

S P E C I A L

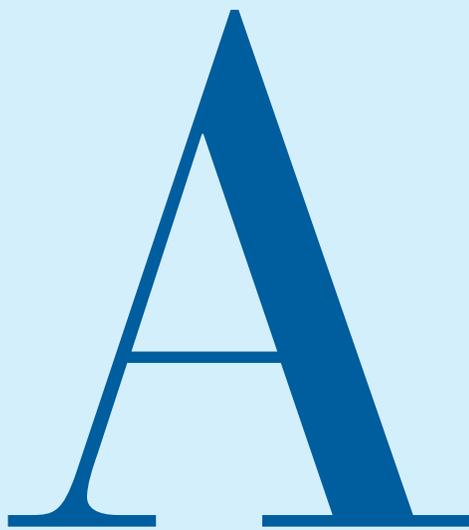
Natural Resource Economics Conservation of

By James N. Sanchirico and Juha Siikamäki



and Policy in the 21st Century

Ecosystem Services



As *Resources* readers are aware, the marketplace is the core of our economy, the means by which goods and services move back and forth. Many environmental goods and services are left out of the marketplace, however, not because of any conscious effort but rather because they are not easily traded and priced. For example, landowners face little difficulty in selling crops or timber but are less able to market the environmental services of their property, such as providing wildlife habitat or protecting rare species. And without economic rewards, landowners have little incentive to engage in such activities.

If the 20th century witnessed the birth of the environmental movement that raised concerns about how the marketplace inadequately conserves natural resources, early predictions for this century see the expanding recognition of the need to bring environmental and natural resource services—ecosystem services, in short—into the marketplace. These services denote the full range of benefits that people obtain from different ecosystems, including, for example, provision of food, water, timber, and fiber; regulation of climate, floods, and water quality, and provision of recreational and aesthetic benefits.

For evidence of this trend, you don't need to look very long or hard. The Millennium Assessment by the United Nations, federal agencies such as the U. S. Forest Service, and more than a few nongovernmental environmental organizations are all focusing their efforts on devising strategies for

sustaining the provision of ecosystem services. In this issue, an essay by Allen Blackman, Francisco Alpízar and Alexander Pfaff focuses on cases in Costa Rica and Honduras, and another by Len Shabman and Sarah Lynch discuss efforts in the Florida Everglades, north of Lake Okeechobee.

A Sea Change

So what is bringing about this marked shift in perspective? One major reason is the view that the traditional (20th century) approach of creating protected areas to preserve and sustain services combined with the limited worldwide budget for conservation can only get you so far. Full protection of habitats and species by way of excluding all activities is extremely costly and socially disruptive. Shifting attention to conservation of ecosystem services on non-fully protected

lands (or working landscapes) requires merging environmental protection with economic activities. As James Boyd mentions in his “call-to-arms” essay, this has created a greater need for natural resource economists and conservation biologists and ecologists to work together.

What does creating economic incentives for managing and sustaining ecosystem services entail? This exercise includes selecting the ecosystem services to consider; measuring the provision of the services and their value; creating markets or other economic incentive schemes, such as payments for ecosystem services programs; and designing monitoring systems to ensure the delivery of the services. How to approach these tasks depends in part on perspective and context; for example, in the Lake Okeechobee case, all of the parties are actively involved in the choice of these components. In Honduras and Costa Rica, the choices involve balancing improved refinements in the proxies used for measuring the provision of ecosystem services to ensure getting the greatest return from the payment-for-ecosystem-service program against the costs of doing so. In both cases, government payments provide landowners with the incentives to protect and to provide ecosystem services.

Many times, values related to ecosystems are related to their intrinsic worth, such as protection of biodiversity or rare species. Such non-use values are challenging to measure because they are captured neither in market data nor by other behaviors that are commonly applied for measuring use values. This problem has given rise to the development of non-market valuation methods, specifically surveys in which citizens are asked to state their preferences and willingness to pay to support the provision of ecosystem services. Alan Krupnick and Juha Siikamäki describe the principles and challenges of these methods. With an example from New York’s Adirondacks, they highlight practical issues, such as how to best identify and describe the services that are not related to the direct use of the ecosystem.

James Sanchirico and Peter Mumby on the other hand, utilize a framework that combines population biology, ecology, and economics to measure and value the provision of services from habitats. This time, the analysis is for coastal mangroves and their importance in the abundance and diversity of fish on coral reefs. Using methods that are similar to valuing inputs to the production of “run-of-the-mill” economic goods and services, Sanchirico and Mumby impute one aspect of the value of coastal mangroves by measuring the changes to the value of the associated coral reef fishery.

An important feature of sustaining and conserving ecosystem services is determining how the different components of an ecosystem—such as forest parcels, hectares of mangroves,

or coral reefs—relate to its overall functioning. As Molly Macauley, Shalini Vajjhala, and William B. Gail discuss, our ability to see how components fit into systems has evolved from static paper maps and charts to dynamic 3-D fly-bys on personal computers. This revolution not only provides exciting environmental information on spatial environmental relationships but is also leading to new social science research questions on how people perceive their connectedness to the environment at various spatial scales. Some of these tools are already being deployed in the Costa Rica and Honduras programs but the full potential of blending visualization technology and ecosystem valuation has yet to be realized.

What Questions to Ask Next

After all this effort and research, a natural question to ask is whether the health of our ecosystems is improving. To find answers, we need to find ways to track the benefits from nature over time. But exactly what endpoints should we focus on? Boyd discusses defining and illustrating measurable, countable endpoints that can act as consistent “points of contact” between ecological and social science. The need for well-defined units and values for nature’s services emerges from both macro- and micro-level perspectives, such as generating economywide environmental statistics and payment programs for providing specific ecosystem services.

But many important questions remain. For example, our case studies are examples of governments providing payments for the services. In some cases, such as carbon sequestration, these payments might stem from private individuals, NGOs, or corporations participating in markets. How can we design such markets to ensure continued support and achievement of the ecosystem goals? Also, how do we reconcile the necessary context-specific definition of services and their provision with the need for consistent definitions and measurement so that we can track performance in national accounts?

Interdisciplinary research on ecosystem services is evolving on two fronts: theoretical, with the development of new concepts and techniques; and practical, with lessons to be learned from projects in the field. The tensions between these fronts and ongoing efforts on both to evaluate and account for the tradeoffs between different benefits from nature will surely lead to advances in our understanding. The next 10 years will also likely see important *ex post* evaluations of the payment for ecosystem service programs now under way.

And you can’t forget the 800-pound gorilla now peeking out of the closet: How will climate change affect everything? ■