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In Defense of Ecosystem Services

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It is a great honor and pleasure to deliver the Garrison lecture at the Pace University Law School, especially on an evening during which we have paid fitting tribute to the lives of two giants of environmental law and policy, Joe Sax, and David Sive. I chose the topic of ecosystem services for this auspicious occasion for three reasons and to answer three questions.

First, the path of ecosystem services as a theme in environmental law and policy spans my practice (1982–1994) and academic (1994–present) careers. The importance of nature to human well-being seems so obvious one would think it has been front and center in environmental law and policy since the beginning, but, until recently, that has not been the case. Lately, however, the ecosystem services framework has catapulted this theme into prominence, if not dominance, in environmental discourse.[1] So my first question is, what accounts for the meteoric rise of the ecosystem services framework?

* David Daniels Allen Distinguished Chair of Law, Vanderbilt University Law School. This essay is an edited version of remarks I gave as the 2014 Lloyd K. Garrison Lecturer on Environmental Law at Pace University Law School. See *Lloyd K. Garrison Lecture on Environmental Law*, PACE LAW SCH. (Mar. 26, 2014), http://streamingmedia.pace.edu/Law/GarrisonLecture032614/Lecture03-26-14.html. I am thankful to Pace Law School for that opportunity, and to the *Pace Environmental Law Review* for transcribing my remarks and editing and publishing this essay version of them. I thank many others who had an influence on my work in the ecosystem services field in the pages that follow.

1. *See* James Salzman, *What is the Emperor Wearing? The Secret Lives of Ecosystem Services*, 28 PACE ENVTL. L. REV. 591, 596 (2011) (tracking number of scholarly articles and Google hits on ecosystem services from 1990–2010).

Second, the assent of the ecosystem services framework provides an example of how a growing network of researchers, academics, practitioners, and policy-makers can push an idea from the sidelines into the mainstream. The second question, thus, is, how did this network succeed in advancing ecosystem services from science to policy?

The last reason I chose ecosystem services is that the concept exemplifies the position I have staked out as a member of the radical middle. The radical middle isn't just about compromising between the left and the right—or however you want to describe the "sides" in environmental policy—it's about challenging their views and coming up with alternatives that work better.[2] Ecosystem services does that, which is likely why, as I will discuss, it has begun to receive some pushback. So the third question is, what is the nature of that pushback, and is it justified?

In developing the three themes and answering these three questions, my primary purpose is to sort out some best practices for using the ecosystem services framework in law and policy. But also, I hope to offer a lesson to law students and young lawyers about the value of taking a chance, of pursuing a theme that resonates with you perhaps before it does with others, and of working within a network to turn it into concrete law and policy solutions.

Let's start with a thought exercise. Close your eyes and envision yourself strolling near a peaceful coastal marshland. What do you see? Birds and bunnies? Mosquitoes? A kayak trip? The future location of a posh, all-inclusive golf resort and marina? I see an economy. I see dollars. But I don't see the same dollars you would if you were thinking about developing the area into a resort. The money I see is in the form of ecosystem services—the economic benefits humans derive from the ecosystem structures and processes that form what might be thought of as natural capital, such as pollination, groundwater recharge, and flood control.[3] This concept has gained tremendous traction in science,

2. *See* J.B. Ruhl, *Manifesto for the Radical Middle*, 38 IDAHO L. REV. 385 (2002).

3. Ecosystem services are economically valuable benefits humans derive from ecological resources directly, such as storm surge mitigation provided by

policy, and law over the past twenty years. It has also attracted critics. Their critiques are coming from several different perspectives and are not all in the same voice, but they are equally loud and urgent, and they are pushing back on proposals to integrate the ecosystem services framework in public policy and private markets.

So, I am here first and foremost to defend ecosystem services. My battle plan is to begin by quickly familiarizing you with the ecosystem services framework. Next I will paint a partial personal-history of how the concept moved from an idea that a small number of ecologists and economists hatched in the 1990s to something that has become mainstream in those disciplines and increasingly employed in law and policy. Then I will briefly discuss the current state of play of ecosystem services in domestic law and policy. Following that I will give you a sense of where the pushback is coming from and the arguments that are being used to suggest that the ecosystem services framework needs to be tempered, or even treated with much skepticism, as a policy instrument. Finally, rather than respond to those critiques point-by-point, I'll respond by way of a set of guidelines I have developed for this purpose, what I call the *Principles for the Responsible Use of the Ecosystem Services Framework.*

coastal dunes and marshes, and indirectly, such as nutrient cycling that supports crop production. Natural capital consists of the ecological resources that produce these service values, such as forests, riparian habitat, and wetlands. For descriptions of natural capital and ecosystem services, *see* WALTER V. REID ET AL, MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING: SYNTHESIS (José Sarukhán et al. eds., 2005), *available at* http://www.millenniumassessment.org/documents/document.356.aspx.pdf [hereinafter MILLENNIUM ECOSYSTEM ASSESSMENT]; GRETCHEN C. DAILY, NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS (1997) [hereinafter NATURE'S SERVICES]; Robert Costanza et al., *The Value of the World's Ecosystem Services and Natural Capital*, 387 NATURE 253 (1997). For coverage of the emergence of the ecosystem services concept in law and policy, see J.B. RUHL ET AL., THE LAW AND POLICY OF ECOSYSTEM SERVICES (2d ed. 2007); J.B. Ruhl & James Salzman, *The Law and Policy Beginnings of Ecosystem Services*, 22 J. LAND USE & ENVTL. L. 157 (2007); James Salzman, *A Field of Green? The Past and Future of Ecosystem Services*, 21 J. LAND USE & ENVTL. L. 133 (2006).

I. WHAT IS THE ECOSYSTEM SERVICES FRAMEWORK?

Under the widely-adopted typology developed in the *Millennium Ecosystem Assessment*, ecosystem services flow to human communities in four streams: 1) provisioning services are commodities such as food, wood, fiber, and water; 2) regulating services moderate or control environmental conditions, such as flood control by wetlands, water purification by aquifers, and carbon sequestration by forests; 3) cultural services include recreation, education, and aesthetics; and 4) supporting services, such as nutrient cycling, soil formation, and primary production, make the other three service streams possible.[4] For example, aquatic resources provide bountiful supplies of ecosystem services to human populations, including water, groundwater recharge, storm and flood mitigation, sediment control, water purification, climate regulation, water supply, and recreation.[5] The important point to be made here, and not forgotten, is that in all four categories the core theme of the ecosystem services framework is that these benefits are valuable *to humans*. More on that later.

The ecosystem services framework has powerful implications for private markets and public policy, but it is often difficult to tap into its full potential. For example, knowledge about the value of ecosystem services improves the information available to landowners in deciding what constitutes the most efficient use of the land and its associated resources. Of course, to take advantage of that information, private landowners need some way of capturing the value of the services in markets, which is difficult for services like pollination from wild pollinators and groundwater recharge of aquifers from wetlands. Many ecosystem services are classic public goods. You don't have to pay for photosynthesis, no one charges for that. How could they? The natural capital owner can't prevent others from benefitting from

4. *See* MILLENNIUM ECOSYSTEM ASSESSMENT, *supra* note 3, at vi. Although this typology is not universally accepted, I will use it here given its wide adoption.

