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REMEDYING THE MISUSE OF NATURE

Sanne H. Knudsen*

INTRODUCTION

Like other life forms, humans depend upon nature for their survival—for food, water, clothing, shelter, and the like. Necessarily, we alter nature considerably as we go about meeting these needs. Some of these alterations are unobjectionable, or even good. Other alterations are not so good; they entail misuses of nature. When nature is misused, environmental problems are created. Air and water get polluted; soil erodes; dead zones spread; species disappear; exotics become pests. Though it is no easy task to distinguish between uses and misuses of nature, the wisdom of curtailing such misuses is clear.

A century ago, we mostly viewed nature as a source of discrete natural resources.¹ We then misused nature when we dirtied our homes and diminished the flows of minerals, plants, and animals through wasteful consumption.² Today we understand nature much differently—we realize that landscapes are complex, functioning wholes.³ We know, or ought to know, that our long-term flourishing depends, not just on specific, valuable parts of nature, but on the ability of these

* © 2012 Sanne H. Knudsen. Assistant Professor of Law, University of Washington School of Law. I am grateful to Professor Eric Freyfogle for his invaluable comments and discussions on earlier drafts of this work.

¹ CURT MEINE, CORRECTION LINES: ESSAYS ON LAND, LEOPOLD, AND CONSERVATION 48 (2004) (“Conservation in the Progressive Era rested, first and foremost, on utilitarian and anthropocentric premises. ‘The first principle of conservation is development, the use of the natural resources now existing on this continent for the benefit of the people who live here now.’”) (quoting GIFFORD PINCHOT, THE FIGHT FOR CONSERVATION 43 (1910)); see also DONALD WORSTER, NATURE’S ECONOMY: THE ROOTS OF ECOLOGY 268 (1977) (“In the history of progressive agriculture, wild creatures had never counted for much. They failed to conform to the farmer’s productive purposes and so were seen as useless when not seen as a threat.”).

² See Dave Foreman, *The New Conservation Movement*, in DEEP ECOLOGY FOR THE TWENTY-FIRST CENTURY: READINGS ON THE PHILOSOPHY AND PRACTICE OF THE NEW ENVIRONMENTALISM 50–56 (George Sessions ed., 1995) (explaining how the work of early conservation biologists exposed the harm that resource extraction causes ecosystems).

³ See Robert B. Keiter, *Beyond the Boundary Line: Constructing a Law of Ecosystem Management*, 65 U. COLO. L. REV. 293, 294–95 (1994) (noting that land managers “[r]ecogniz[e] that natural systems often cross jurisdictional boundaries” and that lawmakers are “beginning to speak in ecosystem terms”). As an example of the interconnectedness of ecosystems, consider that the Inuits inhabiting remote arctic areas have “among the highest PCB levels in their blood of any community on earth.” JAMES RASBAND, JAMES SALZMAN & MARK SQUILLACE, NATURAL RESOURCES LAW AND POLICY 3 (2d ed. 2009).

landscapes to maintain their ecological functioning.⁴ We have also adopted widely held beliefs that certain parts of nature—rare species, for instance—can have value and deserve protection without regard for known human benefits.⁵

While our appreciation for what constitutes a misuse of nature has evolved with the study of ecology, our environmental laws have not. The multitude of environmental laws, although important in their own right, do not protect nature as an interconnected whole. Rather, environmental laws dissect ecosystems into discrete elements—air, water, timber, and wildlife, for example.⁶ This dissection ignores the invaluable services that ecosystems provide when allowed to function without undue disruption.

Shortcomings in current laws are particularly acute in the case of lands and resources that are privately owned. There is a widespread belief that private owners have discretion to act as they see fit so long as they avoid overtly harming neighbors.⁷ Laws tell landowners to restrain their alterations of nature in only a few settings.⁸ As a result, nature on private lands is shaped by decisions and values held by individual landowners, despite the public interests at stake.

Often the problem of protecting ecosystems is made even more complicated by the belief that we should be able to devise a solution by tweaking existing tools and operating within an inherited worldview.⁹ But what if the solution lies in another frame entirely? Imagine an unencumbered opportunity to align ecological understanding, private interests, public needs, and the law. How might we approach the problem then? In particular, if we were to devise a reformed law for curtailing and remedying misuses of nature on private and public lands, what might that law look like? How might it protect ecosystem services like water

⁴ See, e.g., JAMES LOVELOCK, *GAIA: A NEW LOOK AT LIFE ON EARTH* 9 (1979) (“[T]he entire range of living matter on Earth, from whales to viruses, and from oaks to algae, could be regarded as constituting a single living entity”); see also *infra* Part I.B (discussing ecosystem services and the public’s interest in private land).

⁵ See, e.g., Arne Naess, *The Deep Ecological Movement: Some Philosophical Aspects*, in *DEEP ECOLOGY FOR THE TWENTY-FIRST CENTURY: READINGS ON THE PHILOSOPHY AND PRACTICE OF THE NEW ENVIRONMENTALISM*, *supra* note 2, at 64, 64–84 (explaining that the Deep Ecology Movement is based on the view that nature is valuable for its own sake, and not merely for human interests).

⁶ See Clean Air Act, 42 U.S.C. §§ 7401–7671(q) (2006); Clean Water Act, 33 U.S.C. §§ 1251–1387 (2006); National Forest Management Act, 16 U.S.C. §§ 1600–1687 (2006); Endangered Species Act, 33 U.S.C. §§ 1531–1599 (2006).

⁷ Joseph L. Sax, *Ownership, Property, and Sustainability*, 31 UTAH ENVTL. L. REV. 1, 15 (2011); see also ERIC T. FREYFOGLE, *ON PRIVATE PROPERTY: FINDING COMMON GROUND ON THE OWNERSHIP OF LAND* 6–9, 20–24 (2007) (discussing the “partial truths” that pervade American thought and property law, such as the right of landowners to exclude all others, the protection of liberty through the protection of property rights, and the absolute nature of private property rights).

⁸ For example, the Clean Water Act prohibits the alteration of wetlands without a permit, even when the wetlands happen to fall on private lands. 33 U.S.C. § 1344.

⁹ See discussion *infra* Part II.C.

filtration, carbon sequestration, and soil nitrification? How would the law function given that nature is an interconnected whole that knows no boundary between public and private lands? Would it freely acknowledge the public's interest in preserving valuable ecosystem services, even those that happen to fall on private lands? How might a reformed law work with existing federal and state natural resource laws?

A property law that restrained land misuse would go beyond protecting the interests of individual owners. It would respect broader public interests in how nature is altered. It would recognize how one piece of nature is ecologically intertwined with other pieces of nature, near and far, and how uses of one may affect others. It would consider how people living in a landscape depend upon the healthy functioning of the entire landscape. And it would take seriously, and somehow protect, the interests of other life forms and future generations.

A legal system that embraced the goal of using nature responsibly would require more than just new substantive rules on how people could use nature. It would also require a widely applicable legal remedy—a statutory cause of action—that citizens could use to stop misuses of nature and otherwise gain relief. Given the limitations of the common law,¹⁰ a more explicit and broad-based approach is needed in order to remedy harms to ecosystems. Some scholars have recognized this need,¹¹ and many have lamented the difficulties inherent in attempting to mend a broken view of private property.¹² None, however, have suggested the approach proposed in this Article—a rethinking and expansion of natural resource damages law.¹³

¹⁰ See *infra* Part II.C.

¹¹ See William H. Rodgers, Jr., *Improving Laws, Declining World: The Tort of Contamination*, 38 VAL. U. L. REV. 1249, 1259 (2004) (proposing the creation of a new tort of contamination “defined as interference with the use and enjoyment of ecosystem functions”); David S. Wilgus, *The Nature of Nuisance: Judicial Environmental Ethics and Landowner Stewardship in the Age of Ecology*, 33 MCGEORGE L. REV. 99, 107 (2001) (“The reality that we do not live on a boundless continent, coupled with an increasingly sophisticated understanding of our affects on the natural environment, should cause us to broaden our notions of property and infuse modern property law with an environmental ethic.”).

¹² See, e.g., ERIC T. FREYFOGLE, *THE LAND WE SHARE: PRIVATE PROPERTY AND THE COMMON GOOD* 7 (2003) (“Much of today’s conflict about property rights has arisen precisely because land is so different in law and nature.”); see also Robert J. Goldstein, *Green Wood in the Bundle of Sticks: Fitting Environmental Ethics and Ecology into Real Property Law*, 25 B.C. ENVTL. AFF. L. REV. 347, 352–53 (1998) (arguing that courts should recognize “green wood” in the bundle of sticks that make up property rights as a means of balancing private property rights and environmental ethics); Wilgus, *supra* note 11, at 102 (“[O]utmoded notions of property law prevent a harmonization of ecology and law.”).

¹³ Although very few scholars have discussed the potential for natural resource damages to serve a broader role in remedying harms to nature, Professor Peter M. Manus remarked over a decade ago that natural resource damages law “has direct and real

As currently conceived, natural resource damages are limited in scope; even in combination they cannot adequately remedy misuses of nature. Even so, these damages provide a good starting point for assessing the promise and flaws embodied in existing laws. By identifying the limits of current resource-related remedies, the changes required to better protect ecosystem health become clearer.

In search of a reformed natural resource damages law, Part I of this Article begins by exploring the idea that we should not misuse nature. It surveys current literature and explains how the idea would—if taken seriously—recast the ways we think about private property. Part II sets the stage for a reformulated law of natural resource damages by noting the gaps and limits of key environmental statutes and of the common law of property. It focuses particularly on the law's failure to respect ecological functioning and the public's interest in private land. Part III surveys the law of natural resource damages, which provides useful elements for constructing a broader, more ecologically grounded remedy. Part IV draws together the Article's various parts to outline an expanded remedy for misuses of nature. The assessment is necessarily broad brushed. Its contribution is not in proposing detailed answers but in getting the challenges on the table. Part IV considers eight such challenges, each of which is foundational to the problem of protecting the healthy functioning of ecosystems when those systems know no boundary between federal, state, tribal, and private lands.

I. THE MISUSE OF NATURE—PUBLIC AND PRIVATE

The very suggestion that we provide remedies for the misuse of nature assumes that we can decide which human alterations of nature qualify as misuse. That task, however, is not so easy.

How do extractive and destructive land uses—for example, mining—fair when we delineate between use and misuse? Is a piece of land misused simply because it is destroyed? Or, is land only misused when the benefits derived from its degradation do not outweigh the benefit derived from leaving the ecosystem more intact? On what basis do we decide whether one set of benefits outweighs another? Who receives the benefits and for what reason? To what will we turn for guidance in determining where to draw the line between use and misuse—science, economics, or ethics? Will we rely on some combination of idealism and pragmatism?

Even though science can provide objective information about the character, extent, and consequences of land use, some ethical framework is needed to decide

potential to translate into financial liabilities the long-term, broad ranging, and aesthetic effects of human activities on nature.” Peter M. Manus, *Natural Resource Damages from Rachel Carson's Perspective: A Rite of Spring in American Environmentalism*, 37 WM. & MARY L. REV. 381, 388 (1996); see also *id.* at 421 (“Perhaps more than any other environmental law concept, [natural resource damages] has the potential to represent progress toward a legal structure that incorporates [Rachel] Carson's philosophy.”).

what changes are wise or foolish, moral or immoral. In search of such a framework, the widespread tendency of some observers is to evaluate a human-altered landscape by comparing it with what the landscape would have looked like without any human-caused change.¹⁴ This is the wilderness ideal, and it implies that all human change is bad and that less change is better. This normative standard may have value in some settings—in landscapes that we want to preserve or restore to wilderness-like conditions—but it makes no sense when applied to landscapes that humans inhabit to meet their needs. All species change their environments as they go about living.¹⁵ Humans are not, and need not be, different.

Once we discard this wilderness ideal as the baseline for good land use, we are cast adrift—we must come up with some other standard for distinguishing between legitimate uses of nature and abuses of nature. The subject has drawn the attention of various commentators, and their work provides a starting point. For now, let us set aside the question of how to distinguish between use and misuse of nature. Let us work first to achieve consensus on the point that it is necessary and proper to do so.

A. *Avoiding the Misuse of Nature*

As people living in a community, we have a collective responsibility to avoid the misuse of nature. This obligation must be accepted before the problem of ecosystem conservation can even begin to be solved; without a shared ethical basis for accepting limits on the use of nature, we will never be comfortable with the sacrifices of economics or convenience that such limits will inevitably require.

Support for our shared obligation to avoid the misuse of nature is found in literature, religion, culture, science, and law. In particular, there is a rich literature of scholars contemplating the roots and extent of our ethical obligations to serve as stewards of nature, rather than merely consumers of it. The best-known and perhaps most influential call for an environmental ethic (a land ethic, as he termed it) has come from Aldo Leopold (1887–1948). In much-quoted language, Leopold

¹⁴ For a general introduction to the large body of literature on the wilderness ideal, see *THE GREAT NEW WILDERNESS DEBATE* (J. Baird Callicott & Michael P. Nelson eds., 1998) (a collection of previously published works that approach the concept of wilderness in a variety of ways); *THE WILDERNESS DEBATE RAGES ON: CONTINUING THE GREAT NEW WILDERNESS DEBATE* (Michael P. Nelson & J. Baird Callicott eds., 2008) (a collection of works contributing to the wilderness conversation). One much-cited essay in the debate is William Cronon, *The Trouble with Wilderness; or, Getting Back to the Wrong Nature*, in *UNCOMMON GROUND: RETHINKING THE HUMAN PLACE IN NATURE* 69, 69–90 (William Cronon ed., 1995) (discussing the wilderness ideal and arguing that the time is ripe to look beyond it).

¹⁵ See Carolyn M. Malmstrom, *Ecologists Study the Interactions of Organisms and Their Environment*, 1 *NATURE EDUC. KNOWLEDGE*, no. 8, 2010 at 9, available at <http://www.nature.com/scitable/knowledge/library/ecologists-study-the-interactions-of-organisms-and-13235586>.

summed up the substance of his proposed land ethic with this deceptively poetic measure: “A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.”¹⁶ In other writings, Leopold emphasized the place of humans as citizens within a larger land community; he urged us to recognize the importance of land health. In doing so, Leopold argued for treating nature as an interconnected whole so that it retains its capacity for self-renewal:

[T]he health of the land as a whole, rather than the supply of its constituent ‘resources,’ is what needs conserving. Land, like other things, has the capacity for self-renewal (i.e. for permanent productivity) only when its natural parts are present, and functional. It is a dangerous fallacy to assume that we are free to discard or change any part of the land we do not find ‘useful’ (such as flood plains, marshes, and wild floras and faunas). Too violent modification of the natural order has repeatedly disorganized the land’s capacity for self-renewal.¹⁷

The responsibility for maintaining land health, Leopold argued, is a shared responsibility, a collective duty of stewardship: “A land ethic, then, reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land.”¹⁸ Leopold’s words resonate in the quest to protect ecosystem services and use nature in a way that preserves nature’s functions.

Modern day scholars, most notably Professor Eric Freyfogle, have echoed Leopold’s call to root conservation in the stewardship of land and a concern for community interests.¹⁹ Freyfogle artfully sums up Leopold’s work by explaining

¹⁶ ALDO LEOPOLD, *A SAND COUNTY ALMANAC AND SKETCHES HERE AND THERE* 224–25 (spec. commemorative ed. 1989). For an excellent summation and explanation of the context of Leopold’s work, see ERIC T. FREYFOGLE, *WHY CONSERVATION IS FAILING AND HOW IT CAN REGAIN GROUND* 18–27 (2006).

¹⁷ FREYFOGLE, *supra* note 16, at 22 (citing Aldo Leopold, Conservation (Aug. 8, 1946) (unpublished manuscript) (on file with the University of Wisconsin Digital Collections) (attached to Letter from Horace S. Fries to Aldo Leopold (Aug. 8, 1946) (on file with the University of Wisconsin Digital Collections), available at <http://digidoll.library.wisc.edu/cgi-bin/AldoLeopold/AldoLeopold-idx?type=goto&id=AldoLeopold.ALCorresAK&isize=M&submit=Go+to+page&page=510>)).

¹⁸ LEOPOLD, *supra* note 16, at 221.

¹⁹ Leopold is the touchstone for legal scholars who argue in support of an environmental ethic focused on land stewardship. See, e.g., Craig Anthony (Tony) Arnold, *The Reconstitution of Property: Property as a Web of Interests*, 26 HARV. ENVTL. L. REV. 281, 281 (2002) (using Leopold to begin the article’s discussion questioning the modern metaphor that describes property as a bundle of sticks); FREYFOGLE, *supra* note 16, at 18 (“Leopold has hardly been conservation’s only major intellect, but he remains the dominant one, long after his death in 1948.”); Alyson C. Flournoy, *In Search of an Environmental Ethic*, 28 COLUM. J. ENVTL. L. 63, 77 (2003) (beginning the discussion of environmental

that “conservation for Leopold focused on the totality of nature as an interconnected whole and on the need to counteract the chief forces—market economics and private property above all—that fueled harmful land-use choices.”²⁰ Picking up Leopold’s call to critically analyze private property, Freyfogle has written extensively on property law and our mistaken perception that private land use is without limits.²¹ By placing modern views on private property in a historical context, Freyfogle argues in favor of a conservation ethic that is rooted in community and supported by a public rights perspective of property law.²² Property law, Freyfogle explains, is

full of legal arrangements that recognize ownership in one party and use rights in another. It would be a significant step, but hardly unprecedented, for lawmakers to declare that the public owns all of nature, with private owners holding something akin to use rights, tailored to respect the common good.²³

Professor Joseph Sax has similarly emphasized the necessity of respecting and incorporating ethical obligations into the evolution of environmental laws. In his well-known 1970 article, Sax recognized moral and ethical limits on the ownership of nature when he argued that the public trust doctrine²⁴ is a viable tool for

ethical frameworks with the “formative writings” of Leopold); Goldstein, *supra* note 12, at 391–92 (explaining that the concept of stewardship has been developed from Leopold’s writings and land ethic).

²⁰ FREYFOGLE, *supra* note 16, at 19.

²¹ See, e.g., FREYFOGLE, *supra* note 12, at 58–63 (discussing liberty and government regulation); FREYFOGLE, *supra* note 7 (discussing the rights of landowners, how these rights change overtime, and how these rights intertwine with other rights); Eric T. Freyfogle, *Property and Liberty*, 34 HARV. ENVTL. L. REV. 75 (2010) (discussing how private property and liberty are intertwined, and what liberties should be secured in the realm of private property); Eric T. Freyfogle, *The Particulars of Owning*, 25 ECOLOGY L.Q. 574 (1999) [hereinafter Freyfogle, *Particulars of Owning*] (discussing private property, popular will, and public policy).

²² FREYFOGLE, *supra* note 16, at 17.

²³ FREYFOGLE, *supra* note 12, at 239.

²⁴ In its traditional formulation, the public trust doctrine provides that states hold title to certain lands (submerged lands) in trust for the benefit of citizens of the state. See *Ill. Cent. R.R. Co. v. Illinois*, 146 U.S. 387, 458–60 (1892); Charles F. Wilkinson, *The Headwaters of the Public Trust: Some Thoughts on the Source and Scope of the Traditional Doctrine*, 19 ENVTL. L. 425 (1989). Because certain resources are held in trust, their disposition and use must be consistent with public trust responsibilities of the state. See, e.g., *Phillips Petrol. Co. v. Mississippi*, 484 U.S. 469, 475 (1988) (“[I]t has been long established that the individual States have the authority to define the limits of the lands held in public trust and to recognize private rights in such lands as they see fit.”).

protecting certain “gifts of nature” from privatization or exploitation.²⁵ Sax has also argued for a property system based on a usufructary model, wherein the owner of the usufruct only has a “right to uses compatible with the community’s dependence on the property as a resource.”²⁶ Because public resources fall on private lands, Sax more recently urged that that we need to do some “fundamentally fresh thinking” about what it means to be a landowner²⁷ and that “the public has a legitimate stake in the way in which owners use land.”²⁸

In their writings, Sax and Freyfogle both echo Leopold’s theme of humans being part of a land community. They urge the subordination of private land use to community interests where appropriate, as one might expect from a stewardship-based ethic. Inherent in stewardship, of course, is the assumption that the stewards will not misuse the nature entrusted to their care. In this sense, a stewardship-based ethic has strong roots in cultural and religious doctrines.²⁹

Christianity is a good example of a dominant western religion with roots in values of stewardship. In the Christian tradition, God is the creator of Earth and has entrusted humans with the responsibility of caring for His creation.³⁰ Many scholars have argued that this relationship between God, humans, and creation gives rise to a stewardship model in which humans must actively work to manage God’s creation.³¹ Professor John Copeland Nagle has meaningfully contributed to

²⁵ Joseph L. Sax, *The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention*, 68 MICH. L. REV. 471, 484 (1970); Peter Manus, *To a Candidate in Search of an Environmental Theme: Promote the Public Trust*, 19 STAN. ENVTL. L.J. 315, 330–33 (2000).

²⁶ Joseph L. Sax, *Property Rights and the Economy of Nature: Understanding Lucas v. South Carolina Coastal Council*, 45 STAN. L. REV. 1433, 1452 (1993).

²⁷ Joseph L. Sax, Lecture at the Fifteenth Annual Symposium of the Wallace Stegner Center for Land, Resources, and the Environment: Ownership, Property, and Sustainability (Mar. 11, 2010) [hereinafter Joseph L. Sax Lecture]; see also Joseph L. Sax, *Ownership, Property, and Sustainability*, 31 UTAH ENVTL. L. REV. 1 (2011).

²⁸ Joseph L. Sax Lecture, *supra* note 27, at 10.

²⁹ For a detailed discussion on how attitudes towards private property changed during the Industrial Revolution and how individual rather than community interests began to dominate, see FREYFOGLE, *supra* note 12, at 65 (“Industrialism was coming, and by the time it had fully made its mark late in the century, landowners would hold a bundle of rights far different from the one they held when the century began.”); also see Joseph L. Sax Lecture, *supra* note 27.

³⁰ *Genesis* 1:26–28. While *Genesis* provides that God entrusted man with “dominion” over the Earth, and while some have grabbed this passage as giving man license to dominate nature, religious scholars have explained that “dominion” is used elsewhere in the scriptures to “refer to a peaceful rule designed to serve those living subject to it.” JOHN COPELAND NAGLE & J.B. RUHL, *THE LAW OF BIODIVERSITY AND ECOSYSTEM MANAGEMENT* 44 (2002).

