COMMENTARY

Common ground for biodiversity and ecosystem services: the “partial protection” challenge [version 1; peer review: 2 approved]

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Abstract
New global initiatives require clarity about similarities and differences between biodiversity and ecosystem services. One argument is that ecosystem services capture utilitarian values, while biodiversity captures intrinsic values. However, the concept of biodiversity equally emerges from anthropogenic use values. Measures of biodiversity indicate broad option values, and so provide different information about future uses and benefits. Such differences nevertheless can be the basis for “common ground” for biodiversity and ecosystem services. Systematic conservation planning and related frameworks acknowledge such differences through effective trade-offs and synergies among different values of society. The early work on regional biodiversity trade-offs includes a little-explored aspect that could enhance this common ground. Regional planning here takes into account the “partial protection” of biodiversity provided by some land uses. Common-ground will be promoted by better integrating the ecosystem services and biodiversity conservation offered by ecosystems at the “natural end of the spectrum” with the partial protection and other benefits/services provided by more intensively-transformed places.
**Associated Research Article**

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Introduction

“Biodiversity” and “ecosystem services” increasingly travel together as companion terms. Examples include the new “Intergovernmental science-policy platform on biodiversity and ecosystem services” (IPBES), the new Strategic Plan of the Convention on Biological Diversity (CBD), and the emerging Global Biodiversity Observation Network (GEO BON). These new initiatives require clarity about the similarities and differences between biodiversity and ecosystem services. Some distinctions naturally emerge from our basic definitions – “biodiversity” refers to living variation, and “ecosystem services” refers to benefits to humans from natural ecosystems. However, biodiversity also has traditional links to benefits/values, and here comparisons with ecosystem services continue to raise important issues.

Biodiversity sometimes is characterised as all about intrinsic, non-anthropogenic values, with ecosystem services then providing the links to human well-being. For example, Haines-Young and Potschin argue: “Biodiversity has intrinsic value and should be conserved in its own right. However, the utilitarian arguments which can be made around the concept of ecosystem services and human well-being are likely to become an increasingly central focus of future debates about the need to preserve ‘natural capital’”. Similarly, Hardy argues: “The idea of ecosystem services allows for addressing more than the “intrinsic” value of biodiversity by expanding the breadth of the conservation argument to include the “utilitarian” values of nature”. Thus, an argument is that only through ecosystem services do we move beyond biodiversity’s intrinsic values to also consider utilitarian values.

Common ground

A recent statement by Reyers et al. that “the concept of biodiversity emerges from an intrinsic context” echoes earlier studies, including the previous assertion by Reyers and colleagues that “biodiversity and ecosystem services are associated with different values (intrinsic vs. utilitarian)” (see also). However, Reyers et al. do suggest “common ground” based on biodiversity’s additional links to ethical, spiritual, and religious values. They argue that, because these are ecosystem services, conservation of ecosystem services sometimes captures biodiversity and its values (see also).

In a response to Reyers et al., Faith points out that the concept of biodiversity equally emerges from anthropogenic use values, citing the early calls for conservation of diversity to ensure benefits “for present and future use”, and the early references to “option values” (the value of biodiversity in providing uses, often unanticipated, for future generations; see also). Thus, in contrast to recent perspectives, there is no requirement to add-in ecosystem services considerations in order to build a case for biodiversity conservation based on human-use values.

Reyers et al. agree that the concept of biodiversity emerges from anthropogenic values. However, they object to Faith’s observation that biodiversity and ecosystem services “may differ in how well they capture current and future uses”. Reyers et al. correctly argue that ecosystem services include future uses. However, Faith argues that option values of biodiversity are broad in reflecting unknown benefits, including those from unknown elements or services.

In contrast, ecosystem services typically focus on option values related to possible future use of known services (e.g. future timber from a forest area). For example, DIVERSITAS links option value to the “availability of a particular service for use in the future”. Broader option values are measured by estimating biodiversity (for discussion see). Thus, biodiversity by its nature arguably contributes something additional, something different, concerning potential future uses.

