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ALLOCATING PROPERTY INTERESTS IN ECOSYSTEM SERVICES: FROM CHAOS TO FLOWING RIVERS

*Kalyani Robbins**

In the past two decades there has been a surge in legal scholarship on ecosystem services, more recently with an eye toward developing methods for economically valuing them. Ecosystem services supply us with clean air and water, protect us from floods, allow us to grow food, and so much more, so naturally they have great economic value. That value may be understood in terms of the benefits themselves (i.e. what they are worth to us) or in terms of replacement cost (such as the cost of building and operating a water treatment plant—a cost avoided in New York by restoring the Catskills watershed), but no matter how we value them, it has become increasingly clear that they have economic value. While these concepts have been navigated somewhat already, there has been very little discussion regarding how this newly identified economic value impacts property rights. If ecosystem services can be identified as a thing of value, who owns that thing? What is the impact of altering that thing in such a manner that those who previously benefitted from it no longer do? Can it be protected via traditional property principles? This Article will first explore these overarching theoretical questions by looking at the role ecosystem services might play (and in some cases have played) in several property law contexts: eminent domain, exactions, regulatory takings, nuisance, markets, and the public trust. What we see is that ecosystem services are definable as property, and that they may be protected as a property right. This inquiry also unearths a surprising and important problem: this property right has been placed in different hands in different contexts, resulting in a serious failure of security in these interests. For this reason, it is important that we allocate these rights in a consistent and reliable manner. This should be accomplished with an eye toward maximizing their social value.

TABLE OF CONTENTS

Introduction 198
I. Ecosystem Services and Economic Valuation 200
A. What are Ecosystem Services? 200
B. Valuation and its Relationship to Property 201
II. Property and the State of Nature 205
III. Ecosystem Services in Context 207
A. Eminent Domain 207
B. Exactions 210
C. Regulatory Takings 212
D. Nuisance 214

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E. Marketability 215
F. Public Trust Doctrine 219
IV. Fitting Ecosystem Services into the Real Property Bundle 220
A. Conceptual Fit 220
B. Allocation Principles 221
C. Addressing the Problem of Inconsistent Post-Hoc Allocation 227
Conclusion 229

When I bought my farm, I did not know what a bargain I had in the bluebirds, daffodils and thrushes; as little did I know what sublime mornings and sunsets I was buying.

—Ralph Waldo Emerson[1]

INTRODUCTION

What exactly did you bargain for when you bought your home? A structure to separate you from the outdoor elements, a yard in which to relax or play, and perhaps good schools or neighbors? Most likely, you had many expectations that were not as conscious as these, but which you took for granted. You expected potable water to come out of your tap. You expected the soil in your yard to be capable of growing flowering plants, trees, and grass, and pollinators to come help your flowers along. You expected birds and other small wildlife to keep the insects in check so that your property is not overrun or destroyed. If there were nearby wetlands protecting your land from flooding, you (and your insurance company) expected that they would stay there. You expected the air in your neighborhood to be safe to breathe. Perhaps there was a beautiful view or a water body or trails nearby. Even if none of these things was listed in your contract, you relied on them in choosing your home. If these benefits were eliminated, your home would be worth far less to you.

Now imagine instead that you are the owner of nearby land that helps provide some of these services. What happens when you want to develop that land? Whose problem is it if it will make life less tolerable for people such as the one described above? Are they paying you for the value you're providing them? Do you have to pay them if you take it away? Is the access to nature's services simply out there for all, and the extent of that access or its alteration over time is just the luck of the draw? Or does someone own it? Can you rent it to that neighbor on an ongoing basis, or do you have to compensate that neighbor for taking away what they enjoyed when they purchased their land?

These questions cannot be answered by looking at the history of property alone, as they are being pressed upon society in unprecedented ways by the

1. RALPH WALDO EMERSON, EMERSON IN HIS JOURNALS 505 (Joel Porte ed., 1982).

present-day overpopulation of the Earth and corresponding destruction of ecosystems. For most of humankind we have taken for granted nature's contributions to our comfort and basic survival. When ecosystem services were abundant and unquestioned, there was no need to create proprietary interests in them. We need not, in the face of such generosity of the land, define such rights or attempt to parcel them out. If you are in a room with five other people, you do not attempt to divide up your interests in the air, but if there is just one pizza in that room you will likely have ideas regarding its fair division. Property's *raison d'etre* lies somewhere on the spectrum from abundance to scarcity.[2] We have no need for property interests in the sun, which shines on us reliably every day (even if clouded), but have parceled out most of the land on our finite planet. This Article will consider the evidence that ecosystem services have reached the point on that spectrum at which they must begin to be seen as property (regardless of whether owned and controlled publicly or privately).

Then, quite urgently, we must determine where those property interests belong. This has become even more time-sensitive as case law and market-based programs have developed involving ecosystem services property, because there is a serious lack of consistency regarding whether those rights bundle with the service-generating natural capital or the benefitting lands. That lack of consistency is the impetus for this Article. The goal of this Article is to solve a property problem and related economic problems. It is not a proposal for replacing regulation of natural resources, as it does not effectively solve broader ecological problems. It is simply about attaining more clearly defined property rights.

What are ecosystem services? Part I will explain the concept and provide examples to demonstrate how completely dependent we are upon them. Part I will also review the nascent methods of economically valuing ecosystem services, and discuss how such valuation relates to the claims people make to them. Part II explores the concept of property and the purposes it serves, with the aim to set the stage for placing ecosystem services naturally into that concept later in the Article. Part III takes a half-dozen major concepts from Property Law—eminent domain, exactions, regulatory takings, nuisance, markets, and the public trust—and describes a mix of actual and hypothetical examples of treating ecosystem services as the property at stake in these contexts. Finally, Part IV draws from the prior parts to develop a theory of ecosystem services as property, taking on the issues of conceptual fit and just allocation of ownership. Part IV also raises concern regarding the inconsistent post hoc allocations that have already taken place and considers how we might address this problem in order to move forward with clarity of interests.

2. *See* Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347, 350–53 (1967).

I. Ecosystem Services and Economic Valuation

A. What are Ecosystem Services?

"Ecosystem services" is a concept encompassing "a wide range of conditions and processes through which natural ecosystems, and the species that are part of them, help sustain and fulfill human life."[3] Nature and the built environment do not exist on separate planes, functioning separately from one another (with the rare exception of where nature has been left to do so). Although the balance between the two may shift over time (generally in the direction from more natural to more built), they are intimately connected and serve one another in both positive and negative ways. To a far greater extent than most human beings are conscious of, we depend on nature's services for our own functionality, ranging from small quality of life enhancements to sustaining life on Earth.[4] We are thus highly dependent on the functionality of ecosystems, as their functionality can translate quite directly to our own.

Ecosystem services, a term coined barely two decades ago, has undergone rapid development as a subject of study, especially since an impressive project that brought together approximately 1,300 experts from around the globe, culminating in the 2005 Millennium Ecosystem Assessment ("MEA report").[5] The MEA report divided ecosystem services into four categories based upon the functions they serve: provisioning services (e.g., food or medicine), regulating services (e.g., pollination or regulation of air or water quality), cultural services (e.g., recreational or educational), and supporting services (e.g., habitat provision or oxygenation).[6] It has been estimated that the economic value of these services reaches an annual average of $145 trillion,[7] which is nearly double the $75 trillion gross world product (GWP).[8] Unfortunately, the MEA report also concluded that roughly 60 percent of ecosystem services had already been degraded by human activity and that further decline was rapidly underway.[9]

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3. Gretchen Daily et al., *Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems*, 2 Issues in Ecology 1, 2 (1997).
4. *See* Robert Costanza et al., *The Value of the World's Ecosystem Services and Natural Capital*, 387 Nature 253, 253 (1997) ("Ecosystem functions refer variously to the habitat, biological or system properties or processes of ecosystems. Ecosystem goods (such as food) and services (such as waste assimilation) represent the benefits human populations derive, directly or indirectly, from ecosystem functions.").
5. *See generally* Millennium Ecosystem Assessment, Ecosystems and Human Well-Being: Synthesis (MA Board of Review Editors et al. eds., 2005) [hereinafter MEA Report].
6. *See id.* at 39–47.
7. Robert Costanza et al., *Changes in the Global Value of Ecosystem Services*, 26 Global Envtl. Change 152, 152 (2014), https://perma.cc/RA5W-MNBN.
8. *See* Robert Costanza et al., *supra* note 4, at 253.
9. MEA Report, *supra* note 5, at 6–11.

Indeed, in spite of our dependence on functioning ecosystems, we have driven them to scarcity. Our growing population has resorted to sprawl, rather than condensing itself to minimize impact and keep transportation needs down, which "has resulted in a suburban housing abundance that has overtaxed water supplies and infrastructure, whittled away at remaining open spaces, displaced wildlife, altered ecosystems, and otherwise burdened nature in irreversible ways."[10]

Once we understand the full range of benefits derived from ecosystem services and the role they play in our lives, their relationship to property begins to emerge. Ecosystems are generally thought of as being largely within the disciplinary focus of ecology. However, ecology is just one of the three disciplines at the heart of understanding ecosystem services. As J.B. Ruhl notes, ecology, economics, and geography are all essential to understanding ecosystem services and their roles in our lives and the economy:

> [E]cology, to understand the ecological structures and processes that produce and deliver ecosystem services; economics, to understand how those delivered ecosystem services provide value to human beneficiaries; and geography, to understand where the "natural capital" providing services is located, where the beneficiaries of ecosystem services are located, and how the services flow from the former to the latter.[11]

This interdisciplinary nature of the study of ecosystems and the services they provide to humanity is the result of centuries of dependence upon them. We are only beginning to explore and understand this dependence because of the rapid—and potentially catastrophic—decline of the resource. This scarcity, and the economic value it generates, along with the narrow geographic focus of most ecosystem services, leads to the development of property interests in the resource.