³¹ See John Copeland Nagle, *From Swamp Drainage to Wetlands Regulation to Ecological Nuisances to Environmental Ethics*, 58 CASE W. RES. L. REV. 787, 804–08 (2008) (providing an excellent discussion of literature focused on Christian ideas of

this area and noted that “Christian ideas of stewardship build upon the twenty-six references to ‘steward’ or ‘stewardship’ that are contained in the Bible.”³²

Nonchristian cultures have similarly deep traditions that teach respect for nature. For example, in the Native American culture, man is considered “one with nature,” giving rise to a relationship in which man is a steward rather than conqueror or owner:

The Indians saw themselves as one with nature. All of their traditions agree on this. Nature is the larger whole of which mankind is only a part. People stand within the natural world, not separate from it; and are dependent on it, not dominant over it. All living things are one, and the people are joined with trees, predators and prey, rocks and rain in a vast, powerful, interrelationship. . . . Because of this deep kinship, Indians accorded to every form of life the right to live, perpetuate its species, and follow the way of its own being as a conscious fellow creature. Animals were treated with the same consideration and respect as human beings.³³

The respect that Native American and other subsistence cultures have for natural systems has been deemed an important “precursor to a land ethic.”³⁴

Buddhism is yet another example of religion echoing a common theme of stewardship. The most important principle of “Buddhist karma-based ethics is ahinsa, the principles of non-harming and of respect for life.”³⁵ To that end, Buddhist monks take vows to follow moral perceptions that prohibit harming the environment; “[t]here are vows for protecting the purity of the water; for not killing sentient beings who live in the earth; for not killing insects, birds, and animals; for not starting forest fires; and for respecting the life of trees, particularly ancient ones.”³⁶

stewardship). Notably, Bruce Babbitt spoke of the stewardship responsibility that is rooted in Christian tradition when he argued that religious values as well as our responsibility as stewards remain at the heart of the Endangered Species Act. Bruce Babbitt, *Between the Flood and the Rainbow: Our Covenant to Protect the Whole of Creation*, 2 ANIMAL L. 1 (1996), as reprinted in THE LAW OF BIODIVERSITY AND ECOSYSTEM MANAGEMENT, *supra* note 30, at 39, 39–43.

³² Nagle, *supra* note 31, at 804; see also John Copeland Nagle, *Playing Noah*, 82 MINN. L. REV. 1171, 1226–33 (1998) (discussing the Christian idea of stewardship in the environmental context).

³³ NAGLE & RUHL, *supra* note 30, at 46 (quoting J. DONALD HUGHES, AMERICAN INDIAN ECOLOGY 14–17 (1983)).

³⁴ Goldstein, *supra* note 12, at 388.

³⁵ Ron Epstein, *Environmental Issues: A Buddhist Perspective*, VAJRA BODHI SEA, Mar. 2005, at 28, 30 (Winnie Tiu & Gwo Tseng Wei trans.), available at <http://online.sfsu.edu/~rone/Buddhism/EnvironBudPersp.pdf>.

³⁶ *Id.*

In addition to religious traditions, the notion that we ought not misuse nature finds support in our willingness to protect the environment through statutes and the common law.³⁷ In other words, we would not have bothered ourselves with such a complex and comprehensive web of environmental statutes unless we recognized that unfettered pollution of rivers or destruction of habitat is unsustainable and unacceptable.³⁸ This is not to say that the values motivating our various environmental laws form a cohesive or articulated ethic.³⁹ But despite common quibbles over what level of pollution control or land use regulation is acceptable, our willingness to accept an impressive amount of environmental regulation reflects a common understanding that some limits on industrial society and land use are necessary to preserve a healthy civilization.⁴⁰

Various common law doctrines also reflect a desire to limit the use of nature when that use crosses certain thresholds. For example, the natural use doctrine provides that “[a]n owner of land has no absolute and unlimited right to change the essential natural character of his land so as to use it for a purpose for which it was unsuited in its natural state and which injures the rights of others.”⁴¹ Similarly, by protecting private property owners from unreasonable interference by other owners, the nuisance doctrine recognizes that private lands do not exist in isolation and that certain limits are appropriate when land use adversely impacts others. For resources protected under the public trust doctrine, limits on private property use are also appropriate to promote broader public interests. The inherent limits on land use recognized by these common law doctrines support the normative claim that we ought not misuse nature, whether to protect state’s rights, the rights of other landowners, or the public trust.

Beyond law and religion, the claim that we ought not misuse nature finds support in science itself. The science of ecology educates us on the indispensable

³⁷ See Bradley C. Karkkainen, *Framing Rules: Breaking the Information Bottleneck*, 17 N.Y.U. ENVTL. L.J. 75, 75–79 (2008) (referencing the tens of thousands of regulatory mandates embodied in our environmental laws).

³⁸ See Goldstein, *supra* note 12, at 395–96.

³⁹ Flournoy, *supra* note 19, at 66 (arguing “it is not clear that environmental laws do reflect any clearly articulated ethic that should be called environmental” and suggesting “[a]s a nation, we lack an adequate understanding of the values that undergird these laws”).

⁴⁰ Goldstein, *supra* note 12, at 395 (“The whole body of environmental laws that have been enacted over the course of the past forty years are a testament to that policy and to the willingness of society to exact economic costs for the sake of that policy. . . . [These laws] demonstrate the movement of society toward the understanding that preservation and protection of our natural environment is a positive value, and a widespread one.”).

⁴¹ *Just v. Marinette Cnty.*, 201 N.W.2d 761, 768 (Wis. 1972); see FREYFOGLE, *supra* note 12, at 94–97 (explaining and quoting *Just*, 201 N.W.2d at 767–68); see also Arnold, *supra* note 19, at 350–51 (discussing natural use doctrine). Several states, including Wisconsin, Florida, New Hampshire, New Jersey, and South Carolina, have adopted the natural use doctrine. *Id.* at 350 n.344.

value of ecosystems to human survival.⁴² “[I]t is no exaggeration to state that the suite of ‘ecosystem services’—purifying air and water, detoxifying and decomposing waste, renewing soil fertility, regulating climate, mitigating droughts and floods, controlling pests, and pollinating vegetation—quite literally underpins human society.”⁴³ The importance of these services lends urgency to the call for a land ethic grounded in stewardship rather than unbridled consumption. Science has been a strong voice in this regard; Professor Robert J. Goldstein posits that “[t]he science of ecology has been the most significant factor in the development of environmental ethics over the course of the last century.”⁴⁴

Science, religion, culture, and law all offer arguments against misuse of nature. The more difficult question, and the one that will undoubtedly evoke more debate, is where to draw the line between use and misuse. Tackling this uncomfortable and unclear question is inevitable given that people and nature are intertwined. We cannot set aside natural resources in their entirety. We depend on their use for our survival—yet human actions have consequences. Whether we want to be or not, we are stewards of the natural world. The question is whether we are good stewards or poor stewards. And this is how we come to the ultimate question of which consequences are acceptable and which are not.⁴⁵

Consider the role of science. In setting limits for environmental protection and public health, we often turn to science for answers. For example, we turn to science on issues like whether to ban leaded gasoline because of public health impacts of lead exposure,⁴⁶ whether the habitat of a given species is so depleted or fragmented so as to make that species in danger of extinction,⁴⁷ or whether to implement aggressive legislation to reduce greenhouse gas emissions in an effort to curb climate change.⁴⁸ Likewise, science arises in debates over what protections

⁴² See *infra* Part I.B.

⁴³ J.B. Ruhl & James Salzman, *The Law and Policy Beginnings of Ecosystem Services*, 22 J. LAND USE & ENVTL. L. 157, 157 (2007).

⁴⁴ Goldstein, *supra* note 12, at 387.

⁴⁵ Freyfogle explains that the conservation movement needs to adopt a vision of good land use “in such a way that human needs are taken seriously and satisfied insofar as possible, not shunted to the side for others to worry about.” See FREYFOGLE, *supra* note 16, at 176.

⁴⁶ See FRANK ACKERMAN & LISA HEIZERLING, PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING 3–5 (2004) (summarizing the debate about banning leaded gasoline and the role that science played in shaping that debate).

⁴⁷ See, e.g., Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Polar Bear (*Ursus maritimus*) Throughout Its Range, 73 Fed. Reg. 28,212 (May 15, 2008) (to be codified at 30 C.F.R. pt. 17) (relying on “best available scientific data” to determine whether sea ice habitat decline in the Arctic regions warrants protecting polar bears under the Endangered Species Act).

⁴⁸ Through the Department of Commerce Appropriations Act of 2008, Pub. L. No. 110-161, 121 Stat. 1844, Congress mandated that the National Oceanic and Atmospheric Administration (NOAA), together with the National Academy of Sciences, to establish a committee and produce a series of studies to ensure that climate decisions are informed by

ought to be afforded to ecosystem functions.⁴⁹ Indeed, the science of ecology has been a catalyst for contemplating how environmental regulation, common law doctrines, and property law theories need to adapt to new knowledge about the interconnectedness and indispensable value of natural systems.⁵⁰

Science can predict the likely consequences of our actions, telling us whether they are reversible or irreversible, localized or widespread.⁵¹ But science does not provide complete answers. As Professor Freyfogle has explained, part of the problem is that science does not, and cannot, provide all the answers because science is *descriptive* in nature—it tells us what nature does and what consequences of our actions might be, but does not tell us what is right or wrong in terms of degree of acceptable impacts to land.⁵² Nor does it tell us what risk levels we should be willing to accept to promote public health. For example, on the issue of endangered species protection, science could tell us that the proposed site of the Tellico dam in the 1970s would have destroyed the only remaining snail darter habitat.⁵³ Science could not tell us whether this little fish and the associated ecological benefits were worth the economic loss of destroying a nearly completed dam that would produce 200 million kilowatt hours of hydroelectric power and save an estimated 15 million gallons of oil in the midst of a national energy crisis.⁵⁴

Similarly, science plays a central role in the discussion of climate change.⁵⁵ But global climate systems are complex, and there are many questions still unanswered on this issue. For instance, what will be the consequences of climate change in Utah, Florida, or India? Science cannot necessarily answer these questions with certainty at this time, and there are other questions that science

the best possible scientific knowledge. The final report, COMM. ON AMERICA'S CLIMATE CHOICES, NATIONAL RESEARCH COUNCIL, AMERICA'S CLIMATE CHOICES (2011), *available at* <http://dels.nas.edu/Report/Americas-Climate-Choices/12781>, was released in May 2011.

⁴⁹ For example, the state of Washington has passed a Growth Management Act that requires local governments to use the best available science when reviewing and revising their policies and regulations on wetlands. WASH. REV. CODE §§ 36.70A.010–70A.904 (2011). The state's Department of Ecology received funding from the U.S. Environmental Protection Agency to synthesize the science on wetlands in support of its mandate to local governments. *See Wetlands: Nature's Sponges, Nurseries, and Water Filters*, WASH. ST. DEP'T ECOLOGY, <http://www.ecy.wa.gov/programs/sea/wetlands/index.html> (last visited Feb. 25, 2012).

⁵⁰ See *infra* note 197 and accompanying text for a brief survey of the scholarship aimed at aligning environment laws with ecological understanding.

⁵¹ See *infra* notes 44–47 and accompanying text for examples of ways in which science is used as a tool in decision-making.

⁵² FREYFOGLE, *supra* note 16, at 159.

⁵³ *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 153 (1978).

⁵⁴ 125 CONG. REC. 23,867 (1979) (statement of Sen. Howard Baker); see Stephen J. Rechicar & Michael R. Fitzgerald, *Administrative Decision and Economic Development: TVA's Tellico Dam Controversy*, 8 PUB. ADMIN. Q. 223, 235 (1984).

⁵⁵ See, e.g., ACKERMAN & HEIZERLING, *supra* note 46.

cannot answer at all, like how many species are we willing to put at risk through habitat loss? How much land are we prepared to lose along our coasts as a result of the rising sea levels predicted to accompany climate change? Similarly, how many communities in developing island nations are we willing to expose to flooding? These last questions turn on our willingness to accept certain risk levels, which are fundamental issues of policy or values, not science.⁵⁶ Ultimately, our line drawing will be a blend of ethics and science.⁵⁷

Like the role that it has played in many issues before, science will undoubtedly play a central role in distinguishing between use and misuse of nature. Science will help decide when ordinary, expected, and necessary uses of nature cross the line into misuses that ought to be limited for the greater benefit of society. Science cannot, however, provide the wholesale answer. Some measure of ethics and values will have to be considered.

B. The Public's Interest in Private Land

If we are to remedy the misuse of nature, we need more than an ethical framework guiding our actions; we need to be specific about the scope of lands for which we are prepared to accept responsibility. In particular, this means that any enduring remedial framework must address lands in private ownership.⁵⁸ Over sixty percent of lands in the United States are privately owned.⁵⁹ These lands are not neatly separated from public lands, but instead form a pattern of land ownership that resembles something of a patchwork quilt.⁶⁰ Constructing a framework to remedy the misuse of nature that ignores limits on private land use would fail the most basic challenge of respecting land as an interconnected whole.

⁵⁶ Professor Freyfogle has grappled with many of these issues. See FREYFOGLE, *supra* note 16, at 152–59 (suggesting some normative benchmarks for determining what is good land use. Prominent among those benchmarks are human utility, broadly defined; and ethical obligations for future generations).

⁵⁷ See Flournoy, *supra* note 19, at 80–88 (describing the various ethical frameworks that drive the environmental philosophical debate, ranging from anthropocentric utilitarian to biocentric communitarian).

⁵⁸ FREYFOGLE, *supra* note 12, at 16 (“Leading American conservationists have repeatedly offered a stern warning: because private land is so extensive, we are unlikely to achieve conservation goals or halt the processes of degradation unless the country revises (yet again, as we shall see) what it means to own nature.”).

⁵⁹ Jonathan H. Adler, *Money or Nothing: The Adverse Environmental Consequences of Uncompensated Land Use Controls*, 49 B.C. L. REV. 301, 301 (2008).

⁶⁰ For a case study example of how the comingling of public and private lands challenges land conservation goals, see John D. Erickson & Sabine U O’Hara, *From Top-Down to Participatory Planning: Conservation Lessons from the Adirondack Park, United States*, in BIODIVERSITY AND ECOLOGICAL ECONOMICS: PARTICIPATION, VALUES, AND RESOURCE MANAGEMENT 146–61 (Luca Tacconi ed., 2000).

It would amount to nothing more than an incomplete and fragmented vision, doing little to synthesize ecological understanding with legal recourse.⁶¹

Because no discourse on proper land use is complete without considering private lands, the normative claim introduced above should be more finely stated: we ought not misuse nature, whether on public or private land. Accepting this proposition requires us to engage in the more difficult task of healing schisms between private property and environmental stewardship. We must answer thorny questions like what limits are proper to the use of nature on private lands? Or, put differently, what public ownership rights are inherent in private land? Answers to these questions must be consistent with the common law of property and must respect private property as an institution.⁶² Otherwise, legislative efforts will undoubtedly meet staunch resistance from landowners and potentially run afoul of regulatory takings law.

The following subsections examine public ownership of nature on private lands. The first subsection considers from an ecological perspective why the public should have an interest in nature on private land. The second subsection goes on to examine the false dichotomy that clouds perceptions of private property, exploring property law's capacity to protect public welfare on private lands.

1. The Ecological Case For Public Interest In Private Lands

There are certain elements of the natural world that are vital to a functioning society and therefore should not be entirely under private control. The law has recognized this truth in other settings for quite some time, as illustrated by the public trust doctrine's protection of public rights in navigable waterways.⁶³ As the study of ecology has evolved, we have begun to understand how other elements of nature also provide invaluable benefits to society at large and are therefore worthy of protection against unfettered private use.⁶⁴ In particular, our understanding of ecology has matured to the point where we now appreciate that nature is an

⁶¹ Bradley C. Karkkainen, *Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism*, 21 VA. ENVTL. L.J. 189, 212–13 (2001) (explaining the need to involve multiple landowners (public and private) because single parcels are too small to address ecosystem issues); see also Adler, *supra* note 59, at 302 (“Without conservation on private lands, meaningful ecological conservation cannot be achieved.”).

⁶² FREYFOGLE, *supra* note 12, at 122 (“The protection of lands and communities is a goal that inevitably needs balancing against the benefits that the community gets when landowners are reasonably secure in their entitlements.”).

⁶³ See *supra* note 24 for a brief discussion of the public trust doctrine.

⁶⁴ See, e.g., Nagle, *supra* note 31, at 789–97 (describing how an evolved ecological understanding of wetlands has changed its treatment in the law from one of disgust to one of reverence and protection); see also Gretchen C. Daily, *Introduction: What Are Ecosystem Services?*, in *NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS* 1, 3–4 (Gretchen C. Daily ed., 1997).

interconnected whole and that vital societal functions are derived from protecting certain ecosystem services.⁶⁵

“Ecosystem services” are generally defined as “the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life.”⁶⁶ For example, freshwater systems supply drinking water, habitat, and instream benefits (like recreation, transportation, and flood control).⁶⁷ Forests prevent erosion, reduce sedimentation, and sequester carbon.⁶⁸ Grasslands conserve soils, maintain the genetic library, and stabilize the composition of the atmosphere.⁶⁹ Soil moderates the climate, supports plants, and disposes of dead organic matter.⁷⁰ Natural predators, parasites, and pathogens control pests that threaten agricultural crops.⁷¹

Because nature is a network of systems and services, all alterations of the land have consequences. One cannot destroy a wetland, for instance, without impacting the ecosystem service of water retention.⁷² Similarly, one cannot develop forested watersheds without degrading the service of water purification.⁷³

Not only is nature interconnected, but nature and its services also cannot readily be substituted by technological enterprise and human engineering. In an article discussing the obstacles of regulating ecosystem services, Professor James Salzman recounts the failed Biosphere II experiment in the early 1990s. It is an example of the complex underpinnings of nature’s systems:

⁶⁵ Daily, *supra* note 64, at 3.

⁶⁶ *Id.*

⁶⁷ Sandra Postel & Stephen Carpenter, *Freshwater Ecosystem Services*, in NATURE’S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS, *supra* note 64, at 195, 195–207.

⁶⁸ Norman Myers, *The World’s Forests and Their Ecosystem Services*, in NATURE’S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS, *supra* note 64, at 215, 215–36.

⁶⁹ *Id.* Grasslands contribute to the genetic library because of the abundant biodiversity located in that ecosystem. Also, a large fraction of domesticated species originated from grasslands, and the wild populations related to those domesticated species (along with their associated pests and pathogens) continue to thrive in grasslands. These areas are, therefore, most likely to provide information and strains of species that are resistant to disease. Osvaldo E. Sala & José M. Paruelo, *Ecosystem Services in Grasslands*, in NATURE’S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS, *supra* note 64, at 237, 242–43.

⁷⁰ Gretchen C. Daily et al., *Ecosystem Services Supplied by Soil*, in NATURE’S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS, *supra* note 64, at 113, 113–32.

⁷¹ Rosamond L. Naylor & Paul R. Ehrlich, *Natural Pest Control Services and Agriculture*, in NATURE’S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS, *supra* note 64, at 151, 151–74.

⁷² Ruhl & Salzman, *supra* note 43, at 157.

⁷³ *Id.*

In understanding the power and challenge of ecosystem services, it is best to start our story fifteen years ago, beneath the blazing Arizona desert sun. There, on September 26, 1991, walking through a crowd of reporters and flashing cameras, eight men and women entered a huge, glass-enclosed structure and sealed shut the outer door. Their 3.15 acre miniature world, called Biosphere II, had been designed with no expense spared to re-create the conditions of the earth. . . . Biosphere II sought to re-create a truly self-sustaining environment, complete with designer rainforest, ocean, marsh, savanna, and desert habitats. The eight plucky adventurers, so-called “Bionauts,” intended to remain inside this micro-world for two years. By sixteen months into their adventure, however, oxygen levels had plummeted 33%, nitrous oxide levels had increased 160-fold to levels causing brain damage, ants and vines had overrun the vegetation, and nineteen of the twenty-five vertebrate species had gone extinct, as well as all of the pollinators. The experiment was abandoned.⁷⁴

Despite the budget of \$200 million, recreating the basic services that sustain human life proved to be both a daunting feat and a failed experiment.⁷⁵ Given the troubles and expenses that the Biosphere project encountered in its attempts to replicate nature’s intricacies, we should not expect that we can simply engineer our way out of ecological problems. Some foresight in protecting nature from misuse is a necessary step towards creating a sustainable and healthy future for humankind.

The knowledge that nature is interconnected and that ecosystem services are valuable to human existence is not new. Lamenting soil erosion caused by deforestation, Plato once wrote:

[w]hat now remains of the formerly rich land is like the skeleton of a sick man with all the fat and soft earth having wasted away and only the bare framework remaining . . . The soil [used to be] deep, it absorbed and kept the water . . . , and the water that soaked into the hills fed springs and running streams everywhere.⁷⁶

In the more modern era, George Perkins Marsh heralded the role of microorganisms in sustaining life when he explained that “[e]arth, water, the ducts and fluids of vegetable and of animal life, the very air we breathe, are peopled by

⁷⁴ James Salzman, *A Field of Green? The Past and Future of Ecosystem Services*, 21 J. LAND USE & ENVTL. L. 133, 133 (2006).

⁷⁵ *Id.*

⁷⁶ Daily, *supra* note 64, at 5–6 (quoting Plato in DANIEL HILLEL, *OUT OF THE EARTH: CIVILIZATION AND THE LIFE OF THE SOIL* 104 (1991)).

minute organisms which perform most important functions in both the living and inanimate kingdoms of nature.”⁷⁷

Aldo Leopold and Rachel Carson have similarly trumpeted the importance of understanding and preserving the valuable services that intact ecosystems can provide. Leopold eloquently wrote in 1948:

If the land mechanism as a whole is good, then every part is good, whether we understand it or not. If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.⁷⁸

Some years later, in the famed *Silent Spring*, Rachel Carson captured the interconnectedness of humans and living systems through the simple words “in nature nothing exists alone.”⁷⁹

Though our understanding of ecosystem services has been percolating in the minds of some for many years, scholars trace growing mainstream appreciation for these services to the publication of *Nature's Services* in 1997.⁸⁰ This was the mark of a new era in which ecologists, economists, and lawyers began to systematically examine the contributions of ecological services to social welfare.⁸¹ Written by well-respected scientists and economists, *Nature's Services* explained in great detail the services that ecosystems provide to society, with separate chapters devoted to climate, biodiversity, soil, pollinators, pest control, and major biomes (for example, oceans, freshwater, forests, grasslands).⁸² *Nature's Services* was also the first serious attempt to put a dollar figure on the value of ecosystem services – pollinators, for example, were estimated to contribute a \$4–7 billion to the United States agricultural economy each year.⁸³

⁷⁷ GEORGE P. MARSH, *MAN AND NATURE; OR, PHYSICAL GEOGRAPHY AS MODIFIED BY HUMAN ACTION* 123 (1864).

⁷⁸ Aldo Leopold, *The Round River*, in *ROUND RIVER: FROM THE JOURNALS OF ALDO LEOPOLD* 143, 146–47 (Luna E. Leopold ed., 1993).

⁷⁹ RACHEL CARSON, *SILENT SPRING* 51 (1962). Carson similarly emphasized the interconnectedness of living systems when she stressed that the soil community “consists of a web of interwoven lives, each in some way related to the others—the living creatures depending on the soil, but the soil in turn a vital element of the earth only so long as this community within it flourishes.” *Id.* at 56.

⁸⁰ See, e.g., Ruhl & Salzman, *supra* note 43, at 158.

⁸¹ James Salzman et al., *Protecting Ecosystem Services: Science, Economics, and Law*, 20 *STAN. ENVTL. L.J.* 309, 310 (2001).

⁸² See Daily, *supra* note 64, at 6–10.

⁸³ Gary Paul Nabhan & Stephen L. Buchmann, *Services Provided by Pollinators*, in *NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS*, *supra* note 64, at 133, 141.

