly for human development (e.g. recovery of brownfields). Public entities are expected to oversee site specific mitigation through local or national regulatory agencies. Public entities must also undertake mitigation where it is difficult to ascertain what parties can be held liable for damage such as the

THE SEARCH FOR A USABLE ENVIRONMENTAL PAST (Marcus Hall ed., 2010).

⁶⁰ See David Reid, *The Agreement Between Forestry Enterprise and Trees for Life on Work in the Glen Affric Caledonian Forest Reserve*, CALEDONIA CTR. FOR SOC. DEV., normval="http://www.caledonia.org.uk/socialland/affric.htm"><http://www.caledonia.org.uk/socialland/affric.htm> (last visited Mar. 25, 2013) (observing that the NGO is also interested in reintroducing absent species such as the lynx, the bear and the wolf).

⁶¹ See, e.g., Richard Hobbs, Eric Higgs & James Harris, *Novel Ecosystems: Implications for Conservation and Restoration*, 24 TRENDS IN ECOLOGY AND EVOLUTION 599-601 (2009) (displaying analyses of the distribution of human impact across terrestrial ecosystems of the earth; showing types of ecosystem that develop under varying levels of biotic and abiotic alteration).

⁶² See Stewart Brand, *The Dawn of De-Extinction: Are You Ready?*, THE LONG NOW FOUND., normval="http://longnow.org/revive"><http://longnow.org/revive> (last visited Mar. 25, 2013); see also Brockman, *supra* note 2 ("If you could actually bring back anything, would you bring back the California grizzly bear? A species that could eat people? Well, we recently were at the California Academy of Sciences, up front and personal with "Monarch," the last California grizzly, a beautiful specimen there, and we were joking, and not really joking, saying, 'Well, what if you could genome edit the California grizzly so that it didn't like the taste of people?' That would be kind of interesting! Big megafauna, good for the land, but take the fear of it out for people. The truth is all of this could someday be possible.").

"legacy pollutants" left over by the use of mercury to extract gold in California.⁶³ Many of the national laws that reference restoration use the word "restoration" as a proxy for remediation. Unlike the use of the term "restoration" by ecologists to refer to a healing process for re-establishing an ecosystem that has been degraded, damaged, or destroyed, the term "remediation" is limited to removal of contamination and pollution.

In the United States, the government actively removes contamination from certain national priority list sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).⁶⁴ The U.S. Environmental Protection Agency (EPA) is authorized to remediate sites on private lands and seek contribution from private owners. Sums recovered as contribution are retained by the government but can only be used to "restore, replace, or acquire the equivalent of such natural resources."⁶⁵ While in principle CERCLA furthers mitigation for [*510] environmental values, agencies may agree to resource replacements that are not equivalent in terms of system function.⁶⁶

A similar example of government legislation directed at cleanups of contaminated and damaged sites is found in Europe. The European Union Environmental Liability Directive of April 21, 2004, provides for government engagement in restoration activities like its transatlantic counterpart, CERCLA.⁶⁷ Where environmental damage has occurred, the competent authority in each Member State will undertake restorative measures and recover costs later if an operator that has caused the environmental damage fails to undertake adequate restorative measures.⁶⁸ For example, in Italy the Code of Environmental Law provides that environmental regulators will carry out remediation work where the polluter cannot be found or refuses to cooperate and the costs of remediation will become an encumbrance on the land.⁶⁹ The motivation behind implementing the Directive is to prevent ongoing damage to the environment and to remedy existing environmental damage in compliance with the European Union's shared environment policy.⁷⁰

The European Union's emphasis on remedial actions reflects a shared understanding of the need for states to restore damaged ecosystems both independently and across borders.⁷¹ In terms of what is expected as a baseline from the various states, the Directive provides in Annex II "a common framework" to describe restoration efforts for water, protected species, natural habitats, and land and, expects states to deliver a combination of primary and complementary remediation for these natural resources.⁷² Primary remediation "returns the damaged natural resources [*511] and/or impaired services to, or towards, baseline condition."⁷³ Complementary remediation includes additional measures that are taken when primary remediation fails to restore a site. These complementary measures are expected "to provide a similar level of natural resources and/or services, including, as appropriate, at an alternative site, as

⁶³ *San Francisco Bay Restoration Water Quality Improvement Fund*, ENVTL. PROT. AGENCY, normval="http://www.epa.gov/region9/funding/sfbay-water.html"><http://www.epa.gov/region9/funding/sfbay-water.html> (last visited Apr. 3, 2013).

⁶⁴ Comprehensive Environmental Response, Compensation, and Liability Act, [42 U.S.C. § 9605](#) (2012).

⁶⁵ *Id.* § 9607.

⁶⁶ In Idaho, as part of the cleanup of the mine ore and waste along a former railroad bed, the railroad bed has been converted to a paved Trail of the Coeur D'Alene bicycle path running through beautiful open countryside. While this provides new recreational resources for the area, the trail does not address the loss of natural resources associated with the railroad operations including the function of the historically uncontaminated lakes. Today, the lakes and fish have unhealthy levels of lead and other heavy metals that may never be remediated because of the costs entailed.

⁶⁷ Directive 2204/35/CE, of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with regard to the Prevention and Remedying of Environmental Damage 2004/35/EC, 2004 O.J. (L 143/56) [hereinafter EU Liability Directive].

⁶⁸ *Id.* art. 6.

⁶⁹ D.L. 3 Apr. 2006 Part IV, Article 253 Italian Code of Environmental Law.

⁷⁰ Consolidated Version of the Treaty on the European Union, art. 3 (3), Mar. 30, 2010, O.J. (C 83) 17 ("[T]he Union shall work for . . . a high level of protection and improvement of the quality of the environment.").

⁷¹ *Id.* at 28 (Article 21(2)(f) provides that in the field of international relations the Union shall "help develop international measures to preserve and improve the quality of the environment and the sustainable management of global natural resources"); *see also* EU Liability Directive, *supra* note 67, at art. 15 (1) ("Where environmental damage affects or is likely to affect several Member States, those Member States shall cooperate . . . with a view to ensuring that preventive action and, where necessary, remedial action is taken in respect of any such environmental damage.").

⁷² EU Liability Directive, *supra* note 67, at Annex II (1).

⁷³ *Id.* at Annex II (1)(a).

would have been provided if the damaged site had been returned to its baseline condition.”⁷⁴ Exceptions to full remediation are made depending on whether the risk to human health, water, protected species, and habitat is no longer significant and costs associated with the restoration are disproportionate to the level of ecosystem benefit.⁷⁵ Regarding standards for remediation, states are expected “to ensure, as a minimum, that the relevant contaminants are removed, controlled, contained or diminished so that the contaminated land, taking account of its current use or approved future use at the time of the damage, no longer poses any significant risk of adversely affecting human health.”⁷⁶

What is similar in both the US and the European remediation laws is a focus on mitigation for a selection of ecosystem services by creating case-by-case cleanup plans based on liability or threats of liability. In execution, both systems are structured to reduce imminent threats particularly to human health but not necessarily for long-term recovery against threats to ecosystem functions. What is largely achieved in these types of remediation projects is a reduction of the toxicity of the landscape. Notably, neither law focuses on creating lasting or large-scale environmental conservation because both laws are liability laws focused primarily on reducing impacts to human health (with some consideration in the EU directive to protected species), and secondarily on identifying culpable parties. Any legal obligation to create ecologically self-sustaining lands is tangential to the object and purpose of the statutory schemes.

The potential world of “restoration present” based on remediation measures shares with the “restoration past” strategy some of the same gaps between social factors and environmental factors. In “restoration past,” environmental factors eclipsed social factors such that many of the futuristic visions based on flashbacks to the past have no credibility in the current governance system. Here, “restoration present” emphasizes immediate social factors at the potential expense of systemic environmental losses. While remediation is an essential tool for government agents to demand compensation from industries and individuals who have intentionally or accidentally damaged the environment, it is an isolated [*512] strategy that fails to acknowledge that ecological restoration efforts cannot be limited to remediation requirements. There are many uncontaminated regions where fragile ecosystem functions are threatened by ongoing processes that do not need permits, yet there is no legal requirement for mitigation of impacts of legal activities on private lands such as farming and clearcut timber removal that threaten landscape connectivity.

b. Remediation and Restoration Orders

In addition to the national and regional restoration laws that largely promote remediation or mitigation efforts in case of threatened damage, there are also court orders that require remediation and restoration efforts by parties that have already damaged the environment. For example, in Argentina, the Supreme Court in *Mendoza v. State of Argentina*⁷⁷ ruled that the federal government, the city of Buenos Aires, and the province of Buenos Aires had violated a constitutional right to the enjoyment of a healthy environment by failing to maintain the health of the Riachuelo River in Buenos Aires, and had an obligation to restore the environment. The federal, provincial, and local governments were then assigned to clean up the river and create an emergency health plan.⁷⁸

As another illustration of mitigation, the United Kingdom Environment Agency has established an indirect adjudicatory model for requiring restoration activities by regulated entities. Under the Regulatory Enforcement and Sanctions Act 2008, the Environment Agency is empowered since January 4, 2011 to issue civil sanctions instead of pursuing criminal sanctions for violations of environmental law.⁷⁹ Among the civil sanctions that are available to the agency in redressing environmental damage is the issuance of restoration notices where a recipient is requested within a set period of time to take steps to restore the harm they have caused. The Agency is also empowered to enter into “Enforcement Undertakings,” where a party that has caused environmental harm may make an offer to the Agency

⁷⁴ *Id.* at Annex II (1.1.2).

⁷⁵ *Id.* at Annex II (1.3.3).

⁷⁶ *Id.* at Annex II (2).

⁷⁷ *Mendoza v. Estado Nacional*, (2006) J.T.S. 1569 (Spain), available at normval="http://www.equidad.scjn.gob.mx/IMG/pdf/Fallo_Mendoza_Beatriz.pdf">http://www.equidad.scjn.gob.mx/IMG/pdf/Fallo_Mendoza_Beatriz.pdf.

⁷⁸ *Id.*

⁷⁹ See United Kingdom Regulatory Enforcement and Sanctions Act, 2008, c. 13, § 37(1), sch. 5 (Eng.), available at normval="http://www.legislation.gov.uk/ukpga/2008/13/pdfs/ukpga_20080013_en.pdf">http://www.legislation.gov.uk/ukpga/2008/13/pdfs/ukpga_20080013_en.pdf (noting that the Environment Agency is one of the designated regulators that may issue civil sanctions).

that will commit the environmental offender to restoring the environment to the condition that would have existed before the offense or ensuring an equivalent benefit elsewhere if restoration is not possible.

Restoration orders are a common legal remedy for courts faced with ecological damage. For example, in Chile, parties that cause environmental [*513] damage may be required, under Law No. 19,300,⁸⁰ to restore the environment by undertaking a restoration action. A number of African States also provide for restoration orders. Likewise, in Uganda, the National Environmental Management Authority (NEMA) may issue an environmental restoration order to require a party "to restore the environment as near as it may be to the state in which it was before the taking of the action which is the subject of the order" and to recover costs of actions necessary to restore the environment. Parties have 21 days to respond.⁸¹ The Ugandan Constitutional Court recently found NEMA's issuance of a restoration order requiring the removal of a private home from wetlands to be within the constitutional powers of the agency.⁸² In Kenya, the National Environment Management Authority has the power under the Environmental Management and Coordination Act to issue restoration orders.⁸³ Such orders have been issued. For instance, in an oil spill that led to a fire, the Kenyan authority issued a restoration order to rehabilitate flora and fauna along the river as well as the contaminated soil.⁸⁴

c. Restoration Efforts as Project Mitigation

Just as remediation efforts can be problematic because they involve only a limited number of ecological restoration parameters, allowing for mitigation as a standard restoration strategy for projects that have yet to be constructed can be problematic. While mitigation ratios will vary depending on the project and the jurisdiction, a developer will be expected to replace at least one acre of development with one acre of mitigation or some larger proportion of mitigated lands (2:1 and 3:1 mitigation is common). Unfortunately, there is no possibility at the start of most projects to know whether the mitigation site will be adequate to address the loss of ecosystem structures and functions from the project site. For example, with wetland mitigation, many of the replacement wetlands provided to meet the mitigation requirements fail to sustain basic wetland functions.⁸⁵ Further, in [*514] undertaking restoration work, many highly qualified ecologists find themselves facing surprises. For example, in a project in San Diego to reconstruct marshland, the restoration team found itself planting species that did not grow as expected, attracting large numbers of undesirable insects, and growing algal mats that ended up attracting large quantities of birds that ended up trampling the plantings of other seedlings.⁸⁶ In retrospect the team realized that there were so many factors to be considered in the site-specific restoration, ranging from how isolated or connected the site was to the fluctuating salinity of the water to the controllability of invasive species from neighboring sites.⁸⁷

Restoration using a mitigation strategy faces the same problems of piecemealing as restoration using a remediation strategy. Both forms of "restoration present" are ex post responses to damage. Even in the case of environmental restoration projects that are conducted before a development project is begun, there is a quid pro quo attitude embedded in the restoration efforts. Unlike the proposal presented in Part III for ecoscapes, the "restoration present" approach is less concerned with protecting places at an appropriate socio-ecological scale than with delivering marketable prod-

⁸⁰ Law No. 19300, Marzo 9, 1994, Diario Oficial [D.O.] (Chile), amended by Law No. 20417, Enero 26, 2010, Diario Oficial [D.O.] (Chile) (Supp. 2010), available at normval="http://www.cochilco.cl/english/normativa/descarga/Law19.300_general_basesofthe_environment.pdf">http://www.cochilco.cl/english/normativa/descarga/Law19.300_general_basesofthe_environment.pdf.