B. Valuation and its Relationship to Property

Economically valuing ecosystem services, which is an extremely important step toward improved ecosystem management efforts,[12] has exploded in recent

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10. Keith H. Hirokawa, *Sustaining Ecosystem Services through Local Environmental Law*, 28 PACE ENVTL. L. REV. 760, 767 (2011).

11. J.B. Ruhl, *Ecosystem Services and Federal Public Lands: Start-up Policy Questions and Research Needs*, 20 DUKE ENVTL. L. & POL'Y F. 275, 277–78 (2010) (footnote omitted) (citing J.B RUHL ET AL., THE LAW AND POLICY OF ECOSYSTEM SERVICES 15–83 (2007)).

12. *See generally* Deborah McGrath & Travis Greenwalt, *Valuation and Payment for Ecosystem Services as Tools to Improve Ecosystem Management*, *in* THE LAWS OF NATURE: REFLECTIONS ON THE EVOLUTION OF ECOSYSTEM MANAGEMENT LAW AND POLICY (Kalyani Robbins ed., 2013).

years. Not only have several leading legal scholars written extensively on the subject,[13] but an entirely new discipline—sometimes called Ecological Economics,[14] or Environmental Economics (a broader field, with more private-industry experts)—has emerged to focus on the methods of doing this. For this reason, studying and/or evaluating the relationship between nature and economic interests has now become an entire career field for many.

While some ecosystem services lend themselves to valuation based on replacement costs—frequently a much higher cost than that of preserving the ecosystem function to be replaced—many services upon which we depend cannot be artificially reproduced. For example, "valuable services provided by soils include providing physical support for the surface (including vegetation), nutrient cycling, hydrological regulation, waste disposal and organic decomposition, and maintenance of soil productivity."[15] The complexity and variety of these services, along with the delicate mechanisms that enable soil to provide them, means that soil services "cannot be fully substituted by human-made solutions, and operate at multiple, overlapping scales."[16] Consequently, "it is difficult to arrive at an accurate economic value for these services."[17] While this makes precision of valuation much more challenging, it does not alter the economic nature of the value these services provide. Indeed, in some cases the entire economic value of a parcel of real property might depend upon the provision of adequate soil services.

Water purification is an example of an ecosystem service that has undergone substantial economic analysis, and no matter which approach one uses to determine valuation, it is generally clear that a functioning natural watershed is the best way to go:

> [E]cosystems are able to naturally both supply and then filter water for human use. One way to understand the economic value of intact watersheds is to compare it to the cost of building and maintaining water supply and treatment facilities. To the extent that loss of eco-

13. *See, e.g.*, James Salzman, *Creating Markets for Ecosystem Services: Notes from the Field*, 80 N.Y.U. L. REV. 870 (2005) (building on his earlier work: James Salzman, *Valuing Ecosystem Services*, 24 ECOLOGY L.Q. 887 (1997)).

14. *See, e.g.*, Robert L. Fischman, *The EPA's NEPA Duties and Ecosystem Services*, 20 STAN. ENVTL. L.J. 497, 498–99 (2001) (describing the emerging field of ecological economics and how it might serve environmental policy).

15. Hirokawa, *supra* note 10, at 780–81 (citing Gretchen C. Daily et al., *Ecosystem Services Supplied by Soil*, *in* NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS 113, 117 (Gretchen C. Daily ed., 1997)).

16. EARTH ECON., A NEW VIEW OF OUR ECONOMY: NATURE'S VALUE IN THE SNOQUALMIE WATERSHED 45 (2010) (citing Stephen Farber et al., *Linking Ecology and Economics for Ecosystem Management*, 56 BIOSCI. 121 (2006)).

17. *Id.*

> logical systems results in reduced supply, value can also be ascertained through the cost of having to import water from elsewhere.[18]

Watershed protection is critical to providing populations with clean drinking water. Soil and wetlands filter contaminants from water,[19] so in addition to developed land directly adding pollutants to the watershed, it also removes this filtering function.[20] For this reason, protecting certain lands from development can perform double duty in ensuring the watershed's ability to provide clean water.[21]

One of the most famous examples of investment in ecosystem services in order to save substantially higher replacement costs involves water purification. New York City draws most of its tap water from upstate, in what was a carefully developed unfiltered reservoir system. Then the Safe Drinking Water Act mandated that all major surface-water systems filter their water or prove they could protect the watershed producing it.[22] A filtration plant large enough to clean the City's water supply would cost $6–8 billion.[23] Preserving the watershed, on the other hand, was estimated at $1.5 billion.[24]

New York is not alone in its wise investment in natural water filtration services. Seattle has achieved similar success with its acquisition of the majority of the Tolt River Watershed, which supplies its residents with about a third of their water supply. The cost-benefit ratio of such endeavors is impressive:

> As it turned out, this was a magnificent investment by any measure. Today, SPU would have to pay $250 million to build a filtration plant to filter the city's water supply with annual operating and maintenance costs of $3.6 million per year if the forest did not do this job. In addition, by 2010 it would likely have been the third or fourth filtration plant to be built as filtration plants, like all built capital, depreciate and eventually fall apart. Like most natural capital, the forest did not depreciate or fall apart. Relative to the size of the asset, a forest requires light maintenance. The watershed now provides far more water and value than ever was imagined by the original SPU directors. An additional benefit reaped from this wise investment is that lives were saved as cholera, once a significant problem in Seattle,

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18. *Id.* at 39.
19. *See* Stephen M. Johnson, *Federal Regulation of Isolated Wetlands*, 23 ENVTL. L. 1, 30 (1993) ("[M]any types of isolated wetlands play a vital role in protecting water quality by filtering sediments and pollutants out of water and by preventing nutrient overloading.").
20. James Salzman et al., *Protecting Ecosystem Services: Science, Economics, and Law*, 20 STAN. ENVTL. L.J. 309, 314 (2001).
21. *See id.* at 314–15.
22. 42 U.S.C. § 300(g)(1) (2012).
23. Salzman et al., *supra* note 20, at 315–16.
24. *Id.*

was eliminated through the development of a clean, reliable water supply.[25]

Just as scarcity plays a role in the development of property interests in a given resource,[26] it is also an important component in the valuation of ecosystems and the services they provide. This is where marginality, a concept quite familiar to economists, comes into the analysis.[27] Let us say, for example, that we want to determine the economic value of an acre of wetlands. How do you think a single acre on its own would compare with an acre taken away from a 1000-acre wetland? The marginal thousandth acre is likely worth less than the only acre, or say a marginal third acre. This distinction demonstrates how complex valuation can be, and the important role that marginality plays in that complexity.[28] Another way of looking at marginality is to determine which side of a tipping point it falls upon. Suppose you need a certain acreage of habitat to support a species of concern. Let's set the hypothetical line at fifty acres. Taking away five acres well above that line may be harmless (say, from seventy-five acres to seventy acres), while taking five acres that straddle that line (fifty-two acres to forty-seven acres) could be disastrous.[29] Those hypothetical acres have very different valuation for the species, just as acres of ecosystem-service-providing lands may have differing economic valuation to us, depending upon the marginal value of the precise acres at issue.

Another aspect of ecosystem services that ties them to property and property value is the localized impact they usually have. Yes, some ecosystem services have benefits on either a large scale (such as flood mitigation by wetlands) or even a planetary scale (such as carbon retention). However, many of the benefits we derive from ecosystem services come from our immediate proximity to their sourcing ecosystems. It is the functioning ecosystem's connection to our land that renders it so valuable to us. This can sometimes play out in the context of district-level taxes or water surcharges with funds directed to land acquisition for the purpose of watershed protection and resulting water filtration service.[30]

Several jurisdictions have made significant economic investments in wetlands in order to receive the ecosystem service of flood prevention. The insurance industry has made clear the economic advantages of situating land development outside high flood-risk areas. This ecosystem service has such

25. DAVID BATKER & MAYA KOCIAN, VALUING THE PUGET SOUND BASIN: REVEALING OUR BEST INVESTMENTS 10–11 (2010), https://perma.cc/3JXK-T93B.

26. *See supra* Introduction, Section I.A.

27. *See* James Boyd, Dennis King & Lisa A. Wainger, *Compensation for Lost Ecosystem Services: The Need for Benefit-Based Transfer Ratios and Restoration Criteria*, 20 STAN. ENVTL. L.J. 393, 405–06 (2001).

28. *See id.* at 406.

29. *See id.*

30. *See generally* Salzman et al., *supra* note 20, at 315–19, 329–31.

high economic value that in 1998, voters in Napa County, California approved an initiative to spend $160 million on the acquisition of 500 acres of flood plain, based on the goal of conservation of the area to significantly reduce the risk of flooding.[31] In several communities around Boston, the decision was made to acquire 8,000 acres of wetlands[32] rather than construct a $100 million system of dams and levees.[33] The cost-benefit analysis between investing in ecosystem services and developing human-made systems to replace those services can often overwhelmingly favor the former over the latter.