5. *See* STUART BUTCHART ET AL., MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING: WETLANDS AND WATER: SYNTHESIS (José Sarukhán et al. eds., 2005), *available at* http://www.maweb.org/documents/document.358.aspx.pdf.

the service (it's non-excludable), and if you were for some reason to buy photosynthesis from the owner, you couldn't prevent other people from benefiting from it (it's non-rivalrous).[6] Thus, the challenge in the private lands context is how to integrate regulating and supporting ecosystem service values into private market contexts.[7]

When public agencies must conform their decisions to a cost-benefit analysis test, they face similar problems in terms of quantifying regulating and supporting ecosystem service values. But many public agency decision contexts are not bound by econometric handcuffs, allowing a more fluid and qualitative account of ecosystem service values to be integrated into decisions. An example comes in the public lands management context. Federal public lands often are managed to enhance ecosystem services for onsite human populations, such as campers and hikers.[8] But what about delivery of regulating and supporting services to *offsite* human populations?[9] This is fertile ground for using the concept of ecosystem services to reorient and clarify federal land policy, define agency mission, and communicate the benefits public lands deliver to the broader public, even if in only qualitative terms.[10] Presumably, it would not be news to most people that federal public lands can benefit the surrounding and even distant human populations, in ways consistent with ecosystem services theory.[11] But the existing and potential flow of services is vast and has not been coherently managed and communicated as such.[12] Getting this message out, however, will require a substantial research and communication effort.

Fundamentally speaking, the ecosystem services framework went from an idea to a dominant policy theme precisely because it

6. The extensive literature on the economics of ecosystem services given their status as public goods is surveyed in RUHL ET AL., *supra* note 3, at 57–83.

7. *See* James Salzman, *Creating Markets for Ecosystem Services: Notes from the Field*, 80 N.Y.U. L. REV. 870 (2005).

8. J.B. Ruhl, *Ecosystem Services and Federal Public Lands: Start-Up Policy Questions and Research Needs*, 20 DUKE ENVTL. L. & POL'Y F. 275, 281 (2010).

9. *Id.*

10. *See id.*

11. *Id.*

12. *Id.*

operationalizes the obvious. By explicitly describing ecosystems as providing economically and culturally valuable benefits *to humans* and proposing a rigorous, scientifically-based argument for integrating those values into private and public decisions, the ecosystem services framework put something on the table that had been missing from the conservation side of the negotiation of environmental policy and decision making: money. For too long the argument in support of conservation had depended largely on appeal to environmental well-being and intrinsic values of nature; whereas the argument in support of resource development has had human well-being, especially in the form of economic progress, on its side. And money talks, plain and simple. The ecosystem services framework might not even up the stakes in that sense, but by putting raw economic values and other contributions to human well-being in play on behalf of conservation, it goes far to change the negotiation dynamics and final terms in the never-ending struggle between conservation and development. That may sound crass, and, as discussed below, it rankles many who place primacy on environmental conservation, but it is what it is. Nevertheless, it is hard to argue with the key tenet of the ecosystem services framework in an objective sense—the environment unquestionably delivers economically valuable benefits *to humans*.

II. A BRIEF (PERSONAL) HISTORY OF THE ECOSYSTEM SERVICES FRAMEWORK IN SCIENCE AND LAW

Ecologists and economists have been actively forging the theory and application of the ecosystem services framework since the early 1970s,[13] but only in the past decade has the concept begun to register in any meaningful way in federal environmental

13. *See* Harold A. Mooney & Paul R. Ehrlich, *Ecosystem Services: A Fragmentary History*, *in* NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS 11 (1993); Erik Gomez-Baggethun et al., *The History of Ecosystem Services in Economic Theory and Practice: From Early Notions to Markets and Payment Schemes*, 69 ECOLOGICAL ECON. 1209 (2010); Ruhl & Salzman, *supra* note 3, at 158–61.

law and policy.[14] I am going to present the history of how the ecosystem services framework got from point A to point B, not through a chronological account of events, but rather through a more personal story about the people who significantly influenced the theme along the way. It is a partial history in the sense that I won't recognize every person that has had something to do with it. It's personal because I am going to emphasize people who influenced me, who affected my particular pathway to this point. Part of my reason for doing this, besides just self-indulgently wanting to thank them, is to illustrate that I've taken some chances and said yes to invitations that didn't seem to be leading anywhere obvious, but that doing so paid off in big ways for me in terms of my personal development as a lawyer and legal academic. So the lesson for you law students and young lawyers is to take an opportunity when handed to you. Say yes, especially when you sense an idea is emerging and you want to be a part of it. And my story is largely about a growing web of people who took the same chances and slowly started to interconnect. The current state of play for ecosystem services in law and policy today is the result of people who fifteen to twenty years ago decided to push an idea they thought was promising into the mainstream. Be part of networks like that yourselves as you construct your careers. Think about the people you'll be working with, and how together you might help the next new idea become a big idea.

Of course, the idea that the environment benefits humans is not a new idea. People get that the environment is good for humans, and they've gotten it for a long time. Plato bemoaned the fact that human populations were, even as long ago as his time, abusing the environment, and he observed how important the environment was for supporting human civilization.[15] The modern research agenda, however, has the benefit of a much more robust apparatus for examining the intersection of ecosystems and economies. We can, in other words, take Plato's observation and put it into action.

14. *See* RUHL ET AL., *supra* note 3, at 127–57; Ruhl & Salzman, *supra* note 3, at 163–64.

15. *See* Salzman, *supra* note 1, at 594.

The first step in doing so was to lay out the ecosystem services concept at a macro level. The early days of ecosystem services thus were defined by some very important big-picture publications. For example, Stanford University biologist Gretchen Daily edited a book, *Nature's Services*, published in 1997.[16] This was the first attempt to unpack the idea into different ecosystems and generate lists of different services for each, such as forest ecosystem services, fresh water ecosystem services, and coastal and marine ecosystem services.[17] To put some dollar signs into the picture, ecologist Robert Costanza, while at the University of Maryland, led a research team that published a very high-profile article in *Nature* titled *The Value of the World's Ecosystem Services and Natural Capital*.[18] They placed the value of global ecosystem services at $33 trillion.[19] That is a lot of money. The point was not that there is actually that much money flowing through the economy in the form of ecosystem services, but just the opposite—markets underestimate the value of ecosystem services that we derive from global ecosystems.

These two publications were quite influential, generally and also for me personally. The challenge they left, of course, was how do we actually take this idea out into the field and say, there is a ten-acre wetlands tract providing services of some kind to a particular human population in a particular way, time, and location? That's where the real hard work had to begin. Coming up with the list of possible wetland or forest ecosystem services is intuitive in many ways. Identifying, measuring, monitoring, and valuing the services in the field is a much different undertaking.[20] Think about it. We first have to identify the natural capital, the ecosystem structures and processes providing us a service. That's the capital in the economy of ecosystem services; it just happens to be natural, not financial, technological, or social capital. But natural capital is not economically valuable in and of itself—the values of ecosystem

16. NATURE'S SERVICES, *supra* note 3.

17. *Id.*

18. Costanza, *supra* note 3.

19. *Id.* at 253.

