Ecosystem services: Acts of simplification and precision

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I. Introduction

Questions of knowledge production offer a useful lens onto socioecological interactions and interfaces. Attention to knowledge production provides glimpses of how we perceive, represent and interact with the material world. Study of whose knowledge and knowledge needs are privileged highlights distributions of power and cultural commitments. Recognition of artifacts and practices as outcomes and, at the same time, the nexus of social and material interactions derives largely from a focus on knowledge production. As pursued through general reference to co-production (Jasanoff 2006; Gustafsson, 2013), knowledge production is a function of interplay between science and policy, the global and the local, and between producers and users of standards. This work allows us to penetrate dualities that obscure important opportunities.

The workshop addresses ‘knowledge production as simplification.’ Simplification can be understood as a process premised on claims regarding which differences matter (Bateson, 1979). Recognizing differences, differentiating among differences and making determinations of the implications of differences – both in terms of choices of variables and amounts of variance – is the stuff of science and engineering. It is also the stuff of everyday life, as we are constantly filtering sensory data and information based on a hidden and largely inaccessible sensitivity analyses that allow us to focus our resources and increase our capabilities relative to some objectives. These determinations of what matters are also determinations of what we can (safely) ignore. Ignoring lies at the core of simplification (Proctor, 2008). Some information filters are genetic and globally shared. I’ll venture an example that I am sure some friends – both ecologists and sociologists - will seize on; humans tend not to ignore snakes, and the attention a snake commands can be understood as an adaptive trait. Other filters, both positive and negative, derive from particular cultural values, judgments and socio-historical processes (i.e., bias, power). Critical social science can be fundamentally thought of as engagement with what and

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2 Thanks to Clive Potter for many relevant conversations.
whom are ignored and, more generally, the production of ignorance. We make a contribution through empiricism informed by skepticism applied to what is presented as organic, self-evident, timeless and placeless.

In this paper I am concerned with claims of ecosystem services as simplification. I focus analysis on two different sites at very different levels, and I derive contradictory results. The first site focuses on popular conceptions of ecosystem services, specifically the characterization of payment for ecosystem services (PES) as a transactional process (See Wunder’s (2000) canonical definition). I offer a critical assessment of PES as Coasian bargaining (simplification #1) and go on to review the realist, institutional perspective on PES that is currently gaining momentum (Vatn 2010; Norgaard, 2010; Fletcher and Breitling, 2012; Wynne-Jones, 2012; Primmer et al. 2013; Boisvert, 2013; Potter and Wolf, 2013; Wolf 2014). This new interdisciplinary wave of thinking about PES takes us beyond neoclassical economics and opens up many exciting possibilities for research and practice.

Building on existing interest in production of metrics and specifications required to operationalize a transactional model of conservation, the second site at which I pursue the question of ecosystem services as simplification is a specific domain of environmental policy and management. I report specifically on ongoing efforts to introduce PES-logic into agrienvironmental policy (AEP) in the US. I emphasize science-policy interfaces and the metrics and models that structure determinations of what constitutes conservation and is therefore worthy of payment. Following the logic of co-production and the commitments of the realist, institutional program, I regard these technical determinations as outcomes of interactions within and across scientific domains and domains of practice. My empirical research highlights historical simplifications embedded in AEP (simplification #2) and how actors are drawing on elements of the PES repertoire to critique existing policies and advance reforms in the name of efficiency and effectiveness. The technical standards in the proposed policy designs are necessarily premised on simplifications. ‘Black-boxes’ and unsupported assumptions can surely be found, and it is quite likely that the knowledge claims acted upon and the knowledge claims ignored reflect social structures. Yet applied to environmental management questions, it is possible to conclude that these PES-like schemes promise to integrate more variables, higher attention to detail, and greater site specificity than those undergirding bureaucratic administrative
procedures of contemporary AEP. Further, it is possible to conclude that introduction of more market logic into AEP will enhance transparency and accountability. Simplifications embedded in PES schemes can be assessed in relation to a counter-factual. Applied to the case of AEP, these simplifications look like precision upgrades.