While the cost-benefit analysis can be fairly straightforward in some circumstances, such as where very large populations have significant ecosystem service needs that would be costly to replace, the societal value of ecosystem services will often be more nuanced. In many cases there will be few property owners involved, and the services at stake may vary from essential to merely pleasant. The true value will often be in the eye of the beholder, and even more often, it will be complex to determine due to myriad functions and impacts occurring simultaneously.[34] This complexity and subjectivity makes clarity of rights and interests (i.e., power to decide) even more important. It is also critical that we create reliable pathways to protect this resource, and doing so will likely require some private investment.[35] Property interests in a resource traditionally serve to encourage such investment,[36] or at least restraint from destruction,[37] especially where, as with ecosystem services, there is inadequate regulatory protection.[38]

II. Property and the State of Nature

"Property rights serve human values. They are recognized to that end, and are limited by it."[39]

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31. *See* Steve Lerner & William Poole, The Trust for Public Land, The Economic Benefits of Parks and Open Space: How Land Conservation Helps Communities Grow Smart and Protect the Bottom Line 35 (1999).

32. This was an area "capable of containing 50,000 acre-feet of water." *Id.* at 37.

33. *See id.*

34. *See generally* Boyd, King & Wainger, *supra* note 27, at 403–08.

35. *See* James Salzman et al., *The Most Important Current Research Questions in Urban Ecosystem Services*, 25 Duke Envtl. L. & Pol'y F. 1, 31–35 (2014) (discussing ways to encourage private investment in preserving ecosystem services).

36. *See generally* Richard A. Posner, Economic Analysis of Law 30 (4th ed. 1992).

37. *See generally* Garrett Hardin, *The Tragedy of the Commons*, 162 Sci. 1243, 1247 (1968).

38. *See* James Salzman, *A Field of Green? The Past and Future of Ecosystem Services*, 21 J. Land Use & Envtl. L. 133, 137 (2006) (noting the lack of legal standards for ecosystem protections).

39. State v. Shack, 277 A.2d 369, 372 (N.J. 1971).

An important thing to note about real property—individual claims to land parcels as opposed to commons—is that it is not the natural state of things. This is not a normative argument against property—indeed, it exists largely due to the many problems it solves for our highly populated world—but simply a reminder that it had to *begin*. There was a time when no land was owned, and civilization had to get from there to here. The fact that a given parcel was once not owned does not invalidate its current ownership. There was, for all real property, a moment in time when it first was identified as such and recognized by the state in which it resides.

A notable difference between first allocations of land and twenty-first century allocation of property interests in ecosystem services is the fact that the latter is inextricably intertwined with existing property rights. There is a range of quite different potential conceptual bases for claiming the right to ecosystem services. The three most obvious would be: 1) Generating landowners, meaning those whose property contains a meaningful portion of an ecosystem providing services to others; 2) Receiving landowners, meaning those whose property benefits from ecosystem services generated elsewhere; and 3) Governments, whether state or local, because of the importance of ecosystem services to society and the arguable claims in both directions between property owners. In the last example, we would be placing all ecosystem services into the public trust resource pool, thereby greatly expanding it. Although this will be discussed in the section on public trust,[40] it is an unlikely scenario and this Article focuses largely on the property rights in landowners (categories 1 and 2), which includes circumstances in which government entities are landowners.

Although discovering the economic value in ecosystem services after already having allocated most real property has produced a complexity beyond that of our pioneering days, the situation we find ourselves in is not without precedent. The law of property allocation, recognizing rights in property not yet established as such, has evolved throughout U.S. history, right into modern times. We have also repeatedly managed to place dollar values on interests that rise above money.[41]

The importance of allocating property interests in ecosystem services is apparent regardless of whether one prefers to view property through the lens of law and economics theory (with the goal of maximizing economic efficiency) or social obligation theory (in which property interests confer rights and are constrained by duties).[42] As the remainder of this Article demonstrates, specifically allocating this property interest to historically receiving landowners will both

40. *See infra* Section III.F.

41. *See* Cass R. Sunstein, *Incommensurability and Valuation in Law*, 92 MICH. L. REV. 779, 820 (1994).

42. *See* Gregory S. Alexander, *The Social-Obligation Norm in American Property Law*, 94 CORNELL L. REV. 745 (2009).

maximize efficient use of land and fairly distribute the rights and duties of land ownership.

III. Ecosystem Services in Context

Ecosystem services arise in property matters—whether common law cases, regulatory enforcement, or market-based programs—with increasing frequency. A review of several areas of property law demonstrates this and also sets the stage to begin thinking about the problems emerging from this nascent property right. These problems include resolving inconsistencies and questions of just allocation.

A. Eminent Domain

As noted at the outset, ecosystem services may flow *to* one's private property or *from* it to others, and, most likely, both will occur with a single parcel. It was also noted above that ecosystem services benefits may be derived at multiple scales, including sometimes the regional scale. When considering these points, it becomes readily apparent that, at times, entire communities may be depending upon ecosystem services provided by private landowners, intentionally or otherwise. Of course, this creates a kind of power and risk we don't often see—a private landowner's land use may devastate a town. For this reason, eminent domain has begun to develop as an important tool for securing ecosystem services.

The economic benefit of choosing a functioning watershed over a water treatment plant has been demonstrated repeatedly, beginning with the New York Catskills experience described in Part I.B, *supra*. New York City used a varied toolbox for investing in the watershed, which included substantial land acquisition for conservation purposes. While this was largely negotiated, agreements were obtained under threat of eminent domain, and against a backdrop of the City having decimated towns in the region with eminent domain decades earlier in order to create the reservoirs in the first place.[43]

As another example of a major metropolitan area with potential for using eminent domain to secure the land necessary to provide clean water into the community, consider Baltimore's 2009 Sustainability Plan.[44] The report emphasized the importance of preserving Baltimore's "potential to be a city where [its] own natural resources are relied upon to provide habitat, shade, water and air purification, food, and recreational opportunities through the greening of

43. *See* Alice Kenny, *Ecosystem Services in the New York City Watershed*, Ecosystem Marketplace, https://perma.cc/EAF8-BDGJ.

44. Balt. City Planning Comm'n, Baltimore Sustainability Plan (2009), https://perma.cc/D7YK-QDKL.

[its] surroundings."[45] The substantial economic value of ecosystem services clearly informed the strategy. The report noted that "[h]ealthy biodiversity contributes to water resource protection, soil health, pollution breakdown and absorption, climate stability, and natural resources such as food and medicinal ingredients."[46]

In order to achieve the desired water purification ecosystem service, the plan recommended allocating funds to restore and maintain riparian areas throughout the watershed.[47] As Keith Hirokawa notes, this is where eminent domain could play an important role:

> An analysis of watershed regulation on private lands might encourage local governments to adopt land use regulations to curtail private interference with ecosystem services, but it might also compel local governments to purchase (through negotiation of eminent domain) interests in such lands to insure uninterrupted services from the relevant properties.[48]

Although the eminent domain in these examples applies directly to actual land, as traditionally it would, the reality is that the ecosystem service is what the government is purchasing. It has no other use for the land, apart from ensuring that it is not developed, rendering it unsuitable to its task of ecosystem service provision. In this sense, the thing of value—the property needed—is the ecosystem service itself.

Of course, this also raises questions about the nature of the eminent domain itself: if it is a taking, what is compensable? In exploring this question it helps to consider the context of regulatory takings, in which complete inability to develop land is often treated as synonymous with complete loss of economic value of the land.[49] But when we consider the value of ecosystem services, we see that some land is actually *more* valuable undeveloped. The problem, of course, is that if one is not permitted to develop the land, and thus not voluntarily forgoing doing so, one cannot charge a fee for that sole remaining value of the land. As such, the economic loss is in fact complete. If we consider the perspective that taking away the right to charge for the ecosystem services the landowner is providing to others is the final increment of value that renders the regulation a taking, then it follows that the owner did possess that right before. Alternatively, if the owner did not possess the right to charge for those ecosystem services in lieu of land development, then arguably she never possessed the right to develop her land at all. The latter is an especially strained characteriza-

45. *Id.* at 70.

46. *Id.*

47. *Id.* at 48.

48. Hirokawa, *supra* note 10, at 789.

49. *See* Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1027 (1992).

tion of the rights involved, given how little we have questioned the right to develop land absent regulatory restrictions, so it appears that in the context of eminent domain we are operating under the assumption that the ecosystem services belong to the providing landowner.

One might respond that, rather than utilize eminent domain, a government should pay the individual for the provision of ecosystem services. Payment for ecosystem services ("PES") is indeed a growing trend.[50] Of course, this wouldn't work well in the context of restoring and relying on the water purification service of a large watershed area such as the one in New York. It is critical that the government control the essential lands if it is to forgo the water treatment plant option. However, the fact that this value is so much greater than the land's development value, both of which are taken from the landowner, raises serious questions regarding how to determine appropriate compensation. Is the landowner to be compensated merely for the land itself, or for the more economically valuable ecosystem service that the government is actually purchasing?