20. The mapping challenge discussed in this paragraph is covered in detail in RUHL ET AL., *supra* note 3, at 36-56.

services depend on their provision to human populations. So we have to think about how the service is being provided to humans: what is the service, when and where is it provided, and to whom? In short, how does the service get delivered to human populations? This is not always straightforward. For example, if we are talking about riparian habitat on a river system, some of the services are provided nearby in the form of thermal regulation, but others are provided well downstream in the form of flood control or sediment control. We have to trace that service flow spatially and temporally, and we have to identify the human populations that benefit from a service and determine where they are and when the service is delivered. And the forest might be providing multiple services to different human populations at different scales and different times. For example, flood control benefits a local population intermittently, whereas carbon sequestration benefits the global population continuously.

Unless we can map ecosystem services in this complex framework, we really can't get far toward integrating them into private markets and public policy.[21] In particular, four disciplines merge at the core of this challenge: ecology, to understand the ecological structures and processes that create the potential to produce and deliver ecosystem services; economics, to understand how those delivered ecosystem services provide value to human beneficiaries; geography, to piece together 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; and law, to operationalize the science into public policy and market transactions. So it is no surprise that many of the figures who follow in my story fit into one or the other of those four disciplines.

For me it all started with a chance occurrence in 1998. I was sitting in my office one day at Southern Illinois University Law School (SIU), where I began my teaching career, and Jim Salzman, at the time at American University Law School and now at Duke Law School, called me and asked whether I'd like to attend a conference on ecosystem services being planned at the

21. *See* PETER KAREIVA ET AL., NATURAL CAPITAL: THEORY AND PRACTICE OF MAPPING ECOSYSTEM SERVICES (2011).

Missouri Botanical Gardens, known as MOBOT. I had read *Nature's Services* and the *Nature* article and was intrigued by the concept, so I said yes. Why not? Peter Raven, who was the MOBOT president at the time, hosted the conference. Gretchen Daily and Geoff Heal of the Columbia Business School were the main organizers. Jim and I show up. We're sitting in an audience of about 100 people in a lecture auditorium. There were forty-nine economists, forty-nine ecologists, and two lawyers: Jim and me. About halfway into the conference Jim and I observed that there seemed to be only a few legal academics following the topic closely, yet we could think of all sorts of legal questions and applications. So we decided then and there to begin working on this theme from the law and policy perspective.

Jim visited at Stanford the year after, and along with Gretchen Daily and Stanford Law School's Buzz Thompson, he organized a workshop on ecosystems services funded partially by a grant from the U.S. EPA. About six other legal academics and I attended along with representatives of other disciplines, and we mostly theorized about how the ecosystem services framework could be operationalized in law. The papers were published in a special issue of the *Stanford Environmental Law Journal* in 2001.[22]

The MOBOT meeting and Stanford workshop were transformative for me. While teaching at SIU, I had entered the Geography Department PhD program in 1996. My doctoral committee mentors, geographer Chris Lant and economist Steven Kraft, attended the MOBOT conference as well and afterwards nudged me towards working ecosystem services into my dissertation. It ultimately became the theme of my doctoral work. But what would form my dissertation empirical study component? Well, while at the MOBOT conference, Jim Salzman and I decided to study the wetlands mitigation banking component of the compensatory mitigation program the Corps of Engineers and EPA administer under section 404 of the Clean

22. *See* Lisa A. Wainger et al., *Wetland Value Indicators for Scoring Mitigation Trades*, 20 STAN. ENVTL. L.J. 309 (2001).

Water Act,[23] and we finished the first draft of the paper at the Stanford symposium.[24] That paper gave me the idea of studying the geographic distribution of wetland impact and bank sites in order to explore the idea that mitigation banking might be redistributing ecosystem services across the landscape. I joined the faculty at Florida State University College of Law (FSU) in 1999, and begin to apply the study to Florida's mitigation banking program. My research assistant, Adam Schwartz, spent one year hounding government agencies to give us what was, theoretically, publicly available information on mitigation bank sites and their associated impact sites. As I was assembling the data and gearing up GIS studies, Don Elliot, a former Yale Law School professor who remained an adjunct there after moving back into private practice, invited me to deliver a paper at a seminar he was offering as an adjunct at Georgetown Law School. I said yes. Why not? I told him about my mitigation banking project and we decided I would present that. When I arrived for the seminar, Don had invited Palmer Hough of the EPA, who happened to be working at the time on a joint rulemaking with the Corps of Engineers to overhaul the section 404 compensatory mitigation program. He asked for a copy of my empirical study, which eventually was published in the *National Wetlands Newsletter*,[25] to help inform the rulemaking. Again, a chance occurrence. I said yes. Why not?

It was now seven years after the MOBOT meeting and, as I was wrapping up my PhD. I received a phone call from an old friend, Brad Raffle. Brad had worked with me in private practice at Fulbright & Jaworski. He left Fulbright to go to work in-house at Conoco, then left Conoco to become a partner at Baker & Botts in Houston. Then he left Baker & Botts to form Conservation Capital, which he positioned to "broker" ecosystems services—to match up natural capital owners with the beneficiaries of the ecosystem services in market transactions. That's called taking a

23. See Palmer Hough & Morgan Robertson, *Mitigation Under Section 404 of the Clean Water Act: Where It Comes From, What It Means*, 17 WETLANDS ECOLOGY & MGMT. 15 (2009).

24. *See* James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607 (2000).

25. *See* J.B. Ruhl & James Salzman, *The Effects of Wetlands Mitigation Banking on People*, NAT'L WETLANDS NEWSL., Mar.–Apr. 2006, at 1, 9–14 (2006).

chance: to leave a partnership at Baker & Botts to become an ecosystem services entrepreneur. Brad had called to invite me to speak at a conference on ecosystem services in Houston that Rob Doudrick of the U.S. Department of Agriculture was organizing. I said yes. Why not? I also suggested they invite Jim Salzman, which they did. When Jim and I saw the conference program, we thought they had assembled a great set of speakers, but we wondered whether anyone would show up in the audience. When we walked into the lecture hall and there were about 400-500 people there from government agencies, companies, university departments, and NGOs, we were amazed, stunned. The idea clearly had picked up steam in the "real world" since the MOBOT conference.

Indeed, largely due to the influence of the *Millennium Ecosystem Assessment*, which carried the imprimatur of the United Nations and provided a universal lexicon for ecosystem services discourse, by 2005 the ecosystem services framework was being mainstreamed in environmental policy discourse. For example, Jim and I organized a second symposium on the topic, this time at FSU in 2006, and by then over a dozen legal scholars were eager to participate and had developed very robust studies of how the framework was gaining traction in law and policy. FSU's *Journal of Land Use & Environmental Law* published that set of papers in 2007.[26] Island Press published my dissertation, with the addition of several case studies from Chris and Steve, in 2007 as *The Law and Policy of Ecosystem Services*.[27] Then Jody Freeman of Harvard Law School invited me to visit there for a semester to teach, among other courses, a seminar on ecosystem services. I said yes. Why not?

