



So you want your research to be relevant? Building the bridge between ecosystem services research and practice



Lydia Olander^{a,*}, Stephen Polasky^b, James S. Kagan^c, Robert J. Johnston^d, Lisa Wainger^e, David Saah^f, Lynn Maguire^g, James Boyd^{h,i}, David Yoskowitz^j

^a Nicholas Institute for Environmental Policy Solutions and Nicholas School of the Environment, Duke University, Durham, NC, USA

^b Department of Applied Economics, University of Minnesota, St. Paul, MN, USA

^c Institute for Natural Resources, Oregon State University and Portland State University, Portland, OR, USA

^d Department of Economics and The George Perkins Marsh Institute, Clark University, Worcester, MA, USA

^e Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, Solomons, MD, USA

^f Geospatial Analysis Lab, University of San Francisco, and SIG GIS, San Francisco, CA, USA

^g Nicholas School of the Environment, Duke University, Durham, NC, USA

^h Center for the Management of Ecological Wealth, Resources for the Future, Washington, DC, USA

ⁱ National Socio-Environmental Synthesis Center, Annapolis, MD, USA

^j Harte Research Institute, Texas A&M University, Corpus Christi, TX, USA

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ABSTRACT

There is growing demand for information regarding the impacts of decisions on ecosystem services and human benefits. Despite the large and growing quantity of published ecosystem services research, there remains a substantial gap between this research and the information required to support decisions. Research often provides models and tools that do not fully link social and ecological systems; are too complex, specialized, and costly to use; and are targeted to outcomes that differ from those needed by decision makers. Decision makers require cost-effective, straightforward, transferable, scalable, meaningful, and defensible methods that can be readily understood. We provide illustrative examples of these gaps between research and practice and describe how researchers can make their work relevant to decision makers by using Benefit Relevant Indicators (BRIs) and choosing models appropriate for particular decision contexts. We use examples primarily from the United States, including cases that illustrate varying degrees of success in closing these gaps. We include a discussion of the challenges and opportunities researchers face in adapting their work to meet the needs of practitioners.

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* Corresponding author.

E-mail addresses: Lydia.olander@duke.edu (L. Olander), Polasky@umn.edu (S. Polasky), jkagan@pdx.edu (J.S. Kagan), rjohnston@clarku.edu (R.J. Johnston), wainger@umces.edu (L. Wainger), dssaah@usfca.edu (D. Saah), lmaguire@duke.edu (L. Maguire), boyd@rff.org (J. Boyd), David.Yoskowitz@tamucc.edu (D. Yoskowitz).

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1. Research that meets practitioner needs

Evaluating the impact of public and private decisions on natural capital and ecosystems is an increasing focus of public and private decision-makers, including government and business leaders (e.g., [The Declaration, 2012](#); [WAVES| Wealth Accounting and the Valuation of Ecosystem Services, 2016](#); [EOP, 2015](#); [IPBES| Intergovernmental Platform on Biodiversity and Ecosystem Services, 2016](#)). Practitioners in both the public and private sectors are motivated to incorporate the value of ecosystem services in decisions affecting issues such as land management (e.g., [Bateman et al., 2013](#); [Johnston et al., 2014](#); [Lawler et al., 2014](#); [Ouyang et al., 2016](#); [National Ecosystem Services Partnership, 2016](#)), pollution control ([TEEB, 2012](#)), natural resource supply ([Reddy et al., 2015](#)), rural/agricultural policy ([Ribaud et al., 2010](#); [Bauer and Johnston, 2013](#)), and coastal/marine management ([Holland et al., 2010](#); [Barbier et al., 2011](#); [Lipton et al., 2014](#)), but often lack the capacity to do so. This focus has led to a growing demand for applicable tools to assess the impacts of decisions on ecosystem services and human benefits ([PCAST, 2011](#)).