⁸¹ The National Environmental Statute, Part IX, §§ 68-70, Uganda (1995).

⁸² Amooti Godfrey Nyakana v. NEMA, Constitutional Petition No.03/05, High Court of Uganda (Nov. 29, 2009), available at normval="http://www.elaw.org/system/files/Constitutional+Petition.pdf"><http://www.elaw.org/system/files/Constitutional+Petition.pdf>.

⁸³ Environmental Management and Coordination Act, (1999) Cap. No. 8 § 108(1) (Kenya).

⁸⁴ Bernard Momanyi, *Sinai: NEMA Puts Pipeline on the Spot*, CAPITAL FM NEWS (Sept. 15, 2011), normval="http://www.capitalfm.co.ke/news/2011/09/sinai-nema-puts-pipeline-on-the-spot"><http://www.capitalfm.co.ke/news/2011/09/sinai-nema-puts-pipeline-on-the-spot>.

⁸⁵ Martine Maron et al., *Faustian Bargains? Restoration Realities in the Context of Biodiversity Offset Policies*, 155 BIOLOGICAL CONSERVATION 141, 143 (2012) (observing that replacement of wetland acreage may not deliver ecosystem restoration benefits such as a replacement of wetland soils or ecosystem functions such as nutrient cycling because of the complexity of mitigating for whole-ecosystems).

⁸⁶ Joy B. Zedler, *Introduction*, in 1 HANDBOOK FOR RESTORING TIDAL WETLANDS 7 (Joy B. Zedler ed., 2001).

⁸⁷ *Id.* at 11.

ucts. Hence, in response to mitigation demands, we end up with the current phenomena of mitigation banks where either land of high ecological value is set aside in perpetuity or, in a few instances, low value land is restored to high ecological value.⁸⁸ In principle this seems desirable, except that existing mitigation banks are geographically small, may not deliver adequate ecological values, and many have limited resources to maintain ecological values in perpetuity.⁸⁹ There have been small successes but an overall failure to restore ecological systems in the face of the Anthropocene.

3. Restoration Yet to Come: Restoration as the Delivery of Ecosystem Services and Markets

In 1996, the Ecological Society of America observed that defining an ecosystem is challenging because it can scientifically refer to numerous locales, beyond what might be environmentally meaningful from a protection perspective. The authors noted that, "a dung pile or whale [*515] carcass are ecosystems as much as a watershed or lake."⁹⁰ Because this was true, policymakers understood that they needed to be more specific about what they wanted society to invest in regarding resource protection. Sometime in the late 1990s, they struck upon the idea of "ecosystem services."

Paul and Anne Ehrlich made the point that ecosystem functions have inherent value for humans and, in 1981, coined the term "ecosystem services" to urge policymakers to protect whole ecosystems as units that are greater than the sum of the various non-integrated individual parts. Their idea, however, became commoditized when the spotlight shifted from "ecosystem services," providing an ecological perspective on human needs, to the term providing a quantifiable economic perspective on ecological "goods and services."⁹¹ What can be quantified can theoretically generate markets. Identifying restoration as a component of a market system of tradable goods and services has a potential to be profitable.

Restoration of ecosystem services involves intentional efforts to return an ecosystem through total restoration, rehabilitation, remediation, or reclamation to some condition where the ecosystem is capable of delivering ecosystem services that are equivalent to the services delivered before the ecosystem became degraded. Services that might be "restored" include ecosystem-based flood control, clean water, pollination, food production, refuge for diverse plant and animal species, and recreational services.⁹²

The idea of ecosystem services has gained strong traction in the last decade with proponents arguing for restoration efforts as financially wise investments for society⁹³ and legally sound bases for legal reform.⁹⁴ The idea of ecosystem services has definitely motivated recent government actions and laws. For example, Southeast Asian governments have been investing in long-term coastal ecosystem restoration projects in response to ongoing sea level rise and disasters such as cyclones and tsunamis. In [*516] Bangladesh, the government has been sponsoring since 1961 an ongoing mangrove reforestation and afforestation program along the coastal plain to ensure a number of ecosystem services including protecting its population from natural catastrophes, conserving newly accreted lands, pro-

⁸⁸ Ralph G Stahl Jr. et al., *Prospective Environmental Restoration/Restoration Up Front: A Concept for an Incentive-Based Program to Increase Restoration Planning and Implementation in the United States*, 4 INTEGRATED ENVTL. ASSESSMENT AND MGMT. 6, 6-11, 13 (2007).

⁸⁹ *Id.* at 13 (stating that the oversight required for wetland mitigation may only be five years even though wetlands may take decades to be established).

⁹⁰ Norman L. Christensen et al., *The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management*, 6 ECOLOGICAL APPLICATIONS 665, 670 (1996).

⁹¹ Robert Costanza et al., *The Value of the World's Ecosystem Services and Natural Capital*, 387 NATURE 253, 253-254 (1996).

⁹² *Id.* at 254.

⁹³ See, e.g., NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS (Gretchen C. Dailey ed., 1997); James Salzman et al., *Protecting Ecosystem Services: Science, Economics, and Law*, 20 STAN. ENVTL. L.J. 309, 309-10 (2001) (emphasizing that maintenance of natural ecosystems and the services they provide should be a top priority of the Environmental Protection Agency); Barton H. Thompson, Jr., *Ecosystem Services & Natural Capital: Reconceiving Environmental Management*, 17 N.Y.U. ENVTL. L.J. 460, 460-64 (2008) (insisting that ecosystem services are of extreme importance to environmental researchers and policy makers because of the valuable services they provide).

⁹⁴ See, e.g., J.B. Ruhl, *Ecosystem Service and the Common Law of "The Fragile Land System,"* 20 NAT. RESOURCES & ENV'T 3 (2005) (suggesting that the concept of ecosystem services could spur a sort of common-law revolution for environmental cases).

ducing wood, and preserving estuary ecosystems.⁹⁵ After the 2004 tsunami, the Indonesian government embarked on a program to reforest 600,000 hectares of depleted mangroves.⁹⁶ Similar government financed programs are operational in Thailand.⁹⁷

Restoration as a conservation strategy is offered as an antidote to ongoing economic harms. In the U.S., laws like the Elwha River Ecosystem and Fisheries Act,⁹⁸ Federal Aid in Wildlife Restoration Act,⁹⁹ Klamath River Basin Fishery Resources Restoration Act,¹⁰⁰ New England Fishery Resources Restoration Act,¹⁰¹ and the Trinity River Basin Fish and Wildlife Restoration Act¹⁰² all provide for restorative activity targeted at provisioning ecosystem services associated with human interests in fish and game.

The concept of "ecosystem services" has received international acceptance with the creation of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).¹⁰³ Formulated on the same idea as the Intergovernmental Panel on Climate Change and drawing explicitly on the Economics of Ecosystems and Biodiversity work [*517] chaired by primarily economists, the IPBES is designed to assist government policymakers in understanding the latest biological and ecological science to assist with ecosystem valuation. Governments and intergovernmental organizations will have the opportunity to request scientific analysis by IPBES on issues involving "biodiversity" and/or "ecosystem services." By including "ecosystem services" within its research agenda, the IPBES efforts seem to be focused largely on human needs and market mechanisms.¹⁰⁴ It is curious that the research arm is not simply focused more generically on "ecosystem" research, which would encompass a greater number of ecosystem research perspectives. It is possible that the organizers of the platform conceived of "biodiversity" as a counterpoint to "ecosystem services" with biodiversity focused on non-human species. In any case, "ecosystem services" has global policy approbation.

Yet a world motivated by the development of "Green Infrastructure" may be a future of unintended consequences. There are a number of problems inherent in the concept of ecosystem services as motivating markets. First, as Palmer and Filoso observe, restoration is still a developing practice and as such there is a danger that the so-called restored ecosystem services do not accurately reflect the losses of ecosystem services already experienced within the sys-

⁹⁵ Mohammed Kamal Hossain et al., *Forest Restoration and Rehabilitation in Bangladesh*, in 3 KEEPING ASIA GREEN 21, 36 (Don Koo Lee ed., 2008), available at normval="http://www.iufro.org/science/special/spdc/actpro/keep/ws20-iii"><http://www.iufro.org/science/special/spdc/actpro/keep/ws20-iii>.

⁹⁶ *Indonesia Plans to Reforest 3 Million Hectares of Land*, RELIEFWEB (Mar. 4, 2003), normval="http://reliefweb.int/report/indonesia/indonesia-plans-reforest-three-million-hectares-land"><http://reliefweb.int/report/indonesia/indonesia-plans-reforest-three-million-hectares-land>.

⁹⁷ Ampai Harakunarak & Sanit Aksornkoe, *Life-Saving Belts: Post Tsunami Reassessment of Mangrove Ecosystem Values and Management in Thailand*, TROPICAL COASTS, July 2005, at 48, 52.

⁹⁸ Elwha River Ecosystem and Fisheries Restoration Act, Pub. L. No. 102-495, 106 Stat. 3173 (1992) (authorizing the Secretary of the Interior to acquire and remove two dams on the river in order to restore the ecosystem and anadromous fisheries).

⁹⁹ North American Wetlands Conservation Act, Pub. L. 101-233, 103 Stat. 1968, 1974-75 (1989) (using interest collected from certain taxes to fund North American Wetlands Conservation Act until fiscal year 2005 and then a wildlife restoration fund).

¹⁰⁰ Act of Oct. 4, 1986, Pub. L. No. 99-552, 100 Stat. 3080 (1986) (establishing implementing a twenty-year program to restore and maintain levels of anadromous fish populations within the Klamath River).

¹⁰¹ An Act of Nov. 16, 1990, Pub. L. No. 101-593, § 111, 100 Stat. 2954 (1990) (requiring implementation of restoration plans for Atlantic salmon).

¹⁰² Act of Oct. 24, 1984, Pub. L. No. 98-541, 98 Stat. 2721 (1990), amended by Trinity River Basin Fish and Wildlife Management Reauthorization Act of 1995, Pub. L. No. 104-143, 110 Stat. 1338 (1996) (requiring an implementation of a restoration program for fish and wildlife to levels existing before the construction of a dam).

¹⁰³ United Nations Env't Programme, *Report of the Second Session of the Plenary Meeting to Determine Modalities and Institutional Arrangements for an Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, 6, IPBES.MI/2/9 (May 18, 2012) [herein after *Report of the Second Session*], available at normval="http://www.ipbes.net/plenary/24-ipbes/ipbes-meetings/previous-meetings/274-panama-trial-2.html"><http://www.ipbes.net/plenary/24-ipbes/ipbes-meetings/previous-meetings/274-panama-trial-2.html>.

¹⁰⁴ *Report of the Second Session*, supra note 103, at 16 ("Ecosystem services" for the purpose of the Platform are defined as "the benefits that people obtain from ecosystems.").

tem.¹⁰⁵ Second, as Peterson and others have pointed out, the neoliberal market logic of ecosystem services cannot fully protect ecosystem functions because there are no existing markets for certain key functions such as restoration of self-sustaining soil fertility.¹⁰⁶ Soil fertility today is sustained instead by annual mechanical inputs of various mass-produced chemicals.

Third, there can be no single market goal for restoration because ecosystems are continually in transition depending on numerous synergistic or competitive ecological and social factors. In practice, certain ecosystem values become prioritized when markets are set for certain ecosystem services. For example, when we create a monoculture plantation for carbon storage in response to a market for carbon sequestration, we end up with losses of other ecosystem values such as resilience of habitat. If we [*518] introduce species to serve one ecological niche, we may end up inadvertently impacting other species.¹⁰⁷ Ecosystem services as a concept is prone to over-simplification with vain attempts "to fit the complex nature of ecosystem functions into a mechanistic analytical framework used to handle the relatively simple nature of human-made commodities."¹⁰⁸

Even assuming that one could have more complex nested groups of ecosystem services and that we can create markets that reflect the complexities of a variety of ecosystem services; we are still faced with a system that will require constant social inputs. In many communities, the current model of restoration for ecosystem services relies on payments for ecosystem services, which in theory is straightforward. Experts define a specific ecosystem service and identify a monetary value for the service. Buyers compensate communities and individuals for maintaining or restoring a service. In concept it seems like a healthy incentive for good stewardship; in practice, it ends up with programs that are plagued by high transaction costs such as the Everglades Restoration project.¹⁰⁹

There is ample political will for ecosystem services perhaps because they segue nicely into existing market frameworks as well as social discourses on sustainable development and the "green economy."¹¹⁰ Restoration for ecosystem services has been heralded as a sensible policy approach for the Anthropocene and international research groups and multilateral agencies have put forward numerous successful examples.¹¹¹ Perhaps ecosystem services are considered the future for restoration because it is a model that our neoliberal economies understand. Yet there are reasons to be discontent with a commodity approach. There is the possibility that if we identify global markets in ecosystem services, some countries in search of investment opportunities and particularly vulnerable communities in those countries, may find themselves captive to the market. If, theoretically, palm oil plantations were to reduce their operations, would these areas be restored to lands that were familiar to Indonesians or [*519] Malaysians? Maybe. But, if there is a global market for carbon sequestration and participation in the market is a top priority for a state, then a plantation of invasive but high carbon absorption plants would seem to be as desirable as any other restored landscape if the state metric is based on the economic opportunity aspects of ecological restoration. A paradigm of restoration for the purpose of delivery of ecosystem services may be particularly destabilizing for conserv-

¹⁰⁵ Margaret Palmer & Solange Filoso, *Restoration of Ecosystem Services for Environmental Markets*, 325 SCIENCE 575 (July 31, 2009) ("[T]he flurry of interest in ecosystem markets . . . is obscuring the fact that restoration projects, particularly those in aquatic ecosystems, are not providing all the services of healthy ecosystems. Stream and river restoration projects are often based on reshaping a channel and adding wood or rocks, yet there are few documented cases in which this has resulted in improved water quality or biodiversity comparable to those in undisturbed streams.").