Reyers et al.’s conclusion that “some scientists focus on differences while others focus on similarity and common ground” therefore is a concern. It implies that proposing differences is counter-productive to finding “common ground”. However, I think any truly useful “common ground” for biodiversity and ecosystem services will build on differences. This is apparent in decision-support frameworks related to systematic conservation planning and “regional sustainability analysis” that seek trade-offs and synergies among the different values associated with biodiversity, ecosystem services, and other needs of society. Part of that common ground framework is now well-established. Measures of regional biodiversity are used to identify places with high versus low biodiversity marginal gains (“complementarity” values which vary depending on other allocations in the region). For a given locality, high complementarity, combined with high co-benefits (or “negative costs”) and low opportunity costs of conservation, implies priority for conservation over alternative land uses having higher costs and smaller co-benefits (for related work, see and Insights from an Australian planning framework for biodiversity and ecosystem services.

Partial protection

The early foundations of that regional biodiversity-plus-costs framework include some little-explored aspects that could enhance the common ground of biodiversity and ecosystem services: here, planning includes land/water uses offering ecosystem services or other benefits, combined with only “partial protection” of biodiversity (implying some lower complementarity value). Early examples illustrate cases where a partial protection option is allocated, and other cases where the non-conservation land use in a given place is preferred over the partial protection option because it maximises regional net benefits (see Partial degrees of protection and regional sustainability analysis).

The Millennium Ecosystem Assessment (MA) highlights this approach in the context of biodiversity policy options:

“...an integrated biodiversity trade-offs framework (Faith et al. 2001a, 2001b) suggests how such partial protection (for example, from private land) can contribute to the region’s trade-offs and net benefits”. However, the MA also observes that “The great uncertainty is about what components of biodiversity persist under different management regimes, limiting the current effectiveness of this approach”.

As more information of this kind becomes available, case studies should explore applications, and evaluate interesting variants of the partial protection framework. Variants now include extensions to the original DIVERSITY-ED, and TARGET (e.g.,) partial
protection approaches, to better accommodate multiple options for areas, and the related “partial protection” method in Marxan\textsuperscript{14}.

Because partial protection accommodates otherwise-competing values, it helps establish an inclusive, “common ground”, framework that acknowledges differences. Biodiversity measures can complement ecosystem services in indicating broader option (and other) values. Further, “ecosystem services”, which conventionally refer to ecosystems at the “natural end of the spectrum”\textsuperscript{13}, are complemented by more intensively-transformed places which sometimes provide partial protection along with other benefits/services.

Of course, one could define “ecosystem services” to capture all these aspects, but making clear distinctions helps to avoid possible conceptual confusions arising when everything is forced under the ecosystem services umbrella (where any human benefit from any place becomes an “ecosystem service”; for related discussion, see\textsuperscript{7,14,15}). Ecosystem services can point to co-benefits specifically from retained natural ecosystems (providing essentially “full protection” of the elements of biodiversity in that place), and be integrated into a broader decision-support framework that also considers the partial protection (or no-protection) options in a region.

### Competing interests

No competing interests were disclosed.