In summary, the lens of knowledge production as simplification opens up interesting lines of inquiry. Simplification is ubiquitous, useful and it can obscure important information. For this reason, questions of transparency, accountability and governance rise to the top. Applied specifically to PES, it is important to call attention to gross simplifications and to offer correctives. As Einstein expressed it, “make everything as simple as possible, but no simpler.” With respect to the emerging ‘recall’ of PES as understood narrowly through reference to the powerful abstractions of environmental economics, the project is underway. We observe expanding attention to historical, political and organizational dimensions of conservation within analysis of PES. Policy makers and conservation organizations are increasingly curious about the complementary institutional arrangements required to advance incentive-based policies. But I argue that PES should not be interpreted strictly as over-simplified. There is evidence that policies that reflect PES logic have potential to introduce valuable elements of precision into environmental management. As is generally the case, care must be exercised in order to save the baby when we throw out the bath water.

II. The rise of ecosystem services

The rise of ecosystem services as a master frame for environmental policy and management poses important and interesting questions about ecology and political economic relations of environment. The concept emerged as a way to talk about interdependencies between economy, society and ecology in the 1990s. While political geographers and other students of political economy have emphasized commoditization under capitalism as an explanation for the rise of ecosystem services logic (Robertson, 2004; Sullivan, 2009), it can also be understood as an historical outgrowth of conservation organizations’ strategic efforts to achieve gains in the

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3 Recall Law’s recall of actor-network theory, Latour’s recall of nature as agent, and Ostrom’s recall of common pool resource management (beyond panaceas).
absence of vigorous engagement of nation states in conservation. Crudely stated, conservation organizations were tired of waiting for a return to the heyday of the 1970s. It was difficult to maintain optimism and generate excitement about a coming new wave of national legislation that could realign relations between economy and ecology on the one hand, and private demands and public purposes on the other. At the same time, confidence in community-based resource management and common-pool resource management designs within which local people (i.e., users) would come to embrace natural resource conservation rather than exploitation reached some kind of limit. Faced with mounting scientific evidence of environmental change and risks, and personal commitments to engagement, conservationists and ecologists adopted the problem specifications and the remedies of environmental economics (McNeely, 1988; Daily and Ellison, 2002). More specifically, the problem was market failures and failures to have markets, and the solution involved valorization of nature, and eventually, specifying property rights and enabling trade. This framing of the problem and the way forward speaks directly to the power of neoliberal thought in the late 1980s and 1990s, the period when market-based environmental policy instruments achieved lift-off. In this sense, the genesis stories derived from critical social science and conservation planning are complementary.

Out of the project to make visible the contributions of ecosystem to socioeconomic development and security, for example the Millenium Ecosystem Assessment and The Economics of Ecosystems and Biodiversity report, the concept of ecosystem services has been mobilized in creative ways. The most striking and controversial application of the concept lie in the diffusion of designs for payment for ecosystem services (PES) and the even more bold idea of creation of markets for ecosystem services (MES) (Dailey and Ellison, 2002 and what has become The Natural Capital Project). The institutional innovations represented by the US CAA amendments and its construction of tradable pollution permits for sulfur dioxide and the Clean Development Mechanism within the globally-scaled Kyoto Protocol injected power into efforts to reimagine and restructure environmental policy and management. Creation of market-based policy instruments to address climate change (green house gasses), acid rain (SO2), water quality (phosphorous and nitrogen) and the conservation of wetlands and streams continue to spawn diffusion of the concept. The UK is now contemplating a national program of biodiversity offsetting whereby developers would be required/able to conserve or restore habitats in exchange for permits to build roads, houses and shopping centers.
These developments invite a raft of technical and political questions. They speak to ambition, pragmatism, creativity and a deep commitment to conservation on the part of a set of actors who have championed these ideas. At the same time, there is an air of desperation on the part of conservationists who have chosen to go down this neoliberal road. The project of trying to ‘internalize the externalities’ - by getting the prices right and creating new markets (assigning property rights to newly imagined and specified concepts in order to make transactions possible) – is at the same time extraordinarily powerful and naïve. These are the two faces of simplification.