¹⁰⁶ Markus J. Peterson et al., *Obscuring Ecosystem Function with Application of the Ecosystem Services Concept*, 24 CONSERVATION BIOLOGY 113, 115 (2010), available at normval="http://trpeterlab.tamu.edu/media/2739/cb_obscurring_ecosystem.pdf">http://trpeterlab.tamu.edu/media/2739/cb_obscurring_ecosystem.pdf.

¹⁰⁷ Richard S. Fulford et al., *Evaluating Ecosystem Response to Oyster Restoration and Nutrient Load Reduction with a Multi-species Bioenergetics Model*, 20 ECOLOGICAL APPLICATIONS 915 (2010) (describing the introduction of oysters to handle eutrophication problems having unintended consequences on other aquatic species).

¹⁰⁸ Erik Gomez-Baggethun & Manuel Ruiz Perez, *Economic Valuation and the Commodification of Ecosystem Services*, PROGRESS IN PHYSICAL GEOGRAPHY 9 (2011) (observing that "[t]he attempt to compartmentalize ecosystem services as discrete unit, however, neglects the fact that ecosystem functions are inextricably linked to each other").

¹⁰⁹ James M. Bullock et al., *Restoration of Ecosystem Services and Biodiversity: Conflicts and Opportunities*, 26 TRENDS IN ECOLOGY AND EVOLUTION 541, 546 (2011).

¹¹⁰ UNITED NATIONS ENVIRONMENTAL PROGRAMME, TOWARDS A GREEN ECONOMY 36 (2011), available at normval="http://www.unep.org/greeneconomy/Portals/88/documents/ger/ger_final_dec_2011/Green%20EconomyReport_Final_Dec2011.pdf">http://www.unep.org/greeneconomy/Portals/88/documents/ger/ger_final_dec_2011/Green%20EconomyReport_Final_Dec2011.pdf (describing six major benefits of a green economy).

¹¹¹ *Id.* at 19.

ing biodiversity.¹¹²

Markets for single ecosystem services are no more robust for the local community that hosts them than markets for ecotourism. It was hoped that ecotourism would bring relief to isolated communities around the world, yet it has not fulfilled its promise for development. Poor communities cannot build their developmental futures on the whims of powerful communities of interest. Relying on the free market system to protect ecosystem services may be naïve since an ecosystem service assigned a monetary value today may be altered by new monetary values in the future. Referring to an effort to protect pollinators in Costa Rica to deliver a provisioning ecosystem service, Douglas McCauley makes some important observations in a commentary in *Nature* when he observes that:

A recent study found that native bees from two forest fragments adjacent to Finca Santa Fe yielded approximately US \$ 60,000 a year in pollination services to the coffee plants. . . . Shortly after the conclusion of the study, however, Finca Santa Fe, probably affected by one of the worst dips in coffee prices this century, cleared its coffee and planted pineapple instead. Pollinators are irrelevant to pineapple production. . . . [T]he monetary value of the pollinators in forest fragments around Finca Santa Fe dropped from \$ 60,000 per year to zero. . . .if there is a 'devaluation' of nature, as in the case of Finca Santa Fe, what are we to tell local stewards who have invested in our ideology, and how can we protect nature from liquidation.¹¹³

For most people, not every act is motivated by a monetary incentive. Some restoration acts are done out of a degree of selflessness and a pursuit of "feeling I am doing the right things" or "being a part of something [*520] profound."¹¹⁴ In fact, the continued development of Payments for Ecosystem Services (PES) based programs and markets may "crowd out" future environmental conservation behavior" as researchers have observed that socially valuable behavior is often motivated by moral concerns or civic duty and not by monetary rewards.¹¹⁵ With the three current faces of restoration, we have become obsessively target-oriented rather than process-oriented. We have focused on "ecosystems" to the exclusion of larger place-based systems of interaction between people and their environment. By focusing on piecemeal mitigation and restoring individual marketable ecosystem services independent of other ecosystem processes, we forget that we also have "place specific" attachments that might motivate us to protect and restore.¹¹⁶ Because of our attachment to place, there is a strong potential for individuals to become "a conservative force within the ecosystem" and for our laws to reflect new restorative relationships between people and their places.¹¹⁷ Honoring our connection to a place as the starting point for restoration is the subject of the final part.

III. ECOSCAPES: RESTORING SOCIO-ECOLOGICAL LANDSCAPES

The focus of this paper has been on restoration and how the practice of restoration has been incorporated into existing domestic legal practices. As will be argued below, we need a new approach to restoration which relies on identifying socio-ecological systems, understanding ourselves as part of these systems, and creating governance policies at the highest levels to restore functions and structures of these socio-ecological systems. To address this gap, the final portion of the paper introduces a new concept: the ecoscape. This idea is proposed both as an intellectual concept for better understanding socio-ecological relationships but also, and perhaps more importantly for setting conservation and restoration priorities in the Anthropocene.

The following subsections define the concept of an ecoscape, explore a number of promising precursors to ecoscapes, and then make a number of modest proposals about priorities for furthering ecoscape thinking. These sections also acknowledge that there are challenges to implementing a more holistic restoration framework in a timely fashion.

¹¹² Dale D. Goble, *What are Slugs Good For? Ecosystem Services and the Conservation of Biodiversity*, 22 J. OF LAND USE 411, 439 (2007) ("[E]cosystem services must be correlated to biodiversity so that marketing an ecosystem's services [necessarily] conserves that ecosystem's diversity. The evidence suggests two problems that make this correlation unlikely. The first is the differing spatial and temporal scales of services and biodiversity. The second is the utilitarianism embedded in the concept of services. The combination of the two make the necessary correlation between services and the full complement of diversity unlikely.").

¹¹³ Douglas J. McCauley, *Selling Out on Nature*, 443 NATURE 27, 27-28 (2006).

¹¹⁴ David Kidner, *Rewilding the Restorer*, in RESTORATION AND HISTORY: THE SEARCH FOR A USEABLE ENVIRONMENTAL PAST 253, 268 (Marcus Hall ed., 2010).

¹¹⁵ Nicolás Kosoy & Esteve Corbera, *Payments for Ecosystem Services as Commodity Fetishism*, 69 ECOLOGICAL ECON. 1228, 1233 (2010).

¹¹⁶ Kidner, *supra* note 114, at 266.

¹¹⁷ *Id.*

[*521] *A. Motivation Behind a New Restoration Strategy for Conservation: Thinking Beyond Existing Restoration Strategies*

What is needed more than ever is an approach to restoration that focuses not on the surface aspects of restoration but on system functions. As Gene Likens and F. Herbert Bormann wrote forty years ago: “[I]n the face of man’s exploding population and dwindling resource base, his very survival may depend on an accurate knowledge of ecosystem function, i.e. maintaining the continuous flow of energy and nutrients vital to the existence of ecological systems and life itself.”¹¹⁸ Given the intended and unintended damage to so many ecological systems through erosion, development, and industrialization, the only possibility for maintaining “the continuous flow of ecological systems” in our current situation of fragmented ecosystems may be restoration. But restoration at the level of isolated mitigation or ecosystem service projects is not enough to return “flow” at a meaningful scale.

What is needed is a cognitive shift by both decision-makers and other individuals to an ecologically based restoration that begins with the land and water as places that we inhabit and presumably value as something more than fungible commodities. For restoration to be effective as a long-term ecological conservation strategy, we need to recover natural processes to a condition where they might be capable of natural resilience.¹¹⁹ This is a tall order that requires premeditated thought about the complex interaction of natural processes, what ecological conditions may be necessary to ensure a greater degree of resilience within a system, and how much land is necessary for those processes.

As ecosystem goods and services have declined and threatened basic environmental processes such as pollination, there has been no systematic response in terms of land and water management practices to restore these goods and services as part of a larger place-based system. There has instead been an institutional focus on recovering ecosystem services on a service-by-service basis. Projects define themselves in terms of the ecosystem service that they seek to restore. For example, in the Catskill/Delaware Watershed of New York, the emphasis is on natural buffers for watershed protection.¹²⁰ In areas such as Australia, the emphasis has been placed on [*522] carbon sequestration through reforestation efforts.¹²¹ More than one service can of course be restored during a project but institutional metrics will be attuned understandably to those ecological goods and services that can be quantitatively measured and those goods and services that will bolster human economies and communities.¹²² Those goods and services that are less capable of monetization such as biodiversity may be jeopardized by legislative decisions regarding restoration priorities.¹²³

With ecosystem services as the emerging dominant approach towards restoration, we will collectively end up with a patchwork of commodity policies rather than a workable conservation policy that focuses on the whole system rather than selective parts of the system. Richard Norgaard, one of the founders of ecological economics, is troubled that ecosystem services has become in vogue among policymakers. He writes, “environmental governance can no more succeed around the metaphor of ecosystem services apart from the richness of ecological thinking than mortgage markets can succeed on the myth that housing prices will always rise Somehow, we need to make a significant transition toward richer ways of understanding and governing.”¹²⁴ We need policy that accepts complexity rather than reducing it to simplistic functions. Ecologists have been advocating that an organic system is always

¹¹⁸ Gene Likens & F. Herbert Bormann, *Nutrient Cycling in Ecosystems*, in *ECOSYSTEM STRUCTURE AND FUNCTION*, 25 (John A. Wiens ed., 1972).

¹¹⁹ RESILIENCE ALLIANCE, *ASSESSING RESILIENCE IN SOCIAL-ECOLOGICAL SYSTEMS: WORKBOOK FOR PRACTITIONERS* (2010), available at [normval="http://www.resilience.org">www.resilience.org](http://www.resilience.org) (describing the process of increasing the ability of the ecosystems ability to adapt to change).

¹²⁰ James Salzman, Barton Thompson & Gretchen Daily, *Protecting Ecosystem Services: Science, Economics, and Law*, 20 STAN. ENVTL. L.J. 309, 315 (2001).

¹²¹ Colin Hunt, *Economy and Ecology of Emerging Markets and Credits for Bio-Sequestered Carbon on Private Land in Tropical Australia*, 66 *ECOLOGICAL ECON.* 309, 309-311 (2008).

¹²² Peterson et al., *supra* note 106, at 114.

¹²³ *Id.*

¹²⁴ Richard Norgaard, *Ecosystem Services: From Eye-Opening Metaphor to Complexity Blinder*, *ECOLOGICAL ECON.*, 2009, at 7 (observing that emphasizing “stock-flow models,” which are important for understanding ecosystem service markets, “will likely lead to dominant ways of thinking in ecology that could substantially reduce scientific and public understanding of the true complexities of ecosystems that will lead to narrow management and future crises”).

more than a sum of its parts.¹²⁵ David Quammen uses a clever humanistic metaphor to comment on ecological integrity. He wisely suggests that one large carpet is a very different resource functionally than the same carpet cut into thirty-six smaller pieces.¹²⁶

While conservation groups are not trained in the magic of restoring eggs from eggshells, there are opportunities to create a discourse of restoration and law that maintains focus on the larger landscape. Humans and our institutions must be part of this endeavor. In his early conservation essays and the *Sand County Almanac*, Aldo Leopold underscored that environmental restrictions and regulations that leave out the human element may ultimately fail because humans are an intrinsic part of the environment. Leopold proposed a "land ethic" and emphasized that people must [*523] cooperate to repair damage as both an ecologically and philosophically ethical act.¹²⁷ Leopold also understood in his writings that not only do humans need the land but the land also needs us.¹²⁸ Sometimes what the land needs most from us is an end to interference with ecology and evolution and the opportunity for nature's processes to repair degraded lands. This is a difficult paradigm shift in light of our extraction-oriented economic and social systems. As a species, we rarely offer life-sustaining inputs into ecosystems. Yet we are capable of doing so if we are mindful in our relations with the land and this consciousness becomes reflected in our laws and policies.

Environmental historian Donald Worster persuasively argues that Leopold's idea of a "land ethic" must form the foundation of the field of restoration ecology.¹²⁹ While Worster used the term restoration ecology largely to refer to the burgeoning field of science-based restoration practice, there is also an urgent need for the land ethic to become the basis of how we are legalizing ecological restoration. If the "land ethic" is about valuing specific places to which we have intrinsic ties, restoration efforts must also be imagined as place-based efforts at a sufficiently large enough scale to be meaningful. People understand, value, and identify with places;¹³⁰ many do not understand the abstractions of ecosystems, ecosystem goods, or ecosystem services. If somehow, law can shift its focus from detached concepts of "ecosystem management" to prioritizing the socio-ecological bonds that real people have with their physical environment, then environmental restoration may be possible at a larger and more meaningful ecological scale. Furthering a "land ethic" is not simply a project for civil society or for individuals; it is also a project for governments.