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### References

1. Haines-Young R, Potschin M: The links between biodiversity, ecosystem services and human well-being. Chapter six in Ecosystem Ecology: A New Synthesis, eds. DG Raffaelli and CLJ Frid. Cambridge University Press 2010. Publisher Full Text
2. Hardy D: Motivating Private Landowner Conservation to Maximize Ecosystem Services. River Basin Center, Odum School of Ecology, University of Georgia 2008. Reference Source
3. Reyes B, Polasky S, Talits H, et al.: Finding a common ground for biodiversity and ecosystem services. Bioscience. 2012; 62(5): 503–507. Publisher Full Text
4. Eghn B, Rouget M, Reyes B, et al.: Integrating ecosystem services into conservation assessments: a review. Ecol Econ. 2007; 63(4): 714–721. Publisher Full Text
5. Eghn BN, Reyes B, Carwardine J, et al.: Safeguarding biodiversity and ecosystem services in the Little Karoo, South Africa. Conserv Biol. 2010; 24(4): 1021–1030. PubMed Abstract | Publisher Full Text
6. Maguire LA, Justus J: Why Intrinsic Value Is a Poor Basis for Conservation Decisions. Bioscience. 2008; 58(10): 910–911. Publisher Full Text
7. Mace GM, Norris K, Fitter AH: Biodiversity and ecosystem services: a multilayered relationship. Trends Ecol Evol. 2012; 27(1): 19–26. Publisher Abstract | Publisher Full Text
8. Faith DP: Biodiversity and ecosystem services: similar but different. Bioscience. 2012; 62(9): 785. Publisher Full Text
9. IUCN: World Conservation Strategy: living resource conservation for sustainable development. International Union for Conservation of Nature and Natural Resources (IUCN) 1980. Publisher Full Text
10. McNeely JA: Economics and biological diversity: developing and using economic incentives to conserve biological resources. IUCN, Gland, Switzerland. 1988: 232pp. Reference Source
11. Wilson EO: The Diversity of Life. Norton, New York 1992. Reference Source
12. Larsen FW, Turner WR, Brooks TM: Conserving Critical Sites for Biodiversity Provides Disproportionate Benefits to People. PLoS One. 2012; 7(5): e36971. PubMed Abstract | Publisher Full Text | Free Full Text
13. Reyes B, Polasky S, Talits H, et al.: The Common ground of biodiversity and ecosystem services demonstrated: a response to Faith, Bioscience. 2012; 62(9): 785–786. Publisher Full Text
14. Faith DP: Biodiversity. The Stanford Encyclopedia of Philosophy (Fall 2008 Edition), Edward N. Zalta (ed.) 2008. Reference Source
15. Humphries C, Williams PH, Vane-Wright RI: Measuring biodiversity value for conservation. Annu Rev Ecol Syst. 1995; 26: 93–111. Publisher Full Text
16. Margules CR, Pressley RL: Systematic conservation planning. Nature. 2000; 405(6783): 243–253. PubMed Abstract | Publisher Full Text
17. Faith DP: Biodiversity and regional sustainability analysis. CSIRO, Canberra. 1995. Reference Source
18. Faith DP, Walker PA: Integrating conservation and development: effective trade-offs between biodiversity and cost in the selection of protected areas. Biodivers Conserv. 1996; 5(4): 431–446. Publisher Full Text
19. Faith DP, Walker PA: The role of trade-offs in biodiversity conservation planning: linking local management, regional planning and global conservation efforts. J Biosoc. 2002; 27(4 Suppl 2): 393–407. PubMed Abstract | Publisher Full Text
20. Faith DP, Carter G, Cassis G, et al.: Complementarity, biodiversity viability analysis, and policy-based algorithms for conservation. Environ Sci Policy. 2003; 6(3): 311–328. Publisher Full Text
21. Boyland M, Nelson J, Bunnell FL, et al.: Creating land allocation zones for forest management: a simulated annealing approach. Can J For Res. 2004; 34(6): 1669–1682. Reference Source
22. Davis FW, Costello C, Stoms D: Efficient conservation in a utility-maximization framework. Ecol Soc. 2006; 11(1): 33. Reference Source
23. Naidoo R, Balmford A, Ferraro PJ, et al.: Integrating economic costs into conservation planning. Trends Ecol Evol. 2006; 21(12): 681–687. PubMed Abstract | Publisher Full Text
24. Chan KM, Shaw MR, Cameron DR, et al.: Conservation Planning for Ecosystem Services. PLoS Biol. 2006; 4(11): e379. PubMed Abstract | Publisher Full Text | Free Full Text
25. Cameron SE, Williams KJ, Mitchell DK: Efficiency and concordance of alternative methods for minimizing opportunity costs in conservation planning. Conserv Biol. 2008; 22(4): 886–896. PubMed Abstract | Publisher Full Text
26. Chan KM, Hoshizaki L, Klinkenberg B: Ecosystem Services in Conservation Planning: Targeted Benefits vs. Co-Benefits or Costs? PLoS One. 2011; 6(9): e24378. PubMed Abstract | Publisher Full Text | Free Full Text
27. Luck GW, Chan KMA, Klein CJ, et al.: Identifying spatial priorities for protecting ecosystem services [v1; ref status: indexed, http://F1000r.ca/TbyiHYV]. F1000 Research. 2012; 1: 17. Publisher Full Text
28. Faith DP, Walker PA: Integrating conservation and development: incorporating vulnerability into biodiversity-assessment of areas. Biodivers Conserv. 1996; 5: 417–429. Publisher Full Text
29. Faith DP, Walker PA, Ives J, et al.: Integrating conservation and forestry production exploring trade-offs between biodiversity and production in regional land-use assessment. For Ecol Manage. 1996; 85: 251–260. Publisher Full Text
30. Faith DP, Walker PA: Regional sustainability and protected areas–biodiversity protection as part of regional integration of conservation and production. In: Pigram, J.J., Sundell, R.C.-E., (Eds.), National Parks and Protected Areas: Selection, Delimitation and Management. Centre for Water Policy Research, University of New England, Armidale, 1997; pp. 271–296.
31. McNeely JA, Mooney HA, Oteng-Yeboah AA, et al.: Biodiversity. In: *Ecosystems and Human Well-Being, Policy Responses*. K. Chopra, et al., Eds. (Millennium Ecosystem Assessment, Island Press, Washington, DC) 2005; 3: pp. 119–172.

