

Payment for Ecosystem Services and the Challenge of Saving Nature

In a seminal and underappreciated book, *Green Imperialism*, Grove (1995) explains the rise of a global environmental consciousness as a result of European colonial expansion. Grove details how, by the mid-seventeenth century, "... a coherent and relatively organized awareness of the ecological impact of the demands of emergent capitalism and colonial rule started to develop, to grow into a fully fledged understanding of the limited nature of the earth's natural resources and to stimulate a concomitant awareness of a need for conservation" (p. 6). In particular he documents the growing belief that loss of forests, particularly in island settings, could negatively affect shipping, agriculture, and even the local climate. The colonial powers awoke to the importance of what today would be called ecosystem services and set about trying to restore them and diminish their further degradation.

In recent decades humankind's reliance on the natural world has increasingly been expressed through the concept of ecosystem services. In the time period covered by Grove, ecosystem services were seen as vital for maintaining the economic output of the colonies. Today they are judged important as a way of framing conservation imperatives to convince humans of the value of the natural world. The Millennium Ecosystem Assessment began a rapid shift in the concept of ecosystem services from an academic backwater to the mainstream of conservation and environmental policy. *Nature* noted how recent developments "seem to herald ecosystem services entry into mainstream scientific and political thinking" (*Nature* 2009:764). Ecosystem services have now become the central metaphor within which to express humanity's need for the rest of living nature. As the Global Environment Outlook-4 report rightly points out, "As the basis for all ecosystem services, and the foundation for truly sustainable development, biodiversity plays fundamental roles in maintaining and enhancing the well-being of the world's more than 6.7 billion people, rich and poor, rural and urban alike" (UNEP 2008:160). Important research is being undertaken to establish empirically the value of ecosystem services and their distribution in space and time.

The concept of ecosystem services increasingly structures the way conservationists think, the ways they ex-

plain the importance of nature to often skeptical policy makers, and the ways they propose to promote its conservation. Is this a good thing? Not entirely. There are risks to the current enthusiasm for the ecosystem services concept. Conservation has a history of placing great faith in new ideas and approaches that appear to offer dramatic solutions to humanity's chronic disregard for nature (e.g., sustainable development, community conservation, sustainable use, wilderness), only to become disillusioned with them a few years later. The payment for ecosystem services framework fits this model disturbingly well. Like the seductive ideas that preceded it, it is being adopted with great speed, and often without much critical discussion, across the spectrum of conservation policy debate and developing a life of its own independent of its promulgators.

There is particular risk with the idea of payments for ecosystem services as an effective way of achieving conservation. The argument goes that people depend on the services provided by ecosystems and that the way to ensure their continued provision is to pay for them—thus ensuring services are sustained and the species and ecosystems providing the services are conserved. Arguments for the importance of conserving ecosystem services and value of payment for ecosystem services as a tool for conservation are typically compelling and carefully crafted. Yet we are worried about the approach of payment for ecosystem services as a conservation strategy.

In the spirit of constructive criticism, we outline here seven problems with ecosystem services. If these are addressed, the role of payment for ecosystems services in conservation will be clearer and arguments for conservation itself made stronger. If not, all the research and policy enthusiasm for ecosystem services may turn sour, in the process costing time and invaluable support.

First, in a world of relentless pursuit of economic logic, there is a real risk that economic arguments about services valued by humans will overwrite and outweigh noneconomic justifications for conservation. As many advocates for the approach point out, payments for ecosystem services should be one of a set of tools used in pursuit of conservation. Multiple arguments for conservation are

likely to be more resilient and persuasive than single ones. Strategy development and implementation that responds to stakeholder needs from the outset and is collaborative may make it possible to take proper account of the intrinsic values of nature, which, given contemporary realpolitik, are often too easily lost.

Second, there is a widespread but erroneous assumption that ecosystem services are necessarily benign. Definitions of ecosystem services cite positive values for human society. Only certain things in nature are therefore regarded as services. The UN Food and Agriculture Organization defines ecosystem services as “[t]he conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life” (http://www.fao.org/ag/wfe2005/glossary_en.htm). Nevertheless, not all ecosystem processes sustain and fulfill human life. Processes such as fire, drought, disease, or flood work against this goal, yet they are vital for ecosystem function, structuring landscapes, and providing vital services and regulatory functions to nonhumans. There is a danger that an economically driven focus on those “services” that are valuable to humans in their nature, scope, and timing may lead to calls to “regulate” ecosystem services to times and in flows that match human needs. Such regulation may be highly detrimental to long-term survival of the nonhuman parts of the ecosystems.

Third, ecosystem services need not be provided by native species. Many introduced species will do the job as well, or perhaps better. Zebra mussels are highly effective in filtering particulates from water, although their impact on ecosystems is in other ways strongly negative. Ecosystems managed so as to deliver services may do their job perfectly well if existing species are replaced with exotics; they may even do it better. Environmental policy based on the optimization of ecosystem-service values will not necessarily lead to the conservation of biodiversity.