Many of our codified laws focus on human needs such as maximum sustainable yield in the ocean's exclusive economic zones or reducing pollution loads in rivers. Those laws, which do not focus primarily on human needs such as the Endangered Species Act, have been the subject of political controversy because they have created in the minds of some individuals an "us" and "them" dichotomy.¹³¹ One potential strategy for bridging between anthropocentric and biocentric worldviews is for our [*524] governance systems to focus on restoring long-term self-sustaining ecosystem processes within a place-based context.¹³²

One means of normalizing this place-based restoration is to shift our focus from the fragmented, market-driven approach of restoration to an "ecoscape" approach. The following section defines how an "ecoscape" as a socio-ecological concept may provide a better linkage between human governance structures and the physical environment than the term current technocratic "ecosystem management" approach.

B. What is an Ecoscape?

¹²⁵ VITTORIO INGEGNOLI, *LANDSCAPE ECOLOGY: A WIDENING FOUNDATION* 18 (2002).

¹²⁶ DAVID QUAMMEN, *SONG OF THE DODO: ISLAND BIOGEOGRAPHY IN AN AGE OF EXTINCTIONS* 11 (1996).

¹²⁷ ALDO LEOPOLD, *A SAND COUNTY ALMANAC* 238 (Ballantine Books 1970).

¹²⁸ *Id.*

¹²⁹ DONALD WORSTER, *THE WEALTH OF NATURE: ENVIRONMENTAL HISTORY AND ECOLOGICAL IMAGINATION* 183 (1993).

¹³⁰ RICHARD BROOKS, ROSS JONES & ROSS VIRGINIA, *LAW AND ECOLOGY: THE RISE OF THE ECOSYSTEM REGIME* 383-85 (2002) ("*The history of the relationship of ecology and environmental law reveal that they are most likely to come together when the public culture is focused upon the value of place or species ... it is often the mixture of natural place and human culture which contributes to our valuing the place in question.*") (emphasis in original).

¹³¹ Jonathan H. Adler, *Anti-Conservation Incentives*, 30 REG. 54, 54-57 (2008), available at normval="http://www.cato.org/sites/cato.org/files/serials/files/regulation/2007/12/v30n4-6.pdf"><http://www.cato.org/sites/cato.org/files/serials/files/regulation/2007/12/v30n4-6.pdf>.

¹³² Examples of ecosystem processes include forest succession, soil development, predator-prey interactions, pollination/transport of seed, decomposition, species competition, and hydrological flow regimes.

In some ways, it is easier, at first, to define an ecoscape by what it is not. It is not a synonym for the physical environment, for a landscape, or for an ecosystem, though it draws on each of these concepts. An ecoscape refers instead to a socio-ecological concept that links human place-based governance priorities with large-scale ecological restoration concerns. The choice to introduce a new term is an attempt to connect the dialogue between large landscape research found in the scientific literature with the scope of human planning.

The term "eco" comes from the Greek word for "household" and is incorporated in part because it is also a prefix in both the word economy and ecology. Like the term "household," it can refer to both a place and a body of residents. The suffix "scape" derives from the Latin word for stem. Just as the stem connects the leaves with the roots, the suffix -scape denotes unity. So an ecoscape is a place intimately connected to a body of residents that is capable of ecological self-sustenance through governance at appropriate scales.

This concept of an ecoscape has been introduced in order to recognize that ecological governance requires deliberate human-initiated efforts to connect physical environmental places with the various groups of people making decisions about the given landscape or seascape including government officials, individual landowners, corporations, and civil society groups. Presently, as will be explored in the next subsection, most emerging ecoscape thinking is the product of scientists working with civil society groups who in turn work with individuals and government officials. As will be suggested in the following sections, government officials need to take a more active role in understanding the implications of an ecoscape for social and ecological planning since many potential ecoscapes will cross international and subnational political boundaries. It is in the political [*525] boundary regions where government involvement may be most effective in ensuring large-scale ecologically meaningful and socially acceptable restoration.

There have been some suggestions by some scholars for "ecosystem service districts" that would operate as institutions based on ecological units such as the watershed.¹³³ While such ideas are valuable in terms of enlarging the ecological jurisdictional units, these calls do not address the challenges of system-wide restoration. Adopting watersheds as the basis for reconfiguring land and water practices may ultimately end up prioritizing certain ecological geographies over others in order to ensure that ecological values associated with water are protected over other ecological values such as land fertility.

In contrast, an ecoscape concept provides the opportunity to think outside of existing jurisdictional patterns and instead create jurisdictional patterns that reflect the experience of creating larger socio-ecological landscapes that a variety of stakeholders are committed to restoring for both conservation and use. Scholars have been grappling with the need to create legal regimes that link people to places.¹³⁴ As long as we do not have enough information to understand the key connections within seemingly disconnected environmental systems and as long as conservation efforts fail to take into consideration political boundaries including boundaries between public and private lands, we will have a need for ecoscape thinking.¹³⁵ Ecoscape thinking shifts the fixation by government and private decision-makers over sometimes contentious jurisdiction and ownership to a potentially different legal framework based on the possibilities of protecting a sense of place.

Ecoscapes allow for the realization of ecosystem management at the landscape level. As several ecologists have observed, "without restoration at large spatial scales, the goal of protecting all species and ecosystems cannot be achieved."¹³⁶ The physical scale of ecoscapes is important for [*526] environmental protection because ecoscapes allow for the protection of genetic, species, and ecosystem heterogeneity.¹³⁷

While landscapes may be dynamically changing environments and novel ecosystems are emerging all of the time, the concept of ecoscape thinking provides a motivation for restoration because it focuses human attention, including

¹³³ Christopher L. Lant, J.B. Ruhl & Steven Kraft, *The Tragedy of Ecosystem Services*, 58 BIOSCIENCE 969-73 (2008).

¹³⁴ BROOKS, *supra* note 130, at 269 (describing nine elements of a place-based ecosystemic management regime including "an enabling law focusing upon the ecosystem and defining the objectives of its management" and "the establishment of a collaborative ecosystem governing process").

¹³⁵ BERTIE JOSEPHSON WEDELL, CONSERVING LIVING RESOURCES IN THE CONTEXT OF A CHANGING WORLD 317 (2002).

¹³⁶ Daniel Simberloff, *Regional and Continental Restoration*, in CONTINENTAL CONSERVATION: SCIENTIFIC FOUNDATIONS OF REGIONAL RESERVE NETWORKS 70 (Michael E. Soulé and John Terborgh eds., 1999).

¹³⁷ ALMO FARINA, LANDSCAPE ECOLOGY IN ACTION 89 (2000) ("[H]eterogeneity is more important for sustaining biodiversity [than previous models based on homogeneity of an area] heterogeneity is a property of the scale of landscapes.").

our system of laws, on our relationship with the larger environment and on our role in recovering rapidly disappearing places. Protecting a socio-ecological "place" makes sense in the human psyche. After all, we are creatures of habit and part of that habit is having a place that looks and feels like someplace that we belong to or want to belong to. So if we come from the Pacific Islands, or want to experience the Pacific Islands landscape and seascape, we might expect palm trees along beaches and viable coral reefs. This may not have always been the ecological history of these islands but a certain degree of tropical vegetation and reef life features strongly in the cultural expectations of people from these regions today. Ecoscape thinking might emerge where political communities react to a loss of culturally important environmental elements by either cooperating on restoration or demanding better governance over environmentally damaging behaviors.

The concept of protecting the environment as a social and political commitment is already understood by the international community as part of the UN Convention on World Heritage.¹³⁸ The World Heritage Convention provides for protection of cultural landscapes that reflect a relationship between people and their natural environment. In addition to Tongariro landscape in New Zealand, the first UNESCO designated cultural landscape combining both natural community sites with sites that are important to the Maori people,¹³⁹ there are eighty-five other national cultural properties as well as five transboundary properties.

Beginning in 1992, the World Heritage Committee revised its guidelines to include cultural landscapes based on a list of ten criteria.¹⁴⁰ Two of these criteria are specifically ecologically based.¹⁴¹ Criteria IX provides for the protection of "outstanding examples representing significant on-going ecological and biological processes in the evolution [*527] and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals."¹⁴² Criteria X provides for protecting landscapes that "contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation."¹⁴³ Of the approximately 91 cultural landscape projects registered with the World Heritage Committee, only three of the projects qualified on the criteria of protecting ecological processes and habitat conservation. In Gabon, the Ecosystem and Relict Cultural Landscape of Lopé-Okanda conserved the interface between dense and well-conserved tropical rainforest and relict savannah environments.¹⁴⁴ In the United Kingdom, St. Kilda has been designated as an ecological cultural landscape based on its large bird colonies and the presence of three marine zones that support both marine and terrestrial biodiversity.¹⁴⁵ In the United States, the Papahānaumokuākea Marine National Monument was designated to keep marine ecosystems and ecological processes intact by, for example, protecting large apex predators and restoring ecological processes on small islands and atolls within the monument.¹⁴⁶

Given the small number of projects being designated for international recognition, relying on the legalized recognition of a cultural landscape under the UNESCO Convention will not be sufficient for conserving most large-scale ecosystems. The motivation for most States to protect cultural landscapes is largely different from protecting a socially negotiated ecoscape. While a handful of global protected sites¹⁴⁷ including the United States' Papahānaumokuākea

¹³⁸ *The Criteria for Selection*, UNESCO.ORG, normval="http://whc.unesco.org/en/criteria"><http://whc.unesco.org/en/criteria> (last visited Apr. 3, 2013).

¹³⁹ *Tongariro National Park*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/421"><http://whc.unesco.org/en/list/421> (last visited Apr. 3, 2013) (79,596 hectares).

¹⁴⁰ *Criteria for Selection*, *supra* note 138; United Nations Educ., Scientific and Cultural Org., *Operational Guidelines for the Implementation of the World Heritage Convention*, ch. II, P 47, Annex III, WHC 08/01 (2008).

¹⁴¹ *Operational Guidelines*, *supra* note 140.

¹⁴² *Id.*

¹⁴³ *Id.*

¹⁴⁴ *Ecosystem and Relict Cultural Landscape of Lopé-Okanda*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/1147"><http://whc.unesco.org/en/list/1147> (last visited Apr. 3, 2013).

¹⁴⁵ *St. Kilda*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/387"><http://whc.unesco.org/en/list/387> (last visited Apr. 2, 2013).

¹⁴⁶ *Papahānaumokuākea*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/1326"><http://whc.unesco.org/en/list/1326> (last visited Apr. 3, 2013) (this is the World Heritage list's largest site with a 36,207,499 hectares designation).

¹⁴⁷ *The Causses and the Cévennes, Mediterranean Agro-Pastoral Cultural Landscape*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/1153"><http://whc.unesco.org/en/list/1153> (last visited Apr. 3, 2013) (noting that the site encompasses 302,319

marine protected area and some of the single [*528] island sites¹⁴⁸ might be considered an ecoscape given the emphasis on large-scale protection coupled with some environmental values, most of the ninety-one properties listed by UNESCO are focused only minimally on protecting ecosystem processes through restoration. Unless there is greater attention placed by states especially in a transboundary context to protecting landscapes that meet especially Criteria IX, then there will be little synergy between UNESCO cultural landscapes and ecoscapes. What is important about the UNESCO cultural landscape program is that it represents an international precedent for legalization of landscape protection and an emerging norm for government protection of large-scale landscape and seascape through soft governance tools.

Landscape ecologists concern themselves with organic systems where the whole is always more than a sum of the parts¹⁴⁹ and where certain premises of protection create sound planning rules: "bigger is better than smaller, connected is better than isolated."¹⁵⁰ The ecoscape becomes a physical form upon which and within which ecological connections are made possible between ecosystems, between differentiated populations, and between populations and ecosystems.¹⁵¹ Ecoscapes are both living systems and lived-in systems.

Ecoscapes dispel with the modern policy myths of a fixed subject for regulation. Unlike most contemporary political boundaries, ecoscapes are not fixed spaces. They depend on human interventions to define their boundaries and to identify subject ecosystems for restoration. As a result, ecoscapes can expand and shrink in order to respond to the level at which humans are willing to commit to restoring ecosystem functions. For example, an ecoscape might start as largely a watershed project, such as restoring sustainable populations of shellfish in the Chesapeake Bay, but might expand to include other stakeholders such as adjacent farmers with a concern for the sustainability of small scale farming or residents from neighboring cities who have some concern for the cleanliness of the Bay's tributaries and surrounding forestland and a willingness to invest in restoring certain ecological values.

[*529] C. Precursors to Ecoscapes

The idea of looking at landscapes as part of a system where the whole is greater than any assembly of the parts is not a new idea but has been well-developed by scientists and planners. As will be explained below in the first subsection, the idea that political boundaries do not align with ecological boundaries is also not new. What is new about the idea presented in this paper is the emphasis on (1) identifying shared socio-ecological spaces at the appropriate level in order to further long-term restoration objectives and (2) promoting high-level government action to harmonize transboundary decision-making concerning restoration. Before examining the potential role for governments in promoting ecoscape thinking, this paper reviews some government initiatives and a number of mostly civil society efforts to promote large landscape conservation across political boundaries.