**Beyond stylized conceptions of PES: The realist program**

We appear to be emerging from the first historical phase of a program of development of ecosystem services and now entering into a second phase. In line with the historical analysis of the progression of the conceptualization and practice of ecological modernization - an analysis and positive program of incorporation of ecological limits into market capitalism - the first phase can be seen as flawed. The initial ecological modernization program of technical change supported by policy reform came to be seen as incomplete because there was insufficient attention to the drivers of institutional reform through which states, markets and firms could internalize ecological limits (Mol and Sonnefeld, 2000). Over time, theories of ecological modernization grew to encompass processes of reflexivity (i.e., willingness and capacity to understand ourselves, our actions and our security in relation to ecological processes) that could, conceivably, trigger cognitive and behavioral change at the level of individuals, organizations, institutions and societies (Mol and Sonnenfeld, 2000). I argue that a similar maturation process is underway for ecosystem services. Overly-simplified conceptions and terms of reference are giving way to richer, more encompassing, integrated questions and designs.

The weaknesses of the original program of ecosystem services (ES - Mark I) and the value of the remedies proposed center on knowledge claims, more specifically claims about knowledge production. Payments for ecosystem services (PES) should be understood as something that involves but is not limited to market calculus. The attention devoted to economic valuation of ecosystem services, estimation of willingness to pay and willingness to accept and the attention to contract design have tended to crowd out attention to institutional dimensions of conservation.
and policy. While this diverse set of consideration might be referred to as transaction costs, such a framing keeps us squarely in the domain of economics when what is needed lies outside the contemporary boundaries of economics as a discipline. What is happening now and where we can identify interesting and important questions is recognition that the historical, cultural, political, organizational challenges of creation, implementation and assessment of incentive based conservation schemes require attention. The complexity of PES and the scope of the learning challenge demands that proponents acknowledge that ecological mapping and economic analysis alone cannot explain or advance PES.

By going beyond attention to ecological mapping of ecosystems services and environmental economic efforts aimed at monetary valuation - the core inputs as seen within a transactional conception of PES - this new work addresses knowledge production at a far richer set of sites critical for understanding PES and for advancing incentive-based conservation. For example, study of discourses and processes of innovation within policy communities (Potter and Wolf, 2013; Primmer et al. 2013; Wolf, forthcoming), practices of front line bureaucrats (Wynne-Jones, 2012), performative dimensions of PES (Boisvert, 2013), and the roles of various intermediaries that make PES almost practical (Muradian et al. 2010), will serve us well in our roles as analysts and as citizens interested in sustainability.

The mainstream critique of a strictly transactional conception of PES emphasize institutional hybridity (Vatn 2010; Norgaard, 2010; Prirad, 2012; Fletcher and Breitling, 2012; Boisvert, 2013; Potter and Wolf, 2013; Wolf 2014), and this line of thinking has been productive. Hybridity is largely conceptualized in terms of blending of characteristics of market-based policy instruments and bureaucratic administrative procedural controls. A more general critical approach lies in attention to social dimensions of knowledge production. Studying knowledge production at the various nodes of the actor networks offers a means to advance understanding of the “social labor of coordination” (Storper, 1998) that is required to realize something that resembles PES. As with all innovations and technical practice in general, these feats of social/material coordination must be accomplished at multiple sites, at multiple levels of social organization, on a sustained basis. Placing the analytical focus on agency and on processes of socioeconomic coordination rather than treating production of coherence and incoherence as strictly determined by the structure of incentives and information flows lies at the core of much
heterodox economic thought and institutionalism (Hollingsworth and Boyer, 1997). This paper is an initial exploration of some elements of a heterodox program of research on ecosystem services and PES more specifically.