Fourth, if the trend to mainstream ecosystem services in policy continues, it would be logical to expect that natural systems will increasingly be engineered to maximize single services, for example through the creation of novel ecosystems to deliver critical services but that lack the biodiversity of their wild predecessors (e.g., forestry plantations to sequester carbon or artificial wetlands to process sewage) or the alteration of existing ecosystems to maximize service delivery (e.g., intensified tree-farm management of standing forests). The maximization of single-service provision would, undoubtedly, lead to increased ecological brittleness. Treating services in a “bundle” rather than singly may help maintain more-intact ecosystems, but the economics of such a strategy will come under scrutiny and may make it unattractive to policy makers.

A logical extension of the alteration of natural systems to increase flows of ecosystem services is to re-

place naturally occurring parts with novel, artificial alternatives. Could bioengineering become part of a new “nature manipulation” industry, creating novel organisms to populate industrial service-maximizing ecosystems? Biomimicry could provide the basis for novel engineering to deliver services such as carbon sequestration through artificial processes, systems, and devices. Such strategies draw on the biodiversity of existing ecosystems, but only as the intellectual raw material of industrial processes. For example, carbon capture through artificial “trees,” mechanical devices that remove carbon from the air, has been proposed as a strategy to deliver carbon-sequestration services (<http://news.bbc.co.uk/1/hi/programmes/6374967.stm> [accessed April 2009]).

Fifth, there is a range of problems associated with valuation of ecosystem services. Markets only exist for a certain range of ecosystem services, and some services are not amenable to pricing or valuation, such as the fertilizing effect of atmospheric dust from the African Sahel carried across the Atlantic. Markets also change rapidly, as the emerging and volatile market for carbon shows. Where markets do exist, the value of the services from different ecosystems will not reflect their diversity, but their desirability to human consumers. There is a serious potential mismatch between the scales at which services are provided and the institutions available to realize those values. Certain spatial relationships will be privileged (e.g., collocation of service and consumer). Where a valuable service is provided by a biodiverse ecosystem (e.g., water yield from a forested catchment), where that ecosystem is close to a major consumer, and where institutions exist to enable those consumers to pay for the service they receive, ecosystem services may provide a powerful stimulus for conservation. Elsewhere, they will not. These problems are recognized in the literature, but there is a real danger that such caveats will be lost in the rush to frame conservation in the language of ecosystem services.

Sixth, as ecosystem services become increasingly scarce and valuable, people will compete to gain control over flows of services and the ecosystems that provide them. There will be winners and losers in markets for ecosystem services. There are significant issues related to who holds rights to ecosystem services. Where these are private, or privatized, ecosystem payment schemes may have welfare implications. Moreover, the ecosystem services that have the highest price may not be those that deliver the greatest welfare. As people annex ecosystems and adapt them to maximize revenue flows, collateral damage to biodiversity will be unnoticed or discounted, for example in intensively managed forests or dammed rivers. In economic terms, such transformations in biodiversity may make perfect sense.

Seventh, as always the joker in the pack, the impacts of climate change on ecosystem service delivery are unknown. If we succeed in selling existing ecosystems in

terms of their provision of services, what happens when those ecosystems break apart and reassemble in new ways? Will the service recipients resist, reinforcing the barriers to movement of species so as to maximize the current benefits and driving a process of ecological brittleness when it is ecological resilience that we most need?

Nature underpins the human economy, and ecosystem services represent an attempt to measure, and more importantly to explain, that dependence. They are a vital tool in the effort to explain conservation to a still-skeptical world. Yet ecosystem services are not a fractal of nature but represent only part of the full spectrum of biodiversity. The assumption is frequently made by those not familiar with the complexities of the concept that conserving the functional attributes of ecosystems—also called the ecosystem “services”—would save all the parts. But it is not at all obvious this would be the outcome. Success in creating schemes where ecosystem services are valued may cause genetic and species dimensions of biodiversity, as well as some attributes of ecosystems, to be lost.

The strategic importance of ecosystem services as a tool for conservation is obvious. The strategy of payment for ecosystem services has enormous potential to help in heretofore largely unsuccessful efforts to sway humanity’s view on the value of nature. There are risks, however, in the speed and uncritical enthusiasm with which the strategy is being applied. Skepticism about this enthusiasm for payment for ecosystem services is, in our expe-

rience, often met with sharp rebuke, frequently correct in the technical details, but ducking wider strategic issues. Yet some skepticism is warranted. There are risks as well as benefits in the ecosystem services approach, and it is important that these are considered and addressed. If conservation places too much emphasis on payment for ecosystem services in its strategies, we may stop thinking hard about the wider consequences. This would be a disaster. Ecosystem services are extremely important, but need to be drawn into conservation strategies with great care.

Kent H. Redford* and William M. Adams†

*Wildlife Conservation Society Institute
2300 Southern Blvd.
Bronx, N.Y. 10460, U.S.A., email kredford@wcs.org

†Department of Geography, University of Cambridge, CB2 3EN,
United Kingdom

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