1. Precursors to Ecoscape Concepts

This idea of designating large landscape and waterscapes for scientific work has already had some significant traction among both scientists and policymakers in countries such as the United States. Several scientists, including James Omernik of the U.S. Geological Services and Robert Bailey of the U.S. Forest Service have proposed the idea of

hectares, with a buffer zone of 312,425 hectares); *Ecosystem and Relict Cultural Landscape of Lopé-Okanda*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/1147"><http://whc.unesco.org/en/list/1147> (last visited Apr. 3, 2013) (491,291 hectares; buffer zone of 150,000 hectares); *Matobo Hills*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/306"><http://whc.unesco.org/en/list/306> (last visited Apr. 3, 2013) (205,000 hectares; buffer zone of 105,000 hectares); *Quebrada de Humahuaca*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/1116"><http://whc.unesco.org/en/list/1116> (last visited Apr. 3, 2013) (172,116 hectares; buffer zone of 369,649 hectares); *Richtersveld Cultural and Botanical Landscape*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/1265"><http://whc.unesco.org/en/list/1265>, (last visited Apr. 3, 2013) (160,000 hectares; buffer zone of 398,425 hectares); *Pyrenees--Mount Perdu*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/773"><http://whc.unesco.org/en/list/773> (last visited Apr. 3, 2013) (30, 639 hectares); *Upper Middle Rhine Valley*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/1066"><http://whc.unesco.org/en/list/1066> (last visited Apr. 3, 2013) (27,250 hectares; buffer zone of 34,680 hectares).

¹⁴⁸ *St. Kilda*, *supra* note 145; *Agricultural Landscape of Southern Öland*, UNESCO.ORG, normval="http://whc.unesco.org/en/list/968"><http://whc.unesco.org/en/list/968> (last visited Apr. 3, 2013).

¹⁴⁹ INGEGNOLI, *supra* note 125, at 18.

¹⁵⁰ Richards Hobbs, *Towards a Conceptual Framework for Restoration Ecology*, 4 RESTORATION ECOLOGY 93, 104 (1996).

¹⁵¹ Non-connectivity is also possible within an ecoscape and may be important to ensure the genetic resilience of a given species. This line of reasoning is called the theory of "metapopulations" in ecological theory and explores interactions between and isolation of certain populations. DAVID GREEN ET AL., COMPLEXITY IN LANDSCAPE ECOLOGY 87 (2006).

"ecoregions"¹⁵² which are large areas that include similar geology, physiography, vegetation, climate, soils, land use, wildlife, water quality, and hydrology.¹⁵³ Omernik has created maps for North America that include three levels of ecoregions.¹⁵⁴ The first level includes fifteen ecoregions that can be used for collecting and comparing inter-continental data; level two contains fifty-two smaller ecoregions for collecting national level data; level three divides North America into 194 sub-ecoregions.¹⁵⁵ On the macro level, Bailey has proposed fifteen ecoregion such as rainforest, savanna, and prairie that reflect very different diversity.¹⁵⁶

[*530] The World Wildlife Fund (WWF) has also introduced its own concept of Global Ecoregions as a planning tool with 142 terrestrial, fifty-three freshwater, and forty-three marine ecoregions.¹⁵⁷ WWF introduced its version of "ecoregions" as a chance to use ecological science in order to rank "Earth's most biologically outstanding terrestrial, freshwater and marine habitats" and prioritize conservation efforts.¹⁵⁸ For purposes of conservation, an "ecoregion" is a "large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions."¹⁵⁹ Based on this definition, WWF has named a number of ecoregions including the Galapagos Islands, the Amazon Basin, the Serengeti, deserts of western Mexico, coral reefs of the Sulu Sea, and the forests of New Caledonia.¹⁶⁰ While it is not clear from WWF's publications, the concept of "ecoregions" seems largely focused on reducing human intervention in the ecoregion rather than understanding something more about the relationship between people and their places. WWF's descriptions of ecoregions seldom recognize human beings as an intrinsic part of the biodiversity and are strangely and perhaps deliberately absent from their definitions.¹⁶¹

Ecoregions are places that are bound by similar ecological values, and have become an influential idea for ecological research,¹⁶² civil society planning,¹⁶³ and to a lesser extent government planning.¹⁶⁴ Omernik and [*531] Bailey's concept of ecoregions is sound from the perspective of holistic ecological management. Bailey is right that "[t]o conserve resources, we must be attentive to the sense of place, and match development to the limits of regions

¹⁵² James M. Omernik & Robert G. Bailey, *Distinguishing Between Watersheds and Ecoregions*, 33 J. AM. WATER RES. ASS'N 935 (1997); James Omernik, *Ecoregions: A Spatial Framework for Environmental Management*, in BIOLOGICAL ASSESSMENT AND CRITERIA 49 (Wayne S. Davis & Thomas P. Simon eds., 1995).

¹⁵³ *Omernik's Level III Ecoregions of the Continental United States*, U.S. ENVTL PROT. AGENCY, normval="http://nationalatlas.gov/mld/ecoomrp.html"><http://nationalatlas.gov/mld/ecoomrp.html> (last modified May 29, 2013).

¹⁵⁴ *Id.*

¹⁵⁵ *Id.*

¹⁵⁶ BAILEY, *supra* note 12, at 49.

¹⁵⁷ *Major Habitat Types*, WORLD WILDLIFE FUND, normval="http://wwf.panda.org/about_our_earth/ecoregions/about/habitat_types">http://wwf.panda.org/about_our_earth/ecoregions/about/habitat_types (last visited April 19, 2013).

¹⁵⁸ *What is an Ecoregion?*, WORLD WILDLIFE FUND, normval="http://wwf.panda.org/about_our_earth/ecoregions/about/what_is_an_ecoregion">http://wwf.panda.org/about_our_earth/ecoregions/about/what_is_an_ecoregion (last visited April 2, 2013).

¹⁵⁹ *Id.*

¹⁶⁰ *See generally List of Ecoregions*, WORLD WILDLIFE FUND, normval="http://wwf.panda.org/about_our_earth/ecoregions/ecoregion_list">http://wwf.panda.org/about_our_earth/ecoregions/ecoregion_list (last visited Apr. 3, 2013). In light of the need for careful and deliberate human intervention in certain ecoregions to stop the current pattern of degradation, it seems surprising that WWF does not highlight the integral relationship of the ecoregion to various human groups who rely upon the ecoregions for sustenance. For a representative example of this absence of human communities as a force for positive ecological transformation, see also *Eastern Arc Montane Forests--A Global Ecoregion*, WORLD WILDLIFE FUND, normval="http://wwf.panda.org/about_our_earth/ecoregions/easternarc_montane_forests.cfm">http://wwf.panda.org/about_our_earth/ecoregions/easternarc_montane_forests.cfm (last visited Apr. 3, 2013) (including humans in the description of the ecoregion as encroaching for farm plots and extracting wood products).

¹⁶¹ *What is an Ecoregion?*, *supra* note 158.

¹⁶² Depending on the author, there are a number of terms to describe a continuous community of species and geographical processes connected to a particular, usually large, space. See BAILEY, *supra* note 12, at 38 (citing a number of terms, including A.J. Herbertson's "major natural regions," S. Passarge's "landscape belts," A.G. Isachenko's "landscape zones," and J. Schultz' "ecozone").

¹⁶³ *Id.* at 168-69 (citing groups influenced by the concept of ecoregions including The Land Institute, The Nature Conservancy, and the Wildlands Project).

¹⁶⁴ *Id.* at 135-46 (describing the use of ecoregions by the USDA for climate networks; the Long-Term Ecological Research Net-

where we live.”¹⁶⁵ Unfortunately, the ecoregion concept has made significantly less headway in terms of government policy. Perhaps, this is because the ecoregion concept relies on largely technical parameters rather than shared social understandings between people and their places. The “ecoscape” approach proposed in this paper is an effort to revitalize the potential of human governance to contribute to ecological restoration at levels large enough to be meaningful in terms of maintaining landscape/seascape-level ecological functions.

Some have proposed bioregionalism as a precursor to ecoscapes.¹⁶⁶ Bioregionalism provides “rehabitation” and “a body of thought and related practice” about “reconnecting socially-just human cultures in a sustainable manner to the region-scale ecosystem in which they are irrevocably embedded.”¹⁶⁷ Bioregionalism is a broad-based grassroots movement concerned with place, politics, ecology, spirituality, and social change.¹⁶⁸ It has become more of a gestalt than a physical concept. It is about integrating “mind and landscape, self and ecosystem, psyche and planet . . . cultivating mindfulness about human/nature relationships in the service of both self-realization and community health.”¹⁶⁹ It is not about stimulating further government sponsored initiatives¹⁷⁰ such as those proposed in this paper.

While the ecoscape broadens the concept of an ecoregion by highlighting political and legal mechanisms for decision-makers to be more attentive to the sense of place, the ecoscape also narrows the ideological reach of bioregionalism and restores a role for governments. Like bioregionalism, ecoscapes are concerned with place and politics but instead rely on traditional channels of governments in hopes of place-based communities creating national, regional, or international priorities. As suggested earlier, many ecoscapes reach across international and national boundaries making diplomatic efforts and federal compromise for transboundary restoration particularly important. An emphasis on instilling ecological thinking at the highest levels of governance is essential to largescale [*532] restoration of socio-ecological systems since, as Ronnie Lipschutz suggests, governments support is “essential to the legitimation of local environmental governance.”¹⁷¹ And yet, most of the bioregional thinking is being done by civil society groups partially for fiscal reasons¹⁷² and presumably also due to a lack of political commitment to large-scale ecological restoration.

2. Precursors to Ecoscape Practices

The concept of approaching conservation at a landscape/seascape level is beginning to resonate with policymakers who understand the dangers of continued habitat fragmentation and thus loss of connectivity. As a result, there are both top-down government funded efforts and bottom-up land initiatives to address the leviathan problem of large-scale conservation and restoration. Almost all of these initiatives are driven by contributions from environmental agencies or environmental advocacy groups. While these initiatives provide a framework to shift governance practices, they are not mainstream governance changes because a number of the targeted large landscapes seem to be valued more for their ecological values than socio-ecological values. Focusing largely on ecological values rather than socio-ecological values diminishes the importance of governance to the success of large-scale restoration projects. The governance aspect of the ecoscape discussed above in subsection b will be further refined as a policy suggestion in subsection d.

a. Top-Down, Large-Landscape Conservation and Restoration Practices

work of the National Science Foundation; the National Park Service for environmental sustainability; EPA for water body management; the North American Commission for Environmental Cooperation; and, potentially, the United States military for evaluation of American military lands).

¹⁶⁵ *Id.* at 158.

¹⁶⁶ Doug Aberley, *Interpreting Bioregionalism: A Story from Many Voices*, in *BIOREGIONALISM* 13 (Michael Vincent McGinnis ed., 1999).

¹⁶⁷ *Id.*

¹⁶⁸ *Id.* at 16.

¹⁶⁹ Mitchell Thomashow, *Toward a Cosmopolitan Bioregionalism*, in *BIOREGIONALISM* 121, 124 (Michael Vincent McGinnis ed., 1999).

¹⁷⁰ Aberley, *supra* note 166, at 35.

¹⁷¹ Ronnie Lipschutz, *Civil Society and Environmental Governance*, in *BIOREGIONALISM* 101, 115 (Michael Vincent McGinnis ed., 1999).

¹⁷² *Id.*

One of the premier large-landscape approaches to conservation and restoration is an effort initiated by the U.S. Department of Interior (DOI) called the Landscape Conservation Cooperatives.¹⁷³ There are presently twenty-two cooperatives administered by the Fish and Wildlife Service, including five cooperatives in Alaska, one in Hawaii, and one in the [*533] Caribbean.¹⁷⁴ What is innovative about these cooperatives is that they are public-private partnerships operating across political boundaries. For example, the North Atlantic Landscape Conservation Cooperative (LCC) has thirteen U.S. state partners, tribal partners, and Canadian provincial partners.¹⁷⁵ The LCCs focus on a number of North American applied science problems related to climate adaptation, such as fragmented habitat, invasive species, and water quality.¹⁷⁶ The implementation of the LCCs is expected to improve data sharing, communication between agencies and stakeholders, and supply science to inform conservation plans.¹⁷⁷

The concept of the LCCs was introduced in a Secretarial Order by Secretary of the Interior Ken Salazar in 2009 as a commitment to addressing the impacts of climate change.¹⁷⁸ The Order works to coordinate climate change responses with impacts on resources under the stewardship of the DOI, and calls for the agency to work with a variety of public and private stakeholders to "develop landscape-level strategies for understanding and responding to climate change impacts."¹⁷⁹ While the word "restore" is not used within the Order, the Order implies that restoration is a viable strategy for conservation since it addressed the need for possible "acquisition of upland habitat and creation of wetlands and other natural filters and barriers to protect against sea level rise and storm surges."¹⁸⁰

LCCs are not authorized to create binding regulatory networks and are limited to encouraging cooperation among stakeholders. While voluntary regulatory networks may emerge from this initiative and groups may agree to implement science-based conservation planning, there is no legal obligation to consider the LCC geographical unit in making future governmental decisions. What this means is that the LCC may inform a decision particularly if the decision is being made by the DOI but has no [*534] legal authority to influence the decision. This is where the concept of the ecoscape becomes relevant as a subsequent policy step towards building socio-ecological concerns into landscape-level restoration and conservation projects.

In addition to the U.S. LCCs, notable for their collaborative systems approach to landscape-level conservation planning for climate change adaptation, a number of nations in the last few decades have also invested national funds in large-scale restoration projects. Most of these projects are selected on an ad hoc basis. For example, in the U. S.

¹⁷³ U.S. DEP'T OF INTERIOR, SECRETARIAL ORDER NO. 3289, ADDRESSING THE IMPACTS OF CLIMATE CHANGE ON AMERICA'S WATER, LAND, AND OTHER NATURAL AND CULTURAL RESOURCES 3 (2009), available at normval="http://www.nps.gov/sustainability/documents/Quick-Links/SecOrder3289%5B1%5D.pdf"><http://www.nps.gov/sustainability/documents/Quick-Links/SecOrder3289%5B1%5D.pdf>.

