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Linking Ecology and Economics for Ecosystem Management

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Abstract

This article outlines an approach, based on ecosystem services, for assessing the trade-offs inherent in managing humans embedded in ecological systems. Evaluating these trade-offs requires an understanding of the biophysical magnitudes of the

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changes in ecosystem services that result from human actions, and of the impact of these changes on human welfare. We summarize the state of the art of ecosystem services–based management and the information needs for applying it. Three case studies of Long Term Ecological Research (LTER) sites—coastal, urban, and agricultural—illustrate the usefulness, information needs, quantification possibilities, and methods for this approach. One example of the application of this approach, with rigorously established service changes and valuations taken from the literature, is used to illustrate the potential for full economic valuation of several agricultural landscape management options, including managing for water quality, biodiversity, and crop productivity.

Keywords: [ecosystem services](#), [valuation](#), [ecosystem management](#), [LTER](#), [trade-offs](#)

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Appendix

Box 1. Valuation methods.

Methods of valuing ecosystem services include conventional economic valuation (Freeman 1993, Willis and Corkindale 1995, O'Connor and Spash 1999, NRC 2005) and nonmonetizing valuation or assessment (Renn et al. 1995, Kahn 2005).

Conventional economic valuation

Revealed-preference approaches

- Travel cost: Valuations of site-based amenities are implied by the costs people incur to enjoy them (e.g., cleaner recreational lakes).
- Market methods: Valuations are directly obtained from what people must be willing to pay for the service or good (e.g., timber harvest).
- Hedonic methods: The value of a service is implied by what people will be willing to pay for the service through purchases in related markets, such as housing markets (e.g., open-space amenities).
- Production approaches: Service values are assigned from the impacts of those services on economic outputs (e.g., increased shrimp yields from increased area of wetlands).

Stated-preference approaches

- Contingent valuation: People are directly asked their willingness to pay or accept compensation for some change in ecological service (e.g., willingness to pay for cleaner air).
- Conjoint analysis: People are asked to choose or rank different service scenarios or ecological conditions that differ in the mix of those conditions (e.g., choosing between wetlands scenarios with differing levels of flood protection and fishery yields).

Cost-based approaches

- Replacement cost: The loss of a natural system service is evaluated in terms of what it would cost to replace that service (e.g., tertiary treatment values of wetlands if the cost of replacement is less than the value society places on tertiary treatment).
- Avoidance cost: A service is valued on the basis of costs avoided, or of the extent to which it allows the avoidance of costly averting behaviors, including mitigation (e.g., clean water reduces costly incidents of diarrhea).

Nonmonetizing valuation or assessment

Individual index-based methods, including rating or ranking choice models,

expert opinion.

Group-based methods, including voting mechanisms, focus groups, citizen juries (Aldred and Jacobs 2000, Howarth and Wilson 2006), stakeholder analysis (Gregory and Wellman 2001).

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Daniel G. Wenny,^{1, 8} Travis L. Devault,² Matthew D. Johnson,³ Dave Kelly,⁴ Cagan H. Sekercioglu,^{5, 9} Diana F. Tomback,⁶ and Christopher J. Whelan⁷. (2011) The Need to Quantify Ecosystem Services Provided By Birds. *The Auk* **128**:1, 1-14

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