Economics and Ecosystem Management: Discussion

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The transitional period in the development of a new field is often characterized by competing articulations, recourse to philosophy, and a debate over fundamentals (Kuhn 1970). As exemplified by numerous articles and books providing alternative definitions in the recent academic and policy literature, it is clear that the emerging field of ecosystem management is still struggling to identify a shared paradigm. Thus it is not a surprise that, in surveying the ecosystem management literature, Swallow (1996, p. 83) finds this field to be "one of the vaguest ideas or mandates of the decade." A critical concern is that this debate over definitions may not be resolved in the foreseeable future, inhibiting policy-relevant research progress in this important area.

A strength of the two invited papers in this session (Swallow 1996 and Aillery et al. 1996) is that they avoid getting mired in the definitional cycle that has hampered the development of a cumulative body of research in other emerging fields, such as sustainable development. The papers instead build upon existing economics paradigms to identify approaches in which economics might offer important insights into ecosystem management.

Swallow provides a critical overview of two existing paradigms used by economists in this area. Importantly, he offers some suggestions as to how economists might bridge the sharp delineation between safe minimum standard and conventional economics approaches. Whereas Swallow is able to deal with these issues largely in the abstract, Aillery et al. contribute to the literature by summarizing two actual applications of landscape-scale ecosystem management. In providing a review of a recent USDA-ERS costing study of reducing agricultural impacts on salmon in Northwest river basins and a prospectus of a broader, more comprehensive ecosystem study currently being initiated in the Florida Everglades, the authors demonstrate that economics can provide critical information for ecosystem management decisions. The Aillery et al. project overview also drives home the oft-mentioned difficulties of conducting economic research at a landscape scale.

In assessing the contribution of these two papers, it is helpful to delineate three key paradigms along the continuum of economic to ecological thought. The first, or "standard" economics, paradigm is the circular flow of goods, services, money, and labor frequently taught in elementary economics courses. In this framework ecosystems are considered separate from economic systems and enter the economic realm only as externalities; there is a focus on continuous tradeoffs in current production and consumption, with efficient resource use over time determined by an appropriate discount rate; and the orientation is clearly anthropocentric.

The second paradigm retains the anthropocentric orientation but incorporates direct and indirect ecosystem values into the economy in an "input-output" framework. Ecosystems enter this framework as filtration devices (or input-output matrices) affecting the flows of goods and services in the economy. Natural resources are regarded as assets fungible with other capital and are managed in a multiple output framework. There is also a tendency toward adopting a sustainability ethic that allocates future generations an equal opportunity (as measured by the total stock of capital) to fulfill their needs and desires.

The third, or "ecological," paradigm treats the economic system as a subset of an encompassing ecosystem and can be classified as ecocentric rather than anthropocentric. In this framework there is a discontinuous limit to substitutability, to the extreme that there are no tradeoffs between ecosystem health and other activities. Time is considered on an evolutionary scale, management forces on the entire landscape, and a hierarchical decision framework with ecosystem health and resiliency as the top tier is promoted. Some economists (e.g., Bishop 1978) have accommodated ecological primacy, to a certain extent, in natural

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resource policy by promoting a safe minimum standards approach that recognizes the limits of standard benefit-cost analyses and treats species preservation as a constraint on economic activities. An ecological orientation would extend these species-based recommendations to preserving entire ecosystems and would also necessitate a greater modeling of interactions between economic activities and ecosystems.

Swallow (1996) evaluates these later two approaches in his paper. His primary contribution is that he extends the contemporary ecological-economic consensus viewpoint that bifurcates ecosystem policy into two decision loci (see Norton 1995 and Toman 1994). Under this viewpoint, a safe minimum standard approach is warranted in conditions corresponding to ecosystem impacts that are highly irreversible and catastrophic. At the other extreme, reliance on standard economic or input-output decision frameworks is justified in cases where economic activities result in modest but relatively reversible impacts and environmental assets are regarded as ready substitutes for other capital. Implementation of this two-tiered decision approach calls for interjecting an ecosystem orientation into the natural resource decision hierarchy envisioned by Ciriacy-Wantrup and Bishop (1975), in which a role of public policy is to determine the appropriate boundary between market and nonmarket processes (Bromley, 1989).