Since the release of Nature's Services, there have been numerous scientific studies describing and valuing ecosystems services around the world.⁸⁴ One salient example is the Millennium Ecosystem Assessment ("the Assessment"), which consisted of a series of reports published between 2001 and 2005 assessing how changes in ecosystem services impact human well-being.⁸⁵ The Assessment was modeled on the Intergovernmental Panel on Climate Change and involved approximately 1,360 experts from over 95 different countries.⁸⁶ It starts with the premise that "[e]veryone in the world depends completely on the Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfillment, and aesthetic enjoyment."⁸⁷ One of the Assessment's major findings is that sixty percent of the ecosystem services studied "are being degraded or used unsustainably, including fresh water, capture fisheries, air and water purification, and the regulation of regional and local climate, natural hazards, and pests."⁸⁸ Stop and think about those two statements in concert. Ecosystem services are our lifelines. We are destroying over half of those lifelines.

2. False Dichotomy Between Natural Resources Protection on Public and Private Land

The importance of ecosystem services to society at large, and the fact that many of these vital services happen to fall on private lands, demonstrate the need for a legal regime that protects those services from unfettered private control. Protecting nature's services, therefore, requires that we embrace property law's legitimate role in serving public welfare as well as private interests.

The idea that public ownership rights exist on private lands is neither new nor radical. Many property scholars, having traced the historical foundations of property law in much detail, argue for a more public-rights based model of property.⁸⁹ Based on a more mature understanding of the interconnectedness of nature and ecosystem services, scholars like Professors Sax and Freyfogle have concluded that reviving the voice of public ownership and communal needs to the

⁸⁴ For citations to works published on ecosystem services, see Ruhl & Salzman, *supra* note 43, at 161.

⁸⁵ See MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING SYNTHESIS (2005), available at <http://www.maweb.org/documents/document.356.aspx.pdf>.

⁸⁶ *Id.* at viii.

⁸⁷ *Id.* at 1.

⁸⁸ *Id.*

⁸⁹ Numerous commentators have championed "an ecological image of private property," including DONALD WORSTER, *NATURE'S ECONOMY: A HISTORY OF ECOLOGICAL IDEAS* (2d ed. 1994); Holly Doremus, *The Rhetoric and Reality of Nature Protection: Toward a New Discourse*, 57 WASH. & LEE L. REV. 11, 62-65 (2000); Sax, *supra* note 26, at 1433; *The Particulars of Owning*, *supra* note 21, at 584.

institution of property is both correct and necessary.⁹⁰ Reviving that voice is necessary to prevent undue and irreversible damage to ecosystem services. It is also correct in that the institution of property both protects societal needs and preserves individual rights.

To understand why a public rights view of property is consistent with natural resource protection and property law, consider how property was conceived at the birth of this nation. As a historical matter, property rights were created to serve public welfare and not just individual interests.⁹¹ Indeed, the reigning republican view of property recognized that “property is held by the individual in trust for the benefit of society as a whole.”⁹² Implicit in that statement is the understanding that private property exists only because of society’s agreement to protect the interests of the individual.⁹³ In exchange for that protection, private interests must in some cases give way to the greater needs of society.⁹⁴

Professor Freyfogle has been a prominent voice in this important discourse. In *The Land We Share*, he reminds us that limits on land uses are deeply engrained in the institution of private property. Those limits prevent harm to other landowners or society as a whole. He explains that at the beginning of this nation’s history, “[c]ourts agreed that legislatures possessed broad powers to control how private land was used. Even for Chief Justice Roger Taney, a Southern conservative and author of the proslavery Dred Scott decision, private desires were properly subordinated to public need.”⁹⁵

Early on, and throughout much of the eighteenth century, property law continued to yield significant respect for societal welfare.⁹⁶ For example, “[o]wners of attractive sites for water mills could have their lands seized if they failed to use them in the public interest.”⁹⁷ Indeed, many colonial and early federal-era laws “went well beyond the avoidance of harm to impose affirmative duties on

⁹⁰ FREYFOGLE, *supra* note 12, at 9 (“It is possible, I believe, for the Constitution to give lawmakers substantial power to redefine the rights of landowners, bringing them up to date and promoting conservation, while at the same time heightening the protections landowners enjoy against unfair government treatment.”); Sax, *supra* note 26, at 1451–52; *see also* Goldstein, *supra* note 12, at 429; Wilgus, *supra* note 11, at 100 (“[T]raditional notions of property law must contend with new scientific discoveries about our environment as well as popular notions of an environmental ethic.”).

⁹¹ Jerry L. Anderson, *Takings and Expectations: Toward A “Broader Vision” of Property Rights*, 37 U. KAN. L. REV. 529, 530 (1988) (“[T]he history of views of private property suggests that this country was founded on the ideal of protecting not only private property but also the social good.”).

⁹² *Id.* at 532.

⁹³ *Id.* at 533.

⁹⁴ *Id.*

⁹⁵ FREYFOGLE, *supra* note 12, at 5.

⁹⁶ *Id.* at 58–63.

⁹⁷ *Id.* at 60.

private owners to help achieve social aims.”⁹⁸ Evidence of community-minded views of property rights found its way into the Supreme Court’s 1887 decision *Mugler v. Kansas*.⁹⁹ Writing for the majority, Justice Harlan reiterated that “all property in this country is held under the implied obligation that the owner’s use of it shall not be injurious to the community.”¹⁰⁰

Though many individual laws regulated land use in the public interest throughout the eighteenth century,¹⁰¹ the recognition of public interests in private lands was expressed most directly and uniformly through the common law doctrine *sic utere tuo ut alienum laedas* (“*sic utere tuo*”). This doctrine translates to mean, “use your own so as to cause no harm”; it is referred to as the “no harm” rule for short.¹⁰² Under this doctrine, otherwise reasonable land uses were restricted if they caused harm to other landowners or to the public at large.¹⁰³

Over time, society’s perception of what constitutes harm (and benefits) to the public at large has changed. In the beginning, the “no harm” rule gave rise to applications like the natural-flow rule, where landowners had the right to use water only in ways that left downstream users unaffected.¹⁰⁴ By contrast, during the industrial revolution, society began to elevate the importance of economic development such that developing natural resources was unequivocally seen as a public benefit.¹⁰⁵ The result is a conception of property that would—when viewed purely from a common law perspective—permit landowners to “use land for maximum gain,” even when such use “severely disrupted neighbors.”¹⁰⁶

The common law picture of private property is not complete, however. The role of protecting natural resources from harm has shifted principally from common law to public, or statutory, law. Aside from the common law doctrine of nuisance, environmental statutes are now primarily responsible for regulating land uses and protecting nature from harm.¹⁰⁷ Therefore, when environmental regulations are criticized for undermining individual freedom on private lands, we would be wise to remember that those regulations help fill in the complete picture of private property—one that has always embodied a healthy respect for public interest (whether in the common law itself or in the public law).

Though the public-rights based view of private property has a strong legacy, another voice could be heard in the property debate, one that would grow louder and more forceful over time—the voice of Federalists like James Madison who stressed the importance of individual rights and sought freedom from

⁹⁸ *Id.* at 62.

⁹⁹ 123 U.S. 623 (1887).

¹⁰⁰ *Id.* at 665.

¹⁰¹ FREYFOGLE, *supra* note 12, at 60.

¹⁰² *Id.* at 67.

¹⁰³ *See id.*

¹⁰⁴ *Id.*

¹⁰⁵ *See id.* at 65–99.

¹⁰⁶ *Id.* at 72–73.

¹⁰⁷ *See id.* at 83–84.

governmental interference as much as possible.¹⁰⁸ Indeed, somewhere around the turn of the nineteenth century, with the coming of the Industrial Revolution, pressures for development and economic advances began to overshadow detrimental consequences of destroying public resources for private gain.¹⁰⁹ Soon these pressures changed perceptions of property rights and gave rise to a divisive vision of property, pitting public welfare against private interests.¹¹⁰

The 1922 Supreme Court decision *Pennsylvania Coal Co. v. Mahon*¹¹¹ aptly illustrates and foreshadows the dichotomous views that continue today.¹¹² Justice Holmes, writing for the majority, concluded that to steer clear of the Fifth Amendment, statutes could limit uses of private property only to a minor degree.¹¹³ On the other hand, Justice Brandeis echoed public-rights based views of private property in his dissent when he urged that no regulatory takings should be found where the statute “merely prevents the owner from making a use that interferes with the *paramount* rights of the public.”¹¹⁴

These two voices have continued their uneasy duet in the property debate throughout the settlement and development of this nation. Today, the voice of those who would elevate private property rights and financial interests above the public good can most readily be found in leaders of the “wise use” movement.¹¹⁵ More specifically, under the banner of regulatory takings, wise use leaders have rounded up a broad range of economic and political interests, including developers, small property owners, and timber companies into the so-called “property rights” movement.¹¹⁶

¹⁰⁸ Anderson, *supra* note 91, at 533–34.

¹⁰⁹ FREYFOGLE, *supra* note 12, at 62–63, 65.

¹¹⁰ *Id.*; see also FREYFOGLE, *supra* note 7, at 20–21 (describing as a “universal benchmark” the idea that property can be held in absolute ownership and that any government regulation therefore curtails private property rights).

¹¹¹ 260 U.S. 393 (1922).

¹¹² See *id.* at 415–16. For a discussion about how the property rights debate has evolved and continued throughout the twentieth century, see Anderson, *supra* note 91, at 537–62.

¹¹³ See Anderson, *supra* note 91, at 538 (summarizing divisive views in *Pennsylvania Coal*).

¹¹⁴ See *id.* (quoting *Pennsylvania Coal*, 260 U.S. at 417 (Brandeis, J. dissenting)).

¹¹⁵ See, e.g., DAVID HELVARG, *THE WAR AGAINST THE GREENS: THE “WISE-USE” MOVEMENT, THE NEW RIGHT AND THE BROWNING OF AMERICA—REVISED AND UPDATED* (2004); see also *The Wise Use Agenda: The Citizen’s Guide to Environmental Resource Issues* (Alan M. Gottlieb ed., 1989).

¹¹⁶ The origins of the regulatory takings movement have been attributed to the libertarian ideals espoused by Professor Richard Epstein. See Christine Klein, *The New Nuisance: An Antidote to Wetland Loss, Sprawl, and Global Warming*, 48 B.C. L. REV. 1155, 1186 (2007) (explaining that Epstein’s work serves as “the intellectual blueprint for the modern property rights movement”); see also Douglas T. Kendall & Charles P. Lord, *The Takings Project: A Critical Analysis and Assessment of the Progress So Far*, 25 B.C. ENVTL. AFF. L. REV. 509, 510 (1998) (“[M]any of the changes in takings law that have

In their newsletters, journals, books, and presentations, leaders of the wise use movement routinely argue that environmental regulations are destroying private property rights.¹¹⁷ This rhetoric asserts that environmentalists have generated an avalanche of regulatory red tape that threatens to suffocate small property owners and destroy industrial civilization altogether. "Supporters of both privatization and strong individual property rights distrust—and at times, even scorn—government regulation conducted in the name of the public interest."¹¹⁸

Although extreme, the property rights movement is the product of divisive rhetoric that pits the public interest against the private one. This world—in which regulation of private property for the public good is characterized as an intrusion of rights—is premised on a false dichotomy between public interest and private rights. It is false not because divisive viewpoints have been absent from our history, but because the views that pit private and public rights against one another (1) do not reflect the physical realities of nature and (2) do not appreciate property law's capacity for simultaneously protecting private rights and public resources.

On the first point, natural resources do not differentiate between private and public lands.¹¹⁹ Resources that are important to the public interest, such as privately owned wetlands, cannot be segregated from private ownership any more than valuable topsoil can be dug up and set aside for cultivating society's food. So long as land is privately held, certain resources that are invaluable to society's healthy functioning inevitably will be in private control. In other words, it would

taken place over the last 11 years correspond quite closely to a blueprint for takings doctrine proposed by Professor Richard Epstein in his now-famous book called *Takings, Private Property and the Power of Eminent Domain*. Epstein "advanced a notion of property rights under which individuals should not be forced to bear community burdens." Klein, *supra* at 1186. Epstein called for a broad application of the Fifth Amendment's Takings Clause, admitting that his expansive interpretation would call into question "many of the heralded reforms and institutions of the twentieth century: zoning, rent control, workers' compensation laws, transfer payments, progressive taxation." RICHARD A. EPSTEIN, *TAKINGS: PRIVATE PROPERTY AND THE POWER OF EMINENT DOMAIN*, at x (1985). Other scholars have taken similarly aggressive stances and argued that many environmental regulations amount to regulatory takings and improperly impede on private property rights. See, e.g., Anderson, *supra* note 91, at 536 n.41 (citing Ellen Frankel Paul, *Moral Constraints and Eminent Domain: A Review Essay of Richard Epsteins's Takings: Private Property and the Power of Eminent Domain*, 55 GEO. WASH. L. REV. 152, 177-78 (1986)) (arguing that Epstein's attack on social legislation does not go far enough).

¹¹⁷ For a description and detailed discussion of the property rights movement, see Kendall & Lord, *supra* note 116, at 510-14.

¹¹⁸ See, e.g., Klein, *supra* note 116, at 1166.

¹¹⁹ Anderson, *supra* note 91, at 536 n.38 ("[W]hatever the state of its title, one parcel of land is inextricably intertwined with other parcels, and . . . causes and effects flow across artificially imposed divisions in the land without regard for legal boundaries. The land simply cannot be neatly divided into mine and yours." (quoting Donald W. Large, *This Land Is Whose Land? Changing Concepts of Land as Property*, 1973 WIS. L. REV. 1039, 1045)).

be impossible to set aside or buy up every piece of private land that served some public function. Not only that, but ecosystem health will often turn on more than the health of an individual parcel of land; the value of some resources manifest as part of a larger landscape that spans multiple parcels and multiple landowners. So while some land uses are harmful on their own because of soil erosion or critical habitat destruction, other land uses are harmful in the aggregate. “When too many fields in a watershed are plowed, or too many fields are drained, or too much wildlife habitat is altered, or too many homes are built in an area, or too much impervious pavement distorts hydrologic patterns, the ecological status of entire landscapes can be degraded.”¹²⁰

The issue of aggregate harm is worth probing because it helps to explain the need for a coordinated legal system that identifies and remedies the misuse of nature. In general, the idea that private land practices can be individually insignificant but collectively destructive is analogous to Garrett Hardin’s “tragedy of the commons.”¹²¹ As Hardin explains, unregulated and limited resources that are shared communally will eventually be depleted.¹²² In this case—where ecosystem health is depleted from unregulated and uncoordinated land use—the problem is similar in that ecosystem services are common resources benefitting society as a whole. But the problem is also different in that ecosystems services cross many land parcels, some of which are publicly managed and other of which are privately held.

The problem with ensuring ecosystem health is more like a “tragedy of fragmentation.”¹²³ Our current predication arises from uncoordinated land use practices despite the interconnectedness of nature. As such, Hardin’s suggestion that land be divided and placed into private ownership is not a satisfactory solution for resolving current land use problems. In fact, one might consider taking Hardin up on his other, less-discussed, suggestion that would mitigate aggregate harm by placing restraints on land use practices: “mutual coercion, mutually agreed upon.”¹²⁴ Consistent with Hardin’s analysis, the solution to ecosystem health will require considering land use practices in the aggregate and some measure of collective restraint.

In light of our greater understanding about what constitutes harmful land use and what comprises the public welfare, revitalization of common law doctrines

¹²⁰ FREYFOGLE, *supra* note 12, at 221.

¹²¹ Garret Hardin, *The Tragedy of the Commons*, 162 *SCIENCE* 1243, 1243–48 (1968).

¹²² To illustrate his theory, Hardin supposes that several herders share a field for grazing cows. *Id.* at 1244–45. Even though overgrazing will eventually destroy the resource, Hardin suggests that it is in each herder’s interest to put additional cows into the field given that all the benefits of grazing and additional cow will be reaped by the individual but all the damage will be shared by the group as a whole. *Id.* Central to Hardin’s example is that the commons is unregulated. *Id.*

¹²³ For an excellent discussion and analysis of Hardin’s work and connection to modern day natural resource protection, see FREYFOGLE, *supra* note 12, at 158–74.

¹²⁴ *Id.* at 160, 171–72.

such as *sic utero tuo* is needed for property law to keep pace with new ecological understanding. These fundamental doctrines and their specific applications need to reappear in property law and regain proper respect along side other, well-funded property rights such as the right to exclude. Indeed, as part of this effort at revitalization we would be wise to recall the corollary common law principle of *salus populi suprema lex est*—the welfare of the people is the supreme law.¹²⁵

The Wisconsin Supreme Court's 1972 decision *Just v. Marinette County*¹²⁶ is an example of how property law can be more mindful of ecological realities and begin to shift the balance of property rights more toward an equilibrium between private and public welfare.¹²⁷ In *Just*, the court upheld the constitutionality of a shoreline protection law and prevented the Justs from filling in a wetland on the south shore of Lake Noquebay in Marinette County. In so holding, the court explained:

An owner of land has no absolute and unlimited right to change the essential natural character of his land so as to use it for a purpose for which it was unsuited in its natural state and which injures the rights of others. The exercise of the police power in zoning must be reasonable and we think it is not an unreasonable exercise of that power to prevent harm to public rights by limiting the use of private property to its natural uses.¹²⁸

Advocates of staunch private property rights would predictably be aghast at the suggestion that all private lands are inherently limited by public ownership and must give way to overarching societal interests.¹²⁹ Again, such individualistic views of property are born from a divisive rhetoric that fails to appreciate that private and public interests are inextricably intertwined;¹³⁰ private interests are still served when property law imposes reasonable limitations on land use.

In all instances, property law resolves land use conflicts, either by allowing or restricting an activity. Private interests are simultaneously expanded and curtailed. The law simply decides whose private interests are given preference—those that would use land intensely or those that would use their land in a less-disruptive manner. On this point, Freyfogle concludes, “there is no ‘pro-private property’

¹²⁵ The need for the property law to keep pace with changing perceptions of public welfare is not to argue that the common law can—or should—carry the weight of protecting nature from misuse. This may well be a role best served by legislation. Nonetheless, property law and the balance between private and public rights in the ownership of nature must be restored in order for legislated protection to have legitimacy.

¹²⁶ 201 N.W.2d 761 (Wis. 1972).

¹²⁷ See *id.* at 771 (discussing land value in terms of balancing private and public use).

¹²⁸ *Id.* at 768.

¹²⁹ See *supra* notes 118–120 and accompanying text.

¹³⁰ See *supra* notes 118–120 and accompanying text.

position that the law can take.”¹³¹ This is not to say that the policy choices have no material consequences. Rather, elevating intensive land uses above all else will harm other landowners, the public at large, and nature itself. In this way, intensive land use weakens the property rights held by others, such as the right to enjoy land free from unreasonable interference. Unfettered rights to use land without regard to others, therefore, threaten the very institution of property. In other words, the security of private property rights depends on limits.¹³²

In the end, although divisive rhetoric is simple and effective for drumming up controversy, private interests and public welfare cannot be separated out and pitted against one another. Like nature itself, they are interconnected. Achieving ecosystem health will require a more complete understanding of property. In doing so, the voice of public welfare must return to any conversation about proper uses of nature.

Fortunately, property is not a static institution. Instead, an important and well-recognized aspect of property law is its flexibility to accommodate new assumptions of what the public interest contains: “As a strictly legal matter, landowners possess only such rights to develop as property law allows at any given time. Property law, like other law, evolves to keep in line with shifting communal needs.”¹³³ It is because property law is capable of evolving that Professor Sax has urged a new definition of property in light of what he termed the “economy of nature.”¹³⁴ This new definition would respect the interconnectedness of nature and the ability of undeveloped lands to serve valuable ecosystem functions.¹³⁵ More specifically, it would focus less on individual dominion, approach rights in land from an ecosystem’s perspective, recognize that different lands play different kinds of roles, and impose affirmative obligations on landowners to “protect natural services, with owners functioning as custodians as well as self-benefitting entrepreneurs.”¹³⁶ Sax recognizes the mismatch between viewing private property as an individualistic institution, a more sophisticated understanding of the natural world, and the rich history of property law in serving communal needs.¹³⁷

If indeed there is a role for public ownership in private lands, one might object to such an approach on the basis that achieving a balance between protection of public resources and respect for private lands would be legally or logistically difficult. It seems much easier, albeit detrimental, to accept a world with bright line divisions between “yours” and “mine.” Fortunately, there are historical examples that shed light on how a workable relationship between public rights and private ownership can be achieved. The area of water law and water

¹³¹ FREYFOGLE, *supra* note 12, at 20.

¹³² *See id.* at 18.

¹³³ *Id.* at 123; *see also id.* at 208–09 (describing how perceptions of the communal good have changed over time and how property law has responded accordingly).

¹³⁴ Sax, *supra* note 26, at 1442.

¹³⁵ *See id.* at 1451.

¹³⁶ *Id.*

¹³⁷ *Id.* at 1442–46.

rights is a good example. Given the continuous, interconnected characteristics of water, not to mention its importance to public welfare, water has never been considered a good candidate for total privatization.¹³⁸ As a result, water has long belonged to the people collectively, even when it runs underneath or through private property—private owners possess only conditional rights to use the water resource.¹³⁹ Their rights are limited to “reasonable” uses that are “beneficial.”¹⁴⁰ And, when community interests require, private property interests in water are curtailed to serve public needs.¹⁴¹

Likewise, the public trust doctrine, which historically safeguarded public rights in navigable waterways, embodies the notion that the public possesses inviolable rights in certain natural resources.¹⁴² Wildlife has enjoyed similar protection from unfettered private ownership because of its importance to public welfare and natural movement in and out of private lands.¹⁴³ For these historically elite resources, the subordination of private ownership to public rights continues to this day.¹⁴⁴

Like water, many ecosystem functions serve the public welfare and are manifestations of the interconnectedness of nature.¹⁴⁵ Just as laws have recognized the importance of recognizing and protecting public rights for resources like water and wildlife, the time is ripe to expand our vision and develop a legal framework that recognizes public ownership in ecosystems services. As discussed above, a legal framework that gives the public a voice in the misuse of nature on private lands need not run afoul of private property rights.¹⁴⁶ Rather, such a framework would merely restore a long-recognized but recently forgotten element of property

¹³⁸ FREYFOGLE, *supra* note 12, at 231; Sax, *supra* note 26, at 1452–53.

¹³⁹ See, e.g., Sax, *supra* note 26, at 1452–53.

¹⁴⁰ FREYFOGLE, *supra* note 12, at 231.

¹⁴¹ Sax, *supra* note 26, at 1453.

¹⁴² Richard J. Lazarus, *Changing Conceptions of Property and Sovereignty in Natural Resources: Questioning the Public Trust Doctrine*, 71 IOWA L. REV. 631, 632 (1986).

¹⁴³ FREYFOGLE, *supra* note 12, at 230–38 (describing unique property relationships for water and wildlife).

¹⁴⁴ For example, several courts have upheld the power of government to prohibit fences that would encumber movement of wildlife. See, e.g., *Dep’t of Cmty. Affairs v. Moorman*, 664 So. 2d 930 (Fla. 1995) (upholding the validity of a law prohibiting fences that interfered with an endangered species of deer); *New York v. Sour Mountain Realty, Inc.*, 714 N.Y.S.2d 78 (App. Div. 2000) (upholding an order directing a landowner to remove a 3500 foot long snake-proof fence that blocked the migration of an endangered snake species). For a further illustration of the subordination of private interests in wildlife management, see *Clajon Prod. Corp. v. Petera*, 70 F.3d 1566, 1575 (10th Cir. 1995) (rejecting private landowner’s argument that they had the exclusive “right to hunt the ‘harvestable surplus’ from their land—i.e., the excess animals available for hunting which were produced on their land”).