References to a convention theoretic approach can be found in attention to the production of technical standards that lie behind specifications that make accounting possible (Bowker and Starr, 1999) and the establishment of equivalencies that make transactions possible (Cronon, 1991). For example, Robertson (2013) calls our attention to metrics underlying PES as “adequate abstractions.” Here I want to draw attention to the social, political and scientific processes through which the relevant actors produce agreements regarding what constitutes knowledge claims that are good enough to pass the various ‘tests’ relevant within the various worlds that they inhabit (Boltanski and Thevnot, 2006).

The second phase of ecosystem services (ES - Mark II) is then understood as post-, or perhaps more accurately, neo-Coasian. By invoking Ronald Coase, who passed away in September of 2013, I mean to highlight that emphasis on self-organized transactions within the private sector between willing buyers and willing sellers of ecosystem services is an inaccurate and counter-productive way to think about and communicate the notion of PES. The Vittel-Perrier case and a very small handful of others stand as exceptions (Perrot-Maître, 2006). We now understand PES to be aspirational in terms of private sector solicitation of ecosystem services. In terms of contemporary implementation, PES is an updated framing of NGO and public sector investment in conservation. The schemes are predicated on sustained injection of money and political capital from parties other than buyers and sellers (e.g., Majanen et al., 2011). Attention to the role of intermediaries (Muradian, 2010) that make transactions possible can be partially understood in microeconomic terms - Coase insisted that transactions will not occur when transaction costs outweigh gains from trade – but the role of state actors in creation of demand for ecosystem services and the role of conservation NGOs in the discursive construction of PES as legitimate and practical cannot be considered to be classes of transactions costs.

Late in his career, Coase chastened those who (willfully) misunderstood implications of his analysis of social cost. He colorfully suggested that the insights gained from studying a world of zero transaction costs are,
“without value except as steps on the way to the analysis of the real world of positive transaction costs. We do not do well to devote ourselves to a detailed study of the world of zero transaction costs, like augurs divining the future by the minute inspection of the entrails of a goose.” (R. Coase, as quoted in Shirley, 2013)

There is always an appetite for tidy remedies, and PES would appear to fall into this category. Hatchuel’s concept of “logical myth” is relevant here (see Allaire and Wolf, 2004). The transactional model of PES offers coherence to a dialogue and a set of material practices, and it contains important insights, but there is also a flaw or fiction embedded in it that makes it self-limiting.

The abstractions that characterize microeconomics - and which make it powerful - have proven counter-productive when they crowd out attention to the other elements of social practice (Granovetter and Swedberg, 2011). Valorization of natural resources has been promoted and interpreted as a pathway to address conservation challenges, and there is likely some value in this idea, but advocates of PES have over-simplified. The realist, institutional perspective seeks to integrate the ecological science and the environmental economics with other pieces of the puzzle through attention to co-production of knowledge. The capabilities and the implications of this heterodox approach are not yet known.

**Agrienvironmental policy, PES logic and science-policy interface**

Environmental conservation in the agricultural sector in the US is supported by the Conservation Title in the Farm Bill, national legislation update approximately every five years. The Farm Bill integrates consideration of agrienvironmental policy (AEP) with nutrition programs, production management, export objectives, rural development policies and a wide range of other dimensions of food and agriculture. Understanding governance of environment in agricultural policy and in agricultural landscapes requires appreciation for the long standing commitments to voluntarism (i.e., hesitancy to regulate) and the historically embedded character of commitments to conservation that emerged in the mid-1980s. As argued elsewhere with regard to the origins of contemporary AEP (Potter and Wolf, 2013),
The resulting agri-environmental policy and rural development programmes reflect profoundly the historical-institutional context in which they were made. The major source of funding for environmental management on private lands, they stand as classic examples of the second-best, politically compromised arrangements that policymakers and those who lobby them invent in order to address a range of policy problems – in this case rural environmental degradation, the support of farmers’ incomes and the overproduction of agricultural commodities. Indeed, from the beginning, agri-environmental payments to farmers have served purposes other than conservation, and their wide scope and the trade-offs they embody are important explanations of their durability. For example, the Conservation Reserve Program (CRP), the most expensive federal agri-environmental programme enrolling roughly 10% of all cropland, serves both environmental conservation and supply control goals while contributing $2 billion annually to farm incomes.