Many NGOs by then were deep into exploring how to use ecosystem services to improve environmental policy. For example, while at Harvard, I stumbled onto the work of Tundy Agardy, of the Marine Ecosystem Services Program (MARES). Tundy was an example of someone working tirelessly in the NGO world to identify opportunities to use the ecosystem services framework.

26. *See* J.B. Ruhl & James Salzman, *Proceedings from the Symposium on the Law and Policy of Ecosystem Services: The Law and Policy Beginnings of Ecosystem Services*, 22 J. LAND USE & ENVTL. L. 157 (2007).

27. RUHL ET AL., *supra* note 3.

There were dozens of Tundys out there working to put ecosystem services into action. I called her, even though I didn't even know her, and invited her to speak in my seminar. She said yes. Why not? She flew in from Africa, landed at Logan, took a cab to my class, spoke for an hour and a half, took a cab back to Logan and went on to her next assignment. Now that's commitment.

Around this time, the ecosystem services framework also started to infiltrate public agencies. For example, the EPA initiated a program called the Ecosystem Services Research Project (ESRP). Rick Lindhurst was the head of it, and Iris Goodman was an instrumental part of the team. I heard of their work and decided to invite Iris to speak in the Harvard seminar. She said yes. Why not? Soon after that, the ESRP hired a team of outside researchers as special employee consultants, including Jim Boyd at Resources for the Future and Lisa Wainger at the University of Maryland, to help steer and inform the research. I was hired to provide a law and policy perspective. ESRP was a tremendous research effort aimed at focusing science on policy-relevant ecosystems services applications. Carl Shapiro at the U.S. Geological Survey picked up on that theme as well, integrating ecosystem services research into their programs. He was also instrumental in starting the *A Community on Ecosystem Services* annual meeting, which today is a substantial event attracting hundreds of speakers and attendees each year.[28]

As scientific research for the framework was broadening, so too legal research continued to develop. In addition to the legal scholars who participated in the Stanford and FSU workshops, most particularly Buzz and Jim, I will mention two others who have truly advanced the ball. Lydia Olander at Duke's Nicholas Institute has organized a fabulous initiative, the National Ecosystem Services Partnership, which among other things has commissioned experts to scour through existing laws to find opportunities to leverage ecosystem services into decision-making.[29] That's really what you have to do given the slim

28. *See Conference Overview,* A CMTY. ON ECOSYSTEM SERVS., http://www.conference.ifas.ufl.edu/aces/ (last visited Nov. 20, 2014).

29. *See National Ecosystem Services Partnership,* DUKE NICHOLAS INST., http://nicholasinstitute.duke.edu/initiatives/national-ecosystem-services-partnership#.VGURDIvF_Dl (last visited Nov. 20, 2014).

likelihood of significant congressional action on the theme any time soon. We must find hooks in existing laws on which to hang the ecosystem services framework hats. Also, Keith Hirokawa at Albany Law School is doing some fabulous academic work on ecosystem services in a variety of promising contexts.[30] So really, the word has spread and now it's about getting down into the details of how to translate this into law and policy.

So that's a brief glimpse into how I got to this point in my research. It doesn't do justice to how the ecosystem services web of players expanded like a nova during the 1990s and 2000s, but it gives you a sense of how one person got swept up along the way and, I like to think, made some contributions. Now let's look at where that process has taken ecosystem services to date.

III. THE CURRENT STATE OF PLAY IN LAW AND POLICY

The hard cases for operationalizing the ecosystem services framework in public policy and private markets are the regulating and supporting services. We already have long-standing markets and policies for provisioning services like crops and cultural services like recreation. It is much more difficult to get a handle on how to bring the regulating and supporting services themes into private markets and public policy. There are three major obstacles in this regard.

First, as I said previously, regulating and supporting services often have the qualities of public goods. Because the natural capital owner can't easily market the service, there is no reason to take it into account when considering alternative uses of the property.[31] And because the service beneficiaries do not have to pay for the service, they do not invest in the natural capital needed to support it. The inevitable consequence of this incentive structure is the depletion of natural capital.[32]

30. *See, e.g.*, Keith H. Hirokawaa & Elizabeth J. Porter, *Aligning Regulation with the Informational Need: Ecosystem Services and the Next Generation of Environmental Law*, 46 AKRON L. REV. 963 (2013).

31. Christopher L. Lant et al., *The Tragedy of Ecosystem Services*, 58 BIOSCIENCE 969, 970–71 (2008).

32. *Id.*

Second, what to do about the first major obstacle is complicated by the lack of clear property rights.[33] Who owns pollination? Who owns photosynthesis? Are these property rights that run with the land? Or is providing these public goods a baseline expectation society demands of property owners? What services must property owners deliver to society versus those they may claim as theirs to control and choose to deplete or, if they can, sell into markets? And if regulation steps in to prevent property owners from making that choice, have property rights been taken without just compensation?

Third, however we decide to respond as a matter of policy, we are working with outdated laws. We're working with laws that haven't been substantially amended since 1990, before the concept of ecosystem services was even in play. That's why projects like the National Ecosystem Services Partnership's review of existing laws are so important. Some of my work is in that vein as well—testing the limits of the *Chevron* doctrine to see how far agencies can integrate ecosystem services into decision making under existing statutes.[34]

Now, only four years ago you heard about ecosystem services from Jim Salzman when he was Pace's Kerlin Lecturer,[35] and he covered a lot of the ground I've covered so far, including giving his own personal history with ecosystem services. So from here I am going to give you an update on the law and then take us in a new direction.

Despite the obstacles outlined above, we find the ecosystem services framework continuing to gain traction in law and policy in five important realms: government payment programs, regulatory programs, public lands programs, impact assessment programs, and the common law and other judicial doctrines. I will briefly go through examples of recent developments in each of those applications. Jim's lecture focused, as well, on the private sector; specifically, where the private markets are in ecosystem services. Unfortunately, they really haven't materialized as much as many expected they would, and Jim has been delving into that

33. *See* RUHL ET AL., *supra* note 3, at 87–126.

34. See J.B. Ruhl, *Ecosystem Services and the Clean Water Act: Strategies for Fitting New Science into Old Law*, 40 ENVTL. L. 1381 (2010).

35. *See* Salzman, *supra* note 1.

problem in his work. I will focus on the public law and judicial doctrines.[36]

A. Payment programs

There are some government-led programs for payments for ecosystem services (PES). For example, in Florida, the Northern Everglades Payment for Environmental Services program,[37] which developed out of the Florida Ranchlands Ecosystem Services Project pilot program,[38] is now up and running, providing ranchers payments for altering onsite water flows and retention to improve water quality and quantity conditions in Lake Okeechobee. That is a viable PES program now, with over $45 million in funding administered by the South Florida Water Management District. There are also a number of watershed-based PES programs now proliferating around the country.[39]

Most prominently, however, the 2008 Farm Bill directed the USDA to "establish technical guidelines that outline science-based methods to measure the environmental services benefits from conservation and land management activities in order to facilitate the participation of farmers, ranchers, and forest landowners in emerging environmental services markets."[40] The USDA now explicitly recognizes ecosystem service values as a basis for payments under traditional conservation program payments,[41] but so far not much has come out of the Farm Bill

36. For a thoughtful and more in-depth review of some of the programs I cover, see Lynn Scarlett & James Boyd, *Ecosystem Services and Resource Management: Institutional Issues, Challenges, and Opportunities in the Public Sector*, ECOLOGICAL ECON. (2013), http://www.sciencedirect.com/science/article/pii/S0921800913002991.

