

PREFACE

Ecosystem Services: From Biodiversity to Society, Part 1

Ecosystem services (ES) are the natural functions and processes of ecosystems which are of value to humans. By definition, therefore, ES are an anthropocentric concept: humans are the focus of ES (Fig. 1). This means that it is essential to acknowledge the social, economic and ecological systems within which individuals and human societies are embedded, in order to fully apply the concept of ES. Given the ubiquity these socioeconomic–ecological interrelationships across the globe, the ES framework has almost universal potential and its importance in policymaking is growing. Nonetheless, ES and the way the concept is sometimes applied (e.g. the commodification or monetarisation of nature) are still viewed with caution by many, especially those who see it as a threat to the traditional conservation goals of maximising biodiversity. Even now, a full decade after the publication of the Millennium Ecosystem Assessment (MEA 2005), which catalysed the field, there is surprisingly little empirical data that bring together social, economic and ecology thinking about ecosystems, and much of the theory is similarly embryonic.

Part 1 of this two-part volume of *Advances in Ecological Research* opens with an overview of the major trends in the field and the remaining challenges that need to be addressed since the publication of the MEA in 2005. Although ES had been studied before then, under a variety of different names and from somewhat different perspectives, it was with the MEA that the field really took off. The number of papers on ES has been growing since then, with ES accounting for an ever-larger slice of the total number of papers published in ecological journals (Fig. 2). As attested by the papers published, including those assembled here, the term ES is often used loosely, rather than being strictly limited to studies that explicitly consider humans. This might partly explain why the growth of ES has outstripped the related and more established fields related to ecosystem processes (EP) or functioning (EF), through a rebadging of more traditional EP and EF research under the ES moniker, as well as “genuine” new ES research. The idea that ecosystems provide things of value to humans is hardly new, but the formalisation of these concepts into a (more) unified framework and the strong links to emerging environmental legislation represent a fundamental

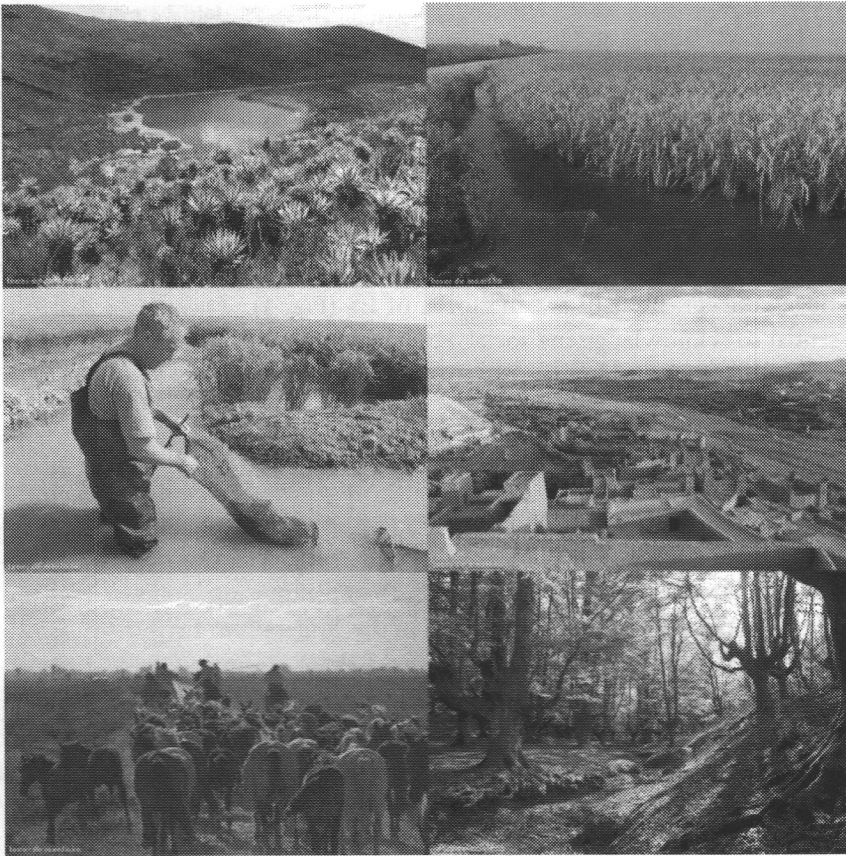


Figure 1 Examples of human-modified ecosystems and the services they provide. *Images courtesy of I. Palomo.*

shift in how humans are now recognised as being integral to nature, rather than somehow set apart.