Because conservation payments made to farmers by the federal government are designed to serve multiple functions simultaneously, their performance defined narrowly in terms of efficiency and effectiveness in reducing environmental degradation is open to question. Actors interested specifically in conservation and in productivity of public investments have been criticizing these policies and the specific design of conservation programs since 1985 when contemporary AEP was introduced. Despite sustained debate and circulation of reform proposals aiming to achieve higher returns on investments in conservation, the policies have proven resilient over the past 25 years. This resilience can be understood through consideration of the ability of actors in the incumbent policy network to defend their interests (i.e., access to conservation payments), their knowledge claims and their administrative procedures (Potter and Wolf, 2013). Also, we can point to the culture of USDA, a certain level of comfort among farmers regarding the way conservation payments are awarded and an unwillingness in the Congress to contemplate a geographic reshuffling of who gets paid what.

While criticisms and proposals for thorough redesign have not been successful to date, the effort continues. The emergence of PES and specifically its emphasis on paying for outcomes – see insistence on ‘conditionality’ and ‘additionality’ (i.e., payments are contingent on production of benefits that would not be produced in the absence of the contract) Wunder’s (2000) definition –
are implicated in contemporary AEP reform proposals in circulation. The most notable of these is the Pay-for-Performance initiative being advanced by Jon Winsten of Winrock International with partners from World Resources Institute, American Farmland Trust and the Sand County Foundation.

As Winsten and Hunter (2011) express it,

“Picture this. It's late winter, and Mr. Brown, an Iowa farmer with 283 ha (700 ac) of corn and soybeans and a midsized hog operation, is planning for the upcoming crop season. He wants to participate in a conservation programme, but he's not looking through a long list of predefined practice standards, trying to find a few that would fit on his farm. Instead, he's analyzing his operation, identifying where soil and excess nutrients might be leaving his fields, and thinking of changes he could make to stop those losses. Why? Mr. Brown is not preparing for a traditional conservation programme. Instead, he's preparing for a pay-for-performance conservation programme, which pays farmers by the pound for quantifiable reductions in sediment and nutrient losses.”

Here, the farmer becomes an entrepreneur and environmental problem solver rather than a simple adopter of codified “best management practices” that are recognized by USDA as meriting conservation payments. The more conservation Farmer Brown produces, the more he gets paid. It is implied here that this payment will be closely tied to a measure of the benefit stream generated on the farm. The Pay-for-Performance concept is critical of the established way of doing AEP, and it draws on key elements of PES-logic.

The Pay-for-Performance concept is premised on development of means to produce better predictions about outcomes of conservation practices than provided by existing tools and metrics. In opposition to the practice of paying farmers to implement technical practices (i.e., inputs) believed to yield conservation benefits, PES is often advertised as ‘outcome-based,’ which suggests that empirical measurements inform payments. But it is almost universally the case that outcomes are inferred from models within PES schemes. These models utilize data about the physical sites and the relevant conservation practices to produce estimates of outcomes. The difference between existing practice of AEP and PES-inspired designs is the capabilities of
these predictive models. Models that have the capacity to utilize more variables, operate at finer scale, and which yield more accurate predictions about the relevant activities can enhance the capacity of program managers to target investments where they will yield the most value for money. The pay-for-performance concept is linked explicitly to the development of next-generation models and in this sense they promise greater precision relative to the status quo.

This empirical case and more general efforts to make sense of production of technical standards for PES through attention to co-production, leads me to offer a simple diagram (Figure 1).