37. *See Water Storage Strategies*, S. FLA. WATER MGMT DIST., http://my.sfwmd.gov/portal/page/portal/xweb%20protecting%20and%20restoring/water%20storage%20programs (last visited Nov. 20, 2014).

38. *See* FLA. RANCHLANDS ENVTL. SERVICES PROJECT (2015), http://www.fresp.org/.

39. *See* Genevieve Bennett et al., CHARTING NEW WATERS: STATE OF WATERSHED PAYMENTS 2012 49-66 (2013), *available at* http://www.forest-trends.org/documents/files/doc_3308.pdf.

40. Food, Conservation, and Energy Act of 2008, Pub. L. No. 110-246, § 2709, 122 Stat. 1651 (codified as amended at 16 U.S.C. § 3845 (2012)).

41. 7 C.F.R. §§ 625.8(f), 1467.20(b) (2014).

provisions in the way of new agricultural PES programs.[42] It is nonetheless significant that the Farm Bill explicitly put the ecosystem services framework into substantive federal legislation.

B. Regulatory programs

As it turns out, not long after my encounter with Palmer Hough of the EPA at the Georgetown seminar, the EPA and the Corps promulgated their new wetlands compensatory mitigation rule in 2008.[43] Significantly, it explicitly requires that the Corps take into account the ecosystems service impacts on humans of moving wetlands around the landscape through the compensatory mitigation program, particularly through mitigation banks.[44] It is taking some time for the Corps to implement that evaluation in the field, but this is progress in terms of explicitly putting the ecosystem services framework into action in a regulatory regime.

C. Public land management programs

The Forest Service has put ecosystem services front and center in the agency's 2012 land and resources management planning rule.[45] The regulations require that plans identify and evaluate "benefits people obtain from the [National Forest Service] planning area (ecosystem services)."[46] Similarly, the Bureau of Land Management has recently developed guidelines on evaluating non-market environmental values for their land management programs.[47] These approaches are in their infancy,

42. *See Newsroom*, U.S. DEP'T OF AGRIC., http://www.usda.gov/oce/newsroom/index.htm (last updated Dec. 16, 2014).

43. *See* 33 C.F.R. §§ 325, 332.1; 40 C.F.R. § 230.41; Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19,594 (Apr. 10, 2008); *see also* J.B. Ruhl et al., *Implementing the New Ecosystem Services Mandate of the Section 404 Compensatory Mitigation Program—A Catalyst for Advancing Science and Policy*, 38 STETSON L. REV. 251 (2009).

44. *See* 33 C.F.R. § 332.3(d)(1).

45. *See* 36 C.F.R. § 219.1 (purposes); 36 C.F.R. § 219.6 (assessment); 36 C.F.R. § 219.8 (sustainability); 36 C.F.R. § 219.10(a) (planning); 36 C.F.R. § 219.19 (definition).

46. 36 C.F.R. § 219.6(b)(7).

47. *See* Memorandum on Guidance on Estimating Nonmarket Environmental Values from Assistant Director, Renewable Resources and Planning, Bureau of

but they are examples of agencies adopting the ecosystem services framework to steer public land management decisions.

D. Assessment programs

Environmental impact assessment programs are probably where the ecosystem services framework is getting the most traction now. The National Oceanic and Atmospheric Administration (NOAA), for example, uses a service-based metric in their natural resources damages assessments.[48] The Corps has developed a policy for integrating ecosystem services impacts in its infrastructure project planning.[49] Further, the National Research Council used an ecosystem service approach to assess the impacts of the Deepwater Horizon Oil Spill.[50]

A prominent application of the ecosystem services framework in assessment programs occurred in 2013 regarding national water resources. In the Water Resources Development Act of 2007, Congress directed that the 1983 Principles and Guidelines, utilized by a variety of federal agencies for water resources planning and development, be updated to reflect national priorities, including not only economic development, but also protection and restoration of natural system functions supporting economic sustainability.[51] In 2013, the White House released the updated P&Gs, which state project assessments "should apply an

Land Mgmt., U.S. Dep't of the Interior (2013), *available at* http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2013/IM_2013-131__Ch1.print.html.

48. *See Environmental Economics - Introduction*, DAMAGE ASSESSMENT, REMEDIATION, & RESTORATION PROGRAM, http://www.darrp.noaa.gov/economics/ (last updated Feb. 13, 2013).

49. *See* DENISE REED ET AL., INSTITUTE OF WATER RESOURCES, USING INFORMATION ON ECOSYSTEM GOODS AND SERVICES IN CORPS PLANNING: AN EXAMINATION OF AUTHORITIES, POLICIES, GUIDANCE, AND PRACTICES (2013), *available at* http://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/EGS_Policy_Review_2013-R-07.pdf.

50. *See* NAT'L RESEARCH COUNCIL, AN ECOSYSTEM SERVICES APPROACH TO ASSESSING THE IMPACTS OF THE DEEPWATER HORIZON OIL SPILL IN THE GULF OF MEXICO (2013), *available at* http://www.nap.edu/catalog.php?record_id=18387.

51. *See Updated Principles and Guidelines for Water and Land Related Resources Implementation Studies*, COUNCIL ON ENVTL. QUALITY, http://www.whitehouse.gov/administration/eop/ceq/initiatives/PandG (last visited Feb. 5, 2015).

ecosystem services approach in order to appropriately capture all effects (economic, environmental and social) associated with a potential Federal water resources investment."[52]

What about the National Environmental Policy Act (NEPA)?[53] I would like to have seen the Council on Environmental Quality move more into this realm and develop some kind of an ecosystem services assessment guideline for NEPA. They haven't yet. But I think it would be an easy case to include ecosystem services assessments as part of a standard NEPA environmental assessment.[54]

E. Common law and other judicial doctrine

The courts are getting in on the ecosystem services framework trend as well. One example is the remand decision from the Supreme Court's decision in *Palazzolo v. Rhode Island*,[55] in which the state trial court held that because a development would degrade the ability of a marsh to filter and clean runoff, it would constitute a public nuisance and, therefore, under the so-called nuisance exception to regulatory takings, the state's denial of the permit for the development did not constitute a taking.[56] And what's interesting is that the court almost seems surprised: wow! The marsh actually filters and cleans runoff! That was an "aha" moment in the courts. Similarly, the public trust doctrine came into play in a Louisiana Supreme Court decision upholding a fresh water diversion project against a regulatory taking claim by some oyster bed lessees.[57] The court concluded that improving

52. *Principles and Requirements for Federal Investment in Water Resources*, WHITEHOUSE.GOV (Mar. 2013), http://www.whitehouse.gov/sites/default/files/final_principles_and_requirements_march_2013.pdf; *see also* Water Resources Development Act of 2007, Pub. L. 110–114, 121 Stat. 1041 (codified as amended at 33 U.S.C. § 1301 (2007)).