Of course, there is always greater value in the government use of property seized under eminent domain, such as building key infrastructure, or the eminent domain action would not be justified. The point here is not to say that, where there is greater value to the government, it should be reflected in the compensation, as this generally would not make sense. The government pays for what it is purchasing, which means the actual property value before it was necessary to, say, build a highway there.[51] But this arguably differs from the case of ecosystem services, which 1) always had value, and 2) have begun to inhabit space in the marketplace as things of value in and of themselves, i.e., arguably property. In other words, a parcel of property that provides valuable ecosystem services has had that value all along, whereas its value as a location for highway placement, while potentially great, is new and unique to the government as purchaser.

Some ecosystem services are more challenging to economically value than others. While the value of water purification has been proven to be astronomical,[52] eminent domain also arises in contexts with more subjectively valued

50. *See* J.B. Ruhl, *Agriculture and Ecosystem Services: Strategies for State and Local Governments*, 17 N.Y.U. ENVTL. L.J. 424, 446–47 (2008); Salzman, *supra* note 13, at 892–99 (2005). For templates for PES agreements, see *Template Payments for Ecosystem Services (PES) Agreements*, THE KATOOMBA GROUP, https://perma.cc/C3LQ-BHR8.

51. Indeed, the use of eminent domain prevents the hold-out problem, in which one or more landowners, seeing the greater value to the new use of their property (such as with the development of a private mall), expect to be paid more than its value for its previous residential use. The value of a segment of highway is too substantial to allow homeowners to play this game, and eminent domain allows the government to pay them the value of their property *before* it was needed for something greater.

52. *See, e.g.*, Salzman et al., *supra* note 20.

ecosystem services at stake, such as recreational value. As an example, Seattle recently threatened landowners with eminent domain in order to force them to sell their land to the city. It was lakefront property (unbuildable land, really just the end of a dead-end street that ended at the lake) that had long been used for public access to Lake Washington, but which the landowners had fenced off once they realized that they (and not the city, as was previously believed) owned the property. They refused to sell, so the mayor resorted to eminent domain in order to keep this recreational ecosystem service flowing to Seattle's residents.[53]

B. Exactions

In *Koontz v. St. Johns River Water Management District*,[54] an exactions case infamous for its impact on takings doctrine and wetlands mitigation, Koontz sought a permit to develop a portion of his land that included wetlands. He offered the district a conservation easement on a much larger portion of his land, meaning that it would be set aside for conservation and could not later be developed. The district deemed the easement inadequate and denied the permit, demanding either a much larger portion of the land or the offered portion plus payment of some offsite restoration expenses on district-owned wetlands. Koontz challenged the constitutionality of this demand under a pair of prior Supreme Court cases, *Nollan v. California Coastal Commission*[55] and *Dolan v. City of Tigard*.[56] Those cases held that, for a land-use permit to be conditioned on the owner's relinquishment of a portion of his property, there must be a nexus and rough proportionality between that demand and the impact of the proposed land use.[57] These cases fall under the Court's "unconstitutional conditions" doctrine, which prevents the government from coercing people to voluntarily give up their constitutional rights, in this case the right not to have their property taken without just compensation.[58] The permission to do so where there is that nexus and rough proportionality provides leeway for the government to require developers to internalize their harmful externalities.[59]

Koontz lost in state court, which distinguished his case from *Nollan* and *Dolan* in two ways. First, he was denied a permit rather than granted one with

53. *See* Daniel Demay, *Tiny Beach Awash with Demand to Access Lake Washington: City Considered Another Option Before Moving to Buy Back the Tiny Waterfront Lot*, SEATTLE PI (Aug. 20, 2015), https://perma.cc/G5QT-CS9U; Erik Lacitis, *Sell or We'll Use Eminent Domain, Seattle Mayor Tells Owners of Beach Lot*, SEATTLE TIMES, (Aug. 14, 2015), https://perma.cc/7RVF-W7W9.

54. 133 S. Ct. 2586, 2591–93 (2013).

55. 483 U.S. 825, 841–42 (1987).

56. 512 U.S. 374 (1994).

57. *See Nollan*, 483 U.S. at 837; *Dolan*, 512 U.S. at 391.

58. *See, e.g.*, *Dolan*, 512 U.S. at 385.

59. *See Koontz*, 133 S. Ct. at 2595.

the unconstitutional condition. Second, the government was demanding money rather than real property (or at least giving that option). In a 5-4 split opinion, the Supreme Court held that these were not distinguishing features.[60] As to the first issue, denying a permit for failure to meet an unconstitutional condition is just as invalid as granting one under force of such a condition, although no property has been taken.[61] The dissent agreed on this point.[62] As to the second issue, conditioning permits on payment into an offsite mitigation project is subject to the *Nollan/Dolan* standard, just as requiring real property would be.[63] This is where the dissent took issue.[64] The dissent saw this outcome as contradicting the Court's holding in *Eastern Enterprises v. Apfel*,[65] which held that the government may impose ordinary financial obligations without triggering the Takings Clause's protections.[66] The dissent expressed great concern that this outcome would "deprive state and local governments of the flexibility they need to enhance their communities."[67]

Koontz effectively extends constitutional takings doctrine to requirements for offsite mitigation, which could have a serious impact on the protection of vulnerable wetlands and other ecosystems. That said, it is important to note that *Koontz* does not hold offsite mitigation requirements (which are quite common) unconstitutional, but merely requires the *Nollan/Dolan* nexus be applied, which keeps it from being a total wipe-out.[68]

What does this say about the property interests in ecosystem services? Well, it ultimately muddies the understanding of who owns these rights, an inevitable result of our failure to appreciate them as the property. If ecosystem services (here, the wetlands' provision of water filtration and flood prevention, which is what the *Koontz* transaction was about) belong to the generating landowner, he should be capable of destroying them without owing anything to his neighbors. If, on the other hand, the right to ecosystem services lies in the receiving landowners (to be protected by them or by a government entity on their behalf), there should be no impediment to these stakeholders' ability to negotiate whatever price they wish for relinquishing that property interest (here, the exaction struck down by the court). Treating this as a taking suggests that *Koontz* is forgoing a property interest, but allowing the exaction if it meets the nexus and proportionality test suggests an interest in receiving properties to continue to receive these ecosystem services, albeit from a different source.

60. *Id.* at 2591.
61. *Id.* at 2595.
62. *Id.* at 2603 (Kagan, J., dissenting).
63. *See id.* at 2598 (Kagan, J., dissenting).
64. *See id.* at 2609–11 (Kagan, J., dissenting).
65. 524 U.S. 498 (1998).
66. *See Koontz*, 133 S. Ct. at 2603–04 (Kagan, J., dissenting).
67. *Id.* at 2612 (Kagan, J., dissenting).
68. *See id.* at 2597–98.

C. Regulatory Takings

Regulatory takings is an area in which there is already substantial case law relating to ecosystem services. Many landowners have challenged regulations designed to protect ecosystem services as unconstitutional takings of their property. *Lucas v. South Carolina Coastal Council*[69] would be the first case to come to mind, given that the landowner's title had the potential to be limited by inherent restrictions based on the common law principles of nuisance.[70] The analysis in *Lucas* was the progression of (and limitation on) the "noxious use" principle articulated in *Mugler v. Kansas*,[71] which long ago upheld the police power to regulate land use to prevent harm to neighboring properties. While the *Lucas* Court did not deny this doctrine, it required governments to pay just compensation when such regulations destroy all economic use of the land, *unless* the restricted use was not already part of the owner's title owing to existing nuisance principles.[72] Interestingly, the regulation at issue in *Lucas* was designed to protect ecosystem services provided by his land and other lands like his, specifically the buffering of high tides, storm surge, and hurricane damage.[73] This case thus begs the question quite loudly of what relationship there is, if any, between title and ecosystem services. Indeed, the answer to that question would determine the right to compensation for the inability to develop the land.

At least as interesting, though, is *Agins v City of Tiburon*[74] and the numerous lower court cases to follow its analysis. Many of these cases, such as *R&Y, Inc. v. Municipality of Anchorage*,[75] have described the role of ecosystem services in creating the "reciprocity of advantage" to avoid triggering compensation, something which is based on the *Agins* principle of shared benefits and burdens justifying restrictions that impact all landowners in a community.[76] Extending this concept to ecosystem services, the court in *R&Y, Inc.* stated:

> The landowners in the present case could make a prima facie showing of a taking under Professor Ellickson's scheme because they have suffered economic loss due to a government regulation that prevents them from engaging in normal land use activities (commercial development in a commercial district). However, the [Anchorage] setback restriction should not trigger compensation because it is part of a city-wide (indeed, nationwide) wetlands preservation scheme which

69. 505 U.S. 1003 (1992).

70. *Id.* at 1031.

71. 123 U.S. 623 (1887).

72. *Lucas*, 505 U.S. at 1017–18.

73. *Id.* at 1075 (Stevens, J., dissenting) (citing S.C. CODE ANN. § 48-39-260(1)(a)).

74. 447 U.S. 255 (1980).

75. 34 P.3d 289, 299 (Alaska 2001).