¹⁷⁴ U.S. DEP'T. OF THE INTERIOR, LANDSCAPE CONSERVATION COOPERATIVES: FREQUENTLY ASKED QUESTIONS 1-4 (2012), available at normval="http://www.fws.gov/landscape-conservation/pdf/LCC_FAQs_2012.pdf">http://www.fws.gov/landscape-conservation/pdf/LCC_FAQs_2012.pdf (identifying the current twenty-two LCCs as Appalachia, California, Desert, Eastern Tallgrass Prairie and Big Rivers, Great Basin, Great Northern, Great Plains, Gulf Coast Prairie, Gulf Coastal Plains and Ozarks, North Atlantic, North Pacific, Peninsular Florida, Plains and Prairie Potholes, South Atlantic, Southern Rockies, Upper Midwest and Great Lakes, Aleutian and Bering Sea Islands, Arctic, Northwestern Interior Forest, Western Alaska, Pacific Islands, and the Caribbean).

¹⁷⁵ N. ATLANTIC LANDSCAPE CONSERVATION COOP., 2011 ANNUAL REPORT 1, 10 (2011), available at normval="http://www.northatlanticlcc.org/about/nalcc-annual-report-executive-summary/NALCC-2011-annual-report/view"><http://www.northatlanticlcc.org/about/nalcc-annual-report-executive-summary/NALCC-2011-annual-report/view>.

¹⁷⁶ *Id.*

¹⁷⁷ U.S. DEP'T. OF THE INTERIOR, LANDSCAPE CONSERVATION COOPERATIVES, *supra* note 174, at 1.

¹⁷⁸ SECRETARIAL ORDER NO. 3289, *supra* note 173, at 3.

¹⁷⁹ *Id.*

¹⁸⁰ *Id.* at 1.

there have been government investments in restoring the Everglades¹⁸¹ and the Chesapeake Bay.¹⁸² There have recently been a number of examples of national government legislation encouraging broader landscape-level restoration facilitated or funded in part by the government.

In 2000, the U.S. Congress passed the Estuaries and Clean Waters Act providing for development of a national estuary habitat strategy and financing for habitat restoration projects.¹⁸³ Restoration is specifically defined in the Act as including activities that improve or create estuary habitat "with the goal of attaining a self-sustaining system integrated into the surrounding landscape"¹⁸⁴ and including control of nonnative species, reintroduction of native species, and construction of reefs.¹⁸⁵ The Act also created an Estuary Habitat Restoration Council to develop a restoration strategy with the goal of restoring 1 million acres of estuary habitat by 2010.¹⁸⁶ In addition to the Estuaries and Clean Waters Act, there are a number of examples of site-specific or ecosystem-specific restoration laws. For example, the Lake Pontchartrain Basin Restoration Act of 2000 in Louisiana¹⁸⁷ emphasized restoration of the second largest inland saltwater body in the U.S., and the Tijuana River Valley Estuary and Beach Sewage Cleanup Act of 2000 focused on a cross-border challenge of transboundary sewage.¹⁸⁸

Both the LCC and remediation law models are limited in their ability to carry out the ecoscape concept. The LCC efforts unfortunately lack social governance authority because the efforts focus mainly on academic [*535] research and not on politics. In the case of estuary restoration laws, the restoration efforts give some lip service to multistakeholder initiatives, but provide only the most limited incentives to dispersed private actors to contribute to restoration efforts.¹⁸⁹

b. Bottom-Up, Large-Landscape Practices: A Review of Large-Landscape Conservation Projects

One of the earliest precursors to ecoscape thinking is the "Greater Yellowstone Ecosystem" (GYE) project¹⁹⁰ which enlarged the management unit associated with the Yellowstone ecoregion beyond the federal boundaries of Yellowstone National Park to include important outlying areas in Idaho, Montana, and Wyoming. The expanded boundary includes two national parks, seven national forests, three national wildlife refuges, an Indian reservation, and around a million acres of private land. The private land provides buffers to federal lands and frequently includes rivers and migration corridors.

The Yellowstone to Yukon Region Conservation Initiative (Y2Y) project, started around 1993, extends the geographical range of the GYE project.¹⁹¹ The Y2Y was created by hundreds of academics and private conservation groups as a biodiversity initiative to include collective efforts targeted at around 1.2 million square kilometers.¹⁹² This Y2Y

¹⁸¹ Water Resources Development Act, Pub. L. No. 110-114, [121 Stat. 1041, 1268-70 \(2007\)](#) (containing provisions on Comprehensive Everglades Restoration Plan); *see also* *Water Resources Development Act (WRDA) Legislation*, THE JOURNEY TO RESTORE AMERICA'S EVERGLADES, [normval="http://www.evergladesplan.org/about/legislation.aspx">http://www.evergladesplan.org/about/legislation.aspx](http://www.evergladesplan.org/about/legislation.aspx) (last visited Apr. 3, 2013) (listing federal laws that provide funding for Everglades restoration projects).

¹⁸² Act of Nov. 7, 2000, Pub. L. No. 106-457, 114 Stat. 1957, 1967 (2000).

¹⁸³ *Id.* § 102.

¹⁸⁴ *Id.* § 103.

¹⁸⁵ *Id.* § 103(4)(B).

¹⁸⁶ *Id.* § 106.

¹⁸⁷ *Id.* § 501.

¹⁸⁸ *Id.* § 802.

¹⁸⁹ *See id.* § 203 (In the Estuary and Clean Water Act, private individuals are only mentioned once as being able to apply for small grants for restoration work on the Chesapeake Bay.).

¹⁹⁰ Duncan Patten, *Defining the Greater Yellowstone Ecosystem*, in THE GREATER YELLOWSTONE ECOSYSTEM: REDEFINING AMERICA'S WILDERNESS HERITAGE 19-21 (Robert Keiter & Mark Boyce eds., 1991).

¹⁹¹ CHARLES CHESTER, CONSERVATION ACROSS BORDERS: BIODIVERSITY IN AN INTERDEPENDENT WORLD 137 (2006).

¹⁹² *Id.* at 136-37.

project also includes a number of different private stakeholders.¹⁹³ The project encompasses swathes of two Canadian Provinces (British Columbia and Alberta), two Canadian territories (Yukon and Northwest), and five states in the U.S. (Montana, Idaho, Wyoming, Oregon, and Washington). The Y2Y ecoregion project is one of the most ambitious ecological conservation projects, encompassing programs for several large predator species as well as the headwaters of seven major rivers.¹⁹⁴ As conceived, the project relied on the vision of a number of biologists and policymakers. Canadian attorney Harvey Locke was particularly instrumental in defining the project around three principles: connectivity, ecological processes, and umbrella [*536] species.¹⁹⁵ Connectivity and umbrella species are the easiest to conceptually implement because they are easy to translate into policies such as wildlife corridors. More difficult to translate into policy is the concept of conserving ecological processes whereby the project endeavors to protect hydrological cycles, nutrient cycles, animal-plant relationships, and predator-prey relationships.

Other ecoscape precursors based on landscape-level conservation include the Algonquin to Adirondacks Conservation Initiative, which is another Canada-U.S. partnership focused on ecologically linking the Canadian Algonquin Provincial Park with the United States' Adirondack Park across the Frontenac Axis in a 93,000 square kilometer project.¹⁹⁶ One ambitious project encouraged by the North American Free Trade Agreement (NAFTA) Commission for Environmental Cooperation is the Baja, California to Bering Sea project, which seeks collaboration among Canada, Mexico, and the U.S. to protect a 4.8 million square kilometer large-scale, shared marine environment.¹⁹⁷

These ecoscape precursor projects are not exclusive to the developed world. In Asia, India and Nepal cooperate on the Terai Arc Landscape (TAL) program, which began in 1993, and works to reclaim monsoonal land as landscapes where humans can manage conservation forests for employment rather than damage the forest resource.¹⁹⁸ Working with communities, the program has sought to reconnect pockets of native forest and to recover habitat through corridors and buffers for transit of large animals such as tigers.¹⁹⁹ This project was considered one of the most successful rewilding programs in the world²⁰⁰ until conflict erupted in the area following influxes of population. The project has been challenged by simultaneous demands for poverty reduction and environmental protection—two goals that can collide in the short-term without enhancing the lives of communities or the environment. Overall, as a landscape based project, the TAL is relatively cost-effective, with restoration expenses of approximately two dollars per hectare.²⁰¹

[*537] In Latin America, Mexican officials alongside and all seven Central American States are committed to creating a Paseo del Jaguar designed to prioritize biodiversity protection through the protection and reconnection of currently fragmented jaguar habitat.²⁰² "Costa Rica has already incorporated protection of the corridor into laws regulating development."²⁰³ This ecoscape precursor project differs from the other large landscapes examples described in this subsection because it focuses on the recovery of one species rather than a more complex socio-ecological landscape.

¹⁹³ *Id.* at 137.

¹⁹⁴ *Id.* at 139-40.

¹⁹⁵ *Id.* at 146.

¹⁹⁶ *Connectivity*, ALGONQUIN TO ADIRONDACKS CONSERVATION ASS'N, normval="http://www.a2alink.org/connectivity.html"><http://www.a2alink.org/connectivity.html> (last visited April 2, 2013).

¹⁹⁷ COMM'N. FOR ENVTL. COOPERATION, BAJA CALIFORNIA TO THE BERING SEA (2005), available at normval="http://www.cec.org/Storage/65/5927_B2B_PCAs_en.pdf">http://www.cec.org/Storage/65/5927_B2B_PCAs_en.pdf.

¹⁹⁸ Eric Wikramanayake et al., *The Terai Arc Landscape: Tiger Conservation History in a Human-Dominated Landscape*, in TIGERS OF THE WORLD: THE SCIENCE, POLITICS, AND CONSERVATION OF PANTHERA TIGRIS 163, 164 (Ronald Tilson & Philip Nyhus eds., 2nd ed. 2010).

¹⁹⁹ *Id.*

²⁰⁰ ERIC DINERSTEIN, THE RETURN OF THE UNICORNS: THE NATURAL HISTORY AND CONSERVATION OF THE GREATER ONE-HORNED RHINOCEROS 254 (2003).

²⁰¹ RAM PRASAD LAMSAL ET AL., GOVERNMENT OF NEPAL, FINAL PROJECT EVALUATION REPORT OF TERAI ARC LANDSCAPE PROGRAM, SACRED HIMALAYAN LANDSCAPE, NORTHERN MOUNTAIN LANDSCAPE 27 (July 2006-June 2010).

²⁰² Mel White, *Path of the Jaguar*, NAT'L GEOGRAPHIC (Mar. 2009), available at normval="http://ngm.nationalgeographic.com/print/2009/03/jaguars/white-text"><http://ngm.nationalgeographic.com/print/2009/03/jaguars/white-text>

²⁰³ *Id.*

In West Africa, the Fouta Djallon Highlands has a regional project concentrated in the central part of Guinea and connected to Gambia, Guinea-Bissau, Mali, Mauritania, Niger, Senegal, and Sierra Leone.²⁰⁴ Started by the Organization of African Unity in 1981, this large-landscape and waterscape project focused primarily on protecting the watersheds for a number of transboundary rivers.²⁰⁵ One of the key aspects of the project is an effort to harmonize policies and practices among all of the Member States both within the Fouta Djallon Highlands plateau and the surrounding areas.²⁰⁶

Other ecoscape precursor projects are the efforts of individual countries. In Bhutan, for example the Bhutan Biological Conservation Complex project (B2C2) is designed to explore how the nation of Bhutan can be a "virtual laboratory for proactive landscape conservation."²⁰⁷ B2C2 manages 14,800 sq. km. of the land (35% of the country) for conservation purposes.²⁰⁸ Project proponents focus on "in situ conservation of wild biodiversity" by designating protected areas, buffer zones, and biological corridors.²⁰⁹

In the U.S., the Highlands to Ocean Initiative focuses on the 5,350 square mile New Jersey and New York metropolitan areas as a landscape.²¹⁰ Mount Agamenticus to the Sea Conservation Initiative based in Southern [*538] Maine initiative that includes ten national, regional, and local partners undertaking to protect 48,000 acres of ecologically significant land.²¹¹ Covering about 2 million acres, the Quabin to Cardigan Collaborative seeks to protect landscape in both the Monadnock Highlands of north-central Massachusetts and western New Hampshire through collaboration between public and private partners.²¹²

In Southwest Australia, a number of NGOs have adopted the Gondwana Link ecoregion project that seeks to revive a large landscape that has become fragmented.²¹³ This landscape-level project is a massive bushland restoration initiative that seeks to better connect the Stirling Range National Park to the Fitzgerald River national park through restoring native vegetation, removing invasive species, and creating better functionality of the landscape.²¹⁴ The project proponents, including Noongar indigenous people, hope to be able to reverse habitat degradation since some of the land they are restoring was only cleared 50-60 years ago and biological connectivity still exists across the landscape for non-human species.

²⁰⁴ *Background*, PGRIN-MFD, normval="http://www.fouta-djallon-programme.org/index.php?option=com_content&view=article&id=212&Itemid=220&lang=en">http://www.fouta-djallon-programme.org/index.php?option=com_content&view=article&id=212&Itemid=220&lang=en (last visited Mar. 26, 2013).