Figure 1. Interplay of science and policy in processes of institutional change

The figure depicts interplay between science and policy. Policy windows (Kingdon, 1995) are moments when a particular issue is high on the political agenda and there is significant appetite for policy change. Policy windows to enact PES through imposition of cap and trade (a market

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4 As signaled by the Conservation Effectiveness Assessment Program (CEAP), a 10 year effort to synthesize and expand the science base underlying agrienvironmental conservation and AEP, there are questions circulating about the quality of the knowledge base and the performance of conservation programs more generally.
created through regulation) can be wide open or tightly closed at any given time. Scientific closure (Valve and Kauppila, 2008) is a process of firming up and codifying scientific beliefs and commitments, for example as required within policies that assert that planting a stream side vegetative buffer strip adjacent to a corn field with a certain slope and soil type and fertilizer application schedule will yield a 25% improvement in phosphorous mitigation under average weather conditions. Scientific closure can be high (unified scientific beliefs exist and confidence in relevant models is high) or low (lack of clarity regarding mechanisms, disagreements within science, poor predictive capabilities).

It is not hard to imagine dynamics under conditions of cells 2 and 3. When a window is wide open and the relevant science is muscular and confident, there is a high likelihood of institutional innovation, perhaps even radical change (Baumgartner, 2006). When there is no appetite to explore policy options and the science is incoherent, there is no reason to expect institutional change. In cells 1 and 4 the situation is ambiguous. An open policy window in a situation in which scientific closure is incomplete could lead policy makers to invest resources in research with the hope of catalyzing scientific synthesis. We can also imagine policy actors trying to influencing processes of science closure (e.g., elicit false or inflated expressions of confidence attached to knowledge claims). These situations we can call “policy pull,” as in cell 1. We can also identify how interests, ambitions and capabilities of scientists, and organizations employing them, can place demands on policy makers to open up debate and to restructure regulations and programs. This would be a case of “science push,” as in cell 4.

Applied to agrienvironmental policy in the US, pay-for-performance concepts are an effort to contest simplifications embedded in historically and politically derived policies. Expressed in stark form, there are actors who are promoting the development and adoption of “smart models” in place of what they consider to be “dumb models” that currently serve to structure AEP. Such rationalization is an eco-centric effort to redirect public funds from one set of politically derived objectives (i.e., historically derived multifunctional policies) to another (ecological risk reduction). While more precision – and less simplification – may serve to enhance efficiency and effectiveness in terms of conservation outcomes, farm incomes, crop prices and costs to taxpayers for production subsidies may be adversely affected. How to interpret these possibilities is a question of values.
Conclusion

In this paper I am concerned with claims of ecosystem services as simplification. I focus analysis on two different sites at very different levels, and I derive contradictory results. The conclusion I draw from these results is that simplification is an ambiguous reference applied to ecosystem services. Clearly, efforts to reduce ecosystems and their contributions to our welfare into discrete units that can be aggregated, compared or recorded in a ledger involves giant leaps of faith in our ability to determine which values matter through contemporary politics. Surely we have not and will not get these judgments “right,” but that is not the standard those promoting ecosystem services in environmental policy and management would argue should be applied, and perhaps they are correct.

The public interest conservationists seek to advance is conservation and security. In the context of global economic expansion, bedrock commitments to liberalism and consumer capitalism and swiftly mounting ecological risks (Bludhorn and Welsh, 2007), there is good reason to believe that time is short. Given the trends and the political economic context, in the absence of swift, widespread and deep rollout of the concept of ecosystem services, or something more ambitious such as green taxes, conservationists argue that we are in for a hard landing (Erhlich et al, 2012). For advocates of PES, what is needed is a practical mechanism to achieve conservation, not a set of technical practices defined by their capacity to withstand exacting scientific scrutiny. In this sense, no one should be surprised to encounter examples where norms have been established about how to characterize variance of ecosystem services across time and space despite less than comprehensive scientific understanding.

This process of simplification - lumping rather than splitting – rests on science in dialogue and in tension with politics. Here, the realist, institutional program can be a useful complement to the existing efforts centered within environmental sciences and environmental economics. Cultivating tolerance for simplification as part of a program of pragmatic action and working to enhance transparency in process of development of technical standards that structure conservation based on ecosystem service accounting could advance the ecosystem services agenda. Research based on co-production perspectives can play a leading role.

\(^5\) The interests of capital are clearly different and how to think about this problem in the context of my argument is not clear to me at this stage.
References


http://rechercheregulation.files.wordpress.com/2013/07/storper.pdf