¹⁴⁵ See *supra* notes 88–110 and accompanying text.

¹⁴⁶ See *supra* notes 93–117 and accompanying text.

law: public ownership. What such a framework might look like and how it might provide remedies for the misuse of nature is taken up in Part III of this Article.

II. THE NEED FOR A STATUTORY CIVIL REMEDY

If we accept the two foundational claims set forth in Part I—that we ought not misuse nature and that the public has an interest in private lands—then we have begun to redefine what it means to own and harm nature. With that new conception of harm in place, we can begin to think about remedies. It might be useful, however, to first consider why a new remedy is necessary within natural resource and environmental law. In other words, why are lawmakers, practitioners, and scholars still talking about a broken system of environmental protection when we have “ten thousand commandments”¹⁴⁷ and hundreds of thousands of pages of environmental statutes and regulations on the books?

For the purposes of appreciating the need for a new statutory civil remedy to protect nature from misuse, there are three inherent limitations within the existing legal framework that are important to explore. First, most environmental and natural resources laws protect discrete elements of nature, not nature as an interconnected whole. Second, and related to the first, there is a significant gap in the law’s protection of ecosystem services. Third, common law doctrines, such as nuisance, are not sufficient to remedy harms to nature, especially when those harms manifest as ills to society at large rather than discrete landowners.

A. Discrete Character of Environmental and Natural Resources Law

Environmental laws can be roughly divided into two categories: traditional pollution control laws and natural resource laws.¹⁴⁸ Traditional pollution control laws regulate discharge, emission, disposal, and cleanup of industrial sources of pollution. These laws segregate the environment into various media—air, water, or waste. Classic examples include the Clean Air Act,¹⁴⁹ the Clean Water Act,¹⁵⁰ the Resource Conservation and Recovery Act,¹⁵¹ the Toxics Substances Control Act,¹⁵² and the Comprehensive Environmental Response Compensation and Liability

¹⁴⁷ Professor Bradley C. Karkkaninen uses the phrase “Ten Thousand Commandments” as a shorthand reference to the sheer volume of regulatory mandates embodied in our environmental laws. See Karkkaninen, *supra* note 37, at 75.

¹⁴⁸ Robert L. Fischman, *What Is Natural Resources Law?*, 78 U. COLO. L. REV. 717 (2007) (book review) (describing the distinction between natural resources law and traditional pollution control laws).

¹⁴⁹ 42 U.S.C. §§ 7401–7671 (2006).

¹⁵⁰ 33 U.S.C. §§ 1251–1387 (2006).

¹⁵¹ 42 U.S.C. §§ 6901–6987 (2006).

¹⁵² 15 U.S.C. §§ 2601–2629 (2006).

Act.¹⁵³ These federal statutes form the basis of state pollution control programs as well.¹⁵⁴

Natural resource laws similarly divide nature into discrete elements, focusing on extractable resources such as wildlife, minerals, timber, oil, and gas.¹⁵⁵ Natural resources law is largely “dominated by [a] ‘resource-ist,’ utilitarian approach rather than by a naturalist intrinsic value approach.”¹⁵⁶ In that spirit, Merriam-Webster’s dictionary defines “natural resources” as “industrial materials and capacities (as mineral deposits and waterpower) supplied by nature.”¹⁵⁷ Federal examples of natural resource laws include the Endangered Species Act,¹⁵⁸ the National Forest Management Act,¹⁵⁹ the Mineral Leasing Act,¹⁶⁰ and the Federal Land Policy Management Act.¹⁶¹ At the state level, natural resource laws include game programs that regulate fishing and hunting,¹⁶² forestry statutes that regulate timber on state lands,¹⁶³ and water codes that allocate water use and instream flows.¹⁶⁴ Overlapping both pollution control regulation and natural resource laws are environmental statutes that are more ubiquitous in their application—namely the National Environmental Policy Act (NEPA)¹⁶⁵ and their state equivalents.¹⁶⁶

¹⁵³ 42 U.S.C. §§ 9601–9675 (2006).

¹⁵⁴ Many of the major federal pollution control statutes—the Clean Air Act, Clean Water Act, and Resource Conservation and Recovery Act—are based on a concept of cooperative federalism. They allow the EPA to delegate the programs to state agencies, so long as certain minimum criteria are met. For a breakdown of the delegated programs operated in each state. See ENVTL. COUNCIL OF THE STATES, <http://www.ecos.org> (last visited Feb. 19, 2012).

¹⁵⁵ Lazarus, *supra* note 142, at 631 (describing natural resource law as “historically concerned with the maintenance and orderly exploitation of basic natural resources such as water, fossil fuels, oil, natural gas, mineral deposits, and timber . . .”).

¹⁵⁶ Fischman, *supra* note 148, at 733; see also James Peck, Comment, *Measuring Justice for Nature: Issues in Evaluating and Litigating Natural Resources Damages*, 14 J. LAND USE & ENVTL. LAW 275, 277 (1999) (“Traditional definitions of natural resources were limited to resources providing quantifiable economic products such as industrial minerals, energy sources, timber, and agricultural land.”).

¹⁵⁷ *Natural Resource Definition*, MERRIAM-WEBSTER, <http://www.merriam-webster.com/dictionary/natural%20resource> (last visited Feb. 19, 2012); see also BLACK’S LAW DICTIONARY 1027 (6th ed. 1991) (“Any material in its native state which when extracted has economic value . . . [and also] features which supply a human need and contribute to the health, welfare, and benefit of a community, and are essential to the well-being thereof . . .”).

¹⁵⁸ 16 U.S.C. §§ 1531–1544 (2006).

¹⁵⁹ 16 U.S.C. §§ 1600–1687 (2006).

¹⁶⁰ 30 U.S.C. §§ 181–287 (2006).

¹⁶¹ 43 U.S.C. §§ 1701–1785 (2006).

¹⁶² See, e.g., Game and Fish, MINN. STAT. ANN. § 97A (West 2009 & Supp. 2010).

¹⁶³ See, e.g., Idaho Forestry Act, IDAHO CODE ANN. § 38-102 (2011).

¹⁶⁴ See, e.g., WASH. REV. CODE ANN. § 90.03.247 (West 2004).

¹⁶⁵ 42 U.S.C. §§ 4321–4347 (2006).

Despite the breadth of environmental media and parts of nature addressed in these numerous federal and state statutes, no major laws focus on the protection of ecosystems as a whole.¹⁶⁷ By and large, our environmental regulatory regime addresses discrete segments of nature on the overarching assumption that intense management and regulation of the parts will ultimately protect the whole: “We are accustomed to managing environmental and natural resource problems one-at-a-time and in isolation from each other, as if pollution control, water supply, fisheries management, and habitat conservation had nothing to do with each

¹⁶⁶ In general terms, NEPA requires federal agencies to examine the impacts of major federal actions on the environment before deciding on a course of action. *Id.* § 4332(2)(C). NEPA does not mandate substantive outcomes; rather it requires agencies to consider impacts of the propose action and viable alternatives. *See, e.g.*, *Dep’t of Transp. v. Pub. Citizen*, 541 U.S. 752, 756–57 (2004). Having done so, agencies are then free to choose among its proposed alternatives. *See id.* at 757. Unlike NEPA, some state environmental protection statutes, or “little NEPAs,” do provide substantive mandates. *See, e.g.*, MINN. STAT. ANN. § 116D.04, Subd. 6 (West Supp. 2010) (prohibiting the state agency to approve actions that significantly affect the environment if “there is a feasible and prudent alternative consistent with the reasonable requirements of the public health, safety, and welfare”); *see also* CAL. PUB. RES. CODE § 21061.1 (West 2007) (defining feasible as “capable of being accomplished in a successful manner within a reasonable period of time, taking into account . . . environmental . . . factors.”); N.Y. ENVTL. CONSERV. LAW § 8-0109(1) (2005) (“Agencies shall . . . act and choose alternatives which, . . . to the maximum extent practicable, minimize or avoid adverse environmental effects . . .”).

¹⁶⁷ *See, e.g.*, J.B. Ruhl, *Biodiversity Conservation and the Ever-Expanding Web of Federal Laws Regulating Nonfederal Lands: Time for Something Completely Different?*, 66 U. COLO. L. REV. 555, 578 (“No single federal law can reasonably be portrayed as encompassing all the goals of biodiversity conservation and the authorities needed to carry them out.”); Salzman, *supra* note 74, at 137 (“[I]t should come as no surprise that our laws do not explicitly protect ecosystem services.”); *see also* Mary Jane Angelo & Mark T. Brown, *Incorporating Emergy Synthesis into Environmental Law: An Integration of Ecology, Economics, and Law*, 37 ENVTL. L. 963, 967 (2007) (“The ecological shortcomings in current environmental statutes are rooted in the fact that most environmental statutes were enacted in the 1970s and 1980s, prior to many of the recent developments in the ecological sciences, and most of these statutes are media-based rather than ‘system’-based.”); Salzman et al., *supra* note 81, at 309–10 (“In recommending that reduced ecological risk become a primary focus of EPA, its scientists and managers have revealed the single greatest failing of modern environmental law and its greatest challenge today—the inadequate protection of ecosystems and the services they provide.”).

other.”¹⁶⁸ This is true regardless of the distinctions drawn between pollution control laws and natural resource laws.¹⁶⁹

Of course, there are some aspects of existing environmental and natural resource laws that do provide indirect opportunities for ecosystem protection.¹⁷⁰ The most notable of these opportunities come from NEPA’s requirement that federal agencies broadly examine the indirect and cumulative impacts of their actions,¹⁷¹ the Endangered Species Act’s protection of habitat as a critical aspect of species recovery,¹⁷² and the Clean Water Act’s Section 404 regulation of wetlands.¹⁷³ Each of these statutes, however, contains significant limitations in their ability to fill the gap of ecosystem protection.

For instance, NEPA appears to be a promising tool for ecosystem-level protection because it requires an expansive examination of impacts beyond a particular species, discrete element, or isolated media of nature.¹⁷⁴ But NEPA is

¹⁶⁸ Karkkainen, *supra* note 61, at 204; *see also* Annecoos Wiersema, *A Train Without Tracks: Rethinking the Place of Law and Goals in Environmental and Natural Resources Law*, 38 ENVTL. L. 1239, 1241 (2008) (noting the growing scholarship advocating “a holistic approach to environmental protection, moving away from a focus on separate media like air, water, and waste.”).

¹⁶⁹ Salzman, *supra* note 74, at 136–37 (explaining that neither pollution control laws, conservation laws, nor resource management laws provide legal standards for conserving natural capital and ecosystem services).

¹⁷⁰ For a comprehensive survey and analysis of federal laws with some biodiversity conservation potential, *see* Ruhl, *supra* note 167.

¹⁷¹ 40 C.F.R. §§ 1500–1508 (2001).

¹⁷² 16 U.S.C. § 1533(a)(3) (2006) (requiring the Secretary to designate habitat to an endangered or threatened species).

¹⁷³ 33 U.S.C. § 1344 (2006). There are also some provisions of federal land management statutes that would appear, to require a broader vision for ecosystem management by prohibiting degradation of certain resources. For example, the Federal Land Policy and Management Act prohibits “unnecessary or undue degradation” of the lands managed by the Bureau of Land Management. 43 U.S.C. § 1732(b) (2006). While promising in theory, such provisions have not historically had much effect: “The reality of natural resources law is that commodity users have overridden the good intentions and discretionary language of the Multiple-Use Sustained-Yield Act of 1960, the Federal Land Policy and Management Act, the National Forest Management Act, and similar statutes without breaking stride.” Oliver A. Houck, *On the Law of Biodiversity and Ecosystem Management*, 81 MINN. L. REV. 869, 882–83 (1997); *see also* NAGLE & RUHL, *supra* note 30, at 72 (citing MICHAEL J. BEAN & MELANIE J. ROWLAND, *THE EVOLUTION OF NATIONAL WILDLIFE LAW* 278 (3d ed. 1997)) (“[W]ildlife law is not a commanding force in federal land management. It is one of several management objectives on all major federal land classifications It is not the exclusive, or even the dominant goal on any lands but the national wildlife refuges.”).

¹⁷⁴ In its simplicity, NEPA requires all federal agencies to consider the impacts of major actions having a potentially significant impact on the human environment. 42 U.S.C. § 4332 (2006); *see also* Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 347–50 (1989). As part of that consideration, agencies must examine not only direct, but also

limited in notable ways.¹⁷⁵ First, it applies only to major federal actions, which means that actions on nonfederal lands are outside NEPA's reach unless they are otherwise connected to federal approval or funding. Second, even when it does apply, NEPA is procedural in nature; it requires agencies to consider impacts of their actions but it does not require agencies to choose the environmentally responsible alternative.¹⁷⁶ Indeed, it is a common observation that NEPA prevents uninformed decisions, not unwise ones.¹⁷⁷

Unlike NEPA, the Endangered Species Act (ESA) does impose substantive mandates; once a species is listed as endangered or threatened, the ESA aggressively prohibits takings on both federal and nonfederal lands.¹⁷⁸ Notably, its protections extend to habitat. The United States Fish and Wildlife Service (FWS) regulations, for example, prohibit "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."¹⁷⁹ And though the Supreme Court endorsed only a strict reading of this harm rule,¹⁸⁰ the FWS has successfully used it to advance ecosystem protection goals by policing habitat destruction.¹⁸¹ Another important tool for habitat protection is the ESA's

indirect and cumulative impacts of its decision on a myriad of resources including "natural systems." 40 C.F.R. § 1508.8(b) (2001). This includes evaluating all reasonably foreseeable impacts in the larger context of the project. The CEQ regulations implementing NEPA expressly provide that a project's potential to impact "ecologically critical areas" informs whether the action is deemed "significant" within the meaning of the Act. *Id.* § 1508.27(b)(1)–(3).

¹⁷⁵ For a more detailed critique of the limitations of NEPA in protecting ecosystems, see David R. Hodas, *NEPA, Ecosystem Management and Environmental Accounting*, 14 NAT. RESOURCES & ENV'T, Winter 2000, at 185.

¹⁷⁶ See, e.g., *Dep't of Transp. v. Pub. Citizen*, 541 U.S. 752, 756–57 (2004) (quoting *Robertson*, 490 U.S. at 350) ("NEPA itself does not mandate particular results Rather NEPA, imposes only procedural requirements on federal agencies"); *Lands Council v. Powell*, 395 F.3d 1019, 1026 (9th Cir. 2004) ("NEPA imposes procedural requirements, but not substantive outcomes, on agency action."); see also Ruhl, *supra* note 167, at 612–13 (discussing NEPA's shortcomings as an effective biodiversity conservation tool, including its "dearth of substantive effect").

¹⁷⁷ *Robertson*, 490 U.S. at 351.

¹⁷⁸ 16 U.S.C. § 1538 (2006).

¹⁷⁹ 50 C.F.R. § 17.3(c)(3) (2010); see also *Endangered and Threatened Wildlife and Plants; Definition of "Harm,"* 64 Fed. Reg. 60,727, 60,727 (Nov. 8, 1999) (to be codified at 50 CFR Part 222) (NFMS final rule adopting a similar definition).

¹⁸⁰ In *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*, the United States Supreme Court upheld the rule as consistent with congressional intent but only to the extent that the harm resulting from habitat modification is foreseeable and the proximate cause of actual death or injury to identifiable individuals of the species. 515 U.S. 687, 711 (1995).

¹⁸¹ J.B. Ruhl, *Ecosystem Management, the ESA, and the Seven Degrees of Relevance*, 14 NAT. RESOURCES & ENV'T, Winter 2000, at 156, 160–61.

requirement that the FWS designate critical habitat for listed species.¹⁸² This tool, however, is underutilized and largely dependent on litigation.¹⁸³

Like NEPA, the tools available under the ESA can be used to advance some broader ecosystem conservation goals. In the end, however, the ESA's focus has been on protecting species, not ecosystems. This makes the ESA a poor substitute for laws that are more specifically focused on ecosystem protection.¹⁸⁴ Indeed,

¹⁸² This is especially the case when critical habitat designations are made for larger predators with more expansive ranges and habitat needs. See, e.g., Robert B. Keiter, *Beyond the Boundary Line: Constructing a Law of Ecosystem Management*, 65 U. COLO. L. REV. 293, 308 (1994) (describing the role that the ESA has played in constraining development on large blocks of land in order to ensure grizzly bear recovery in the Northern Rocky Mountains). But see Julie B. Bloch, *Preserving Biological Diversity in the United States: The Case for Moving to an Ecosystems Approach to Protect the Nation's Biological Wealth*, 10 PACE ENVTL. L. REV. 175, 202 (1992) (noting one of the shortcomings of the ESA is the fact that it "protects high profile species that do not usually play an important role in overall biodiversity"); Bradley C. Karkkainen, *Biodiversity and Land*, 83 CORNELL L. REV. 1, 20 (1997) (A "well-understood limitation of the ESA is that it has generally afforded greater protection to high-profile 'charismatic' species, especially large vertebrates, at the expense of lesser-known or less popular species.").

¹⁸³ In reality, the critical habitat designation requirement has failed to protect approximately two-thirds of listed species. In particular, in August 2007, the U.S. Fish & Wildlife Service reported that critical habitat had been designated for only 492 of the 1351 listed endangered and threatened species. U.S. FISH & WILDLIFE SERVICE, CRITICAL HABITAT: WHAT IS IT? 2 (2007), available at http://library.fws.gov/Pubs9/critical_habitat07.pdf; see also Patrick Parenteau, *An Empirical Assessment of the Impact of Critical Habitat Litigation on the Administration of the Endangered Species Act* (Vt. Law School Faculty Papers, Paper No. 1, 2005), available at http://lsr.nellco.org/cgi/viewcontent.cgi?article=1000&context=vermontlaw_fp; Matthew D. Crawford, Note, *The Timing of Challenges to Compel Critical Habitat Designation Under the Endangered Species Act: Should Courts Toll the General Federal Statute of Limitations?*, 36 B.C. ENVTL. AFF. L. REV. 497 (2009). Moreover, most of those designations have come in direct response to litigation and court-ordered timelines. In fact, between 1990 and 2005, 350 out of 357 critical habitats designated by FWS were the result of litigation. Parenteau, *supra* at 2 n.7. "Each critical habitat designation made since 1997 has resulted from a court order or a settlement agreement . . ." U.S. GEN. ACCOUNTING OFFICE, GAO-03-803, ENDANGERED SPECIES: FISH AND WILDLIFE SERVICE USES BEST AVAILABLE SCIENCE TO MAKE LISTING DECISIONS, BUT ADDITIONAL GUIDANCE NEEDED FOR CRITICAL HABITAT DESIGNATIONS 34 (2003), available at <http://www.gao.gov/new.items/d03803.pdf>. So while the number of listed species afforded critical habitat designations has climbed from roughly nine percent in 1999 to thirty-six percent in 2007, the Fish & Wildlife Service acknowledges that this increase is due, in large part, to litigation.

¹⁸⁴ Houck, *supra* note 173, at 870 ("One of the more rational conclusions to emerge from American's experience with the Endangered Species Act is that we need to manage ecosystems and protect biological diversity on a scale larger than individual species on the brink of doom."); Keiter, *supra* note 182, at 307-09 (explaining the limitations of the ESA and concluding that "although the ESA breaches conventional boundary lines and protects enumerated species against extinction, it cannot be regarded as a general ecosystem

notwithstanding the ESA's promise "to provide a means whereby ecosystems upon which endangered and threatened species depend may be conserved,"¹⁸⁵ no other provision of the ESA contains action measures specific to ecosystem protection. Moreover, the ESA's ability to serve double duty as an ecosystem protection statute is limited by the fundamental reality that species only trigger the protections of the Act when they are endangered or threatened with extinction over a significant portion of their range.¹⁸⁶ Benefits of the ESA to ecosystems therefore come from a reactive posture; they only become effective after habitats and their broader ecosystem functions have already been curtailed or adversely modified.

It is worth examining one last example of an environmental statute that has potential to protect some parts of ecosystems. Section 404 of the Clean Water Act (CWA) authorizes the Army Corps of Engineers to issue permits for the "discharge of dredged or fill material into the navigable waters at specified disposal sites."¹⁸⁷ Although this section does not actually mention wetlands, its permitting regulations construe the term "navigable waters" broadly to include wetlands.¹⁸⁸ Over time, Section 404 has become synonymous with wetlands regulation¹⁸⁹—it prohibits wetlands from being drained without some balancing of the expected benefits of the permitted activity and its potential for environmental harm.¹⁹⁰ Although the CWA plays an important role in protecting at least one ecosystem service, wetlands are but one piece of an ecosystem, and protecting wetlands cannot substitute for broader ecosystem protection. As useful as the CWA is, it is not (and does purport to be) a complete package for ensuring the longevity of ecosystem services as a whole.¹⁹¹

management statute."); Ruhl, *supra* note 167, at 589 ("The ESA thus is too inflexible both in substantive effect and biological scope to provide a comprehensive, broadly accepted approach to biodiversity conservation policy.").

¹⁸⁵ 16 U.S.C. § 1531(b) (2006).

¹⁸⁶ Bloch, *supra* note 182, at 201 (critiquing the ESA's usefulness in preserving biodiversity and noting the piecemeal, reactive character of the Act that only "rescue[s] a species when its population dwindles below a certain level.").

¹⁸⁷ 33 U.S.C. § 1344(a) (2006).

¹⁸⁸ See Corps of Engineers' General Regulatory Policies, 33 C.F.R. § 320 (2012).

¹⁸⁹ With some exceptions for isolated, wholly intrastate wetlands, nearly all wetlands are protected from unpermitted drainage and fill activities. For a discussion of the scope of wetlands regulation endorsed by the Supreme Court after *Solid Waste Agency of N. Cook County v. U.S. Army Corps of Engineers*, 531 U.S. 159 (2001), and *United States v. Riverside Bayview Homes*, 474 U.S. 121 (1985), see Jamison E. Colburn, *Waters of the United States: Theory, Practice, and Integrity at the Supreme Court*, 34 FLA. ST. U. L. REV. 183 (2007); see also Alyson C. Flournoy, *Section 404 at Thirty-Something: A Program in Search of a Policy*, 55 ALA. L. REV. 607, 621–30 (2004).

¹⁹⁰ 33 C.F.R. § 320.4(a) (requiring balancing of benefits and harm of the proposed permitted activity); see also *id.* § 320.4(b) (discouraging destruction of wetlands as "contrary to the public interest"); Ruhl, *supra* note 167, at 604.

