Response from Luck and Colleagues

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The Economic Value of Ecosystem Services

Luck and coauthors (2009) in their thoughtful article examine "the concepts of service-providing units (SPUs) and ecosystem service providers (ESPs)." In spite of their able analysis of these concepts, they concede that "the contribution that the protection of ecosystem services will make to biodiversity conservation is largely unknown."

The problem may lie less in the concept of an SPU or ESP than in the concept of the economic value that applies to them. There are at least two possibilities: total and marginal value. To estimate the total economic value of an SPU, one may ask what losses an industry would suffer in its absence or what the industry would have to pay for a substitute. Losey and Vaughan (2006), whom Luck and colleagues cite in relation to the services of insects, take this approach. For example, they estimate at $380 million the losses that the cattle industry would endure in the absence of the activity of dung beetles.

A difficulty with this approach is that any industry may require many inputs. For example, farmers probably could not raise cereal crops, which are wind pollinated, without wind—nor conceivably in the absence of labor, tractors, fuel, rain, seed, fertilizer, and so on. Should we assess the economic value of each of these inputs on the basis of the cost of a substitute or the losses its absence would create? These valuations when aggregated could greatly exceed the price of the crops themselves.

The total economic value of an SPU—such as the wind that pollinates cereal crops—can be immense but at the same time irrelevant to conservation policy. No one need care about the total value of dung beetle services, for example, because the cattle industry, far from threatening the beetle, provides resources that help it thrive. Value of this kind provides a reason to protect an SPU only if (a) it is threatened with destruction and (b) nature will not provide as cheap and as good a substitute.

Marginal value is calculated in terms of the amount someone is willing to pay for the next marketable unit of a good—an additional dung beetle, gust of wind, bag of seed, or tractor. If SPUs are plentiful and free, their marginal value is effectively zero, however beneficial they may be. No farmer is willing to pay people to use bellows to provide a service the wind offers without charge or to grow additional dung beetles that nature likewise provides gratis.

It is the scarcity of a good relative to effective demand that determines its competitive market price and thus its economic value in that sense. For example, in Thailand, dung beetles are considered delicacies. They are raised and sold like any marketable good. A large scarab well prepared can fetch $10 in a fine restaurant.

The concept of economic value presents a dilemma. If conservationists refer to total value, they must concentrate on just those SPUs that are in jeopardy. It serves no purpose to "valuate" services that are not threatened. If conservationists refer to marginal value, however, they tie themselves to the familiar conceptual framework of market failure, externalities, common pool resources, discounting, transaction costs, and so on. Conservationists then go down a long and weary road, at the end of which they will find mainstream environmental economists waiting for them.

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Response from Luck and colleagues

In his thought-provoking commentary, Mark Sagoff documents various pitfalls of economic valuation of ecosystem services. Economic valuation was not central to our study, but we hope that our approach will, among other things, improve economists' ability to value ecosystem services accurately. Our article emphasized the urgent need for ecologists and environmental managers to identify the primarily biotic components of ecosystems that provide services and quantify the characteristics of individual organisms (e.g., population size), functional groups (e.g., trait values), or ecological communities (e.g., vegetation heterogeneity) required to provide the service at a level desired by service beneficiaries.

Despite complications, such knowledge is vital to our understanding of how nature contributes to human society irrespective of the need to place a dollar value on any service. Without this understanding, it is not possible to develop wise management plans or policies to sustain these natural resources. Sagoff argues that service providers may have economic value only if they are under threat and if humans are unable to replace the service readily. We agree that level of threat and availability of alternatives are important in any scheme designed to rank the relative value of services (along with measures of capacity to meet demand, costs of protection, etc.).

Sagoff also suggests that "no one need care about the total value of dung beetle services" because these services are currently not threatened. It is unwise, however, to believe that such services will be ubiquitous in the future (because, e.g., some chemical treatments of internal parasites of cattle have been shown to impact dung beetles negatively) or that it is not necessary to understand their ecological underpinnings. We would argue that it is vital to know how changes in dung beetle populations affect the beetles' capacity to handle cow manure generally, and what supporting systems (e.g., grassland vegetation) are required to ensure that these services continue at the desired level. Well-known examples of the extensive reduction (e.g., bison) or complete extinction (e.g., passenger pigeon) of once common service-providing organisms underscore the necessity of paying attention even to those that are not yet scarce.

It is more likely that many ecosystem services are already under severe threat

(MEA 2005), and economic valuation (as well as other methods of quantifying value; e.g., contribution to human health) may be particularly pertinent in these circumstances. For example, almond growers in southern Australia truck in more than 50,000 hives of the European honeybee each year to pollinate their crop, at great financial cost. In the United States, more than a million hives are brought to California annually. In both cases, pollination services from native insects are likely to be limited since much of the native vegetation has been cleared for almond crops. Almond growers would be well advised to explore the cost-benefit trade-offs (at least in dollar terms, if not also including biodiversity benefits) of implementing land-management strategies to support native pollinators, particularly given massive and still poorly understood die-offs of honeybees on several continents.

Sagoff points out that environmental economists have traveled "a long and weary road" in their attempts to value nature. Too few ecologists have traveled this road with them. It's past time for ecologists and economists to travel a new valuation road together, and to pick up sociologists and psychologists along the way.

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