53. National Environmental Policy Act of 1969, 42 U.S.C. § 4332 (2012).

54. *See generally* NAT'L ECOSYSTEM SERVS. P'SHIP, INTEGRATION OF ECOSYSTEM SERVICES VALUATION ANALYSIS INTO NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE: LEGAL AND POLICY PERSPECTIVES 6 (2014), *available at* http://nicholasinstitute.duke.edu/sites/default/files/publications/frmes_lp_1_nepa.pdf.

55. Palazzolo v. Rhode Island, 533 U.S. 606 (2001).

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

57. *See* Avenal v. State, 886 So. 2d 1085 (La. 2004).

the coastal resources provides an important barrier for coastal populations against storms.[58] They know something about that in Louisiana.

Indeed, the New Jersey Supreme Court recently went far towards embedding the ecosystem services framework into judicial doctrine, in this case, the rules governing just compensation for takings of private property. In *Borough of Harvey Cedars v. Karan*, a New Jersey Shore home-owning couple complained that the government's post-Sandy dune restoration program, which placed higher dunes on shorefront properties, diminished their view of the ocean and claimed $375,000 in just compensation.[59] The obvious response from the state was that they might not have such a great view, but at least they're going to have a house the next time a storm like Sandy hits.[60] The lower court said that is not proper offsetting under the New Jersey court-made doctrine governing just compensation, which disallowed offsetting of private losses by public benefits, and the jury awarded $375,000 to the homeowners.[61] The state high court said, in essence, if that's how the doctrine works then the doctrine is silly, because obviously the storm protection benefits the dune will provide to the homeowner should be taken into account.[62] The court remanded the matter to the trial court to require the jury to determine how much the protective services the dune is providing are worth to those homeowners *in dollars*.[63] And I say that's great. That is exactly how we should be using the ecosystem services framework. The homeowners saw the writing on the wall and settled the case. After having been awarded $375,000 by the jury the first time, they settled the case for one dollar.[64] I think they knew what the second outcome would be.

58. *Id.* at 1101.

59. Borough of Harvey Cedars v. Karan, 70 A.3d 524 (N.J. 2013).

60. *Id.* at 526.

61. *Id.*

62. *Id.* at 540-41. Florida has codified this approach. *See* FLA. STAT. § 161.141 (2014).

63. *Id.*

64. *See* MaryAnn Spoto, *Harvey Cedars Couple Receives $1 Settlement for Dune Blocking Ocean View*, NJ.COM, Sept. 25, 2013, http://www.nj.com/ocean/index.ssf/2013/09/harvey_cedars_sand_dune_dispute_settled.html.

While we have a ways to go before the ecosystem services framework is fully up and running in environmental law, these are signs of progress. I think that right now the courts are beginning to get it. Public payment systems are probably where we are going to see ecosystem services become a metric. Environmental assessment programs are also ripe for integrating the ecosystem services framework, and the public land management agencies are definitely moving in this direction. But, it will be a slower game in terms of regulating private landowners, the Corps wetland mitigation regulation being the major exception so far.

IV. PUSHBACK

In his Kerlin lecture four years ago, Jim Salzman used the interesting metaphor of ideological cross-dressing to make the point that Liberals and Libertarians alike should love the ecosystem services framework, because it appeals to both environmental values and economic values.[65] He reminded us that the Bush administration pushed the 2008 Farm Bill that included provisions on ecosystem services markets.[66] Well, I agree that there is a bit of a strange bedfellow dynamic behind support for the ecosystem services framework, but guess what—some of them are seeking a divorce. There's pushback from both those who place primacy on environmental conservation and those who place primacy on economic development.

A. Environmental Primacy Critique

The chief concern coming from those who place primacy on environmental conservation is that incorporating ecosystem services into markets and public policy will commodify nature[67] and oversimplify environmental challenges in the public mind.[68]

65. *See* Salzman, *supra* note 1, at 609.

66. *Id.* at 606.

67. *See* Nicolas Kosoy & Esteve Corbera, *Payments for Ecosystem Services as Commodity Fetish*, 69 ECOLOGICAL ECON. 1228 (2010).

68. *See* Roldan Muradian et al., *Reconciling Theory and Practice: An Alternative Conceptual Framework for Understanding Payments for Environmental Services*, 69 ECOLOGICAL ECON. 1202 (2010); Richard B.

They don't want people to think about how much a wetland is worth in dollar terms, as that could dilute the public's perception of the wetland's environmental and intrinsic values. Worse, once you assign dollars signs to nature, big corporations are going to move in and we'll have corporatized the environment even more than already is the case. The corporate culture, the concern goes, will use ecosystem services as a cover for technology and development, because they'll be able to engineer ecosystems to mitigate resource development rather than preserve nature *in situ*. In short, the ecosystem services framework, it is alleged, is a front for more neo-liberal capitalism.[69]

The other major pushback theme from environmental interests, particularly in the Global South, comes from land tenure advocates who argue that by commoditizing ecosystem services, we open the door to greater state and corporate control of the environment at the expense of poor and other marginalized populations.[70] The fear is that the powerful alignment of state and corporate interests ultimately will push indigenous populations off of their lands because of the very ambiguous land tenure systems that many countries have.[71] In general, the concern is that the market efficiency, payments, and property rights themes of the ecosystem services framework, even when purportedly aimed at ameliorating poverty, ignore equity concerns.[72]

Another concern is that advocates of the ecosystem services framework are masking the tradeoffs of managing for particular

Norgaard, *Ecosystem Services: From Eye-Opening Metaphor to Complexity Blinder*, 69 ECOLOGICAL ECON. 1219 (2010); Bhaskar Vira & William M. Adams, *Ecosystem Services and Conservation Strategy: Beware the Silver Bullet*, 2 CONSERVATION LETTERS 158 (2009).

69. *See* Brett Sylvester Matulis, *The Economic Valuation of Nature: A Question of Justice?*, 104 ECOLOGICAL ECON. 155 (2014).

70. For an extensive discussion of this theme, see Sharachchandra Lele, *Environmentalisms, Justices and the Limits of Ecosystem Services Frameworks, in* THE JUSTICES AND INJUSTICES OF ECOSYSTEM SERVICES 119 (Thomas Sikor ed., 2013) [hereinafter "JUSTICES AND INJUSTICES"].

71. *See* Diana Suhardiman et al., *Payments for Ecosystem Services in Vietnam: Market-Based Incentives or State Control of Resources?*, 6 ECOSYSTEM SERV. 64 (2013).

72. *See* Unai Pascual et al., *Exploring the Links Between Equity and Efficiency in Payments for Environmental Services: A Conceptual Approach*, 69 ECOLOGICAL ECON. 1237 (2010).

ecosystem services.[73] There's a saying in wildlife management that if you manage for ducks you get ducks. Likewise, if you manage for carbon sequestration you get carbon sequestration. If you manage for groundwater recharge you get groundwater recharge. Do we want to engineer specialized ecosystems to provide our preferred flows of ecosystem services? If so, what ecosystem structures and processes are relegated to the sidelines?