For the sake of presentation, figure 1 shows the two decision loci depicted as "red" and "green" zones. Using forest management as an example, Swallow suggests that the boundary between these

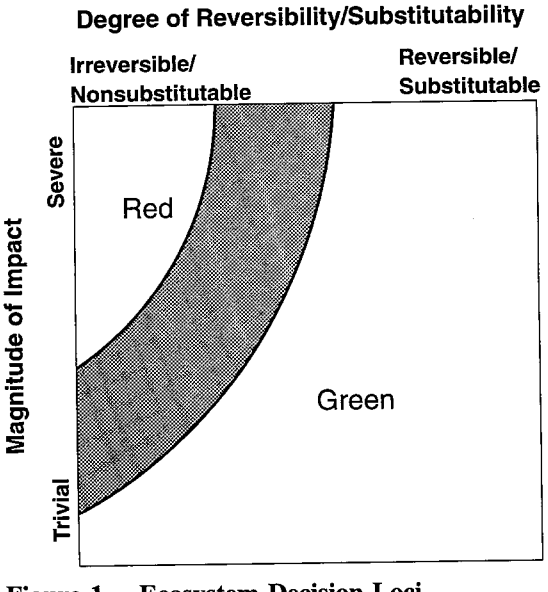

Figure 1. Ecosystem Decision Loci

two zones is buffered by an intermediate range in which ecosystem tradeoffs exist but are not a part of the current ecological paradigm. In this intermediate zone, depicted by the shaded area in figure 1, choices between ecosystems may be discrete, and collective decision making is necessary. The challenge is to educate conservation biologists about the reality of these tradeoffs. Swallow further argues that economists can educate ecosystem managers about favorable/supportive social preference structures that might provide a stronger base for the ethical arguments being promoted in the ecological literature.

I support Swallow's proposal that there is much work to be done in the intermediate zone. I would, however, like to raise some minor points of emphasis with respect to his presentation. First, at the frontier of the red zone, his analysis appears to limit the role of the economist to defining "intolerable" opportunity costs of not pursuing a development strategy and to identifying "cost effective" strategies of protecting the safe minimum standard. Beyond these activities, there remains a large potential role for valuing the benefits associated with protecting ecosystems at the safe minimum standard even though this approach precludes benefit-cost comparisons. For instance, benefit estimates from past nonmarket valuation research have provided support for ecosystem management decisions such as preserving minimum water levels in Mono Lake (Loomis 1995) and instituting additional flood releases at the Glen Canyon Dam (National Research Council 1996). Second, the economist's role in designing incentive programs may be much more important than Swallow presents, especially in the case of water management. Economists can play a critical role in devising efficient water conservation programs for competing water consumers in order to meet acceptable water levels in water-based ecosystems like the Florida Everglades. Finally, Swallow's analysis focuses mostly on the academic debate existing between conservation biologists and economists. It should be stressed that the safe minimum standard idea is already an integral part of state and federal legislation and agency goals. Moreover, judicial application of the public trust doctrine requiring a balancing of commodity and natural demands "shows signs of influencing every corner of resources law" (Sax 1993, p. 150).

In contrast, the Aillery et al. paper is motivated directly by the conservation requirements imposed by administrative mandates as well as judicial rulings. An objective of this paper is to broaden "the definition of an ecosystem to include economic activities" (1996, p. 101). The proposed methods

of using a minimum indicator of ecosystem health as a constraint on economic activities and identifying systemwide linkages and interactions between ecological functions and economic activities correspond to the ecological paradigm. This analysis also provides an informative demonstration of least-cost accounting for meeting species constraints. Yet, the actual conceptual framework proposed for future analyses in the Florida Everglades gravitates toward a dynamic general equilibrium approach consistent with the input-output paradigm. Rather than broadening the ecosystem to include economic activities, this conceptual framework appears to do the reverse. It attempts to incorporate ecological interactions into an expanded general equilibrium framework.

In all, each paper broadens and extends previous research, but retains an economics, rather than an ecological-economics, orientation.[1] Swallow's arguments can be categorized as teaching ecologists about economic principles. Aillery et al. extend the input-output approach to a landscape scale. While a long-run perspective might favor more integrated ecological economic approaches, such as that found in Bockstael et al. (1995), these efforts represent needed progress toward an intermediate goal of greater interaction between economists and ecologists under the umbrella of ecosystem management.

[1] One could argue that this economics orientation is entirely consistent with the ecological-economics literature that has emerged in journals. This concern was raised in a recent letter to the editor of *Ecological Economics* that stated: "It is presumed that readers of *Ecological Economics* accept the premise that the science of Economics is a subset of ecology. . . . Despite recognition by enlightened economists that ecology drives economics, the focus of the majority of articles in our journal and recent books dealing with EE, is on economics with its own parlance, not ecology" (Lotspeich 1995).

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