The papers in this volume are arranged in a sequence of increasingly broader scope and scale, from those focused in Part 1 on understanding how human activities can alter local biodiversity and ecosystem processes that ultimately support, deliver and modulate services, through to those in Part 2 that move deeper into the more complex territory where the natural and social sciences overlap. Our aim was to show how these studies lie on a continuum and that ES can permeate all levels of biological organisation, influencing socioeconomic–ecological systems both directly and indirectly.

One theme that emerges throughout the volume is the need to move towards a more unified framework, to develop a clear, unambiguous shared

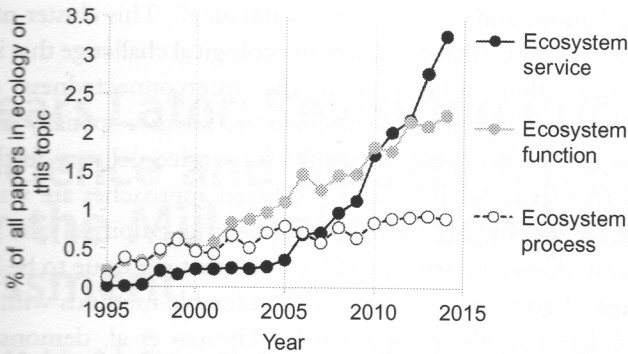


Figure 2 Trends in ES publishing in peer-reviewed journals over the past two decades spanning the publication of the MEA in 2005. Searches were undertaken using Web of Science for the topics "ecosystem servic*", "ecosystem functio*" and "ecosystem proces*" within the category "ecology" and the results were compared to the total number of papers in that category published between 1995 and 2014 inclusive.

lexicon and also, where possible, analytical approaches. This may be done by applying network-based approaches, which are powerful tools for coping with complex systems having multiple drivers, responses and entities that interact with one another—whether these are species in a food web, humans in a farming cooperative or banks within an economic system. This is of course just one of many potential ways of studying ES, but given the multivariate and multidisciplinary nature of the field—and the fact that network theory has already developed in parallel, but largely independently, within each of these disciplines—it represents a promising extension and integration of existing tools that could help provide the more coherent approach we need.

Part 1 opens with a paper by Mulder et al., which sets the tone by assessing the current state of the field and future prospects, in the context of the MEA, its precursors and the revolutionary changes that have occurred since its publication. They identify recurrent themes that have yet to be addressed and suggest how this might be done. This is followed by a series of papers that grapple with some of the more fundamental issues that underpin service provision, but which have yet to be resolved—in particular, these reflect the growing realisation that a synthesis of EF, resilience theory and food web ecology has much to contribute to the development of ES research (Truichy et al.; Mancinelli and Mulder; Hines et al.). These papers highlight the need to be able to understand both the direct cause-and-effect relationships and the subtler, often counterintuitive, indirect effects that can arise

when perturbations and drivers “act at a distance”. This cluster of papers is followed by an exercise that considers an ecological challenge that is touched upon by the other authors; that the interconnectedness of meta-communities, here of plants and pollinators, forms a spatially explicit set of networks that could confer resilience on service delivery in the face of habitat loss (Astegiano et al.). Network-based approaches are visited again by Thomas et al., but in terms of developing empirical and analytical methods, from theory, to feed into ES studies that continue to be hampered by a shortage of good quality data and transferable methods with which to test and validate hypotheses objectively. Thomas et al. demonstrate how networks that contain both ecological and social elements can be used for managing ES.

The 12 chapters in this two-part volume provide a snapshot of ES research: illustrating the current state of the art and spanning a full spectrum from developing a mechanistic understanding of the biological processes that ultimately deliver services, through to the implementation of policies designed to optimise service delivery. There is clearly much work to be done, but this volume offers an important step towards developing the next generation of approaches that we will need to ensure humanity remains within a “safe operating space” in a more sustainable future.

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DAVID BOHAN

MICHAEL J.O. POCKOCK

GUY WOODWARD