There is also a social justice dimension to the ecosystem services specialization question.[74] If we are going to manage for specific ecosystem services, which services and for which beneficiaries? Particularly with climate change likely to disproportionately impact vulnerable low-income populations, how do we ensure that public investments in natural capital as part of adaptation planning provide an equitable resilience profile?[75]

Finally, there is the so-called stacking problem, which raises the concern that landowners and other market participants will game the ecosystem services framework.[76] This concern postulates a day when a property owner, say of a wetland, could split the property into all the discrete services it provides and sell them in different credit markets operated by public agencies and private interests.[77] A credit for the habitat, a credit for the groundwater recharge, a credit for this other service, and so on. So, like the plot in the movie *A Funny Thing Happened on the Way to the Forum*, we could be selling the wetland twenty times. But it's just one wetland, not twenty discrete streams of services. Or is it? Can we really slice it and dice it so that these credits are going in many different directions and we suffer no net loss of ecological structures and functions?

73. *See* Elena Bennett et al., *Understanding Relationships Among Multiple Ecosystem Services*, 12 ECOLOGICAL LETTERS 1394 (2009); A.P. Kinzig, *Paying for Ecosystem Services—Promise and Peril*, 334 SCIENCE 603 (2011); Robert B. Jackson et al., *Trading Water for Carbon with Biological Carbon Sequestration*, 310 SCIENCE 1944 (2005).

74. *See* Katie K. Arkema et al., *Coastal Habitats Shield People and Property from Sea-Level Rise and Storms*, 3 NATURE CLIMATE CHANGE 913 (2013).

75. *See generally* JUSTICES AND INJUSTICES, *supra* note 70.

76. *See generally* Royal C. Gardner & Jessica Fox, *The Legal Status of Environmental Credit Stacking*, 40 ECOLOGY L.Q. 713 (2013).

77. *Id.* at 717.

B. Economic Primacy Critique

Although most of the pushback on the ecosystem services framework as to date come from the environmental conservation side, those who place primacy on economic development, particularly in the form of property rights, also have their beef with ecosystem services. Their concern is that the ecosystem services framework is a cover for more regulation and erosion of property rights. For example, a few years ago Jim Huffman, then Dean of Lewis & Clark Law School, wrote a scathing critique of an article I published in the same issue of the *Case Western Reserve Law Journal*.[78] I suggested in my article, much as the trial court ruled in *Palazollo,* that one landowner's interference with the provision of ecosystem services benefitting another landowner could be actionable as a private and public nuisance.[79] Jim warned that I was being sneaky. "It's a Trojan Horse," he claimed, "because Ruhl wants courts to do just what the *Palazzolo* court did and find no regulatory taking when the government steps in to regulate the depletion of natural capital."[80] My proposal, he argued, was "a radical disruption of the settled expectations that the common law exists to protect."[81] I published a response a few years later with Mike Blumm, Jim's colleague, in the *Ecology Law Quarterly*, arguing that my position represents the natural evolution of nuisance law responding to new understanding and knowledge about the value of ecosystems.[82] The background principles of property law can and do change—Justice Scalia said so![83] Well, Jim, they have changed. It was a lively debate, to say the least.

78. *See generally* James L. Huffman, *Beware of Greens in Praise of the Common Law*, 58 CASE W. RES. L. REV. 813 (2008).

79. *See* J.B. Ruhl, *Making Nuisance Ecological*, 58 CASE W. RES. L. REV. 753, 763 (2008).

80. *See* Huffman, *supra* note 78, at 826.

81. *Id.* at 814.

82. See Michael C. Blumm & J.B. Ruhl, *Background Principles, Takings, and Libertarian Property: A Reply to Professor Huffman*, 37 ECOLOGY L.Q. 805, 820-32 (2010).

83. *Id.* at 806-07.

V. PRINCIPLES FOR RESPONSIBLE USE OF THE ECOSYSTEM SERVICES FRAMEWORK

The ecosystem services framework is not a silver bullet, and there is legitimate concern that some of its advocates use it as a panacea. I am not surprised there is pushback, and there is some truth in some of these points. Stacking is a concern to me.[84] We need to be careful about how we slice up ecosystems and spin off credits and services, but I think crediting systems can be implemented if they are designed responsibly. On the other hand, to some of these critiques, I say bring it on. If you don't like what this does to takings law, don't look at me. Blame Justice Scalia—he planted the background principles of the Trojan Horse in the *Lucas* opinion—that they change over time with new knowledge and thus move the regulatory takings baseline.[85] I'm fine with it changing the takings balance.

But I am not going to push back on the pushback by way of point-counterpoint (though I should say that there is plenty of commentary on the benefits of the ecosystem services framework).[86] Rather, below I propose and briefly outline eight principles for the responsible use of the ecosystem services framework. These clarify that the ecosystem services framework is neither panacea nor threat if it is implemented based on rigorous science, a keen eye for equity, and competent and robust oversight.

A. Principle One: The Ecosystem Services Framework Is About Human Well-Being – Enforce a Strict Anthropocentric Test

I will lead my principles with the point emphasized in my opening: the ecosystem services framework is about what the

84. J.B Ruhl et al., *Stacking Ecosystem Services*, 12 FRONTIERS OF ECOLOGY AND ENV'T 186 (2014).

85. *See* Blumm & Ruhl, *supra* note 82, at 606-07.

86. *See, e.g.*, Rudolph S. De Groot et al., *Benefits of Investing in Ecosystem Restoration*, 27 CONSERVATION BIOLOGY 1286 (2013) (study of 200 restoration projects calculates high net social benefits); Hua Zheng et al., *Benefits, Costs, and Livelihood Implications of a Regional Payment for Ecosystem Service Program*, 110 PROC. NAT'L. ACAD. SCI. 16681 (2013) (assessing a large-scale agricultural PES program in China).

environment does *for humans*. It has to be anthropocentric. A wetland providing groundwater recharge in the middle of nowhere is likely not providing the same ecosystem service values as one doing the same in an area where human communities depend on groundwater for water supply. That really bothers some environmental conservation interests, but this idea doesn't work if you call every ecosystem structure and process an ecosystem service.[87] That would negate any value-added the ecosystem services framework lends to environmental policy discourse. To be sure, it is important to think about what benefits the wetland in the middle of nowhere could provide as the land use development moves in its direction, but that contingency has to be made explicit in the analysis. Bottom line: It's about what ecosystems do for humans.

B. Principle Two: Define Equitable Baseline Property Rights and Distributional Impacts

Because the ecosystem services framework is about people, it is important to define, ahead of time, equitable baseline property rights and distributional impacts. Which services do landowners own and which must they deliver to society? In some cases perhaps they must deliver a baseline level but should expect compensation for provision above that level. Similarly, which services will government ensure are equitably enjoyed by human populations? These questions have to be worked out to make PES programs viable.[88] Also, government must regulate private ecosystem service markets, design public PES systems, and manage flows of ecosystem services on and from public lands to ensure distributional equity, just as it does for the distribution of environmental protection and enforcement. To those who are worried about the impacts of PES systems on indigenous and

87. Heather M. Leslie, *A Roadmap to Nature's Benefits*, 332 SCIENCE 1264, 1264 (2011) ("This distinction between processes and services highlights the importance of 'mapping' services explicitly: If no one is living along a particular stretch of coast, then the marsh there does not provide a coastal protection value (although it may well provide other benefits . . .).").