76. *Id.*

> applies broadly to all landowners and which benefits both the public generally and the landowners in particular. Scientists and legislators have recognized the unique ecological and economic value that wetlands provide in protecting water quality, regulating local hydrology, preventing flooding, and preventing erosion. In preserving the valuable functions of wetlands, regulations like those of the MOA provide ecological and economic value to the landowners whose surrounding commercially-developed land is directly and especially benefitted by the functioning of Blueberry Lake.[77]

The cases that treat ecosystem services as the crucial benefit resulting in this reciprocity of advantage arguably situate the interest in these services in the commons, albeit a regulated commons. Indeed, their benefit to all involved is the source of justification for treating all involved as responsible for the burden of their maintenance.[78] This differs from extractive commons in that the public may destroy them, as exemplified by Garrett Hardin's famously tragic grazing meadow.[79] Because ecosystem services are not always extractive, they may be enjoyed by all in perpetuity if not destroyed, so the regulations at issue do not constrain the enjoyment of their benefits but merely their destruction, which can be enjoined regardless of being generated on private lands. As such, this may be interpreted as more consistent with the notion that the interest lies with the receiving properties than with the generating property, even though such land may qualify as both.

Overall, the ecosystem services–based regulatory takings cases generally place the rights to those services either in the receiving property owners or the "public" more holistically, but without expressly treating them as a property interest. Even under the deprivation of all economic value analysis, courts look solely at the development value and do not account for the ecosystem services value, which may be economically substantial. This may be a consequence of placing the rights to these services outside the landowner. What happens if we define ecosystem services as property allocated to the producing landowner? If the landowner has title and can sell or rent this to neighbors, then she retains that economic value in these takings cases (unless the regulation makes it impossible to charge for the services because it renders them guaranteed). Of course, situating the property right to ecosystem services in the ecosystem-service providing landowner creates both a risk of exploitation and a corresponding need for regulation that would then require analysis as a taking.

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77. *Id.* at 298.

78. *See* Fla. Rock Indus., Inc. v. United States, 18 F.3d 1560, 1570–71 (D.C. Cir. 1994) (instructing the lower courts to look for these shared benefits in analyzing an alleged economic burden).

79. *See* Hardin, *supra* note 37, at 1243–48.

D. Nuisance

Lucas also famously raised the issue of potentially treating destruction of ecosystem services that previously flowed to neighbors as a common law nuisance.[80] In 2003, the New Hampshire Supreme Court in *Cook v. Sullivan*[81] found that a nuisance was established by filling a wetland.[82] Interestingly, *Cook* and other similarly successful wetland-filling nuisance cases have involved a private nuisance, in which the harm clearly flows to a particular landowner.[83] Courts seem inclined to protect the rights of landowners from the potential loss of vital ecosystem services. Public nuisance claims, or more broadly publicly needed ecosystem services, do not fare as well. As the Court noted in *Lucas*:

> [r]egulations that leave the owner of land without economically beneficial or productive options for its use—typically, as here, by requiring land to be left substantially in its natural state—carry with them a heightened risk that private property is being pressed into some form of public service under the guise of mitigating serious public harm.[84]

Given that the *Lucas* court would not allow such a taking (without compensation), but would allow it if the landowner would otherwise be violating background nuisance principles (apparently focused on neighboring land), there is an unspoken suggestion of potential rights in the ecosystem services at issue. If you would violate those rights, the regulation is only stopping you from doing that which you already cannot do (violate a neighbor's property rights), but if you are being regulated so those ecosystem services may generally benefit the public, that is a taking of your property interests. The situation created by this case and its progeny highlights the need to determine where the property interests in ecosystem services belong.

This is not to say that the context of treating the wetland filling as a public nuisance (rather than a private nuisance) would not also create the potential for upholding the regulation without compensation. This phenomenon is beginning to take hold in recent years. A little over a decade ago this occurred in the context of state remand from a well-known U.S. Supreme Court case, *Palazzolo v. Rhode Island*,[85] rejecting a takings claim from a landowner prevented from developing the wetland portion of his property. After the Court had remanded it to the state to follow the test in *Penn Central Transportation Co. v. City of New York*,[86] the state went further and held that damaging the wetlands would

80. Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1027–31 (1992).
81. 149 N.H. 774 (2003).
82. *Id.* at 775.
83. *Id.* at 780.
84. *Lucas*, 505 U.S. at 1018.
85. 533 U.S. 606 (2001).
86. 438 U.S. 104 (1978).

constitute a public nuisance in any event (and would have thus survived even the *Lucas* test).[87] This was because it would inhibit the "valuable filtering system regarding water runoff containing pollutants and nitrogen from adjacent land."[88]

Indeed, as Christine Klein points out, this evolution of nuisance law happened in several states following the *Lucas* decision.[89] She argues that "new nuisance" principles can evolve to gain the status of the background principles of nuisance that *Lucas* provided as a way to view the regulated activity as not actually within the landowner's title.[90] In this way, however, and as clearly envisioned in the *Lucas* discussion itself, a landowner may own less than he bargained for. This creates precedent for the notion, proposed here,[91] that we might interpret property rights in a manner inconsistent with what people expected when they purchased, thus creating winners and losers in the shift. While not ideal, this is, alas, a necessary casualty of evolving our understanding of property interests and their relationship to nature.

J.B. Ruhl has outlined the prima facie case for an "ecosystem services nuisance," in which one landowner manages her property so as to deprive another of economically valuable ecosystem services.[92] His nuisance claim rests on owning land that generates positive externalities and then cutting off those externalities.[93] This, for the purposes of the present Article, creates the question of who owns the rights to those externalities.[94] Should we decide this issue in the same way regardless of whether externalities are negative or positive? Or perhaps we should instead view the nuisance claim in relation to the bad thing now flowing from the defendant's property, such as flooding or sediment that it did not send over before. What would this approach do to the idea of ecosystem services as property?

E. Marketability

"Markets for nature hold out the promise of a third rail, along with regulation and education, for preservation efforts."[95]

87. Palazzolo v. State, No. WM 88-0297, 2005 WL 1645974, at *3 (R.I. Super. Ct. July 5, 2005).

88. *Id.*

89. *See* Christine A. Klein, *The New Nuisance: An Antidote to Wetland Loss, Sprawl, and Global Warming*, 48 B.C. L. REV. 1155, 1205 (2007).

90. *Id.* at 1189–99.

91. *See infra* Section IV.B.

92. *See generally* J.B. Ruhl, *Making Nuisance Ecological*, 58 CASE W. RES. L. REV. 753 (2008).

93. *Id.* at 761–64.

94. That said, this author does not agree with the externality characterization, as discussed *infra* in Section IV.B.

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

It has often been said that "most environmental amenities cannot be adequately monetized, not because they are not valuable, but because they are not supplied through a market."[96] This may once have been true, but certainly is no longer entirely the case. Indeed, markets for ecosystem services have been developing for decades in clear, direct terms, and arguably have existed for much longer in the subtler context of bundling with other property interests.

While there already exists several relatively easy-to-observe markets for ecosystem services—conservation easements and PES programs come readily to mind—there is also potential for unpacking some of the less obvious market values ecosystem services create. Ecosystem services are frequently an important part of otherwise typical property transactions, whether identified as such or not, so it may take some unbundling in order to see the role ecosystem services already play in the property bundle.

There are already many PES programs. They are broad and varied overseas,[97] but tend to focus on agricultural land in the United States.[98] Farmers or ranchers are paid to engage in practices that maximize certain desired ecosystem services.[99] Such practices may include setting some land aside or may focus more on the methods applied, and the services thereby improved may be water retention, wetland stability for filtration and flood prevention, phosphorous load reduction, and much more.[100] The system functions in a typical supply and demand manner, with local governments purchasing those services they need.[101] Payments should mirror or better the forgone income relative to unrestricted use of the property at issue, as these transactions take place when the ecosystem service value is greater than the marginal agricultural value. As such, PES programs maximize the economically efficient use of land.

Unfortunately, PES is not a panacea for solving the problem of ecosystem services loss. Situating the rights to those services in the generating landowners creates significant moral hazards, placing landowners in a position of power over society that may encourage bad behavior and extortion.[102] Moreover, PES forces taxpayers to pay, maximizes transaction costs, and "may undermine in-

96. David B. Hunter, *An Ecological Perspective on Property: A Call for Judicial Protection of the Public's Interest in Environmentally Critical Resources*, 12 HARV. ENVTL. L. REV. 331, 335–36 (1988).

97. *See generally* Brian C. Steed, *Government Payments for Ecosystem Services? Lessons from Costa Rica*, 23 J. LAND USE & ENVTL. L. 177 (2007); Salzman, *supra* note 13.

98. For a discussion of such programs, see Ruhl, *supra* note 50.

99. *See id.* at 446–47.

100. *See id.*

101. *See id.*

102. *See* Stefanie Engel, Stefano Pagiola & Sven Wunder, *Designing Payments for Environmental Services in Theory and Practice: An Overview of the Issues*, 65 ECOLOGICAL ECON. 663 (2008).

trinsic motivations for conservation and debilitate preexisting social markets."[103] Experience with PES thus far highlights the need to clearly allocate the property interest in ecosystem services, and supports the preference for doing so in favor of receiving properties.

Conservation easements are another common approach to marketing ecosystem services. Indeed, this is another typical way (besides eminent domain or consensual land acquisition) to maintain water filtration services and avoid expensive artificial water treatment. Many conservation easements are purchased in order to maintain essential habitat for dwindling species, though even in such cases one can extrapolate human value for the ecosystem service.[104] Of course, conservation easements are already understood as property, like all easements. In this sense they are arguably the most concrete example of ecosystem services as property.

