The Value of Nature and the Nature of Value


Since 1997, the government of Costa Rica has been paying landowners for several ecosystem services: carbon sequestration and protection of watersheds, biodiversity, and scenic beauty. The payments, about US$50/ha-year, are financed in part by a tax on fossil fuels and are resulting in significant forest conservation and restoration (5). Costa Rica has also sold carbon sequestration credits to several European nations. These and other promising government initiatives are supported by scientific expertise and growing industry participation (6).

Value of ecosystem goods and services. A hypothetical Australian farm business in 20 years (8). In this model, traditional agricultural commodities account for 55% of revenues, as opposed to 100% today. Other income derives from a mature market for ecosystem goods and services supported by scientific expertise and growing industry participation (6).

Worldwide, ecosystems are being protected or restored to control floods, to filter water, to enhance soil fertility, to stabilize climate, to offer human enjoyment, and even to recycle orange peels (7). Such efforts are being rewarded with innovative financial mechanisms, whose scope and variety are expected to grow (see table).

These developments all involve putting a price tag on nature, an act seen by many as risky at best (9). To be sure, individuals and societies already assess the value of nature implicitly in their collective decision-making, too often treating ecosystem services as “free.” Until recently, this was generally safe to do: relatively speaking, ecosystem capital was abundant, and the impacts of economic activity were minimal. Ecosystem capital is now critical to understand both how to value ecosystems and the limitations of such valuations.

Ecological Basis for Valuation

To establish sound policy, the “production functions” describing how ecosystems generate services need to be characterized, and the interactions among these functions quantified. To begin, a cataloging of the sources and consumers of ecosystem services is needed. For any given location, this would involve the supply of services and the time scales over which services are amenable to repair. Yet these are poorly known now and are likely to remain elusive. Ecosystems typically respond nonlinearly to perturbation. For example, gradual increases in salinity for decades went unnoticed by farmers in Australia but have now reached crisis levels. Replanting native vegetation reduces soil salinity (a benefit) but also reduces river flow (a cost). Furthermore, ecosystems are idiosyncratic; what holds true in one region may not apply well elsewhere. Soil salinity appears controllable with ecosystem approaches in eastern parts of Australia, for example, but in Western Australia, the threshold is higher, and there is little hope for reversal without enormous investment. Putting theory into practice will therefore require locally based information.

Principles of Valuation

There are three fundamental steps of decision-making. In this context, all require integration of ecological and economic understanding. The first step, identification of possible alternatives, is probably the most important but also the most underrated. Often the identification of alternatives is guided by narrow conventions: if a city is expanding its water treatment system, engineers may evaluate different physical treatment plants, ignoring ecosystem approaches (watershed or wetland management).

The second step requires that all impacts be identified and measured for each alternative: everything from immediate...