²⁰⁵ *Id.*

²⁰⁶ *Id.*

²⁰⁷ NATURE CONSERVATION DIV., DEP'T. OF FORESTRY SERVICES, MINISTRY OF AGRIC. & WWF BHUTAN PROGRAM, BHUTAN BIOLOGICAL CONSERVATION COMPLEX (LIVING IN HARMONY WITH NATURE) 1 (2004), *available at* normval="http://awsassets.panda.org/downloads/b2c2_20landscapeconservation_20plan.pdf">http://awsassets.panda.org/downloads/b2c2_20landscapeconservation_20plan.pdf.

²⁰⁸ *Id.* at 12.

²⁰⁹ *Id.* at 47.

²¹⁰ TONY HISS & CHRISTOPHER MEIER, HIGHLANDS TO OCEAN: A FIRST CLOSE LOOK AT THE OUTSTANDING LANDSCAPES AND WATERSCAPES OF THE NEW YORK/NEW JERSEY METROPOLITAN REGION (Sara Baerwald, ed., 2004).

²¹¹ *The Challenge Continues*, THE MT. AGAMENTICUS TO THE SEA CONSERVATION INITIATIVE, normval="http://www.mta2c.org"><http://www.mta2c.org> (last visited Apr. 3, 2013).

²¹² THE QUABBIN-TO-CARDIGAN PARTNERSHIP, normval="http://www.q2cpartnership.org"><http://www.q2cpartnership.org> (last visited Apr. 3, 2013).

²¹³ The vision for Gondwana Link is: "Conservation at an unprecedented scale." The approach for Gondwana Link has been to:

[R]estore the strategic connections by increasing the scale and quality of conservation management ... Ultimately [the Gondwana Link] will have landscapes that continue to support human communities, but within nature-friendly landscapes that include large vegetated areas, linkages and 'stepping stones' that give all species and communities a better chance to survive.

The Gondwana Link Vision, GONDWANA LINK, normval="http://www.gondwanalink.org/aboutus/vision.aspx"><http://www.gondwanalink.org/aboutus/vision.aspx> (last visited Apr. 3, 2013); *see also* CAROLINE FRASER, *REWILDING THE WORLD* 326-41 (2009) (describing the park and its goals).

²¹⁴ *Id.*

It may also be possible to build on the concept of existing peace parks as the base for future ecoscope efforts. The Red Sea Marine Peace Park between Jordan and Israel²¹⁵ might be extended to take in additional shared frontier areas between Jordan and Israel and function as an ecoscope connecting terrestrial ecological processes with marine ecological processes. It is possible that the demilitarized zone (“DMZ”) between North Korea and South Korea could become a core area for a future ecoscope since human development is currently prohibited within the DMZ. African [*539] transfrontier parks such as the Ais-Ais/Richtersveld Park between Namibia and South Africa might be extended to include non-park regions that share similar values.²¹⁶ Other possible core areas for ecoscapes might be based on pre-existing transboundary biosphere reserves listed under UNESCO.²¹⁷

Each of these ecoscope precursor projects must be applauded for the vision of an environment that incorporates human cooperation in protecting core environmental elements. A common thread runs through most of the projects—a reliance on the tenacity and vision of private civil society. The Yellowstone to Yukon project with its combination of public and private lands has been uniquely successful among the ecoregion precursor projects described above, in part, because many of the lands that are encompassed in the project are already wildlands and the concept of wilderness has some resonance within both the United States and Canada. While it has required transnational cooperation between like-minded park services, it has not required intensive human interventions into the landscape in order to restore protection of ecological processes. Many of the other projects described above, such as the Terai Arc, rely on human intervention to support conservation through restoration. Because the projects are not yet fully recognized as legally protected areas either within a State or across the boundaries of States, the idea of setting legally cognizable restoration goals for these projects remains largely aspirational.

Even where programs have government support, this support tends to emanate from agencies already committed to environmental goals. The government support for the Yellowstone to Yukon project is largely been from Parks Canada, the Minister of Canadian Heritage and the United States National Park Service.²¹⁸ Little cooperative attention has come from municipal or regional economic development agencies or land planning agencies.²¹⁹ As a result, this important landscape initiative remains outside of core governance structures in both Canada and the United States where decisions such as resource extraction are made without regard for the long-term viability of the project area.²²⁰

[*540] *D. Restoring Ecoscapes Through Government Action*

With a few exceptions, most of the large ecoscope projects are the product of tireless private advocates who work with land trusts, private owners and sympathetic government agencies. Government led efforts such as the Landscape Conservation Cooperatives spearheaded by the U.S. Department of Interior are a recent and encouraging development, but such government programs are rare. This section calls for greater State government involvement in mainstreaming long-term restoration of the various socio-ecological spaces that we occupy by providing incentives for private actors to restore lands and waters and by creating adequately funded programs to jumpstart restoration in lands that private actors are either unwilling or unable to restore. The following subsections offer some policy proposals along with recognition of both the promise and peril inherent in the concept of restoring connections within fragile socio-ecological systems.

²¹⁵ See Israel-Jordan Peace Treaty Annex IV, Isr.-Jordan, Oct. 26, 1994, available at <http://english.sviva.gov.il> (discussing the protection of nature and the marine environment); *Red Sea Marine Peace Park*, ISRAEL MINISTRY OF THE ENV'T (Jan. 1, 2005), http://english.sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Object&enDispWho=Articals,12693&enZone=Protecting_the_Gulf.

²¹⁶ Treaty Establishing the Ais-Ais/Richtersveld Transfrontier Park, Namib.-S. Afr., Aug. 1, 2003; see PARK DEVELOPMENT, PEACEPARKS.ORG, <http://www.peaceparks.org/story.php?pid=1001&mid=1034> (last visited Apr. 3, 2013) (hoping to link the park eventually with Angola and a second Namibian park for a total of 19 million hectares).

²¹⁷ *Transboundary Biosphere Reserves*, UNESCO.ORG (Nov. 2012), <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/transboundary-biosphere-reserves/#> (listing twelve biosphere reserves).

²¹⁸ CHESTER, *supra* note 191, at 172.

²¹⁹ *Id.* at 174.

²²⁰ *Id.* at 176.

1. States should make the political commitment to manage for ecological function at the large-scale landscape level which may include the need for transboundary collaboration

There are a number of possibilities for how ecoscapes might be constructed across our existing political and ecological geographies. What is clear is that an ecoscape must exist on a large physical scale. One of the recurring challenges with the conservation of ecosystem processes is the repeated fragmentation of the landscape into smaller and smaller jurisdictional parcels. Coordinating ecological goals across these parcels has proven challenging and political boundaries have become obstacles to effective management.

There are some encouraging multilateral and unilateral developments indicating an emerging political will to protect at the large landscape level. As far as multilateral developments, the Large Marine Ecosystem ("LME") projects originally sponsored by the United Nations Environmental Programme and several state government agencies such as the United States National Oceanic and Atmospheric Administration are demonstrating a clear commitment on the part of a number of states to invest resources in long-term management of regional large-scale landscape and seascapes. Several of the LMEs have formed commissions that are empowered to implement regionwide policies focused on large landscapes and seascapes including restoration goals.²²¹

[*541] In terms of unilateral developments, a large number of States, as part of their protected area programs, have designated what are referred to as Category V and VI areas by the International Union for Conservation of Nature ("IUCN").²²² These are areas that include large landscapes and large seascapes which may be managed by the public or by private owners.²²³ What is significant about these categories is the explicit recognition by States that these large protected areas are the product of ongoing social and economic interactions between humans and their environment and that they have the potential for "ecological and/or landscape restoration" and sustainable development.²²⁴

It bears mentioning that the division between natural lands and multi-use lands is somewhat artificial.²²⁵ Many of the other IUCN designated protected area categories beyond Category V and VI also result from human interaction with the environment (e.g. wilderness, monuments).²²⁶ While there are practical reasons for subdividing land into various protected categories for ecological management purposes, there is also the danger of this type categorization resulting in a psychological fragmentation that might contribute to long-term fragmentation of management practices. It might be better to consider the various ecological protection categories as representing various qualities and conditions of a single place rather than as a mosaic for management planning.

Today the major gains in recognized protected areas are in Category V and VI lands. One theory is that this commitment to large scale landscape protection by communities results from local communities valuing multi-management protected areas. This increase reflects the importance of large landscapes and seascapes for communities because these areas are managed with the conservation of nature as the goal it that conservation provides economic, social, and eco-

²²¹ See, e.g., The Commission on the Protection of the Black Sea Against Pollution, *Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea* (Apr. 17 2009), [normval="http://www.blacksea-commission.org/_bssap2009.asp">http://www.blacksea-commission.org/_bssap2009.asp](http://www.blacksea-commission.org/_bssap2009.asp) (The Black Sea Commission has the power presently to implement region-wide recommendations for restoration.).

²²² UNEP WORLD CONSERVATION MONITORING CTR., *THE WORLD'S PROTECTED AREAS: STATUS, VALUES AND PROSPECTS IN THE 21ST CENTURY* 13 (Stuart Chape et al. eds., 2008), [available at normval="http://www.unep-wcmc.org/the-worlds-protected-areas_93.html">http://www.unep-wcmc.org/the-worlds-protected-areas_93.html](http://www.unep-wcmc.org/the-worlds-protected-areas_93.html) (Category V lands include approximately 2,393 sites of 8,495,000 square kilometers and Category VI lands include approximately 4,276 sites covering 4,284,000 square kilometers.).

²²³ INT'L UNION FOR CONSERVATION OF NATURE AND NATURAL RES., *GUIDELINES FOR APPLYING PROTECTED AREA MANAGEMENT CATEGORIES 20-24* (Nigel Dudley ed., 2008), [available at normval="http://data.iucn.org/dbtw-wpd/edocs/paps-016.pdf">http://data.iucn.org/dbtw-wpd/edocs/paps-016.pdf](http://data.iucn.org/dbtw-wpd/edocs/paps-016.pdf).

²²⁴ *Id.* at 21.

²²⁵ Shawn J. Leroux et al., *Global Protected Areas and IUCN Designations: Do the Categories Match the Conditions?*, 143 *BIOLOGICAL CONSERVATION* 609, 615 (2010).

²²⁶ See *id.* at 614 ("IUCN Category 1a protected areas do not consistently respect the criteria of 'strictly controlled and limited' human access . . . in many biomes, only a small proportion of protected areas, among all categories, exhibit a low mean Human Footprint.").

logical benefits.²²⁷ Overall, both the designation [*542] of LMEs and the growth in areas identified by government as protected large landscapes and seascapes reflect a growing government commitment for restoration at an ecoscape level.

2. States should incentivize private action and recognize private successes

The long-term success of an ecoscape depends on more than government financing and engagement. It depends on the willingness of private parties to conform their individual activities to the collective goals implicit in ecoscapes. There are of course monetary incentives that are available from tax credits to payments that may further conservation and restoration goals. However, governmental payment programs may risk "making environmental stewardship an issue of money rather than fundamental values."²²⁸ As suggested above, monetary payments may not be sufficient to shift behavior because individuals are not motivated exclusively by monetary rewards. Instead, being a part of something that has a legacy quality may bring meaning to participants. Designing a truly self-perpetuating ecoscape requires engagement with private stakeholders particularly large landowners whose decisions to fence or not to fence can have implications for the mobility of certain species and the flow of genetic materials.

Building on examples of successful public and private collaboration for conservation,²²⁹ there are various opportunities for improving conservation values. In some cases, it may be enough to provide long-term public recognition of a landowner's engagement in an ecoscape project. Community reputation may be more highly regarded by a private landowner than a side payment for conservation activity. In other instances, there may be a need for grants to cover costs associated with restoration of certain ecosystem resources. Also, there may be need for compensation payments for landowners who bear a disproportionate burden of a conservation policy such as the return of predators or herbivores onto lands that have been historically ranched or cultivated for at least two or more generations.

[*543] 3. States should immediately focus on restoring connectivity in order to restore threatened ecological functions

If we are to attempt to maintain ecological processes at a landscape level, it will be essential to restore better connectivity, which is defined as the "degree to which a landscape facilitates movement of species, population, and genes among resource patches, from ecological to evolutionary time scales."²³⁰ One method of restoration is building connectivity corridors. Another approach to improving connectivity through restoration discussed below is reserve buffering.

Taking stock of the state of the landscape must be a high planning priority. Our uninhibited growth across the landscape has in some places taken on a pathological quality where we are unsustainably consuming our land. If we accept the popular wisdom that "pavement is forever" and "build it and they will come", then we have to proceed with caution as human numbers and needs increase. Scientists observe that in the United States only fifteen percent of landscape locations needed for essential ecological connectivity are on public or private protected lands, twenty-eight percent are on multiple use public lands, and the remaining fifty-seven percent of needed connectivity locations are unprotected.²³¹ There are important modeling efforts that can be used to map where policies need to be developed to protect connectivity.²³² Investments in the type of quantitative work of scientists such as Dr. Theobald and his team that prioritize connectivity are particularly important in rapidly developing parts of the world where landscapes remain more intact than in the United States or Europe. This emphasis on identifying permeability should be a priority for government sponsored projects such as the implementation of the Landscape Conservation Cooperatives in the United States.

²²⁷ See *id.* at 615 ("[B]ecause present Category VI protected areas have a low Human Footprint and also tend to be large, we believe these areas have a significant and unrealized potential for global conservation. In some biomes, these areas may also represent the best option for establishing new large protected areas.").

²²⁸ Barton H. Thompson, Jr., *Markets for Nature*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 261, 278 (2000).