At the same time there has been tremendous growth in scholarly research on ecosystem services. A Google Scholar search finds almost 5 times as many publications using the key word “ecosystem services” in this decade compared to last ([Google Scholar Search, 2016](#)). One might assume that this increasing “supply” of ecosystem services research would meet the increasing demand for ecosystem services information. Yet despite the large and growing quantity of published ecosystem services research and the desire of many decision-makers to account for natural capital and ecosystem service impacts, there remains a substantial gap between academic research and the informational needs of decision-makers and practitioners ([Guerry et al., 2015](#); [Hanley et al., 2015](#); [Ruckelshaus et al., 2015](#); [Braat, 2015](#); [Carpenter et al., 2009](#)).

Why is ecosystem services research not meeting the needs of decision-makers? Over the last 4 years, US federal agency scientists and decision-makers involved with the National Ecosystem Services Partnership (NESP) have described multiple factors that inhibit the use of ecosystem services assessments and valuations produced by the research community (see [NESP, 2016](#)). Similar factors have been described by recent advisory boards and others commenting on the use of ecosystem services analysis within US federal agencies (e.g., [US EPA, 2009](#); [NOAA SAB, 2016](#)), and by advisory groups in other regions of the world ([Braat, 2015](#); [Wong et al., 2015](#)). These factors fall into two primary groups. The first group comprises factors related to failure to develop transparent and unambiguous linkages between ecosystem changes and outcomes that matter to or are directly valued by people. For example:

- Available biophysical models tend to focus on purely ecological or biophysical outcomes not clearly or directly linked to outcomes that matter to people ([Keeler et al., 2012](#); [Schultz et al., 2012](#); [Olander et al., 2015](#)).
- Available economic and social science models capable of estimating the value of ecosystem services are often not well linked with biophysical models or their outputs ([Johnston et al., 2012](#); [Schultz et al., 2012](#)).
- The results of studies that generate estimates of the total value of ecosystem services (e.g. [Costanza et al., 1997](#)) are not capable

of estimating changes in the value of these services arising from many types of changes in policy or management, nor do they fully capture location-specific for ecological or socio-economic factors that determine value.

- Research from the academic community often fails to address topics or ecosystem services directly relevant to organizational decision-making or ignores constraints (e.g., statutory restrictions, data requirements) that are directly relevant to the effects of decisions on ecosystem services or values ([Schaefer et al., 2015](#)).

The second set of reasons for the disconnect between available research and decision-maker needs is related to the use of methods that do not answer relevant policy and management questions, and/or are not sufficiently transparent, usable and generalizable by decision-makers, considering factors such as budget, time, capacity, and data constraints. For example:

- Models provided to predict the ecological consequences of decisions and the value of affected services require expertise that agencies often lack, particularly in economics and other social sciences.
- The data required by most ecosystem service models are too costly to acquire (e.g., in time, money, resources, required approvals).
- The results of high quality studies are often so detailed and specialized that they are difficult to generalize and therefore of limited relevance for policy or management questions.
- Valuation methods advocated by researchers (e.g., stated preference methods) may not be readily accepted by agencies overseeing research and data collection (e.g., Office of Management and Budget), or may require extensive and time-consuming approvals ([Griffiths and Wheeler, 2005](#)).
- The accuracy and reliability of ecological and social models, and the uncertainty associated with results, are often unknown.

There are also reasons why researchers frequently lack incentives to produce relevant research that fits the needs of practitioners. Publication pressures may incentivize researchers to work on projects with greater novelty and precision rather than those relevant to decision-making. Conducting relevant research can also be time consuming. It often requires extensive interactions with stakeholders and the dedication of time to understand specific policy and management contexts. This time cost can be a disincentive for researchers to engage in truly relevant research.

This article is geared to researchers who, despite the challenges raised in the prior paragraph, want to pursue research that meets the needs of those making policy and management decisions. To this end, we suggest and illustrate two key strategies that are designed to improve researchers' ability to produce research that is directly relevant to practice. These strategies reflect approaches that have proven successful in integrating ecosystem services research to decision-making.

The first strategy is to design research methods that go beyond biophysical outcomes (e.g., water storage) to provide clearly linked ecological and social outcomes of interest (e.g., amount and timing of water available for a specific user). We refer to these outcomes as benefit-relevant indicators (BRIs). BRIs have characteristics which make them particularly well suited to informing decisions and supporting any subsequent valuation efforts ([Olander et al., 2015](#)). The

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