¹⁹¹ There are other aspects of the Clean Water Act that could evoke a broader-based view of ecosystems. For example, the requirement that the EPA develop "total maximum

B. Gaps in Protection of Ecosystem Services

Assorted provisions—isolated within disconnected statutes, administered by different agencies, and providing only indirect tools—are hardly an appropriate substitute for the broad-based and comprehensive legal regime that is necessary to effectively protect ecosystems. Indeed, most scholars agree that the complex web of environmental statutes has been largely unsuccessful at providing adequate protections to ecosystems on a holistic basis.¹⁹² Fifteen years ago, Professor J.B. Ruhl observed that “[n]o single federal law purports to encompass all that is meant by biodiversity conservation; rather, a handful of different statutes addresses particular facets of biological resource protection on nonfederal lands. Gluing those laws together without any clear, unifying principles has not created an effective, flexible system of biodiversity conservation.”¹⁹³ More recently, Professor Annecoos Wiersema reiterated, “most commentators now seem willing to agree with two propositions. First, environmental law must be responsive to ecological insights about the complexity of natural systems. Second, traditional approaches to environmental law appear insufficiently responsive to science, and further, insufficiently flexible even to develop responsiveness to science.”¹⁹⁴

This conclusion has been similarly expressed by federal agencies, lamenting the inability of the current regulatory web to adequately protect important

daily loads” (TMDLs) for impaired waterways has the potential to elicit a more comprehensive assessment of all the sources of pollution that give rise to unacceptable levels of pollutants. TMDLs, therefore, force evaluation of nonpoint as well as point sources of pollution and could be used to understand pollution issues on a watershed basis. For a discussion of TMDLs as a tool for watershed-based pollution control, see Michael M. Wenig, *How “Total” Are “Total Maximum Daily Loads”?*—*Legal Issues Regarding the Scope of Watershed-Based Pollution Control Under the Clean Water Act*, 12 TUL. ENVTL. L.J. 87, 106 (1998).

¹⁹² See Angelo & Brown, *supra* note 167, at 967 (“Environmental law’s current integration of ecological science is overly simplistic, ad hoc, and outdated.”); Fischman, *supra* note 148, at 741 (“Over the past thirty-five years, both environmental law and natural resources law have struggled to broaden their scopes to encompass ecological concerns.”); Karkkaninen, *supra* note 147, at 77 (noting that the current approach to environmental protection has not been “effective in the more complex and integrative tasks of protecting ecosystems”); Karkkaninen, *supra* note 61, at 197 (“[W]e have constructed an architecture of laws and management systems that are poorly matched to the challenge of managing ecosystems as complex dynamic systems.”); Ruhl, *supra* note 167, at 561–62 (arguing that a more effective federal policy for conserving biodiversity “would come from melding the disorganized system of federal biodiversity conservation regulation into a single law designed principally to promote biodiversity conservation”); Wiersema, *supra* note 168, at 1249 (“[L]aws that focus on one medium, such as air, water, land, or individual species, will not adequately take account of the multiple connections.”).

¹⁹³ Ruhl, *supra* note 167, at 565.

¹⁹⁴ Wiersema, *supra* note 168, at 1245.

ecosystem functions. In 1994, the EPA exclaimed the need for a more place-driven approach to environmental protection in a planning report named the Edgewater Consensus:

To date, the EPA has accomplished a great deal, addressing many major sources of pollution to the nation's air, water and land. Yet, even as we resolve the more obvious problems, scientists discover other environmental stresses that threaten our ecological resources and general well-being.

. . . Although many federal, state, and local regulations address these problems, past efforts have been as fragmented as our authorizing statutes. Because EPA has concentrated on issuing permits, establishing pollutant limits, and setting national standards, the Agency has not paid enough attention to the overall environmental health of specific ecosystems. In short, EPA has been "program-driven" rather than "place-driven."

Recently, we have realized that, even if we had perfect compliance with all our authorities, we could not assure the reversal of disturbing environmental trends.¹⁹⁵

A report published by the United States General Accounting Office around the same time similarly concluded that "[e]ven though many laws have been enacted to protect individual natural resources—air, water, soils, plants, and animals, including forests, rangelands, threatened and endangered species,

¹⁹⁵ Ecosystem Prot. Workgroup, U.S. Env'tl. Prot. Agency, *Toward a Place-Driven Approach: The Edgewater Consensus on an EPA Strategy for Ecosystem Protection* (Draft 1994), in *THE LAW OF BIODIVERSITY AND ECOSYSTEM MANAGEMENT*, *supra* note 30, at 363, 363; *see also*, U.S. ENVTL. PROT. AGENCY, 200-B-94-002, *THE NEW GENERATION OF ENVIRONMENTAL PROTECTION: A SUMMARY OF EPA'S FIVE-YEAR STRATEGIC PLAN 2* (1994) ("In the past, the Agency's division into air, water, and land programs led EPA to overlook both the cross-media effects of some pollution problems and the potential for new kinds of cross-media programs."); SCI. ADVISORY BD., U.S. ENVTL. PROT. AGENCY, SAB-EC-90-021, *REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION 6* (1990) (recommending the EPA reset its priorities to "attach as much importance to reducing ecological risk as it does to reducing human health risk"); Bloch, *supra* note 182, at 200) ("Many U.S. laws mandate conservation of some aspect of biological diversity, from the broad mandate of the National Forest Management Act to the habitat conservation approach of the Endangered Species Act Nevertheless, these programs and statutes do not form a coherent comprehensive framework for assessing or ensuring progress toward a common goal" (quoting COUNCIL ON ENVTL. QUALITY, U.S. NATIONAL REPORT PREPARED FOR SUBMISSION TO THE U.N. CONFERENCE ON THE ENVIRONMENT AND DEVELOPMENT 69 (Draft 1991) (on file with CEQ))); Salzman et al., *supra* note 81, at 309 ("The top managers and scientific advisors in the [EPA] have consistently declared that maintenance of productive natural systems demands more attention and should, in fact, become one of the agency's highest priorities.").

wetlands, and wilderness areas—ecological conditions on many federal lands have declined.”¹⁹⁶

In conjunction with these and other recognitions of statutory shortcomings, many federal agencies, including the four major public land management agencies, prepared statements and guidelines in the mid-1990s expressing their commitment to more broad-based ecosystem management.¹⁹⁷ For example, the Department of Interior proposed a national biological survey that would inventory the nation’s natural resources. The purpose was to “get, at least, a first cut of how we relate to these ecosystems.”¹⁹⁸ In December 1993, the Bureau of Land Management (BLM) issued a report stating its intent to incorporate ecosystem management principles into its oversight of public lands.¹⁹⁹ Among other things, the BLM envisioned “an interdisciplinary approach to land management in which program advocacy will yield to ecosystem advocacy.”²⁰⁰ The FWS issued a report in March 1994 that described how to apply ecosystem management to fish and wildlife conservation.²⁰¹ And, finally, the Forest Service released a report of its own in the same year that pledged to follow four fundamental principles in its approach to ecosystem management: (1) the use of an ecological approach to multiple-use management; (2) application of the best scientific knowledge and technologies to decision-making; (3) encouragement of partnerships with state agencies and private landholders; and (4) the promotion of grass-roots participation in the planning process.²⁰² The Forest Service even announced its intention to revise its forest planning regulations to incorporate these four ecosystem management principles.²⁰³

Encouraging as it is that the major federal agencies understood the need for an ecosystem focus to land management, did these recognitions of shortcomings and statements of good intentions manifest genuine ecosystem management requirements? In other words, was Professor Oliver Houck correct in 1997 when he exclaimed, “tough odds call for precise law” and cautioned that amorphous goals like ecosystem management would require teeth to be successful?²⁰⁴

Perhaps the best evidence of progress, or lack thereof, lies in the scientific assessment of continuing ecosystem, species, and habitat decline over the past

¹⁹⁶ U.S. GEN. ACCOUNTING OFFICE, ECOSYSTEM MANAGEMENT: ADDITIONAL ACTIONS NEEDED TO ADEQUATELY TEST A PROMISING APPROACH 3 (1994).

¹⁹⁷ See Rebecca W. Thomson, *Ecosystem Management: Great Idea, But What Is It, Will It Work, and Who Will Pay?*, 9 NAT. RESOURCES & ENV’T, Winter 1995, at 42, 43–45 (discussing federal agencies’ efforts to incorporate ecosystem management principles into their missions in the mid-1990s); see also NAGLE & RUHL, *supra* note 30, at 339–79.

¹⁹⁸ Thompson, *supra* note 197, at 45.

¹⁹⁹ *Id.*

²⁰⁰ *Id.*

²⁰¹ *Id.*

²⁰² *Id.* at 70.

²⁰³ *Id.*

²⁰⁴ Houck, *supra* note 173, at 883.

decade. In November 2009, the International Union for Conservation of Nature (IUCN) published its 2008 Red List of Threatened Species, reporting that 17,291 species out of the 47,677 assessed species are threatened with extinction.²⁰⁵ In particular, “the results reveal 21 percent of all known mammals, 30 percent of all known amphibians, 12 percent of all known birds, and 28 percent of reptiles, 37 percent of freshwater fishes, 70 percent of plants, 35 percent of invertebrates assessed so far are under threat.”²⁰⁶ Jane Smart, Director of IUCN’s Biodiversity Conservation Group remarked that “[t]he scientific evidence of a serious extinction crisis is mounting.”²⁰⁷ While the ICUN Report analyzes the global patterns of species and habitat loss, the United States features prominently among nations with top-twenty numbers of threatened species for amphibians, birds, mammals, and conifers.²⁰⁸ This apparent failure to preserve biodiversity is a useful benchmark of the law’s failure to ensure ecosystem health more generally.²⁰⁹

The failed effort to utilize existing environmental statutes as hard-nosed tools for protecting ecosystems is also evidenced by the wealth of scholarship urging the need for new approaches. Professors Mary Jane Angelo and Mark T. Brown conclude that “[a]lthough many existing environmental laws pay lip service to ecological science, they do not incorporate scientific understanding of the ecological world in any meaningful way or are not implemented in a manner that significantly incorporates ecological science.”²¹⁰ To resolve this issue, Professor Bradley Karkkainen argues for expanded embrace and coordination of collaborative ecosystem governance.²¹¹ Others have similarly argued that new models of governance are necessary to adapt to the ever-changing state of

²⁰⁵ Press Release, Int’l Union for Conservation of Nature, *Extinction Crisis Continues Apace* (Nov. 3, 2009), available at <http://www.iucn.org/knowledge/news/?4143/Extinction-crisis-continues-apace>. The International Union for Conservation of Nature Red List of Threatened Species (IUCN Red List) is the world’s most comprehensive information source on the global conservation status of plant and animal species. It is based on an objective system for assessing the risk of extinction of a species should no conservation action be taken. *Id.*

²⁰⁶ *Id.*

²⁰⁷ *Id.*

²⁰⁸ INT’L UNION FOR CONSERVATION OF NATURE, *WILDLIFE IN A CHANGING WORLD: AN ANALYSIS OF THE 2008 IUCN RED LIST OF THREATENED SPECIES* (Jean-Christophe Vié, Craig Hilton-Taylor & Simon N. Stuart eds., 2009). The United States is ranked thirteenth in number of threatened amphibians, nineteenth in number of threatened birds, seventh in number of threatened mammals, and second in number of threatened conifers. *Id.* at 21, 27, 31, 34.

²⁰⁹ See Bloch, *supra* note 182, at 182 (“Species are the building blocks of ecosystems and are often the most obvious indicators of an ecosystem’s health.” (internal quotation marks omitted)).

²¹⁰ Angelo & Brown, *supra* note 167, at 967–68 (arguing that the incorporation of “emergy synthesis” into environmental law “holds significant promise for transforming environmental law”).

²¹¹ Karkkainen, *supra* note 61, at 233–43.

ecological understanding.²¹² Much of this work has focused on developing procedural laws capable of capturing the flexibility that is fundamental to adaptive management.²¹³ Professor Wiersema also recognizes the disconnect between fragmented environmental laws and whole ecosystems, but she advocates staying focused on substantive laws as the primary mechanism for achieving needed change: “long-term environmental protection can only be achieved by these models if we can be sure that all of the values that are at stake in environmental protection will be adequately represented by the procedural mechanisms that these institutions envision.”²¹⁴ While these scholars, and others, have primarily argued for new systems of governance that are adaptive to evolving information concerning ecosystems, there is a body of scholarship more specifically devoted to the protection of ecosystem services through common law doctrines.²¹⁵

From this wealth of scholarship and our examination of substantive environmental laws, we can properly draw two conclusions. First, regulating parts of nature instead of nature as a whole is well understood to be an incomplete approach to environmental and natural resource regulation. Second, despite the fact that scientists, federal agencies, lawmakers, and scholars have long been aware of the need to manage ecosystems on a more holistic basis, there is still a gap in regulation, sparking a need for substantive laws expressly aimed at protecting ecosystems and the important services that they provide.

C. *Limitations of the Common Law*

The increased mainstream attention that ecological services have been receiving from ecologists, economists, and government agencies since the publication of *Nature's Services* in 1997 has led to a corresponding explosion of legal scholarship exploring how to synthesize environmental laws with ecological understanding.²¹⁶ For the most part, this scholarship has grappled with two main issues. First, the ability of existing legal doctrines to utilize the economic value associated with ecological services.²¹⁷ Second, the valuation of ecological services and the creation of markets to capture that value.²¹⁸

²¹² Wiersema, *supra* note 168, at 1242–44 & nn.7–22 (surveying scholarship that urges the adoption of new governance models rooted in procedural law).

²¹³ *Id.* For a detailed discussion and critique of adaptive management, see Holly Doremus, *Adaptive Management as an Information Problem*, 89 N.C. L. REV. 1455 (2011).

²¹⁴ Wiersema, *supra* note 168, at 1244.

²¹⁵ See *infra* Part II.C.

²¹⁶ In the last ten years, over 450 law review articles referencing ecological services have been published, 75 with “ecological services” or “ecosystem services” appearing somewhere in the title or summary.

²¹⁷ See, e.g., *infra* notes 219–230 and accompanying text.

²¹⁸ See, e.g., James Salzman, *Valuing Ecosystem Services*, 24 *ECOLOGY L.Q.* 887 (1997) (approaching ecological services from the perspective of valuation issues); Salzman, *supra* note 74, at 133–34 (tackling the issue of how to create ecosystem services

Among the most prominent and prolific writers in this field is Professor J.B. Ruhl. Most recently, Professor Ruhl's work has focused on the common law nuisance doctrine and its ability to provide a remedy for economic injuries to ecological services.²¹⁹ Ruhl argues that the birth of ecological economics and understanding of ecology create a legal system that is ripe for revisiting nuisance doctrine as a tool for remedying harms to ecological services.²²⁰ He explains that using the nuisance doctrine to address these harms was made possible by the Supreme Court's decision *Lucas v. South Carolina Coastal Council*.²²¹ In that case, Justice Scalia carved out an exception for regulatory takings when the challenged restrictions merely reflect those already imposed by common law nuisance or other "background principles" of property law.²²² In explaining this exception, Scalia noted that common law evolves as new knowledge emerges.²²³ According to Ruhl, this recognition provides the opening for nuisance law to address new knowledge regarding the value of ecological services.²²⁴

Perhaps because its roots lie in capitalizing on *Lucas*, Ruhl's argument for pressing the nuisance doctrine into service is limited to cases where ecological injuries contain identifiable economic values.²²⁵ His is a self-described "instrumentalist" approach based on "welfare economics."²²⁶ He recognizes that there are moral, ethical, or scientific arguments on behalf of ecological integrity,

markets such that the valuation of these services can play a role in environmental laws); Barton H. Thompson, Jr., *Markets for Nature*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 261 (2000) (discussing regulatory markets, public goods markets, and ecosystem services markets).

²¹⁹ See J.B. Ruhl, *Making Nuisance Ecological*, 58 CASE W. RES. L. REV. 753 (2008) [hereinafter Ruhl, *Making Nuisance Ecological*]; J.B. Ruhl, *Toward a Common Law of Ecosystem Services*, 18 ST. THOMAS L. REV. 1 (2005); J. B. Ruhl, *Ecosystem Services and the Common Law of "The Fragile Land System,"* 20 NAT. RES. & ENV'T, Fall 2005, at 3 [hereinafter Ruhl, *Ecosystem Services*]; see also *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1029 (1992).

²²⁰ Ruhl, *Making Nuisance Ecological*, *supra* note 219, at 756–58.

²²¹ *Id.* at 759; see also J.B. Ruhl, *The "Background Principles" of Natural Capital and Ecosystem Services: Did Lucas Open Pandora's Box?*, 22 J. LAND USE & ENVTL. L. 525, 536–40 (2007).

²²² See *Lucas*, 505 U.S. at 1029.

²²³ *Id.* at 1031.

²²⁴ Ruhl, *Making Nuisance Ecological*, *supra* note 219, at 758–60; Ruhl, *supra* note 221, at 536–40. Though Ruhl contends that his arguments are not motivated by takings avoidance, his arguments are nonetheless premised on the openings left by the Supreme Court in *Lucas*, and his pragmatic approach to the use of nuisance law for addressing harms to ecological services suggests that takings avoidance must play a role in the development of his legal theories. Cf. James L. Huffman, *Beware of Greens in Praise of the Common Law*, 58 CASE W. RES. L. REV. 813, 813–14 (2008) (criticizing Ruhl and other scholars for embracing the common law after *Lucas* as a takings avoidance strategy).

²²⁵ Ruhl, *Making Nuisance Ecological*, *supra* note 219, at 760.

²²⁶ *Id.*

but decides to take a pragmatic approach by trying to protect ecosystem services within the playing fields already established—namely market-valuation and common law doctrines that recognize economic injury:

I am not suggesting that nuisance law take on the whole of ecosystem management law Rather, what I have in mind looks and feels like a rather conventional nuisance action, the only novel feature being that the plaintiff is linking damage to ecological resources on defendant's property with injury to use and enjoyment of plaintiff's property.²²⁷

Ruhl also recognizes the limits of this approach and its ability to fully protect ecological services. With respect to private nuisance doctrine, he acknowledges that

it cannot be that all losses of ecosystem services have a remedy in nuisance. Indeed, what I have outlined as an ecosystem service nuisance is intended to fit within the conventional doctrine of private nuisance, not to morph it into a general ecological protection regime. In the absence of a plaintiff whose use and enjoyment of property is substantially injured as a result of another landowner's degradation of natural capital, no ecosystem service nuisance has been committed.²²⁸

Ruhl, in other words, offers nuisance doctrine as a tool for remedying only the most traditional and narrow category of ecological harms.²²⁹

Other scholars have more aggressively argued that common law doctrines can remedy broader categories of ecological nuisances. Professor John Copeland Nagle, for example, would take Ruhl's argument a bit further.²³⁰ Using the destruction of wetlands as an example of ecological nuisances, Nagle argues that we should move beyond the traditional role of nuisance law in protecting economic interest; he argues that environmental ethics should inform which actions give rise to ecological nuisance claims.²³¹

By thinking beyond economics, Nagle gets closer to recognizing the breadth and depth of the problem at hand. Ethics and broader considerations of what constitutes good land use are part of any environmental regulatory decision, whether so acknowledged or not.²³² In other words, we can hardly decide on a satisfactory point of environmental regulation without making a value judgment

²²⁷ *Id.* at 777.

²²⁸ *Id.* at 774–75.

²²⁹ *See id.*; *see also, e.g.*, Anderson, *supra* note 92, at 551; Goldstein, *supra* note 12, at 347; Wilgus, *supra* note 11, at 99.

²³⁰ Nagle, *supra* note 31, at 787–88.

²³¹ *Id.* at 802–11.

²³² *See* FREYFOGLE, *supra* note 16, at 144–46.

about acceptable tradeoffs between interests of the private and the public—for example, private economic interests and public health, or private property rights and public resources. Given the importance of land health and ecological services to human welfare, economic valuation is not an acceptable proxy for the worthiness of protecting us from ourselves.²³³

If Nagle picks up where Ruhl left off, this Article picks up where Nagle left off. While both Ruhl and Nagle looked to common law as an avenue for remedying harms to ecological services, both agreed that the common law, though informative and the only tool that appears readily available, does not offer a broad or comprehensive enough solution. In his work on illustrating ecological nuisance through wetlands regulation, Nagle commented, “individualized assessment provided by nuisance law is not a panacea for wetlands regulation. Ethical norms are more readily incorporated into statutory provisions that are crafted with particular goals in mind.”²³⁴ Ruhl made a similar observation when he expressed skepticism that the common law could accommodate the underlying ethical and moral considerations in an ecological context.²³⁵ In the end, this limitation of the common law appears to have driven his preference for tempting the law’s “instrumentalist core” with economics of natural capital.²³⁶

Other scholars have more strongly criticized the common law’s ability to serve as the foundation for ecosystem protection. Professor James Huffman objects to the creation of ecological nuisances through common law because it would allow courts, and not the legislature, to set environmental policy.²³⁷ Huffman is also critical of arguments advanced by Ruhl and others because he sees those arguments merely as attempts to avoid regulatory takings through common law doctrines.²³⁸

While Huffman’s suggestion that the common law has no useful role in shaping a new law of ecosystem protection is likely overstated, he aptly observes that the challenge before us requires a broader, coordinated approach. The common law provides the foundation for modern environmental pollution control laws and is “profoundly adaptive.”²³⁹ But it is also a slowly churning machine, processing one individual dispute at a time, eventually turning out a by-product of

²³³ See ACKERMAN & HEINZELING, *supra* note 46, 8–9.

²³⁴ Nagle, *supra* note 31, at 811.

²³⁵ Ruhl, *Making Nuisance Ecological*, *supra* note 219 at 784–85.

²³⁶ *Id.* at 785.

²³⁷ Huffman, *supra* note 224, at 813–14.

²³⁸ *Id.* at 813 (“But for the most part the fledgling environmental case for revival of common law remedies is rooted in a belief that a reinvigorated common law will further weaken constitutional protections of property rights that might otherwise stand in the way of command and control regulation.”).

²³⁹ Ruhl, *Ecosystem Services*, *supra* note 219, at 8 (“Almost a century ago the U.S. Supreme Court decision in *Georgia v. Tennessee Copper Co.*, 206 U.S. 230 (1907), suggested that the common law could play an important and innovative role in pollution control.”).

policy that is many cases and years in the making. Because of this, the common law is widely recognized as a “grossly inadequate” tool for providing a broad and effective policy of pollution control.²⁴⁰

Nearly three decades ago, Professor Richard Lazarus wrote of another common law doctrine—the public trust doctrine—and criticized its use as impeding the necessary evolution of natural resources law.²⁴¹ Similar to Ruhl’s invocation of the nuisance doctrine to protect ecosystem services, Lazarus explained how the public trust doctrine was invoked to impose limits on the privatization of natural resources.²⁴² Though he agreed that limits were necessary, Lazarus criticized the public trust doctrine’s application as a legal fiction, arguing that natural resource laws needed to reflect modern ecological concerns and that clinging to old doctrines simply resulted in “tortured constructions of the present rather than repudiations of the doctrine’s past.”²⁴³ In addition, Lazarus cautioned against an overreliance on the public trust doctrine to address natural resource concerns because it was a product of judge-made law.²⁴⁴ In that way, the doctrine depended on a judiciary with a proenvironment bias to achieve sought-after results of natural resource protection. Though Lazarus spoke of a different time, both in terms of ecological understanding and regulatory takings law, some of Lazarus’s criticisms hold true today as nuisance law is advanced to protect ecosystem services and to set limits on private landowners’ misuse of such services.

Though the common law is a flexible tool that achieves legitimacy through its case-by-case embodiment of evolving public values,²⁴⁵ such a slow-moving, piecemeal approach is not responsive enough to the pace at which landscapes are altered and ecological services are destroyed. This is not to say that common law doctrines are inconsistent with these proposals, or that some of the proposals have not been embraced historically by the common law. But there are many layers of change that would need to take place in current thinking before the common law

²⁴⁰ *Id.* at 5 (citing ROBERT PERCIVAL ET AL., ENVIRONMENTAL REGULATION 72 (4th ed. 2003); *Boomer v. Atlantic Cement Co.*, 257 N.E.2d 870, 871 (N.Y. 1970) (“A court should not try to do this on its own as a by-product of private litigation and it seems manifest that the judicial establishment is neither equipped in the limited nature of any judgment it can pronounce nor prepared to lay down and implement an effective policy for the elimination of air pollution. This is an area beyond the circumference of one private lawsuit.”)).