Reference Source

32. Faith DP, Walker PA, Margules CR, et al.: Some future prospects for systematic biodiversity planning in Papua New Guinea – and for biodiversity planning in general. *Pacific Conserv Biol.* 2001; 6: 325–343.

Reference Source

33. Faith DP, Margules CR, Walker PA, et al.: Practical application of biodiversity surrogates and percentage targets for conservation in Papua New Guinea. *Pacific Conserv Biol.* 2001; 6: 289–303.

Reference Source

34. Watts ME, Ball IR, Stewart RR, et al.: Marxan with Zones: software for optimal conservation based land- and sea-use zoning. *Envir Model Softw.* 2009; 24(12): 1513–1521.

Publisher Full Text

35. Daily GC editor: *Nature's Services: Societal Dependence on Natural Ecosystems*. Washington, DC: Island Press. 1997; 392 p.

Reference Source

36. Boyd J, Banzhaf HS: What Are Ecosystem Services? The Need for Standardized Environmental Accounting Units. *RFF DP 06-02*, Discussion paper. Resources for the Future 2006.

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I am pleased to approve this article for publication. I have the following three brief comments:

1. It is important to acknowledge that partial protection, or protection of some components of biodiversity, is possible in places used predominantly for purposes other than biodiversity protection. The qualification of the MEA, noted by Faith, that it is difficult to measure such a contribution must also be acknowledged.

2. More intensively transformed places may also contribute ecosystem services even though they protect little or almost no biodiversity. For example, the sediment free water that sugar cane plantations can deliver (although that water may contain dissolved nutrients).

3. As a comment - an aside really - I wonder how anything can have non-anthropogenic values when those values are being assigned by people.

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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This brief but interesting opinion piece argues that biodiversity has both intrinsic value and human-use (utilitarian, instrumental) value.

Previous studies have focused primarily on the intrinsic value of biodiversity and assigned utilitarian values to the ecosystem services generated by biodiversity. Yet, Faith argues that biodiversity has utilitarian value beyond those of ecosystem services because protecting biodiversity yields option values for humans from unknown future benefits. That is, protecting biodiversity maximises future options for benefits that may be used in the future, but which we are unaware of now. Current benefits are captured in the ecosystem-services concept, and option value for ecosystem services focuses on future use of current known services. Hence, both biodiversity and ecosystem services provide utilitarian values, but in different ways.

In essence, Faith argues for the need to recognise the differences between biodiversity and ecosystem services, and he promotes the use of the ‘partial protection’ approach within a systematic planning framework. The partial protection approach applied within a given region would consider the various trade-offs from protecting biodiversity and protecting land or systems generating services to maximise regional net benefits.

I agree with the need to recognise the different values and benefits of biodiversity and ecosystem services, and do not support subsuming biodiversity entirely within the ecosystem-services framework. The partial protection approach appears to offer promise in this area. This opinion piece is a reply to a reply and readers interested in following this argument should see citations 8 and 13 (in article reference list) and the original paper (Reyers, B et al. (2012) Finding common ground for biodiversity and ecosystem services).

**Competing Interests:** No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.
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