88. *See* Walters Nsoh & Colin T. Reid, *Privatization of Biodiversity: Who Can Sell Ecosystem Services?*, 25 ENVTL. L. & MGMT. 12 (2013); Arild Vatn, *An Institutional Analysis of Payments for Ecosystem Services*, 69 ECOLOGICAL ECON. 1245 (2010).

other marginalized populations in the global south, I say don't blame ecosystem services. The root problem there is inequitable land tenure systems. Get your property rights right, first, then we can really make use of ecosystem services to promote human well-being and address poverty. Bottom line: It has to be equitable.

C. Principle Three: Integrate the Ecosystem Services Framework with Other Environmental Policy Factors

The ecosystem services framework is not designed to supplant or replace the pro-conservation factors already in the environmental policy mix. It is complementary. I think it would be a huge mistake not to include ecosystem services in the mix, but that doesn't mean we aren't also continuing to engage ecological values and intrinsic values. Again, money talks. And if you can't talk money in this world you are not going to get everything you deserve. If conservation proponents sit down at the negotiating table and don't point out that the wetland the government wants to permit for development is providing quantifiably valuable services to the community, they're not putting their best foot forward. Bottom line: Use all you have.

D. Principle Four: Monetization Is the Ideal, But Is Not Usually Necessary

Although money talks loudest in private markets, it will not usually be necessary to monetize ecosystem service values to make good use of them in public policy decisions. The New Jersey dune restoration project involved in the *Borough of Harvey Cedars* case, for example, wasn't predicated on the state establishing a dollar value of the storm protection service the dunes will provide.[89] Only when the property owners demanded compensation for the lost view did anyone seriously expect that the state had to establish the value of storm surge protection for those owners to the penny. Looks like it was going to be a pretty high number. And even when it is necessary to establish economic values for purposes of cost-benefit analysis to support

89. Borough of Harvey Cedars v. Karan, 70 A.3d 524 (N.J. 2013).

public policy decisions, economists have a variety of techniques for estimating dollar values for ecosystem services in the absence of true market price points. Bottom line: Don't get hung up on dollar signs, but if you have them, use them.

E. Principle Five: Make Tradeoffs Explicit

Of course there are tradeoffs when we manage natural capital for ecosystem services. There are tradeoffs in every decision we make about the environment. It's no different when engaging the ecosystem services framework. Indeed, if we were to not engage the ecosystem services framework in private markets and public policy, that would be a tradeoff, as we would have less information at hand to make informed decisions. So, if we don't want to manage for groundwater recharge or carbon sequestration because we are concerned about over-managing for a specific service, then fine. Or if we decide to manage for a specific service, fine. Those are the tough decisions we will need to make. But, we need to make the consequences of any decision about ecosystem services explicit. The tradeoffs need to be put on the negotiation table, and we need robust ecology and economics to back them up. Bottom line: Don't hide the tradeoffs, but don't hide from them.

F. Principle Six: Include Ecosystem Services Impacts in All Environmental Impact Assessments

Given the importance of ecosystem services to human well-being, no resource development decision should proceed without first assessing its impacts to local, regional, and global ecosystem services and including that assessment directly in the alternatives analysis. This would be the most effective platform for making tradeoffs explicit. The Forest Service has led the way in this regard by integrating impacts to ecosystem services into the agency's land use management planning.[90] Doing so has the added effect of "science-forcing." That is, by requiring assessments, agencies will improve the techniques available for

90. *See* Memorandum on Guidance on Estimating Nonmarket Environmental Values, *supra* note 47.

identifying, mapping, and valuing ecosystem services.[91] Bottom line: All environmental impact assessment programs should include assessment of impacts to ecosystem services.

G. Principle Seven: Account for Ecosystem Services in Mitigation, Offset, and Other Environmental Trading Programs

I began my dissertation project on wetland mitigation banking with the naive assumption that I could compare ecosystem services lost at impact sites with those gained at the corresponding bank sites. The flaw in that reasoning was the premise that anyone involved in administering the mitigation banking program had ever bothered to ask what those services were at either location. They hadn't. I resorted to using proxies such as population density to make the point that we ought to make this evaluation. I found, not surprisingly, that densities are far higher around impact sites, which are mostly urban, than around bank sites, which are mostly rural. Mitigation banking and similar programs, such as the Endangered Species Act conservation banking program, focus narrowly on environmental values. Perhaps in some contexts only environmental values matter, but even in such cases if there are alternatives for achieving the same environmental outcome, ecosystem service values could guide which alternative to choose. And it is simply good public policy that humans be informed about the consequences *for humans* of all environmental mitigation programs, offset programs, and similar market-based trading programs. Bottom line: Environmental offset programs should take people into account, too.

H. Principle Eight: Design Carefully and Monitor for Gaming

Even assuming we implement all of the above, chances are we will not always get it right, and there will be those who game the system to their advantage. Indeed, if the history of wetlands

91. *See* Ruhl et al., *supra* note 43, at 265-71 (discussing the science-forcing effects of the 2008 EPA and Corps joint compensatory mitigation rule).

compensatory mitigation is any example, we can almost be sure of it.[92] The design of PES systems, ecosystem services credit systems, and other programs using the ecosystem services framework must be based on rigorous science, pay careful attention to the foregoing principles, employ robust oversight, and continually engage in self-evaluation and adaptive management in response to abuses.[93] I have chiefly in mind here the problem of stacking, but also the tendency for environmental conservation payment programs to be far more adept at distributing money than asking how well the money has been spent. So it will be vitally important as we move forward with the ecosystem services framework to establish a competent administrative regime. Bottom line: It's about humans, so take human nature into account.

VI. CONCLUSION

I believe that these principles, if implemented in tandem, substantially respond to the environmental-primacy and economic-primacy critiques and would allow us to responsibly move forward with the ecosystem services framework in private markets and public policy. There will be no perfect ecosystem services market or policy, however, so we cannot set expectations too high. It is a classic case of not letting the perfect be the enemy of the good. I for one believe that much good can come from employing the ecosystem services framework in private markets and public policy. I am happy, therefore, to have had this opportunity to defend ecosystem services.

92. *See* Rebecca L. Kihslinger, *Success of Wetland Mitigation Projects*, NAT'L WETLANDS NEWSL., Mar.–Apr. 2008, at 14; Ruhl & Salzman, *supra* note 25; Salzman & Ruhl, *supra* note 24.

93. See Margaret A. Palmer & Solange Filoso, *Restoration of Ecosystem Services for Environmental Markets*, 325 SCIENCE 575 (2009); Mary Ruckeshaus et al., *Notes from the Field: Lessons Learned from Using Ecosystem Services Approaches to Inform Real-World Decisions*, ECOLOGICAL ECON. (2013), *available at* http://www.sciencedirect.com/science/article/pii/S0921800913002498#.