²²⁹ See, e.g., *SVPP Forum*, CIENEGA WATERSHED PARTNERSHIP, normval="http://www.cienega.org/who-we-are/svpp-forum"><http://www.cienega.org/who-we-are/svpp-forum> (last visited Apr. 3, 2013); AMERICA'S LONGLEAF RESTORATION INITIATIVE, normval="http://www.americaslongleaf.org">www.americaslongleaf.org (last visited Apr. 3, 2013).

²³⁰ David M. Theobald et al., *Connecting Natural Landscapes Using a Landscape Permeability Model to Prioritize Conservation Activities in the United States*, 5 CONSERVATION LETTERS 123 (2012).

²³¹ *Id.* at 9.

²³² *Id.* at 6-11.

4. States should invest in land acquisitions for buffers to further restoration and conservation efforts.

Much has been written about the need for connectivity through ecological networks or ecological corridors.²³³ In some instances, [*544] governments may be in a position to ensure buffering by either identifying buffer zones on existing government land or by acquiring additional private lands through conservation easements or market purchases. In many instances lands may need to be restored in order to provide sufficient ecological connectivity.

In order to assist with identifying lands in need of restoration, there may be a need for additional global "gap analysis" efforts focused on restoration priorities.²³⁴ "Gap analysis" identifies gaps between ranges of critical species and protected areas and prioritizes areas most in need of resources. While there have been some global collaborations to perform "gap analysis"²³⁵, these efforts are sporadic in light of pressing concerns about species loss. Ecoregional "gap analysis" that looks not just at biodiversity but also at other ecological processes such as loss of soil fertility would provide valuable management tools for restoring an ecoscape.

As a result of an ecoregional gap analysis, it may be possible to identify certain lands that could be purchased from or swapped with private landowners in order to pursue landscape level restoration. While there is nothing new about land exchanges, there has been insufficient effort at national or international levels to pursue strategic land exchanges for the purpose of restoring faltering ecosystem processes.²³⁶ Understandably government engagement in restoration for the purposes of conservation is a sensitive issue in light of the uncertain land tenure in many countries and the uneven power dynamics between communities and governments.

5. Promise of the Ecoscape

The ecoscape is a valuable tool for restoration because it provides the proverbial "big picture" of what systems humans need to focus their attention on in order to avert environmental collapse. It reminds policymakers that the whole is greater than the sum of the parts.²³⁷ [*545] Knowing that we cannot do historical restoration not only because of the sums of money that would be required but also because we are unwilling to expunge ourselves from the landscape, the concept of an ecoscape provides opportunities for new forms of ecological restoration. An ecoscape provides a substructure upon which to redesign anthropogenic habitats so that their use is compatible with use by a broad array of other species and to further the goals of "reconciliation ecology."²³⁸

If government decision-makers reorient their activities around the concept of an "ecoscape" and acknowledge the potential for cumulative impacts at the "ecoscape" level, this would be a significant step towards integrated zone management and working at the level of the "problemshed."²³⁹ The idea of integrated zone management has been championed as a management approach for linking land activities and coastal waters within a State. We are already seeing some transboundary ecological thinking with, for example, regional seas agreements like the Convention on the Pro-

²³³ See, e.g., JODI A. HILTY ET AL., CORRIDOR ECOLOGY: THE SCIENCE AND PRACTICE OF LINKING LANDSCAPES FOR BIODIVERSITY CONSERVATION, 108-115 (2006) (describing the biological and human benefits of ecological corridors); ANDREW F. BENNETT, LINKAGES IN THE LANDSCAPE: THE ROLE OF CORRIDORS AND CONNECTIVITY IN WILDLIFE CONSERVATION 65, 156 (2003) (discussing the benefits of enhanced connectivity); Nick M. Haddad & Joshua J. Tewsbury, *Low-Quality Habitat Corridors as Movement Conduits for Two Butterfly Species*, 15 ECOLOGICAL APPLICATION 250, 250 (2005) (mentioning some of the biological benefits of ecological corridors).

²³⁴ BAILEY, *supra* note 12, at 91.

²³⁵ Ana S.L. Rodgruius et al., *Global Gap Analysis: Priority Regions for Expanding the Global Protected-Area Network*, 54 BIO-SCIENCE 1092, 1094-95 (2004); T.M. Brooks et al., *Global Biodiversity Conservation Priorities*, 313 SCIENCE 58, 60 (2006).

²³⁶ There are exceptions to this rule. For example, the U.S. Fish and Wildlife Service facilitated strategic land purchases outside the Lower Rio Grande Valley National Wildlife Refuge which creates a wildlife corridor that reaches to the Gulf of Mexico. *Creating a Wildlife Corridor*, U.S. FISH & WILDLIFE SERV. (Jul. 6, 2012), normval="http://www.fws.gov/refuge/Lower_Rio_Grande_Valley/resource_management/wildlife_corridor.html">http://www.fws.gov/refuge/Lower_Rio_Grande_Valley/resource_management/wildlife_corridor.html.

²³⁷ GREEN ET AL., *supra* note 151, at 53. ("Holism stresses the . . . need to understand how wholes emerge from their parts."); BAILEY, *supra* note 12, at 18 (noting that a "a system has properties that cannot be observed from simply looking at the pieces").

²³⁸ Michael L. Rosenzweig, *Reconciliation Ecology and the Future of Species Diversity*, 37 ORYX, 194, 201 (2003).

²³⁹ *Reclamation Process Decision Guide: Terms*, BUREAU OF RECLAMATION, normval="http://www.usbr.gov/pmts/

tection of the Natural Resources and Environment of the South Pacific Region that entered into force in 1990.²⁴⁰

The concept of the ecoscape provides a much more robust approach for climate adaptation because it permits an expanding range for animals and plants while striving for legal protections across the various jurisdictions. Implicit in the idea of ecoscape is both expansion of ranges as well as potential contraction of ranges depending in part on human decision-making. This flexibility in the concept is important because it allows for appropriate scaling depending on what ecoscape stakeholders decide are essential ecosystem processes for restoration.

From an ethical perspective, restoration efforts focused on an ecoscape approach rather than our current mitigation approach or ecosystem services approach should further Leopold's land ethic which recognizes the land as a "collective organism."²⁴¹ Individuals living in an ecoscape can understand the significance of a restorative action by reference to the larger landscape. Holistic work is not easy because it is inherently complex but ecoscapes provide the advantage of embedding complex processes in a physical space [*546] that can be visualized and experienced firsthand.²⁴² While we may not understand how complex ecological processes operate, we can understand that these complex processes require large amounts of connected space where key ecological functions are self-maintained and human interference is either absent or insignificant. For example, salmon cannot reproduce and feed in a one-mile rivulet and grizzly bears cannot live in a city park.

While legalizing the ecoscape may seem unattainable for certain States, the concept is not restricted to State interactions but holds great promise for international cooperation among intergovernmental organizations. To the extent that the Secretariat of the Convention on Biological Diversity, UNESCO, the Secretariat of the UN Framework Convention on Climate Change, the International Maritime Organisation, and the Food and Agricultural Organisation all concern themselves with protecting the environment held within the global commons, there is the opportunity for cooperation centered around the global ecoscapes that are already influenced by the activities of these organizations.

6. Peril of the Ecoscape

As with any ideas that will rely on multiple stakeholders that may be in conflict with each other, the ecoscape has inherent challenges. To the extent that policymakers are willing to give credence to the findings of landscape ecologists on the recurring need for connectivity and space to support resilience in ecological systems, one of the greatest challenge would be to ensure that thinking in terms of "ecoscapes" does not simply become an extension of the current reductionist rhetoric in favor of certain categories of ecosystem services.

For example, Martin Nie has observed in his research on United States national forests that the United States National Forest Service has embraced the concept of landscape-scale restoration.²⁴³ Yet, the restoration effort appears to be driven by thinking of the forests largely in relationship to the provisioning of wood products. As Nie observes, the so-called restoration programs almost all, "make linkages between restoration and the timber industry, operating on the principal that a viable wood products industry is necessary for the attainment and financing of various restoration goals."²⁴⁴ This marks a dangerous precedent if restoration efforts support only certain [*547] ecological processes that can be financially underwritten rather than an array of ecological processes. There are many ecosystem processes that are undervalued including decomposition of organic matter, hydrological sheetflow, and mutualism.²⁴⁵

If we can assume that an ecoscape is far more than a place where business interests sustain various resources as economic assets and is instead a space of democratic deliberation about the needs of this generation, future genera-

economics/guide/terms.html#probshed">www.usbr.gov/pmts/economics/guide/terms.html#probshed (last visited Apr. 3, 2012) (A "probsheds" is "[t]he content and context of a problem: a geographical, social, or conceptual area of related actions, influences and needs.").

²⁴⁰ Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (Nov. 24, 1986), available at <http://www.ecolex.org/server2.php/libcat/docs/TRE/Multilateral/En/TRE000892.txt>.

²⁴¹ LEOPOLD, *supra* note 127, at 261.

²⁴² There is, of course, much more information to collect regarding species communities, species interactions within habitats, and ecosystems. Given the recent advances in GIS technology, we have some knowledge, albeit it is not complete (and may never be complete), about how physical landscapes and seascapes are constituted.

²⁴³ Martin Nie, *Place-Based National Forest Legislation and Agreements: Common Characteristics and Policy Recommendations*, 41 ENVTL. LAW REP. 10299, 10241 (2011).

²⁴⁴ *Id.* at 10242.

²⁴⁵ Common forms of mutualism include pollination and zoochory where animals disperse the seeds of plant.

tions, and other species, a second key challenge emerges. The ecoscape does not belong to any one population or interest group--it is a collective landscape. One might even go so far as to theorize that the ecoscape is a regional commons that defines who we are and who we will become. The ecoscape embraces already politically delineated borders populated with vested stakeholders in the regulatory process. Self-interest may easily become a barrier to large-scale planning. Even if self-interest is not at issue, numerous interested parties mean challenges in coordinating management. More parties are likely to mean more conflict resulting in the need for more process.²⁴⁶ The need for more process means more delay and less effort put in to tackling some of the technical challenges of doing restoration work.

CONCLUSION

This is a formidable challenge for this generation. Ecoscapes as units for policymaking entreat us to think beyond our ordinary political boundaries pre-defined for us based on distant events of history and politics. But too much complexity can be overwhelming. With issues such as economic development, social welfare, and human conflict resolution topping the political debates around the world, there is little room for conversations about human relationships with places. Such conversations seem philosophical rather than pragmatic. But if the concept of an ecoscape is to become a normative reality, there will be a need for conversations on what we as individuals living in particular socio-ecological landscapes at a very particular time in history value communally and what we expect the next generation to inherit. Are we comfortable with landscape species that we value like wildflowers disappearing because of problems with pollinators that we are not addressing as national priorities? Are we at peace [*548] with local land users making decisions with regional and possibly global impacts such as removing valuable habitat for migratory birds? Can we live in a world without wild fish?

The success of restoration of an ecoscape requires collaboration, conversation, and commitment at all levels of public and private governance. Ecoscapes may need to be jumpstarted with government funding, but the long-term viability of these places will depend on all actors who live in a landscape agreeing to make certain concessions and tradeoffs in order to achieve something that may only partially reflect their self-interest. We do this on a regular basis with national constitutional law--individuals and institutions collectively restrict unfettered freedoms to achieve community social goals. If certain alternative categories of freedoms including our freedom to belong to a certain kind of landscape were to become the subject of negotiations among individuals and communities, then there might be the shared energy for restoring key components of our threatened ecoscapes. But time is of the essence if we want to protect places that are important not just for individual lived experiences but also for community identity.²⁴⁷ If we wait too long the importance of our relationship with a given ecoscape may not be able to be salvaged.

Even if we cannot reverse time, focusing on restoring healthy human relationships with ecological places offers the possibilities of reviving certain long-term social and ecological values that are essential for the survival of existing ecoscapes. Indeed, "[m]odern humanity yearns to re-establish and restore an ecology of shared identity" and restoration "provides a context of negotiating a relationship with nature and community."²⁴⁸ Our communities need corridors and buffers in order to connect to each other in ways that matter both ecologically, but as importantly, socially. The introduction of ecoscape thinking offers an intermediate way between a philosophy of dominion over the land and a sense of powerlessness. Ecoscapes offer the hopeful possibility of connecting us to places where we can relate to rather than compete with our environment.

Vermont Journal of Environmental Law
Copyright © 2012 Vermont Law School
Vermont Journal of Environmental Law

²⁴⁶ J. David Allan, Donna L. Erickson & John Fay, *The Influence of Catchment Land Use on Stream Integrity Across Multiple Spatial Scales*, 37 FRESHWATER BIOLOGY 149, 158-159 (1997) (Ecologists working in Michigan were discouraged about the possibility of reaching a comprehensive management for the Raisin River basin because of the presence of eighteen different federal, state, regional, and local authorities with different objectives and interests.).

²⁴⁷ See Thiago Rangel, *Amazonian Extinction Debts*, 337 SCI. 163 (2012) (Ecologists working in the Amazon observe that we have a narrow "window of opportunity for forest regeneration" if we hope to recover species and ecosystem functions. If we miss this opportunity, we increase the possibility of "extinction debts" beyond the already expected local losses in eastern and southern Amazon of thirty percent of the endemic amphibians, twenty-five percent of the mammal species, and fourteen percent of the birds).

²⁴⁸ Michael Vincent McGinnis, Freeman House & William Jordan III, *Bioregional Restoration: Re-Establishing an Ecology of Shared Identity*, in BIOREGIONALISM 206 (Michael Vincent McGinnis ed., 1999).