Ecosystem Services 10 (2014) 52–53

Contents lists available at ScienceDirect

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser

The misconception of ecosystem disservices: How a catchy term may yield the wrong messages for science and society

In their recent article, Shapiro and Báldi (2014) build on the long-running narrative of "ecosystem services and disservices" (e.g., Zhang et al., 2007; Lyytimäki et al., 2008), describing how nature yields both benefits and harms to society. These harms include crop pests, floods, landslides, wildfires, and zoonotic disease transmission, among others. While we agree with their argument that calculation of these harms is commonplace and corresponding quantification of benefits is needed, we feel the use of the concept of "ecosystem disservices" hampers, rather than helps, the development of an integrative and constructive dialogue about conservation and the complex interrelationships between humans and nature. Estimation of costs and benefits and their balancing as positives or negatives is a principal activity in economics; however, we fear that in this case the term "disservice" carries the wrong message for both science and society.

The "ecosystem disservices" concept poses a danger to conservation efforts. Since natural phenomena sometimes harm people or valuable economic assets, the destruction of "harmful" species and ecosystems may appear to be economically justified, often leading to undesirable unintended consequences. This mindset guided the worldwide drainage of wetlands throughout much of the 20th Century. Wetland drainage sought to reduce disease vectors – both real and imagined. The external costs of this pursuit, however, included reduction or total loss of important ecosystem services including water supply, flood and nutrient regulation, and habitat for commercially, recreationally, and culturally valued species. Wetland drainage had important consequences that propagated through complex human–natural systems in ways that a simple emphasis on wetland "disservices" could not bring into focus.

As Shapiro and Báldi acknowledge, many disservices are caused or aggravated by an expanding human footprint (i.e., encroachment on ecosystems, which places people at risk of natural ecosystem processes) or human disturbance of ecosystem processes. In an example of the former, population growth and agricultural expansion in the developing world is placing humans, livestock, and crops in closer proximity to pests and disease vectors. In an example of the latter, a century of fire suppression in the western United States, combined with increasing development of the Wildland Urban Interface and potentially exacerbated by climate change-induced drought, has led to increasingly costly wildfires and the loss of life and property. We agree that properly balancing the "costs and benefits of ecosystems" can improve society's economic calculus, as Shapiro and Báldi suggest. However, a more comprehensive approach would seek to preemptively reduce society's exposure to natural disasters, emerging pests, and disease while at the same time restoring their natural regulatory processes.

The ecosystem disservices concept also adds confusion as nascent efforts emerge to tackle the long-standing goal of understanding and quantifying the dynamic aspects of ecosystem services, including their spatiotemporal flows. In our work on modeling ecosystem service flows, we take care to distinguish between *sources* that generate environmental flows, *sinks* that deplete those flows, and their connection to *users* (human beneficiaries) via service-specific flow paths (e.g., hydrologic flows, transportation networks, lines of sight, or functions related to the movement of organisms; Bagstad et al., 2013; Villa et al., 2014). In this paradigm, ecosystems always provide a benefit to people – either by directly supplying value to society (e.g., raw materials, food, water, cultural ecosystem services) or by reducing or eliminating the flow of a potentially detrimental entity that is able to reach people (e.g., floodwater, undesirable nutrients or sediment, disease, or agricultural pests). We term the former *provisioning benefits* and the latter *preventive benefits*. Although this lexicon has unfortunate terminological overlap with the MA (2005)'s "provisioning services," we believe that it provides a far clearer, more systematic approach to quantifying spatiotemporal flows of ecosystem services. Of equal importance, this paradigm provides a clearer conservation message than the "services–disservices" paradigm. For provisioning benefits, people gain from restoring beneficial source ecosystems and/or reducing detrimental sink features. For preventive benefits, people gain from restoring natural processes that act as sinks or from reducing societal exposure to such potential harms (i.e., use) – not solely from "controlling" the offending species or ecosystem that may cause harm to society.

Ultimately, we favor a systems view of the complex interactions between people and nature – a call that has been made many times before (e.g., Carpenter et al., 2009). Enumerating service values alongside those of disservices has advantages, as Shapiro and Báldi point out. But ultimately this distinction outlines and reinforces a simplistic view of humans and nature as independent, rather than interdependent, entities. We feel, with others, that the time is overdue for a revision of this conceptualization that is more respectful of complexity and its consequences. Framing clashes between nature and society with a term such as "disservices" presents an overly simplistic balance sheet that impedes the evolution of a fuller discourse on the sustainability of complex human–natural systems. We believe that replacing the "disservices" concept with a fuller understanding of ecosystem service flow dynamics is a more efficient way to advance both the science of ecosystem services and the policy instruments that may lead to a more sustainable future.

http://dx.doi.org/10.1016/j.ecoser.2014.09.003
2212-0416/Published by Elsevier B.V.

References

Bagstad, K.J., Johnson, G.W., Voigt, B., Villa, F., 2013. Spatial dynamics of ecosystem service flows: a comprehensive approach to quantifying actual services. Ecosyst. Serv. 4, 117–125.
Carpenter, S.R., Mooney, H.A., Agard, J., Capistrano, D., DeFries, R.S., Diaz, S., Dietz, T., Duraiappah, A.K., Oteng-Yeboah, A., Pereira, H.M., Perrings, C., Reid, W.V., Sarukhan, J., Scholes, R.J., Whyte, A., 2009. Science for managing ecosystem services: beyond the Millennium Ecosystem Assessment. Proc. Natl. Acad. Sci. USA 106, 1305–1312.
Lyytimäki, J., Petersen, L.K., Normander, B., Bezák, P., 2008. Nature as a nuisance? Ecosystem services and disservices to urban lifestyle. Environ. Sci. 5, 161–172.
Millennium Ecosystem Assessment (MA), 2005. Millennium Ecosystem Assessment: Living Beyond our Means-Natural Assets and Human Well-Being. World Resources Institute, Washington, DC.
Shapiro, J., Báldi, A., 2014. Accurate accounting: how to balance ecosystem services and disservices. Ecosyst. Serv. 7, 201–202.
Villa, F., Bagstad, K.J., Voigt, B., Johnson, G.W., Portela, R., Honzak, M., Batker, D., 2014. A methodology for adaptable and robust ecosystem services assessment. PLOS One 9, e91001.
Zhang, W., Ricketts, T.H., Kremen, C., Carney, K., Swinton, S.M., 2007. Ecosystem services and dis-services to agriculture. Ecol. Econ. 64, 253–260.

Ferdinando Villa
Basque Centre for Climate Change, IKERBASQUE, Basque Foundation for Science, Spain

Kenneth J. Bagstad *
Geosciences and Environmental Change Science Center, U.S. Geological Survey, Denver, CO, USA
E-mail address: kjbagstad@usgs.gov

Brian Voigt, Gary W. Johnson
Gund Institute for Ecological Economics, University of Vermont, Burlington, VT, USA

Ioannis N. Athanasiadis
Electrical and Computer Engineering Department, Democritus University of Thrace, Xanthi, Greece

Stefano Balbi
Basque Centre for Climate Change, Spain

Received 9 June 2014
25 August 2014
3 September 2014

* Corresponding author. Tel.: +1 303 236 1330.