²⁴¹ See Lazarus, *supra* note 142, at 631–33.

²⁴² *Id.* at 632–33.

²⁴³ *Id.* at 711.

²⁴⁴ *Id.* at 712–13.

²⁴⁵ See Ruhl, *Ecosystem Services*, *supra* note 219, at 6 (“Most comprehensive treatments of the evolution of environmental law begin with the common law as the first meaningful stage of development. . . . The common law [] provided much-needed legitimacy to the public law agenda for pollution control.”); see also *id.* at 7 (arguing that ecosystem management law has gained little traction because “ecosystem management legislation tried to leapfrog its common law formative stage”).

could uniformly embrace new ecological understanding and heal the schism between responsible land use on public and private land. Doing so in a timely fashion asks too much of the common law.

Like Lazarus's criticism of reliance on the public trust doctrine as a panacea, it is dangerous to put too much stock in the ability of nuisance law to reshape remedies for the misuse of private lands that harbor valuable ecosystem services. Such an evolution is not only slow, but it is also dependent on a judiciary being willing to recognize new ecological concerns, and it does not necessarily strike at the heart of some of the more nettlesome issues underlying ecosystem protection.

Given the limitations of the common law, a more explicit and broad-based approach is needed in order to remedy harms to ecosystems. A rethinking and expansion of natural resource damages law is one such approach.

III. THE PROMISE OF A REMEDY IN NATURAL RESOURCE DAMAGES LAW

Before discussing how an expansion of natural resource damages law might be reformed, a recap of the major arguments made so far might be useful at this point. First, we ought not misuse nature, though where we draw the line between use and misuse has yet to be determined.²⁴⁶ Second, our understanding of nature has matured through the study of ecology, and we now have a greater appreciation for the valuable services that ecosystems provide to society.²⁴⁷ Third, we need to broaden our notions of public ownership and assert control over parts and processes of nature that were once deemed worthless but are now understood as valuable.²⁴⁸ Finally, the multitude of environmental laws currently in effect do not protect nature as an interconnected whole.²⁴⁹ It is time to put behind us the language of nature as separable elements and talk about the disruption of nature's vital functional processes.

Putting all these pieces together, the key claim is that we ought to consider a new, broader, more ecologically and ethically informed understanding of "natural resource damages." More specifically, if we combine a concept of natural resources that recognizes ecosystem services; the foundation of natural resource damages law as it exists today; the normative claim that we ought not misuse nature; and a more complete acceptance of public ownership of nature, then we can begin to conceive of a new natural resource damages law that provides a remedy for the misuse of nature.

This Part explores the promise and limitations of expanding natural resource damages law. Part IV then sketches the ways in which we might craft causes of action, provide remedies, and empower citizens through a reformed natural

²⁴⁶ See *supra* Part I.A.

²⁴⁷ See *supra* Part I.B.1.

²⁴⁸ See *supra* Part I.B.2.

²⁴⁹ See *supra* Part II.B–C.

resource damages framework. Enumerating the challenges ahead will set the stage for a longer and more detailed discussion in the future.

A. *The Promise of Natural Resource Damages Law*

Natural resource damages law is a promising starting point for developing a framework for remedying misuse of nature. Key features of its framework include a broad definition of natural resources, the use of nontraditional economic methods, and treatment of natural resources as part of the public trust.

By way of background, federal statutory authority for natural resource damages originated in the 1977 amendments to the Clean Water Act.²⁵⁰ Today, authority is contained primarily in five federal statutes,²⁵¹ including section 107 of the Comprehensive Environmental Response, Compensation and Liability Act (CERLCA);²⁵² section 311(f)(4) of the Clean Water Act (CWA);²⁵³ section 1002 of the Oil Pollution Act of 1990 (OPA);²⁵⁴ the Marine Protection Research and Sanctuary Act;²⁵⁵ and the National Park System Resource Protection Act.²⁵⁶

²⁵⁰ Technically, the natural resource damages concept was first used in the Trans-Alaska Pipeline Authorization Act of 1973 and was also addressed in the Deepwater Porter Act of 1974. The Clean Water Act, however, brought the concept into significant light by applying it beyond particular, designated resources. Manus, *supra* note 13, at 424.

²⁵¹ Of these federal statutes, CERLCA is perhaps the most well known and largest source of natural resource damage recovery actions. The attributes of CERLCA's natural resource damages provisions will, therefore, serve as the primary stepping stone for discussion of natural resource damages potential and limitations here. Many states have similarly enacted state superfund statutes that include provisions for recovery of natural resource damages. *E.g.*, Lloyd W. Landreth & Kevin M. Ward, *Natural Resource Damages: Recovery Under State Law Compared with Federal Laws*, 20 ENVTL. L. REP. 10, 134 (1990) (reviewing existing state laws establishing liability for natural resource damages). For example, the New Jersey Spill Act authorizes natural resource damage recovery for discharges of hazardous substances. *See* N.J. STAT. ANN. § 58:10-23.11(g)(c) (West 2006). A detailed analysis of state natural resource damages laws and their potential to inform a new framework for remedying the misuse of nature is a separate undertaking. This Article examines the promise and limits of natural resource damages as conceived in key federal statutes.

²⁵² 42 U.S.C. § 9607 (2006) (providing that a "trustee" may recover for injury to, destruction, or loss of natural resources, including reasonable cost of assessment, resulting from the release of hazardous substances).

²⁵³ 33 U.S.C. § 1321(f)(4) (2006) (providing that "costs of removal of oil or a hazardous substance" recoverable under the statute include any cost or expenses incurred by federal or state government in the restoration or replacement of natural resources damaged or destroyed "as a result of a discharge of oil or a hazardous substance").

²⁵⁴ 33 U.S.C. § 2702 (2006) (providing recovery of "removal costs and damages" that result from discharges of oil into navigable waters or the adjoining shoreline, including recovery by a trustee for damages for injury to natural resources). OPA was enacted in response to the Exxon Valdez oil spill. *See* William H. Rodgers, Jr., et al., *The Exxon*

In general, these statutes create liability for injury to, or destruction or loss of, natural resources.²⁵⁷ CERLCA and OPA define natural resources to include “land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources” that are managed or otherwise controlled by the United States.²⁵⁸ “Injury” is also broadly defined to include nearly any adverse impact on a resource.²⁵⁹

CERLCA’s broad definition of natural resources reflects a willingness to move beyond the traditional treatment of natural resources as discrete segments of nature and recognize that ecosystems and their services are part of natural resources. To that end, the Department of Interior’s (DOI) damage assessment regulations advise trustees to quantify injuries to natural resources as well as “lost services.”²⁶⁰ Similarly, in the event that trustees must consider acquisition of resource equivalents in lieu of restoration, the DOI requires trustees to consider the “services” provided by the resources. Trustees are instructed not to treat services as commodities that can be restored independently of the resource:

[DOI] does not believe that Congress intended to allow trustee agencies to simply restore the abstract services provided by a resource, which could conceivably be done through an artificial mechanism. For example, nothing in . . . CERLCA suggests that replacement of a spring with a water pipeline would constitute ‘restoration, rehabilitation, replacement, and/or acquisition of equivalent resources.’²⁶¹

The National Oceanic and Atmospheric Administration’s (NOAA) regulations similarly recognize the need to rehabilitate ecological services. Those regulations provide that, where the injury has resulted in the loss of ecological services,

Valdez Reopener: Natural Resources Damage Settlements and Roads Not Taken, 22 ALASKA L. REV. 135, 141 (2005).

²⁵⁵ 16 U.S.C. § 1443 (2006) (holding any person responsible for injuring sanctuary resources liable for the cost of “damages resulting from the destruction loss or injury.”)

²⁵⁶ 16 U.S.C. § 19jj-1 (2006) (“[A]ny person who destroys, causes the loss of, or injures any park system resource is liable to the United States for response costs and damages resulting from such destruction, loss, or injury.”).

²⁵⁷ 42 U.S.C. § 9607(a)(4)(C); 33 U.S.C. § 2702(b)(2)(A).

²⁵⁸ 42 U.S.C. § 9601(16); 33 U.S.C. § 2701(20).

²⁵⁹ 43 C.F.R. § 11.14(v) (2010) (DOI regulations defining injury as “a measurable adverse change, either long- or short-term, in the chemical or physical quality or the viability of a natural resource . . .”); 15 C.F.R. § 990.30 (2011) (NOAA regulations providing a similarly broad definition).

²⁶⁰ 43 C.F.R. § 11.83(c)(1) (“The compensable value can include the economic value of lost services provided by the injured resources, including both public use and nonuse values such as existence and bequest values.”).

²⁶¹ Natural Resource Damage Assessments, 58 Fed. Reg. 39,328, 39,340 (proposed July 22, 1993) (to be codified at 43 C.F.R. pt. 11).

trustees must consider using Habitat Equivalency Analysis²⁶² and similar “resource to resource” and “service to service” approaches to restoration.²⁶³ Because natural resource damages law already takes a more holistic view of natural resources, as opposed to considering them as discrete and separable elements of nature, it could provide the foundation that is needed to remedy misuses of nature more generally.

The second key feature of natural resource damages is the willingness of Congress and courts to accept nontraditional methods of valuing natural resource injuries. Instead of holding natural resource damages captive to traditional market valuations, CERCLA requires damage assessment regulations to “identify the best available procedures to determine such damages, including both direct and indirect injury, destruction, and loss. . . .”²⁶⁴ CERCLA further provides that the relevant factors for assessing natural resource damages will include “replacement value, use value, and [the] ability of the ecosystem to recover. . . .”²⁶⁵

In *Ohio v. U.S. Department of Interior*,²⁶⁶ the leading case interpreting natural resource damage valuation under CERCLA, the D.C. Circuit held that “Congress intended the damage assessment regulations to capture fully *all aspects of loss*.”²⁶⁷ This means that damages are measured, at a minimum, by the cost of restoring the damaged natural resources to their preinjured condition. In some cases, where restoration is not feasible, replacing the injured resource becomes the focal point of the damages assessment.

Even if full restoration is feasible, the public may suffer a loss of enjoyment of the resource while it is injured. In these situations, damages may also include the lost use and nonuse values.²⁶⁸ Lost use values are measured by the benefits derived from current or expected future uses of the resource by identifiable persons; “use values are the more market-translatable values of a natural resource, encompassing both consumptive uses, such as hunting and fishing, in which

²⁶² Habitat Equivalency Analysis is a method for assessing resource injuries. Itzchak E. Kornfeld, *Of Dead Pelicans, Turtles, and Marshes: Natural Resource Damages in the Wake of the BP Deepwater Horizon Spill*, 38 B.C. ENVTL. AFF. L. REV. 317, 330 (2011) (“The principal concept underlying [Habitat Equivalency Analysis] is that the public can be compensated for past losses of habitat resources through habitat replacement projects providing additional resources of the same type.”).

²⁶³ 15 C.F.R. § 990.53(d).

²⁶⁴ 42 U.S.C. § 9651(c)(2)(B) (2006). Indirect injuries include those that result from the implementation of remediation, such as the destruction of a wetland through the dredging of contaminated sediment. *See* 43 C.F.R. § 11.15(a)(3)(ii).

²⁶⁵ 42 U.S.C. § 9651(c)(2)(B); *see also* 43 C.F.R. § 11.80(b) (DOI regulations setting forth two components of natural resource damage claims, including (a) a claim for monies required to restore, replace, or acquire an equivalent of the injured natural resource; and (b) a claim for the lost compensable value of the resource).

²⁶⁶ 880 F.2d 432 (D.C. Cir. 1989).

²⁶⁷ *Id.* at 463 (emphasis added).

²⁶⁸ *Id.* at 463; *see id.* at 454 n.34, 464, 476–78; *see also id.* at 462–63 (“From the bald eagle to the blue whale and the snail darter, natural resources have values that are not fully captured by the market system.”).

resources are harvested, and nonconsumptive uses, such as hiking and bird watching, in which the activity does not reduce the stock or resources.”²⁶⁹ Nonuse, or passive use, values are benefits that people derive from knowing that certain resources exist and could be used in the future.²⁷⁰

It is the inclusion of nonuse values in the damage assessment that underscores the desire to ensure the full measure of harm is remedied through natural resource damages law. For example, in *Utah v. Kennecott Corporation*,²⁷¹ the district court rejected the state trustee’s damage assessment for groundwater contamination because it was based solely on the market value of the volume of water lost to the public.²⁷² The court concluded that the trustee “adopted a too narrow interpretation of use value by equating such with market value only. . . . [It] failed to assess the non-consumptive use values of the aquifer, *i.e.*, option and existence values.”²⁷³

Other courts have similarly recognized the need to include nonuse values into the natural resource damage assessment equation and upheld nontraditional methods of valuation. In *Ohio v. U.S. Department of the Interior*,²⁷⁴ the D.C. Circuit explained that “[o]ption and existence values may represent ‘passive’ use, but they nonetheless reflect utility derived by humans from a resource, and thus, *prima facie*, ought to be included in a damage assessment.”²⁷⁵ Contingent valuation,²⁷⁶ a particularly controversial method for assessing nonuse values, has even been upheld as a valid method for valuing natural resource damages.²⁷⁷ In addition, at least one court has upheld Habitat Equivalency Analysis²⁷⁸ as an appropriate method for valuing ecosystem damages.²⁷⁹

²⁶⁹ Manus, *supra* note 13, at 447.

²⁷⁰ Natural Resource Damage Assessments, 59 Fed. Reg. 14,262, 14,263 (Mar. 25, 1994) (codified in 43 C.F.R. pt. 11) (explaining nonuse values in the preamble to the final rule in response to *Ohio v. U.S. Department of the Interior*).

²⁷¹ 801 F. Supp. 553 (D. Utah 1992).

²⁷² *Id.* at 571.

²⁷³ *Id.*

²⁷⁴ 880 F.2d 432.

²⁷⁵ *Id.* at 464; *see also* *Idaho v. S. Refrigerated Transp.*, No. 88-1279, 1991 WL 22479, at *18 (D. Idaho Jan. 24, 1991) (holding that commercial, existence, and recreation values all “exist and would be appropriate items of damage if proved at trial”).

²⁷⁶ For an explanation of the contingent valuation methodology and why it is controversial, *see* Miriam Montesinos, Comment, *It May Be Silly, But It’s an Answer: The Need to Accept Contingent Valuation Methodology in Natural Resource Damage Assessments*, 26 *ECOLOGY L.Q.* 48 (1999).

²⁷⁷ *Dep’t of the Interior*, 880 F.2d at 476–78 (upholding as consistent with congressional intent DOI’s endorsement of the use of contingent valuation methodology to measure use, existence, and option values); *see also* Manus, *supra* note 13, at 446–49 (providing an overview of contingent valuation method and observing that much of the debate surrounding natural resource damage valuation has centered on that method).

²⁷⁸ For a description of Habitat Equivalency Analysis, *see supra* note 266.

²⁷⁹ *United States v. Fisher*, 977 F. Supp. 1193, 1198–1200 (S.D. Fla. 1997), *aff’d*, 174 F.3d 201 (11th Cir. 1999). Similarly, the natural resource damage regulations adopted by

The effort of natural resource damages to compensate losses that range from purely economic to nonutilitarian underscores its broad-based conception of natural resources and recognition of resources beyond their strict market valuation. In fact, the effort to reflect nonutilitarian losses to humans has been described as “the most poetic and profound element” of natural resource damages law.²⁸⁰

In addition to its expansive definition of natural resources and willingness to accept nontraditional economic methods of valuing harms, another critical attribute of natural resource damages law is its inherent recognition that natural resources are part of the public trust. There are several basic natural resource damage provisions that frame the public trust character of natural resources. First, both CERCLA and OPA limit the pursuit of natural resource damages to federal, state, or tribal trustees.²⁸¹ These trustees are charged with acting “on behalf of the public . . . as trustees of natural resources. . . .”²⁸² Second, natural resources are defined to include “other such resources belonging to, managed by, *held in trust* by, appertaining to, or otherwise controlled by” federal, state, and tribal governments.²⁸³ Finally, trustees are allowed to use natural resource damages recoveries “only to restore, replace, or acquire the equivalent of” the affected resources.²⁸⁴ Recovered monies, in other words, must actually be used to directly benefit the public; trustees cannot simply place natural resource damage recoveries into their general revenue funds.

Several scholars have recognized the benefits of incorporating the public trust model into natural resource damages law. Professor Manus, for instance, explains that

the incorporation of the public trust model into the [natural resource damage] provisions of several major statutes may represent a positive

NOAA require the consideration of habitat equivalency analysis and similar “resource to resource” and “service to service” approaches for scaling restoration when the injury has resulted in the loss of ecological services. 15 C.F.R. § 990.53(d) (2011). Habitat equivalency analysis attempts to compensate loss of habitat resources through habitat replacement projects that provide resources of the same type. *See* U.S. DEP’T OF COMMERCE, NOAA, HABITAT EQUIVALENCY ANALYSIS: AN OVERVIEW 1 (revised ed. 2006), *available at* <http://www.darrp.noaa.gov/library/pdf/heaoverv.pdf>. For an example of habitat equivalency analysis, see Notice of Environmental Assessment for United Heckathorn Superfund Site, 65 Fed. Reg. 10,815, 10,816–18 (Feb. 29, 2000).

²⁸⁰ Manus, *supra* note 13, at 446.

²⁸¹ Oil Pollution Act, 33 U.S.C. § 2706(b) (2006); Comprehensive Environmental Response Compensation, and Liability Act, 42 U.S.C. § 9607(f)(1) (2006).

²⁸² Oil Pollution Act § 2706(b); Comprehensive Environmental Response Compensation, and Liability Act § 9607(f)(1).

²⁸³ Clean Water Act, 33 U.S.C. § 2701(20) (2006) (emphasis added); Comprehensive Environmental Response Compensation, and Liability Act § 9601(16) (emphasis added).

²⁸⁴ Comprehensive Environmental Response Compensation, and Liability Act § 9607(f)(1).

reminder to government officials, particularly those in the agriculture, forestry, and other environmentally related agencies, that overriding all of their individual actions and decisions is an obligation to present and future generations to prevent an irrevocable imbalance in nature.”²⁸⁵

In this spirit, The National Association of Attorneys General has emphasized the importance of the trust relationship in natural resource damages law:

[t]he states and the Federal Governments [sic] are trustees for the people, and . . . their trust corpus includes this nation’s glorious natural resources. We, as trustees, have an obligation to protect these often irreplaceable resources from harm, and those that harm them have the obligation to restore them for all the people.²⁸⁶

The public trust aspect of natural resource damages law underscores the promise that the law holds in serving as the foundation for developing remedies for misuses of nature more generally. If we recognize that a broad range of natural resources and ecosystem services are part of the public trust, we can better accept more fundamental principles such as the notion that we should not misuse nature and that maintaining strict boundaries between public and private property is unrealistic.

B. The Limits of Natural Resource Damages Law

Given these three attributes—broad definition of natural resources, nontraditional means of valuing injuries to natural resources, and recognition of natural resources as public trust—natural resource damages seem to be a logical starting place from which to build a more comprehensive approach to remedying misuses of nature. To that end, it is useful to understand its current dimensions and limitations. In general, natural resource damages law suffers from limitations of scope, accessibility, and process.

Instead of being universally available to redress harms to natural resources, they are only available in particular situations that serve the purpose of the statutes

²⁸⁵ Manus, *supra* note 13, at 435–36; see also Thomas L. Eggert & Kathleen A. Chorostecki, *Rusty Trustees and the Lost Pots of Gold: Natural Resource Damage Trustee Coordination Under the Oil Pollution Act*, 45 BAYLOR L. REV. 291, 292–99 (1993) (discussing the trust attributes of OPA and their connection to the public trust doctrine); Kevin R. Murray et al., *Natural Resource Damage Trustees: Whose Side Are They Really On?*, 5 ENVTL. L. 407, 423 (1999) (“[Natural Resource Damage] trustees do indeed have a fiduciary duty to protect and restore the public’s resources, as well as to refrain from abusing their power in carrying out their responsibilities.”).

²⁸⁶ *Superfund Reform and Reauthorization: Hearing on S. 8 Before the S. Comm. on Env’t and Pub. Works*, 105th Cong. 119 (1998) (statement of Gordon J. Johnson, Assistant Att’y Gen. of New York); see also Murray, *supra* note 285, at 422–23.

in which they are housed. In this way, natural resource damages are limited in scope and embody the same fragmentation that plagues environmental law more generally.²⁸⁷ For example, natural resource damages are only available under CERCLA when there has been a release of hazardous substances into the environment.²⁸⁸ Likewise, under OPA and the CWA, a release of oil into navigable waters is required to trigger liability for natural resource damages.²⁸⁹ Other, less prominent statutes containing natural resource damage provisions—for example, the Marine Protection Research and Sanctuary Act—suffer from similarly narrow applications by limiting natural resource damages to very specific categories of federal lands.²⁹⁰

Not only are natural resource damages limited to certain types of releases or harms, but they are also limited to resources “belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by” federal, state, or tribal governments.²⁹¹ While this definition does not actually require federal or state governments to own the natural resources, it does exclude purely private property from the scope of natural resource damages.²⁹² Given that private property constituted over sixty percent of the land in the United States,²⁹³ excluding this land from the purview of natural resource damages is a significant limitation to any framework seeking a comprehensive remedy for the misuse of nature.²⁹⁴

In addition to their limited scope, natural resource damages are also limited in their accessibility. As described above, only authorized trustees are permitted to pursue natural resource damage recoveries.²⁹⁵ This means that private plaintiffs seeking to recover damages for injuries caused by harm to the environment—for example, the private landowners or commercial fishermen plaintiffs in the Exxon Valdez oil spill litigation—could not unilaterally avail themselves of CERCLA or

²⁸⁷ See *supra* Part II.B.

²⁸⁸ 42 U.S.C. § 9607(a), (f).

²⁸⁹ 33 U.S.C. § 1321(f).

²⁹⁰ The Marine Protection Research and Sanctuary Act limits natural resource damage recovery to harm caused to National Marine Sanctuary resources. 16 U.S.C. § 1443 (2006). Similarly, the Park System Resources Protection Act limits natural resource damages to harm to National Park resources. 16 U.S.C. § 19jj (2006).

²⁹¹ Comprehensive Environmental Response Compensation, and Liability Act § 9601(16) (definition of natural resources).

²⁹² *Ohio v. U.S. Dep’t of the Interior*, 880 F.2d 432, 460 (D.C. Cir. 1989) (concluding that Congress deliberately excluded purely private property from the definition of natural resources).

²⁹³ ECON. RESEARCH SERVS., U.S. DEP’T OF AGRICULTURE, 2002/EIB-14, MAJOR USES OF LAND, BY CLASS OF OWNERSHIP 1 (2002), available at <http://www.ers.usda.gov/publications/EIB14/eib14j.pdf>.

²⁹⁴ See *supra* Part I.B.

²⁹⁵ See *supra* notes 260–286 and accompanying text; see also 33 U.S.C. § 2706(b)(1); 42 U.S.C. § 9607(f)(1).