An interesting and very new question is what happens when PES and conservation easements overlap. This, if not considered ahead, can result in even more confusion over who owns what. David Cooley and Lydia Olander present the problem and a potential solution:

> Under a conservation easement, a landowner retains ownership of his or her land but cedes certain rights to develop the land. In general, conservation easements are flexible instruments, and the details of allowed management can change from contract to contract. For example, most conservation easements preclude commercial or residential development, but some may allow agricultural use or periodic timber harvest. Easements often do not explicitly outline who owns the ecosystem services generated by the eased land—the landowner or the easement holder. Easements are often held by land trusts or other conservation organizations that manage the lands for a landowner. Whether a landowner who has sold a conservation easement retains rights to sell ecosystem services remains unclear. Although conservation easements are a ceding of development rights, they are not necessarily a ceding of the right to sell ecosystem services. This issue will not be resolved for existing contracts until a court decision interprets the arrangement or statutory guidance is created. Nevertheless, new

103. Marcia Silva Stanton, *Payments for Freshwater Ecosystem Services: A Framework for Analysis*, 18 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 189, 283–85 (2012).

104. *See* Jessica Owley, *Changing Property in a Changing World: A Call for the End of Perpetual Conservation Easements*, 30 STAN. ENVTL. L.J. 121, 139 (2011) ("When conservation easements preserve environmental resources on private lands where purchase or regulation would be burdensome, undesirable, or politically difficult, conservation easements can yield the public benefits of increased environmental amenities and healthy functioning ecosystem services.").

> conservation easements can be written so as to clarify which party retains ownership of the ecosystem services generated by a project.[105]

Indeed, even before all of this takes place it would help to know who owns the ecosystem services by default. The authors quoted above have operated on a default presumption that the ecosystem services belong to the generating landowner (which is implied by both the PES and conservation easement contexts, so not surprising). Of course, should we determine that receiving landowners owned rights to those ecosystem services all along, that would alter the approach to these sorts of transactions.

A third example of markets for ecosystem services is wetland mitigation banking.[106] A wetland mitigation bank is a typically large area of wetlands that the "banker" has acquired, restored, and will preserve going forward, although the banker is not required to do so under any legal regime.[107] This voluntary effort and expense is in fact a business investment, as the banker has now generated numerous wetland credits that it may in turn sell to developers seeking to destroy wetland property, as they will be required to mitigate the damage they do by restoring a wetland elsewhere in order to obtain a permit.[108] Because these developers are not themselves in the business of restoring wetlands, nor own any wetland property to restore (apart from the wetland they wish to fill), it is often preferable to them to buy these credits from a mitigation bank and be done with it. This also maximizes efficiency by centralizing the task and managing it with expertise, rather than as an addition to a development project.

The wetlands provide such localized ecosystem services that it is generally necessary that they be in a certain proximity to those to be destroyed (in order to replace the lost ecosystem services), so these banks have popped up all over the country. The original federal guidelines for wetland mitigation banking provided that "[t]he objective of a mitigation bank is to provide for the replacement of the chemical, physical and biological functions of wetlands and other aquatic resources which are lost as a result of authorized impacts."[109] This is a now well-developed market for ecosystem services—when a developer wishes to destroy ecosystem services upon which the community depends, he must purchase them elsewhere in order to replace what he is taking. This concept also arguably lays the groundwork for a theory of ecosystem services–based liability. The recipients of the ecosystem services have an entitlement to continue

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105. David Cooley & Lydia Olander, *Stacking Ecosystem Services Payments: Risks And Solutions*, 42 ENVTL. L. REP. NEWS & ANALYSIS 10150, 10154 (2012).

106. *See* J.B. Ruhl & R. Juge Gregg, *Integrating Ecosystem Services into Environmental Law: A Case Study of Wetlands Mitigation Banking*, 20 STAN. ENVTL. L.J. 365, 365–68 (2001).

107. *Id.*

108. *Id.* at 368–71.

109. Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, 60 Fed. Reg. 58,605, 58,607 (Nov. 28, 1995).

receiving them, so one who would destroy them must simultaneously replace them.

Although ecosystem services are directly marketed via PES or conservation easements, their marketability is far more pervasive (albeit less obvious) via enhanced land value. When we look at the bundle of property rights (the traditional bundle), we find that sticks in the bundle can be relinquished separately from one another. Indeed, individual sticks in the bundle can be sold separately, leaving behind property with a lower value but creating greater value (in order for the transaction to be worth it) in the separate holder. Sometimes dividing the pie actually makes it larger. Ecosystem services fit well within this paradigm. Consider the difference in home value discussed in the opening paragraphs to this Article. What if those ecosystem services are unbundled from the property? What happens to the property value? Does another party get something of value by taking away those services? Why would we see the unbundling of any other stick as falling within the landowner's control, while seeing the unbundling of the highly valuable ecosystem services necessary to enjoyment of the property as mere happenstance?

F. Public Trust Doctrine

As you may have observed, the public trust concept[110] has been underlying many of the other issues here, sitting as an elephant in the room throughout their review. Treating ecosystem services as a public trust right is entirely consistent with treating them as property. Indeed, property is generally what is at issue in public trust cases—it is held in trust for the people with the state as trustee. If the state has a trustee duty in relation to ecosystem services capital, the potential regulatory impacts are enormous.

In cases where the ecosystem services are protecting public trust land, which would be harmed by eliminating them, the doctrine already kicks in to protect the ecosystem services, as occurred in *Avenal v. State*.[111] The public trust concept also reasonably applies in the opposite direction, when public trust resources provide ecosystem services, in which case the government's management duties over those lands should include protecting their ability to provide these services.[112] But what if the ecosystem service benefits flow from private land to private land? For this we would need *ecosystem services themselves* to fit into the public trust doctrine. This would result in such pervasive government control over (and responsibility for) private property interests that it is a highly

110. Public trust resources are deemed to be held in trust for the people with the state as trustee responsible for protecting those resources from private harm. Submerged land is the most established traditional example, but in recent decades the concept has been expanding.

111. 886 So. 2d 1085 (La. 2004).

112. *See generally* J.B. Ruhl & James Salzman, *Ecosystem Services and the Public Trust Doctrine: Working Change from Within*, 15 S. ENVTL. L.J. 223, 224 (2006).

impractical idea, regardless of whether one finds the concept appealing or not as a philosophical policy matter.

For the purposes of this Article, ecosystem services as a property interest would sometimes belong to governments and sometimes to private parties, depending on the ownership of any benefitting lands. Indeed, they would sometimes fit within public trust type management, but would do so on the basis of their impact on existing public trust resources.[113] It is beyond the scope of this discussion to attempt to place all ecosystem services property into the public trust. As useful as that might appear to reliably protect them, it would require entire new government agencies to manage it all. Even if that were conceivably possible as a practical and political matter (it's not), it would be the stuff of a different article.

IV. Fitting Ecosystem Services into the Real Property Bundle

A. Conceptual Fit

So, if we treat ecosystem services as part of the real property bundle, how might that play out? This depends in part on whether we allocate that property interest to the generating landowner or the receiving landowner.[114] As we've already seen,[115] existing legal frameworks sometimes treat the rights to ecosystem services as belonging to the generating landowner and sometimes place those rights in the receiving landowner. If we were to clarify that ecosystem services always belong to the generating landowner, they would become a divisible part of the bundle just like mineral rights or timber rights. If, on the other hand, we were to decide that these rights properly belong to the receiving landowners, they would become servitudes binding the generating landowners. Bargaining could occur between the two parties to shift the interest to the other party, so either way the situation would remain a flexible one. The important thing is that we clarify the interests so that they can be held or transferred at all.

Treating ecosystem services themselves as a property interest may require a shift away from the concept of natural capital as fully-owned property, especially in light of the fact that it often has less economic value than the services it provides. Natural capital, a rather obviously property-based term, refers to "the ecological resources that produce these service values, such as forests, riparian habitat, and wetlands."[116] When we view the property interest as tied to the ecosystem itself, the notion that the right belongs to the historically receiving

113. *See generally Avenal*, 886 So. 2d at 1085.

114. This allocation is discussed in Section IV.B, *infra*.

115. See discussion throughout Part III, *supra*.

116. 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, 525 n.2 (2007).

party becomes strained. While we can certainly still treat it as an easement on the generating property, that would not automatically inhere in the receiving land as it would traditionally be something that should be purchased.[117] The economic value, however, is largely tied to the services themselves, far more than the natural capital from which they are derived. Unlike the natural capital, which by definition sits on the generating land, the ecosystem services have historically situated themselves in the receiving land. This is an important distinction to bear in mind as we consider allocation priorities in the next section.

Understanding nature's services as a property interest also addresses the concern some scholars raise that regulations designed to secure "environmental amenities" for the public are simply a way for the government to shift property to itself without compensation.[118] When we view the maintenance of the status quo as only achievable via regulation, instead of focusing on the protection of existing property rights, it is challenging to come up with a system that is just and fair. If, instead, we include ecosystem service benefits historically received (or generated, albeit with different strategies for maintaining the status quo should the rights fall that way) within the real property bundle, the existing rights become crystal clear and property law already provides all the tools necessary to adjust those rights in either direction.

It is important to note, as a conceptual matter, that for ecosystem services to make sense as property, they should touch and concern benefitting land. It is far too abstract to suggest that we have a property interest in, say, a view we walk by every day. That said, it makes perfect sense to suggest that there is a property interest in ecosystem services that maintain the livability of receiving land. That land was purchased and developed in this ecosystem service-receiving state. Its value may be dependent on those services.