OPA's natural resource damage provisions. Local governments and private parties have to rely on the relief provided under state or common law.²⁹⁶

Foreclosing private citizens from pursuing natural resource damages places the burden of pursuing natural resource damages solely in the hands of agencies with limited time and funding. Without suggesting that natural resource damage recoveries be awarded to private citizens, it is possible that individuals could step into the shoes of trustees through citizen suit-type provisions. In environmental laws generally, citizen suit provisions have been a significant force behind the successful enforcement and interpretation of important statutes such as the Clean Air Act, the Clean Water Act, and the Endangered Species Act.²⁹⁷ A similar concept could make natural resource damages a more effective remedial tool as well.

The third major limitation of natural resource damages law is its limitation of process; even if federal natural resource damages were more widely available in scope and accessibility, the costs, controversy, and delay associated with assessing and valuing natural resource injuries have limited their usefulness in practice.²⁹⁸

In order to support a claim for natural resource damages, for instance, trustees typically prepare a natural resource damage assessment.²⁹⁹ While not mandated by regulation, a natural resource damages assessment is a key component of proving the extent of damages to which trustees are entitled.³⁰⁰ To that end, CERLCA creates a rebuttable presumption in favor of damages assessed according to

²⁹⁶ 42 U.S.C. § 9652(d) (CERLCA does not modify remedies available under the common law).

²⁹⁷ Elizabeth Magill, *Standing for the Public: A Lost History*, 95 VA. L. REV. 1131, 1187–90 (2009) (discussing the significance of citizen suit provisions in federal environmental law and explaining that the first such provision, contained in the Clean Air Act of 1970, “imagined citizens as both private enforcers of existing EPA dictates as well as direct watchdogs on EPA activities”).

²⁹⁸ “The measurement of damages, however, is one of the most controversial aspects of a natural resources damage action.” Gerald F. George, *Litigation of Claims For Natural Resource Damages*, in ENVIRONMENTAL LITIGATION 399, 410 (A.L.I.-A.B.A. Court of Study Materials, June 26–30, 2000). “In most instances, these determinations as well as the scaling of the restoration or compensation activities, will require data and assumptions about ecological services, injury, recovery and productivity rates that are much easier to describe than to develop in practice.” *Id.* at 412.

²⁹⁹ For a discussion of Natural Resource Damage Assessments and the rebuttable presumptions afforded to those Assessments, see Yen P. Hoang, Note, *Assessing Environmental Damages After Oil Spill Disasters: How Courts Should Construe the Rebuttable Presumption Under the Oil Pollution Act*, 96 CORNELL L. REV. 1469 (2011).

³⁰⁰ See generally Craig R. O'Connor, *Natural Resource Damages Under the Comprehensive Environmental Response, Compensation, and Liability Act*, in ENVIRONMENTAL AND TOXIC TORT MATTERS: ADVANCED CIVIL LITIGATION (A.L.I.-A.B.A. Course of Study Materials February, 18, 1999) (noting that the defensibility of a natural resource damages assessment in court is “vital to the ability of the trustees’ legal representatives to recover the funds necessary to restore injured resources”).

regulatory procedures.³⁰¹ Without that presumption, the trustees face the unenviable task of attempting to prove that a particular person caused the harms identified in the natural resource damage claim and that the cost of those harms is properly valued;³⁰² without the benefit of a rebuttable presumption, CERCLA places the burden of proving and valuing ecological injuries on the trustee.³⁰³ Given the complexity, dynamism, and interconnectedness of natural systems, the task of identifying, let alone valuing, natural resource injuries can be a substantial and formidable undertaking.³⁰⁴ Because trustees face a “significant proof obstacle”³⁰⁵ in the identification and valuation of natural resource damages, these assessments are, as a practical matter, indispensable for trustees seeking to avoid challenge and costly litigation by potentially responsible parties.

But natural resource damage assessments are “costly propositions,”³⁰⁶ and the prospect of undertaking these costs puts pursuit of natural resource damages out

³⁰¹ 42 U.S.C. § 9607(f)(2)(c) (2006).

³⁰² Even with the presumption, the task of proving and valuing damages is difficult. In fact, the D.C. Court of Appeals has observed that the presumption does not appear to have created the “powerful advantage” as originally envisioned, but rather has amounted to “nothing more than a burden shifting exercise.” *Gen. Elec. v. U.S. Dept. of Commerce*, 128 F.3d 767, 772 (D.C. Cir. 1997).

³⁰³ Professor Manus posits that Congress’s allocation of the burden of proving liability for natural resource damages on trustees is “[p]erhaps the most telling sign of congressional reticence to allow ready implementation of the ultimate goals of [natural resource damages].” Manus, *supra* note 13, at 440.

³⁰⁴ For a discussion of the complex, dynamic, and uncertain attributes of the environment that, in turn, impact environmental laws, see RICHARD J. LAZARUS, *THE MAKING OF ENVIRONMENTAL LAW* 16–24 (2004); see also Sanne H. Knudsen, *A Precautionary Tale: Assessing Ecological Damages After the Exxon Valdez Oil Spill*, 7 U. ST. THOMAS L.J. 95 (2009); Wiersema, *supra* note 168, at 1246–48; Karkkainen, *supra* note 61, at 194–97.

³⁰⁵ Manus, *supra* note 13, at 442–43 (“[T]he requirement that trustees prove injury could eviscerate the [natural resource damages] claim from within, because in the web of life no ecological change occurs in the sterile isolation required for proof of causation.”).

³⁰⁶ *New Mexico v. Gen. Elec. Co.*, 467 F.3d 1223, 1242 n.28 (10th Cir. 2006) (“[The court is] well aware that NRD assessment is a costly proposition.”). In this case, the Tenth Circuit went on to explain that

[a]ccording to two commentators, after its 1986 amendments, CERCLA ‘cast trustees adrift to finance their own damage assessment before filing claims against polluters—a costly proposition, given that damage assessments typically cost millions of dollars. This lack of funding has created a virtually insurmountable obstacle considering that agency budgets have historically authorized little or no funding for NRD assessments.’

Id. (citing Gina M. Lambert & Anthony R. Chase, *Remedying CERCLA’s Natural Resource Damages Provision: Incorporation of the Public Trust Doctrine into Natural Resource Damage Actions*, 11 VA. ENVTL. L. J. 353, 371–72 (1992)).

of reach for some state and federal trustees.³⁰⁷ Although polluters are ultimately responsible for reimbursing the trustees for the cost of the assessment for successful claims, the time and expense of conducting such an assessment is more than the budgets of many trustees can bear in the first instance.³⁰⁸

Moreover, the inherently complex nature of delineating natural resource injuries turns the preparation of natural resource damage assessments into a long and arduous process. As NOAA explains:

Although the concept of assessing injuries may sound simple, understanding complex ecosystems, the services these ecosystems provide, and the injuries caused by oil and hazardous substances takes time—often years. The season the resource was injured, the type of oil or hazardous substance, and the amount and duration of the release are among the factors that affect how quickly resources are assessed and restoration and recovery occurs. The rigorous scientific studies that are necessary to prove injury to resources and services—and withstand scrutiny in a court of law—may also take years to implement and complete.³⁰⁹

This means that the time between the event that gives rise to the injury and the settlement of the natural resource damages can take decades in some cases.³¹⁰ A 2004 study of state trustees involved in natural resource damage cases found that the average length of time between event and settlement is eleven years.³¹¹ This

³⁰⁷ Patrick E. Tolan, Jr., *Natural Resource Damages Under CERCLA: Failures, Lessons Learned, and Alternatives*, 38 N.M. L. REV. 409, 447–48 (2008) (“Natural resource trustees are generally understaffed and under-funded.”).

³⁰⁸ *Id.* Some states, like New Jersey and California, have devised relatively successful natural resource damage programs because they have made funding available for damage assessments up front. *Id.* at 438–44 (discussing the New Jersey approach to natural resource damages). In addition, these states have also been successful at reducing the cost of assessments by enacting regulations that approve certain simplified methodologies. *Id.* at 445. Those simplified methodologies, however, are nonetheless vulnerable to legal challenge absent any presumption in favor of the trustee if methodologies are followed. *Id.*

³⁰⁹ Nat’l Oceanic & Atmospheric Ass’n, *Natural Resource Damage Assessment (NRDA) Process: About DARRP*, NOAA’S DAMAGE ASSESSMENT REMEDIATION & RESTORATION PROGRAM, <http://www.darrp.noaa.gov/about/nrda.html> (last updated July, 19, 2010); see also U.S. DEP’T OF THE INTERIOR, *Frequently Asked Questions*, NAT. RESOURCE DAMAGE ASSESSMENT & RESTORATION PROGRAM, <http://www.doi.gov/restoration/about/faqs.cfm> (last visited Mar. 24, 2102) (“Damage assessments are often quite complex and often take years to complete.”).

³¹⁰ AMY W. ANDO ET AL., ILL. DEP’T OF NAT. RESOURCES, RESEARCH REPORT NO. 108, NATURAL RESOURCE DAMAGE ASSESSMENT: METHODS AND CASES 12 (2004), available at http://www.wmrc.uiuc.edu/main_sections/info_services/library_docs/RR/RR-108.pdf.

³¹¹ *Id.*

finding is consistent with the conclusions of a federal advisory committee report released in 2007 that found the federal natural resource damages process needs to be revised in order to make restoration of natural resources “faster, more efficient, and more effective.”³¹² To that end, the advisory committee’s recommendations were aimed, in part, at establishing cooperative relationships with potentially responsible parties in order to: (1) encourage responsible parties to fund damage assessments in the first instance; and (2) avoid valuation issues by encouraging responsible parties to conduct the restoration activities.³¹³ Until natural resource damage processes and methodologies can be revised to facilitate effective recovery of public costs to natural resources, they will most likely continue to be underutilized and only be successful in the unusual case.

³¹² NAT. RESOURCE DAMAGE ASSESSMENT & RESTORATION FED. ADVISORY COMM., U.S. DEP’T OF THE INTERIOR, FINAL REPORT TO THE SECRETARY 20 (2007), available at http://www.doi.gov/restoration/library/upload/faca_finalreport.pdf; see also Peck, *supra* note 156, at 275–77, 304–05 (arguing for revisions to natural resources damages laws); Dale B. Thompson, *Valuing the Environment: Courts’ Struggles with Natural Resource Damages*, 32 ENVTL. L. 57, 60–61 (2002) (arguing for the amendment of NRD regulations to provide a more simplified approach); Tolan, *supra* note 307, at 450–53 (arguing for revision of federal natural resource damages program).

³¹³ On this latter point, one of the most hotly contested issues in natural resource damage claims is valuation. See, e.g., Allan Kanner & Tibor Nagy, *Measuring Loss of Use Damages in Natural Resource Damage Actions*, 30 COLUM. J. ENVTL. L. 417, 448 (2005) (citing Richard Stewart et al., *Evaluating the Present Natural Resource Damages Regime: The Lawyer’s Perspective*, in NATURAL RESOURCE DAMAGES: A LEGAL, ECONOMIC, AND POLICY ANALYSIS 163 (Richard Stewart ed., 1995) (“[M]easuring natural resource damages is ‘the most daunting task facing trustees.’”); James L. Nicoll, *Environmental Restoration: Challenges for the New Millennium: The Irrationality of Economic Rationality in the Restoration of Natural Resources*, 42 ARIZ. L. REV. 463, 464 (2000) (challenging traditional economic theory in the valuation of natural resources); Thompson, *supra* note 312, at 60 (“Natural resource damages present a significant challenge for the legal system because in most cases they are non-market commodities.”). How do we effectively measure the loss of, or injury to, certain resources? One approach is by measuring the use and existence value of the resource from a utilitarian perspective, for example, the worth of the resource measured by its value to individuals or society. See Peck, *supra* note 156, at 279–82. Another approach—the biocentric approach—would measure the intrinsic value of the resource independent of human satisfactions. *Id.* Not surprisingly, the preferred method of valuing natural resources is to quantify utilitarian values of use and existence through some method of cost-benefit analysis. *Id.* at 281–82. Three of the most common methods for measuring the value of natural resource damages are market valuation, restoration and replacement cost, and contingent valuation. *Id.* at 282–85. Regardless of the chosen method, however, controversies will certainly arise given that natural resource damages are unique in many instances and their uses not readily subject to valuation.

IV. SKETCHES OF A REFORMED LAW

Unlike existing laws that tend to protect private owners against damage by others,³¹⁴ the reforms proposed in this Article would draw upon and expand on laws that protect parts of nature from damage by the owner itself. Anticruelty laws represent one area where society has deemed it necessary and ethical to protect the thing that is owned from abuse by the owner. For example, the federal Animal Welfare Act requires minimum standards of care and treatment for certain animals bred for commercial sale or transported commercially.³¹⁵ At the state level, anticruelty laws protect privately owned animals against cruelty and neglect; the majority of states even provide for the seizure of animals that are being mistreated.³¹⁶

Other laws, though not as obvious in their delivery, also protect elements of nature from abuse by their owners. At the federal level, the Endangered Species Act protects certain listed species and their habitat from harm even if they exist on private lands.³¹⁷ The ESA prohibits all people, whether private landowners or

³¹⁴ For example, mining laws like the General Mining Law of 1872 govern individual rights to locate and acquire mineral rights; the law is focused on resolving competing claims between individuals or between individuals and the government. 30 U.S.C. § 22 (2006) (giving “free and open” rights to exploration and purchase of hard rock minerals); *id.* § 28 (explaining how claims are located and recorded so as to protect against competing claims); *see also* GEORGE CAMERON COGGINS ET AL., FEDERAL PUBLIC LAND AND RESOURCES LAW 558–84 (6th ed. 2007) (addressing disputes under the General Mining Law). Similarly, the Taylor Grazing Act implements a regime for allocating private grazing permits on public lands. 43 U.S.C. § 315 (2006) (setting forth the purpose of the Act as promoting the highest use of public lands); *Pub. Lands Council v. Babbitt*, 529 U.S. 728, 728, 733–36 (2000) (describing the Act as authorizing the Department of the Interior to “divide the public rangelands into grazing districts” and grant permits to landowners engaged in the livestock business). Water law doctrines like prior appropriation and reasonable use resolve water allocation disputes between individual water users. *See* COGGINS ET AL., *supra* at 486–88 (providing a brief overview of the prior appropriation and reasonable use doctrines). Even frequently invoked common law doctrines in the area of natural resources, like nuisance, are aimed at resolving disputes between individual landowners. *See, e.g., Bormann v. Bd. of Supervisors in and for Kossuth Cnty.*, 584 N.W.2d 309, 311 (Iowa 1998) (landowner challenge to county decision to designate certain land as an “agricultural area,” making Confined Area Feeding Operations (CAFOs) immune from nuisance suits). In each of these examples, natural resource laws decide which landowner, speculator, or right holder is entitled to use nature; they do not necessarily guarantee nature itself will be protected from overuse.

³¹⁵ *See generally* Animal Welfare Act, 7 U.S.C. §§ 2131–2159 (2006) (for the text of the act including the policy behind the law, definitions, and statutory requirements).

³¹⁶ *See* Pamela D. Frasch et al., *State Animal Anti-cruelty Statutes: An Overview*, 5 ANIMAL L. 69, 71 n.13 (1999) (listing State statutes “providing for the seizure of animals being cruelly treated or neglected”).

³¹⁷ 16 U.S.C. § 1533(b)(8) (2006).

commercial businesses, from taking listed endangered and threatened species.³¹⁸ Under some circumstances, this taking prohibition can also protect against habitat modification.³¹⁹ Some state endangered species acts contain similar protections.³²⁰

Even nonwildlife elements of nature receive some protection from misuse under various federal, state, and common laws. Wetlands are protected by section 404 of the Clean Water Act.³²¹ Instream water flows—which provide benefits such as flood mitigation, groundwater recharge, biological productivity, and recreational opportunities—are also often protected. For example, Washington State enacted a Water Resources Act that requires rivers and streams within the state to “be retained with base flows necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values, and navigational values.”³²² Likewise, under the Washington Water Code, permits for water use rights are conditioned upon the protection of instream flows.³²³

As a final example of current efforts to protect nature from misuse by its owners, farm programs like the Conservation Reserve Program expressly limit farm practices that cause soil erosion as a condition of government funding.³²⁴ In particular, the program provides that program participants must “[e]stablish and maintain the required vegetative or water cover and the required practices on the land . . . to achieve the desired environmental benefits and to maintain the productive capability of the soil”³²⁵

Though present, these examples are limited to narrow instances, as when a species is in danger of extinction or when a landowner voluntarily signs up for a conservation program. To protect ecosystem services, these specific rules need to be expanded to a more generalized prohibition against misuse of nature. This scheme would not be intended to replace existing common law or statutory remedies, but rather work in tandem with them to more appropriately protect ecosystem services instead of just selected parts of the patchwork.

For natural resource damages to serve as a realistic foundation for developing a comprehensive framework for remedying misuses of nature, it must protect nature while respecting the right of private property owners to use those resources

³¹⁸ *Id.* § 1538(a).

³¹⁹ See *supra* notes 178–182 and accompanying text.

³²⁰ See, e.g., COLO. REV. STAT. § 33-2-105(3), (4) (2011) (prohibiting any person from taking endangered or threatened species); 520 ILL. COMP. STAT. ANN. 10/1 to /11 (West 2004) (prohibiting any person from taking listed species); MINN. STAT. ANN. § 84.0895 (West 2004) (protecting threatened and endangered species).

³²¹ See Clean Water Act, 33 U.S.C. § 1344(g)(1) (2006).

³²² Water Resources Act of 1971, WASH. REV. CODE ANN. § 90.54.020(3)(a) (West 2004).

³²³ Washington Water Code, WASH. REV. CODE ANN. § 90.03.247 (West 2004 & Supp. 2011).

³²⁴ 7 C.F.R. § 1410.20(a) (2011) (setting forth the participant’s obligations and requiring practices that reduce soil erosion as a condition of participation).

³²⁵ *Id.* § 1410.20(a)(6).

in legitimate ways. It must also accurately incorporate evolving scientific understanding and reflect the realities of the land itself. In particular, there are at least eight key issues that a new natural resources damages framework will have to resolve:

(1) *Accommodating the Uniqueness of Land*

There are natural variations among landscapes, with different lands embodying varying levels of resilience to similar uses. What is sustainable or acceptable land use in one area might not be sustainable in the other. A reformed natural resource damages law should recognize those differences and avoid land use restrictions simply because certain practices are detrimental to substantially different types of land. Professor Freyfogle has made a similar point in suggesting that a new, ecological approach to landownership should tailor private rights “to take into account the natural variations among land parcels.”³²⁶

Incorporating a scientifically based understanding of the landscape would be useful in this regard. For example, ecoregions might prove a useful tool for building a catalog of unacceptable land use practices for various ecotypes. Ecoregions

denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. They are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. By recognizing the spatial differences in the capacities and potentials of ecosystems, ecoregions stratify the environment by its probable response to disturbance.³²⁷

The difficulty in applying science (such as knowledge of ecoregions) will be in providing enough differentiation to accommodate lands’ unique character, and yet enough bright line rules to provide property owners with clarity as to what legitimate uses of property include. Only by providing such clarity do we preserve the stability of property rights. It is also worth recognizing that this challenge of matching acceptable land use and resource management with varying types of land is made even more difficult in the face of climate change, where weather patterns

³²⁶ FREYFOGLE, *supra* note 12, at 229; *see also* Freyfogle, *Particulars of Owning*, *supra* note 21, at 585 (“Slowly, painfully, people are coming to think that landowner rights should somehow depend on the natural features of the parcel owned.”).

³²⁷ U.S. Env’tl. Prot. Agency, *Ecoregions of Oklahoma*, W. ECOLOGY DIVISION, http://www.epa.gov/wed/pages/ecoregions/ok_eco.htm (last updated Apr. 20, 2011).

will inevitably alter the landscape and call into question whether uses once deemed sustainable can still qualify as such.³²⁸

(2) *Drawing the Line between Use and Misuse*

Not all land use and natural resource consumption is bad or unacceptable.³²⁹ Consumption is necessary for survival. As a result, because we cannot simply set land aside and preserve it in perpetuity, a reformed natural resource damages law will have to undertake the challenge of identifying workable rules that balance use against misuse. Naturally, such line drawing will have to accommodate our constantly evolving understanding of ecology. Moreover, because line drawing is a reflection of values in one capacity or another, balancing use against misuse should be rooted in a well-defined and articulated ethical framework.

(3) *Creating a New Cause of Action*

A central task in shaping a reformed natural resource damages law will be the creation of a new cause of action setting forth the elements of proof. This cause of action will need to be flexible enough to accommodate the uniqueness of land, the ever-changing ecological understanding, and the many types of resource use that this law would ideally protect. On the other hand, the cause of action must not permit so much flexibility that it lacks clarity, for in issues dealing with private property, clarity provides stability.³³⁰ Additionally, determining how this cause of action will intersect with existing state property, tort, and natural resource laws will also need to be worked out.

In striking this balance between flexibility and predictability, select elements of the common law of nuisance and current natural resource damages law are important. Nuisance law is a model of simplicity and flexibility, providing a remedy for injuries ranging from interstate disputes over air pollution³³¹ to private property disputes over the location of cattle-feeding operations.³³² Federal natural resource damages law, on the other hand, prescribes a framework that is more consciously tailored to some of the unique characteristics of ecological injury. For example, natural resource damages law recognizes the public trust component of

³²⁸ See, e.g., Gary W. Yohe et al., *Perspectives on Climate Change and Sustainability*, in CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 811–41 (Martin L. Parry et al. eds., 2007) (“Climate change adds to the list of stressors that challenge our ability to achieve the ecologic, economic and social objectives that define sustainable development.”).

³²⁹ See discussion *supra* Part I.

³³⁰ See, e.g., FREYFOGLE, *supra* note 7, at 87 (2007) (“For private property to produce its many possible benefits landowners need protection for at least certain expectations.”).

³³¹ *Georgia v. Tenn. Copper Co.*, 206 U.S. 230, 238–39 (1907).

³³² *Spur Indus., Inc. v. Del E. Webb Dev. Co.*, 494 P.2d 700, 701 (Ariz. 1972).

natural resources and accordingly permits only designated federal, state, and tribal trustees to pursue natural resource damages.³³³ Moreover, natural resource damages law also tailors causal elements to accommodate the difficulty in proving causation for ecological injuries.³³⁴

In the end, the new cause of action will likely be a unique blend of elements borrowed from traditional causes of action and ones that have yet to be devised. Along these lines, Professor Bill Rodgers suggests the creation of a “new tort of contamination,” which he would define as the “interference with the use and enjoyment of ecosystem functions.”³³⁵ In his loose sketch of what this new tort might look like, Rodgers proposes “a strict liability tort with elements being (1) contamination, (2) causation, and (3) prospects of remediation.”³³⁶ In this regard, Professor Rodgers seems to start with common law of nuisance and weave in elements of current natural resource damages law. Though the details are left for another day, what is important at this point is the recognition that a legal tool is missing from the environmental protection toolbox. As Professor Rodgers aptly observed:

Contamination of natural capital—decline in the baseline—might be explained on the grounds of ownership failure. The commons may lack the vigorous champion of private entitlement. But the fish, the drinking water, the shellfish beds, and the body burdens do not appear to lack necessary plaintiffs. What is missing is a legal tool to correct the situation.³³⁷

(4) Proving Causation for Ecological Injuries

Although there are many possible forms that a new cause of action for natural resource damages might take, proving causation is sure to be one of the central elements. Because proving causation for ecological injuries is not an easy task, it deserves separate consideration.