B. Allocation Principles

Once we begin to think of ecosystem services as property, with all the rights and economic attachments that doing so creates, one problem becomes instantly clear: whose property is this? Does it belong to those who have been receiving those benefits? If so, is that only the case if they own benefitting property (as with an appurtenant easement), or does it include the myriad beneficiaries who receive benefits unrelated to land (as with an easement in gross)?

117. *See id.* at 534 (noting that English common law did not extend encumbrances on land this far).

118. *See generally* Steven J. Eagle, *Environmental Amenities, Private Property, and Public Policy*, 44 NAT. RESOURCES J. 425 (2004).

Or does it belong to the owner or owners of the lands that generate the ecosystem services, such that they may charge for their continuation?[119]

Robert Cutting and Lawrence Cahoon make an interesting argument in a different context: that of pollution control.[120] Traditionally property rights have been viewed as in conflict with pollution control regulation, but they argue that requiring polluters to either refrain from releasing anything beyond their property borders or to internalize their externalities is necessitated by property rights—the rights of the receiving properties.[121] According to their argument, the receiving properties are experiencing harm for which they should expect a remedy. This perspective is also supported by Carol Rose's well-known comparison of environmental externalities with computer virus attacks, which are in both cases an invasion of private space.[122]

As UCLA's James Krier pointed out in the early days of U.S. environmental law, the best formula for reaching peak economic efficiency in managing pollution would be for air to be cleaned "to the level that minimizes the sum of (a) the costs of pollution, plus (b) the costs of avoiding the costs of pollution."[123] The costs of pollution are, of course, heavily felt by others, particularly those on the receiving end of that pollution. By including both these costs in the decisionmaking, when any marginal pollution increment is more expensive to avoid than to compensate, you will emit that pollutant, but for any increment that is costlier to compensate neighbors for than to prevent, you will not emit that increment. Forcing polluters to internalize their externalities is not just a political or environmentalist viewpoint—it is a method to maximize economic efficiency in relation to all property interests combined (alas, this is not most efficient in relation to just the polluter's interests, which is where the political interference comes into play).[124]

If we were to adopt this line of thinking—in which we consider the property rights of receiving owners and not just of polluters to use their own land freely—how might this play out in the context of ecosystem services? In both

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119. This, of course, already takes place via PES programs and conservation easements, but that may be an example of approaches cropping up before baseline rights have been clearly defined.

120. *See generally* Robert H. Cutting & Lawrence B. Cahoon, *Thinking Outside the Box: Property Rights as a Key to Environmental Protection*, 22 PACE ENVTL. L. REV. 55 (2005).

121. *See generally id.*

122. *See generally* Carol M. Rose, *The Several Futures of Property: Of Cyberspace and Folk Tales, Emission Trade and Ecosystems*, 83 MINN. L. REV. 129, 137 (1998).

123. James E. Krier, *The Irrational National Air Quality Standards: Macro- and Micro-Mistakes*, 22 UCLA L. REV. 323, 326 (1974).

124. "Someday, politicians may recognize that (1) receptors are far more numerous than generators—although receptors may not contribute as much to campaigns, knowledge of pollution practices may energize them to vote or buy differently if the information is available; (2) Keeping pollutants out of receptors' property protects health, as well as property rights; and (3) these are popular concerns." Cutting & Cahoon, *supra* note 120, at 90.

cases we can see that there is something flowing from one party's land to another's, but in one case that thing is a negative externality and in the other a positive one. When we look at negative externalities, we see no place for a property interest in them, but only potential for liability as a trespass or a nuisance. With something positive, which indeed has substantial economic value, for which we must assign a property interest, this line of thinking (as a positive externality) could place that property interest in the sending property, which in turn could charge the receiving property for it (as well as destroy whatever is generating it, so long as that is on the property owned by the sender, without liability to the receiving property).

If ecosystem services were rightly characterized as a positive externality, perhaps we could end there. There is another key distinction from the pollution model, however, which is that *the sending landowner is not in fact generating the ecosystem services* herself. A polluter acquires land that is not generating pollution and converts it into land that is generating pollution. The pollution is an externality because it is the result of an action chosen by the polluter.[125] The opposite is true with ecosystem services. The sending owner purchases land that is generating ecosystem services (and has done so since the neighboring properties existed as property interests in any holder) and those will continue to flow if he does nothing at all, or can be stopped if he does (thus altering the circumstances of the neighboring landowners from the status quo as it always has been).

This status quo distinction—in which we begin with no pollution and change to pollution or begin with ecosystem services provision and change to elimination of these—can be squared by determining these matters according to a baseline. For the property owner, the baseline is the property as it has always been—sans pollution and benefitting from the ecosystem services it receives. She has a property interest in maintaining this status quo, but that interest varies between these two things.

With a negative externality like pollution, it makes sense to use the traditional tools for protection of property such as trespass or nuisance (both of which have been advocated by scholars,[126] in spite of experiencing a tepid response from judges[127]). With a positive thing of value flowing from one prop-

125. Externalities are impacts of actions which are experienced by parties other than the decisionmaker and thus not included in cost-benefit analyses regarding those actions. Externalities are thus typically inefficient. Pollution is a classic example. If not internalized via regulatory penalties, the costs associated with pollution will not be considered in the decision whether to produce goods in a manner that pollutes.

126. *See, e.g.*, Anthony Z. Roisman & Alexander Wolff, *Trespass by Pollution: Remedy by Mandatory Injunction*, 21 FORDHAM ENVTL. L. REV. 157, 166 (2010); Emily Sangi, *The Gap-Filling Role of Nuisance in Interstate Air Pollution*, 38 ECOLOGY L.Q. 479, 502 (2011).

127. *See, e.g.*, Freeman v. Grain Processing Corp., 848 N.W.2d 58 (Iowa 2014) (nuisance); Borland v. Sanders Lead Co., 369 So. 2d 523 (Ala. 1979) (trespass).

erty to another, having done so since prior to their ownership and typically prior to all previous ownership, the best way to protect the property interest in maintaining status quo is through *allocating the property interest where it already lies: in the receiving property*. The preexisting ecosystem services are part of the value of the receiving property. Perhaps if the sending landowner were actually *generating* the ecosystem services, rather than purchasing land that has long generated them in his absence, it might make sense to grant him rights in this interest—that would render the services a positive externality.[128] But the natural and preexisting ecosystem services themselves—now deemed a thing of economic value and thus capable of ownership—have always been a part of the receiving property.

If we place the property interest in ecosystem services in the receivers, what happens when they are not neighboring landowners, but rather people who benefit in gross, perhaps because they regularly travel past the generating property, or work nearby, or come to visit a public park in the vicinity? In such cases the *property* interest in the ecosystem services would lie in the holder of the *property* being utilized by these individuals. This could be a private party, such as their employer, or a government entity, in the event the receivers are using that entity's roads or parklands. Viewing ecosystem services as property does not require that they be owned privately, as all levels of government own property. The main issue in these situations would be to determine whether the ecosystem services are owned as purely government property or as falling within the public trust, as the latter would create binding responsibilities for the government in charge of them.[129] This could depend upon the nature of the property benefitting from the ecosystem services: if it were public trust property then the ecosystem services upon which it depends would be public trust property,[130] but if it were gratuitously provided to the public then the ecosystem services might be a property interest with the same level of government discretion as the rest of the property.

Where does this leave the sending landowner? Do we wind up with yet more frustrating restrictions on land use, only now coming from property principles rather than regulation? Perhaps, but ultimately these are foundational principles, so going forward buyers should only pay for the property they are actually acquiring. In other words, land that generates ecosystem services to

128. This also distinguishes manmade ecosystem services, such as a wetland mitigation banking (assuming it was developed via restoration), from natural ecosystem services, which are the focus of this Article. It is perfectly reasonable to allow people to invest in the creation of such services and then own them and be able to charge for them.

129. *See* Section III.F, *supra*.

130. This scenario is very close to existing case law holding that where public trust resources are dependent upon ecosystem services from neighboring lands, the government has the same public trust duties to protect those services. *See, e.g.*, Avenal v. State, 886 So. 2d 1085, 1101 (La. 2004).

others would be worth less, in the amount necessary to either purchase that property interest from the receiving landowners or to utilize the sending property without destroying the ecosystem services property that actually belongs to others. To the extent that this may be viewed as costly to some and a benefit to others, that is merely because property was purchased at prices that were based on erroneous assumptions. Ecosystem services-providing lands were overvalued and ecosystem services-receiving lands may have been undervalued. This error does not change the analysis of the foundational principles at issue here, which favor placing this property interest with those who already hold the property, nor does it alter the practical realities and policies that favor this approach, such as the need to maximize efficient use of land.

Indeed, it is probably not the case that the receiving properties were undervalued, in that received ecosystem services are in fact contributing to land values already. The problem is that, as a result, *they have been double-counted.* The receiving property is counting their value, but also the providing property is valued as though the rights to those services belong to it, such that they could be either sold or cut off. As a result of this double counting, no matter how we allocate this property interest now, long after most parcels of land have been claimed, it will result in a loss. Much like the members of a Ponzi scheme, landowners everywhere have been relying on illusory interests that cannot in fact belong to as many properties as has been assumed.