Ecological injuries are characterized by five defining characteristics—complexity, scientific uncertainty, dynamism, precaution, and controversy.³³⁸ Because of these characteristics, ecological injuries give rise to difficult problems in identifying the extent and duration of harm, in proving causal relationships between manifested harm and the allegedly environmentally detrimental act, and in providing such identification and proof within the time frame usually required

³³³ See *supra* Part I.B.

³³⁴ See *infra* notes 338–347 and accompanying text.

³³⁵ Rodgers, *supra* note 11, at 1259.

³³⁶ *Id.*

³³⁷ *Id.* at 1257.

³³⁸ LAZARUS, *supra* note 304, at 16.

from response plans and redress paradigms.³³⁹ A reformed natural resource damages law will have to overcome these obstacles in identifying ecological injury and proving causation for those injuries.

In his call for a “tort of contamination,”³⁴⁰ Professor Rodgers offered CERCLA as an example of an environmental statute that incorporates a nontraditional causation standard.³⁴¹ CERCLA is a strict liability scheme that imposes joint and several liability on parties found to be responsible for contaminating a site.³⁴² But because CERCLA defines responsibility broadly, a plaintiff does not have to show that a defendant actually caused the release that resulted in the incurrence of response costs.³⁴³ Rather than employing a traditional causation test that requires tracing the alleged harm to a particular actor or set of actors, CERCLA adopts a more flexible standard that simply requires that the release was “likely to have been a causative factor” giving rise to the alleged harm.³⁴⁴ Thus, once the plaintiff has proven that the defendant is a potentially responsible party (PRP), a rebuttable presumption of liability arises, and the burden of proof shifts to the defendant, who then may assert an affirmative defense by disproving causation.³⁴⁵

By eliminating traditional tort causation from the plaintiff’s prima facie case, the CERCLA standard recognizes that harms to nature can rarely be proven as a straight-line correlation between action and reaction.³⁴⁶ Whether under this test or

³³⁹ See Knudsen, *supra* note 304, at 99.

³⁴⁰ Rodgers, *supra* note 11, at 1259.

³⁴¹ *Id.*

³⁴² 42 U.S.C. § 9607 (2006) (CERCLA provision on liability); Burlington N. & Santa Fe Ry. Co. v. United States, 129 S. Ct. 1870, 1878–81 (2009).

³⁴³ Steve C. Gold, *Dis-Jointed? Several Approaches to Divisibility After Burlington Northern*, 11 VT. J. ENVTL. L. 307, 328 n.126 (2009) (citing to several cases where courts have recognized CERCLA’s truncated causation requirement).

³⁴⁴ Rodgers, *supra* note 11, at 1259 (citing 4 WILLIAM H. RODGERS, JR., ENVIRONMENTAL LAW: HAZARDOUS WASTE & SUBSTANCES § 8.11, at 660–66 (West 1992)); see also United States v. Alcan Aluminum Corp., 990 F.2d 711, 721 (2d Cir. 1993); Amoco Oil Co. v. Borden, Inc., 889 F.2d 664, 668 (5th Cir. 1989) (citing Ascon Props., Inc. v. Mobil Oil Co., 866 F.2d 1149, 1152–53 (9th Cir. 1989)); Patricia E. Lin & Tom Starnes, *Establishing Liability Under CERCLA: The Causal Nexus and the Alternative Liability Theory* 1 (June 5, 2000), available at http://www.andrewskurth.com/assets/pdf/article_48.pdf (noting that under 42 U.S.C. § 9607(a) (2006), a plaintiff must prove only (1) that there has been a release or threatened release covered by CERCLA, (2) that the plaintiff has incurred response costs, (3) that the response costs were necessary and consistent with the national contingency plan, and (4) that the defendant is a PRP (potentially responsible party) as defined by CERCLA).

³⁴⁵ See *Amoco*, 889 F.2d at 668; United States v. Monsanto Co., 858 F.2d 160, 170–71 (4th Cir. 1988).

³⁴⁶ See John Copeland Nagle, *CERCLA, Causation, and Responsibility*, 78 MINN. L. REV. 1493, 1506–08, 1511 n.86 (1994). To prove causation under traditional tort law, a

a different one, the new natural resource damages scheme would similarly benefit from recognizing the unique character of environmental harm and tailor the causation standard accordingly.³⁴⁷

(5) *Addressing the Likely Aggregate Nature of Harm*

Ecosystems cross ownership boundaries.³⁴⁸ And ecological harms, particularly those stemming from land use and natural resource consumption, often result from compounding stresses to the land.³⁴⁹ Many landowners might, therefore, cause harm to nature through collective, if uncoordinated, action.³⁵⁰

For the purposes of reforming natural resource damages law, the aggregate nature of some ecological harm makes determination of liability difficult but essential. If harm is caused by several actors who are not necessarily operating in concert, who should be held accountable? One could, for instance, choose to hold accountable the last actor who stresses the resource beyond its natural capacity for alteration. This would make it incumbent on any actor to consider the likely cumulative impact of his or her proposed actions on the ecosystem. If that action would trigger an unacceptably negative ecological response, the actor would be held accountable for resulting injuries, notwithstanding the fact that the injury may have been the product of several collective actions. NEPA imposes similar requirements on federal agencies to consider the cumulative impacts of their proposed actions before deciding on an alternative.³⁵¹ Last-in-time liability seems to be a rather simple system for assessing liability, assuming one could identify which actor was last in time. But what if the last actor is the one whose land use provides the greatest utility to the community? Should that actor be prohibited

plaintiff would have to trace particular molecules of contamination back to the defendant, who may have deposited the materials at the release site decades ago.

³⁴⁷ It is important to note that the relaxed test for causation under CERCLA applies only to actions seeking recovery for response costs. For natural resource damages, CERCLA requires a causal link between the responsible party and the injury to the resource. See 43 C.F.R. § 11.62 (2011) (providing a procedure for establishing causation for water resources, geological resources, and biological resources injury). This regulation was upheld in *Ohio v. U.S. Dep't of the Interior*, 880 F.2d 432, 468–73 (D.C. Cir. 1989). To demonstrate injury and causation, the resource must be characterized, samples collected and statistically compared to measure injury, and the discharge modeled through various possible pathways. See 43 C.F.R. § 11.61 (2011).

³⁴⁸ See *supra* Part I.B.1.

³⁴⁹ See, e.g., Wayne R. Munns, Jr., *Assessing Risks to Wildlife Populations from Multiple Stressors: Overview of the Problem and Research*, 11 *ECOLOGY & SOC'Y*, 2006, available at <http://www.ecologyandsociety.org/vol11/iss1/art23/>.

³⁵⁰ See *supra* Part I.B.2 for a discussion of aggregate harm and the tragedy of fragmentation.

³⁵¹ See 40 C.F.R. §§ 1508.7, 1508.25(c) (2011).

from taking action simply because others have collectively made inefficient or reckless resource decisions in the past?

Another option for assessing liability would be holding all contributing actors jointly and severally liable for injuries caused by their aggregate activities. Such a system could look to CERCLA's model of assessing joint and several liability in the environmental contamination context.³⁵² However, the injuries targeted by CERCLA are more focused than the more comprehensive set of harms that reformed natural resource damages law would be designed to address. CERCLA deals with injuries arising from releases of toxic substances.³⁵³ And although such releases might be an inevitable byproduct of industrial activities, most people would probably agree that all toxic releases are undesirable and should be avoidable given enough care or incentive. In that sense, holding all contributing actors jointly and severally liable for toxic releases does not offend the equitable senses. But injuries arising from resource use generally—aggregate resource use in particular—are not so easily judged. From an equity standpoint, not everyone who contributes to the aggregate harm had equal reason to foresee that use of a given resource would unacceptably stress the ecosystem. Why then should all actors be held joint and severally liable? Moreover, what if all of the actors cannot be identified because of the multiple and complex pathways in which ecological harm can manifest?

The area of wildlife management provides a general example of a situation in which multiple stressors contribute to ecological harm. Wildlife population declines can result from the combination of many negative ecological stressors including “alteration of habitat caused by patterns of agricultural and urban land use, introduced invasive and exotic species, nutrient enrichment, direct human disturbance, and toxic chemicals.”³⁵⁴ The presence of multiple stressors complicates the ability of wildlife managers to identify which policy changes would most effectively curtail the population decline.³⁵⁵

A similar situation is one where there is a single stressor from multiple sources, unwittingly joining forces to overcome an ecosystem's natural assimilative capacity. Climate change is one prominent area where the issue of liability for collective harms proves exceptionally difficult and important. Because the Earth's natural systems are capable of assimilating some amounts of

³⁵² See 42 U.S.C. § 9607(a) (2006) (the civil liability provision of CERCLA). While the final version of CERCLA deleted explicit references to joint and several liability, courts have held that potentially responsible party liability is joint and several if no basis exists for dividing the harm of the contamination and the response costs. See Steven Ferrey, *Converting Brownfield Environmental Negatives into Energy Positives*, 34 B.C. ENVTL. AFF. L. REV. 417, 460–64 (2007) (citing *Amoco Oil Co. v. Borden, Inc.*, 889 F.2d 664, 672 (5th Cir. 1989), and *United States v. Monsanto Co.*, 858 F.2d 160, 169–70 (4th Cir. 1988)).

³⁵³ See generally 42 U.S.C. §§ 9601–9675 (for instance, § 9601(14) defines hazardous substances broadly).

³⁵⁴ Munns, *supra* note 349, at 1.

³⁵⁵ *Id.*

greenhouse gases without identifiable disruption, one actor emitting carbon dioxide into the atmosphere causes no discernible injury. But multiple actors responding to our combined unyielding thirst for development, industrialization, and consumption has stressed the earth's natural systems beyond capacity.³⁵⁶ This stress has manifested in very real and identifiable injuries. Given the collective actions contributing to this stress, can any single actor or category of actors be held accountable?

There have only been a handful of climate change litigation cases framed as common law nuisance actions.³⁵⁷ In general, those actions have sought to impose property damage or personal injury liability on sources of greenhouse gas emissions for failing to properly mitigate climate change. Most notably, in *Connecticut v. American Electric Power Co.*³⁵⁸ plaintiffs invoked the common law public nuisance doctrine to file a lawsuit against six electric power companies for contributing to global warming.³⁵⁹ Together, the defendants operated approximately 174 fossil fuel-fired power plants in twenty states that allegedly constituted ten percent of all carbon dioxide emissions in the United States.³⁶⁰ The federal district court dismissed the lawsuit on political question grounds.³⁶¹ On appeal, the Second Circuit reversed and allowed the public nuisance claim to proceed.³⁶² In particular, the Court suggested that joint and several liability is appropriate in the climate change context.³⁶³ To that end, in the course of addressing whether plaintiffs satisfied the redressability element of standing, the court noted that in federal common law of nuisance cases involving air pollution, "ambient air contains pollution from multiple sources" and "liability is joint and several."³⁶⁴ The U.S. Supreme Court reversed, concluding that the Clean Air Act has displaced federal common law of nuisance in the area of greenhouse gas emissions.³⁶⁵ The Court did, however, leave open the possibility that climate nuisance litigation could be viable under a state common law of nuisance theory.³⁶⁶

Scholars have begun to tackle this issue as well. Professor David Grossman has examined joint and several liability in the global warming context and has concluded that "one could reasonably argue that it is possible to identify

³⁵⁶ See *supra* notes 1–5 and accompanying text.

³⁵⁷ David Markell & J.B. Ruhl, *An Empirical Survey of Climate Change Litigation in the United States*, [2010] 40 ENVTL. L. REP. (Envtl. Law Inst.) 10,644, 10,647.

³⁵⁸ 406 F. Supp. 2d 265 (S.D.N.Y. 2005), *vacated and remanded*, 582 F.3d 309 (2d Cir. 2009), *rev'd*, 131 S. Ct. 2527 (2011).

³⁵⁹ *Id.* at 267.

³⁶⁰ *Id.* at 268.

³⁶¹ *Id.* at 274.

³⁶² *Connecticut v. Am. Elec. Power Co.*, 582 F.3d 309, 315 (2d Cir. 2009), *rev'd*, 131 S. Ct. 2527 (2011).

³⁶³ *Id.* at 328, 349.

³⁶⁴ *Id.* at 349.

³⁶⁵ *Am. Elec. Power Co. v. Connecticut*, 131 S. Ct. 2527, 2537 (2011).

³⁶⁶ *Id.* at 2540.

defendants who have contributed substantially to climate change and its resulting effects.”³⁶⁷ Given equity concerns of holding a few actors liable for harm as cumulative and disperse as climate change, Grossman suggests, “apportioning damages (appropriately reduced to account for past emissions) based on a combination of defendants’ market-shares and the greenhouse gas emissions of their products.”³⁶⁸

As additional cases and scholarship develop in the context of climate change litigation, fresh perspectives on imposing liability for ecological injuries from aggregate and disperse activities might also prove useful in developing a new natural resource damages law.

(6) *Choosing Appropriate Plaintiffs*

Part of creating a new cause of action is deciding who might be appropriate to bring claims for harms to nature. Given the public nature of the resources at issue, the plaintiffs raising such claims would be acting in the public interest and must therefore be selected with that important caveat in mind.³⁶⁹

A ready-made solution would be to follow the current natural resource damages law that permits only federal, state, or tribal trustees to initiate claims for natural resource damages. While such a limitation might ensure that the public interest is served, current natural resource damages law has demonstrated that reliance on select trustees to litigate natural resource injuries can stifle the effectiveness of the remedy.³⁷⁰ Relying on designated trustees to identify and pursue remedies for harms to nature would be like relying on federal agencies alone to enforce all environmental statutes without the benefit of citizen suit

³⁶⁷ David A. Grossman, *Warming Up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation*, 28 COLUM. J. ENVTL. L. 1, 28 (2003).

³⁶⁸ *Id.* at 32–33. Professor J.B. Ruhl described this liability conundrum in the context of enforcing the Endangered Species Act’s take prohibition for harms caused by climate change impacts. J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No Analog Future*, 88 B.U. L. REV. 1, 40–42 (2008); see also James R. Rasband, *Priority, Probability, and Proximate Cause: Lessons from Tort Law About Imposing ESA Responsibility for Wildlife Harm on Water Users and Other Joint Habitat Modifiers*, 33 ENVTL. L. 595, 618–23, 628–30 (2003) (criticizing the approach of prosecuting only major contributors for takings violations in the western water diversion context, another area in which there are several and dispersed causal agents giving rise to harm).

³⁶⁹ In his discussion of a new “tort of contamination,” Rodgers similarly observed that “the tort of contamination protects public interests, and appropriate plaintiffs should be selected with that goal in mind.” Rodgers, *supra* note 11, at 1260.

³⁷⁰ See *supra* Part II.B.

provisions. Perhaps this is why citizen suits have played a central role in the enforcement, clarification, and effectiveness of environmental statutes.³⁷¹

Just as citizen suit provisions in many environmental statutes have increased the enforcement and effectiveness of environmental regulations, such provisions might also be instrumental in effectively remedying harms to nature. Given the goal of serving the public interest, a modified citizen suit provision might be considered; rather than permitting “any person” to assert a claim for harms to nature, a modified citizen suit provision could limit plaintiffs to designated public trustees as well as public interest organizations who are able to make a nominal showing of competency and experience in litigating environmental issues. And, similar to the sixty-day notice requirement contained in most environmental citizen suit provisions,³⁷² a modified citizen suit provision for the new natural resource damages law could require notice to public trustees. In this way, trustees, like federal or state agencies, could elect to pursue certain claims of harm deemed particularly sensitive or important to the public trust resources. Other attributes of a modified citizen suit provision might include the right to intervene in cases brought by public trustees upon showing of standing and good cause, or limits to public participation in cases seeking criminal penalties.

In general, the key to selecting appropriate plaintiffs would be affording public access to the courts without sacrificing competent and genuine pursuit of the public interest.

(7) Defining Scope of Appropriate Remedies

It goes without saying that any scheme providing a remedy for the misuse of nature will have to decide what remedies are appropriate once liability is established. Many environmental statutes contain provisions allowing civil penalties, criminal penalties, and injunctive relief.³⁷³ In light of these examples of penalty provisions, one might be most easily inclined toward providing a similar suite of remedies in the new natural resource damages law. One could also choose to borrow from existing natural resource damages statutes, adopting CERCLA and OPA’s requirement that monies recovered be put towards restoration.³⁷⁴

³⁷¹ See Edward Lloyd, *Citizen Suits and Defenses Against Them*, in ENVIRONMENTAL LITIGATION 1079 (A.L.I.-A.B.A. Course of Study, June 27–30, 2007).

³⁷² See, e.g., 16 U.S.C. § 1540(g)(2) (2006) (Endangered Species Act’s sixty day notice requirement); 33 U.S.C. § 1365(b) (2006) (Clean Water Act’s sixty day notice requirement); 42 U.S.C. § 7604(b) (2006) (Clean Air Act’s sixty day notice requirement).

³⁷³ See, e.g., Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. § 136 (2006); Toxic Substances Control Act (TSCA), 15 U.S.C. § 2615 (2006); Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6928 (2006); Clean Water Act § 1319(d); Clean Air Act § 7413.

³⁷⁴ Comprehensive Environmental Response Compensation, and Liability Act, 42 U.S.C. § 9607(f)(1) (2006).

The type of remedies that are ultimately deemed appropriate under this reformed natural resources damage law depends in large part on the goal of the law itself. Professor Rodgers argues, for example, that a “tort of contamination” should strive to restore and rehabilitate.³⁷⁵ Similarly, the goal of a reformed natural resource damages law might be restoration to the extent conceivable. If the goal is to restore, then penalties would not necessarily be appropriate, unless they are required to be put toward restoration.³⁷⁶ On the other hand, if the goal is merely to punish wrongful acts, then we might view the question of traditional penalties differently and encourage penalties and criminalization.

Given how difficult recreating nature’s services can be,³⁷⁷ a suite of remedies that maximally deter misuse in the first instance would seem necessary and appropriate. At the same time, the remedies should ensure that once the damage is done, the effectiveness and efficiency of restoration efforts are maximized. Simply borrowing from current natural resource damages law on that issue would not be wise, as the federal natural resource damages process needs to be revised in order make restoration of natural resources “faster, more efficient, and more effective.”³⁷⁸ Given that current natural resource damages law struggles to achieve effectiveness and efficiency of restoration,³⁷⁹ a better solution must be designed for a new scheme.

(8) *Measuring Natural Resource Damages*

Related to the issue of appropriate remedies is the narrower issue of how to value resource damages. Though relatively narrow, valuation is not a simple inquiry. Rather, it is one of the most hotly contested issues in natural resource damage claims.³⁸⁰ One approach suggests measuring the use and existence value of

³⁷⁵ Rodgers, *supra* note 11, at 1260.

³⁷⁶ *Id.* (“The history of monetary compensation for loss of sustainable resources is not a happy one. These ‘cash-outs’ can create momentary winners but with a poor distribution and sadly skewed (and sometimes opportunistic) calculation of what has been lost.”).

³⁷⁷ See discussion of the biosphere *supra* notes 74–75 and accompanying text.

³⁷⁸ See NAT. RESOURCE DAMAGE ASSESSMENT & RESTORATION FED. ADVISORY COMM., *supra* note 312, at 4. The Federal Advisory Committee’s recommendations were aimed, in part, at establishing cooperative relationships with potentially responsible parties in order to: (1) encourage responsible parties to fund damage assessments in the first instance; and (2) avoid valuation issues by encouraging responsible parties to conduct the restoration activities. *Id.* at 13. Until natural resource damage processes and methodologies can be revised to facilitate effective recovery of public costs to natural resources, they will most likely continue to be underutilized and met with success only in unusual cases.

³⁷⁹ *Id.* at 1.

³⁸⁰ See, e.g., Kanner & Nagy, *supra* note 313, at 488 (citing Stewart, *supra* note 313, at 163) (“[M]easuring natural resource damages is ‘the most daunting task facing trustees.’”); Nicoll, *supra* note 313, at 464 (challenging traditional economic theory in the valuation of natural resources); Thompson, *supra* note 312, at 60 (“Natural resource

the resource from a utilitarian perspective, namely the worth of the resource measured by its value to individuals or society.³⁸¹ Another approach—the biocentric approach—would measure the intrinsic value of the resource independent of human satisfactions.³⁸² Not surprisingly, the preferred method of valuing natural resources is to quantify utilitarian values of use and existence through some method of cost-benefit analysis.³⁸³ Three of the most common methods for measuring the value of natural resource damages are market valuation, restoration or replacement cost, and contingent valuation.³⁸⁴ Market valuation uses definable markets to measure the worth of a resource.³⁸⁵ Restoration or replacement costs, as the name implies, measure the resource's worth by asking how much it would cost to restore the damage.³⁸⁶ Given that restoration projects can be labor intensive and complicated, these costs can greatly exceed market valuation.³⁸⁷ Contingent valuation is a controversial method by which value is measured by surveying members of the public to assess how much they would be willing to pay to replace or restore the resource.³⁸⁸ Regardless of the chosen method, however, there are certain to be controversies given that natural resource damages are unique in many instances and their uses not readily subject to valuation.

V. CONCLUSION

This Article continues the work of scholars who have urged a mended view of private property and others who have described the failings of environmental laws to protect ecosystems as interconnected wholes. Joining the existing dialogue, this Article tackles the uncomfortable and controversial issues of ethical obligations, private property rights, and public ownership: It describes the shared responsibility to avoid the misuse of nature, finding support for this responsibility in literature, religion, culture, science, and law.³⁸⁹ It explains how the study of ecology has led to more mature views on nature—views that recognize the utility of nature when allowed to function as an interconnected whole.³⁹⁰ It surveys the scholarship that calls for a similarly mature understanding property—an understanding that

damages present a significant challenge for the legal system because in most cases they are non-market commodities.”).

³⁸¹ See Peck, *supra* note 156, at 279–86.

³⁸² *Id.*

³⁸³ *Id.*

³⁸⁴ *Id.* at 279–85.

³⁸⁵ *Id.* at 282–83.

³⁸⁶ *Id.* at 283–84.

³⁸⁷ *Id.*

³⁸⁸ *Id.* at 284–85; see also *supra* note 276 and accompanying text.

³⁸⁹ See *supra* Part I.B.1.

³⁹⁰ See *supra* notes 64–66 and accompanying text.

recognizes the legitimate role of public interest in property law.³⁹¹ Finally, it highlights how the multitude of environmental laws currently in effect do not protect nature as an interconnected whole.³⁹²

By bringing these conservations into the same space, this Article sets the stage for a broader vision of natural resource law reform and picks up where others have left off. Turning to natural resource damages law as a touchstone for reform, this Article suggests that the bedrock principles underlying natural damages law are a promising foundation for a reformed legal system that respects broader public interests in how nature is altered and provides a remedy for misuse. The aim of the reformed law is necessarily broad, concerned with misuses of nature on public and private lands alike, as well as misuses that arise from multiple stressors. Though the details of what the reformed law would look like and how it would operate are necessarily left for another day, the challenges enumerated are fundamental considerations for any comprehensive law that seeks to protect ecosystem health across ownership boundaries.

³⁹¹ *See supra* Part I.B.2.

³⁹² *See supra* Part II.