Allocating this property interest to the long-benefitting lands places the sending landowner in the same role of maximizing economic efficiency as when we ask landowners to internalize negative externalities, in that the cost-benefit analysis of any action must take a complete view and cannot avoid considering costs to others. This arguably could be achieved without allocating the property interest in the receiving properties, on the assumption that where the ecosystem services are more valuable than other uses, the landowner can charge for them and thus take into account their value.[131] This meets with the same catastrophic roadblock as it does in the polluted-pays argument, which is that neighboring landowners may lack the means to purchase their ecosystem services, just as they lack the means to pay a factory not to pollute. Thus, maximizing efficient land use absolutely favors placing the property interests with the status quo, and making those who would change the status quo pay those they would harm by doing so. Only then will decisionmakers' cost-benefit analyses be complete.

Finally, what are the consequences of getting the allocation question wrong? We intuitively worry that it could be a taking if the true property right holder is not the one we select, but this assumes that the property to be allocated is already allocated in some natural law sense, and that we are merely affirming this more formally. What happens if we instead view this allocation entirely in the realm of positive law, such that we are creating a property inter-

131. *See* R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

est that did not previously exist? Well, if you ask Abraham Bell and Gideon Parchomovsky, that may not absolve the government for doing so, as they have argued that "givings" can be just as problematic as takings if you think of wealth as relative rather than absolute.[132] In other words, the reason we focus so much on takings is that we think of wealth individually, so we only care about loss and not about gain. That said, if you think of wealth as relative, such that when those around you gain and you do not, you are also harmed thereby, then "givings" become important to avoid as well.[133] This point is bolstered by the fact that the same concerns underlie both takings and givings, in terms of government capture resulting in inequities (An organized faction benefiting by taking property from less powerful citizens to the public underlies the takings concern, and similarly that faction may gain at the expense of the unorganized populace if it can be the recipient of a government giving.).[134]

The question as to whether there are preexisting unrecognized rights involved in the case of ecosystem services is nonetheless important. The approach we have followed thus far has led to a great deal of chaos and a lack of predictability regarding property rights with potentially catastrophic impacts. We cannot continue to treat ecosystem services as a right belonging to the generating landowner in some contexts and a right belonging to the receiving landowner in other contexts. This is both intellectually disingenuous and also an unacceptable practical problem.

Another way to think about allocation of ecosystem services property is by analogy to riparian rights. Landowners downstream from us have a right to water that is flowing through our land, so we cannot take it all, even when in our own domain. Water law is a complex field and there are varying approaches to allocating rights to withdraw water from a river or stream,[135] often by dividing the pie, but also those that consider instream values/rights in addition to withdrawal rights.[136] What is important for comparison to ecosystem services property, however, is that once we determine who has water rights, we constrain the right of upstream landowners to withdraw that which belongs to downstream landowners. The water may flow right through their property, but it belongs to other property to which it will naturally flow if left unimpeded. Nature left to its own devices will deliver the property over one owner's land to reach the land of the owner of the right to that portion of water. Similarly, ecosystem services are that which nature will generate on its own, so long as not

132. *See* Abraham Bell & Gideon Parchomovsky, *Givings*, 111 YALE L.J. 547, 552 (2001).

133. *Id.*

134. *See id.* at 553.

135. See T.E. Lauer, *The Common Law Background of the Riparian Doctrine*, 28 MO. L. REV. 60 (1963), for a more detailed discussion of this background.

136. *See* Carol M. Rose, *Energy and Efficiency in the Realignment of Common-Law Water Rights*, 19 J. LEGAL STUD. 261, 290–93 (1990) (contrasting the importance of instream uses in eastern water law with the failure to provide for such interests in western water law).

impeded by an "upstream" landowner, and deliver to the beneficiary of that service, who (as proposed here) might have a legal entitlement to that benefit.

Although I propose to allocate ecosystem services property to those owning land that enjoyed the preexisting benefits, it is nonetheless possible to generate new ecosystem services property and own it. There are a variety of circumstances in which people artificially design property features that provide ecosystem services, and doing so would not create a right in any serendipitous beneficiaries. Indeed, these benefits could be sold or withheld. Wetland mitigation banks are one example of this concept. As a matter of public policy, we would not wish to discourage land uses that generate ecosystem services not previously provided, nor does fairness dictate giving the right to the receiving landowner if it was not an original attribute of their land.

C. Addressing the Problem of Inconsistent Post-Hoc Allocation

When we look at the existing cases in which we see property interests in ecosystem services assigned, whether directly or as an underlying premise, we see a complete failure of consistency. In different contexts we see these rights fall into different hands, such as where we pay landowners for providing ecosystem services in the PES context, or with a conservation easement, and then in other circumstances punish landowners for withholding ecosystem services previously provided to neighboring properties. The examples[137] are all over the board and when viewed together create a sense of property rights chaos. Indeed, as the Court noted in *Lucas*, these rights can go in either direction even in the *same* context:

> [T]he distinction between "harm-preventing" and "benefit-conferring" regulation is often in the eye of the beholder. It is quite possible, for example, to describe in either fashion the ecological, economic, and esthetic concerns that inspired the South Carolina Legislature in the present case. One could say that imposing a servitude on Lucas's land is necessary in order to prevent his use of it from "harming" South Carolina's ecological resources; or, instead, in order to achieve the "benefits" of an ecological preserve.[138]

The *Lucas* court was comparing nearly identical examples from different states in which the courts had taken opposite approaches as to where to situate the rights to the ecosystem services being destroyed.[139]

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137. Many of these examples are described in Part III, *supra*.

138. Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1024 (1992).

139. *Id.* at 1024–25. *Compare* Claridge v. N.H. Wetlands Bd., 485 A.2d 287, 292 (N.H. 1984), *with* Bartlett v. Zoning Comm'n, 282 A.2d 907, 910 (Conn. 1971).

What comes next in the *Lucas* opinion is fascinating, but has been entirely overlooked as it relates to consistency of property interests. The Court accepts this waffling of baseline rights among jurisdictions, and explains it by suggesting that it will simply depend upon the interpreter's priorities. Does the judge or policymaker think more highly of ecological values or development? That is how this will shake out.[140] The problem with this shrug is that it is not how property rights work. This thing of value—the ecosystem services that have long benefitted other lands—belongs to someone. While we do make regulatory decisions based on our values, we do not adjust property interests in this manner. The Court was not necessarily wrong in this perspective; it was merely focused on the regulatory choice and not the possibility that the ecosystem services at issue were themselves property. That said, the muddling of the discussion of regulatory policy, favored land uses, and property interests does not serve anyone well, regardless of whether we prefer conservation or development. We must begin with clear property interests, even if we are to then proceed with regulating the owner's control over them.

Ironically, perhaps, the *Lucas* Court went on to hold that the question of compensable taking was to be based on whether the right to destroy the ecosystem services generated by the property owner's land was "not part of his title to begin with."[141] This was based on nuisance principles, so the Court stopped short of considering the question of whose *property* bundle included the valuable ecosystem services, whether they were to be used or destroyed. Should we determine, as proposed here, that ecosystem services are part of the value of receiving land, as a practical matter their protection as property would be bolstered by mapping such services. While doing so across the board would be an enormous undertaking at the government level,[142] doing so in the private property context would be a routine step in real property transactions, as an addition to the existing survey requirements.

The absence of a consistent approach to allocating this valuable property interest is the result of both muddled analyses like that in *Lucas* and the random post-hoc situating of these rights differently in various circumstances since, but neither is really blameworthy. At the time *Lucas* was decided the very concept of ecosystem services was only beginning to develop—indeed, the term is not used even once in the opinion.[143] In the many circumstances in which ecosystem services rights have been placed in either the providing landowner or re-

140. *Id.* at 1025 ("Whether one or the other of the competing characterizations will come to one's lips in a particular case depends primarily upon one's evaluation of the worth of competing uses of real estate.").

141. *Id.* at 1027.

142. For an interesting proposal requiring such overall mapping, as part of the creation of "ecosystem services districts," see Geoffrey Heal et al., *Protecting Natural Capital through Ecosystem Service Districts*, 20 STAN. ENVTL. L.J. 333, 358–59 (2001).

143. The search term "ecosystem" yields zero results.

ceiving landowner, without consistency, each participant was largely concerned with the case at hand. Nonetheless, we are at exactly the right moment now to do something about this. We have developed valuation methods for ecosystem services for over two decades and will only get better at it. We are seeing the importance of this question arise in an increasing number of cases. We are buying and selling property whose value is heavily influenced by where this interest falls. Arguably we are too late, but alas we lacked the necessary information and skills to determine this any sooner. We must allocate the property interest—whether in providing landowners, receiving landowners, or the state—as soon as possible.

Conclusion

Ecosystem services have significant economic value, even greater than the entire GWP, and yet we have failed to provide landowners with any clarity regarding the rights to this valuable property. Instead, we have allowed chaos to reign, in which the right to ecosystem services might belong to the generating landowner or receiving landowner depending upon both the legal context (e.g., nuisance vs. conservation easement or PES) and the values of the judge(s) assigned. It is critical that we recognize ecosystem services as a property interest and make clear whose interest it is. Economic efficiency, fairness, and public policy all weigh in favor of allocating this property interest to the receiving landowners, whose property has benefitted from the ecosystem services since before any property was allocated at all.