Principles to Guide Assessments of Ecosystem Service Values

Authors:

Ervin, D., S. Vickerman, S. Ngawhika, F. Beaudoin, S. Hamlin, E. Dietrich, P. Manson, J. Schoenen.

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Cover photos: Dad and daughter fishing. Photo by Recreational Boating and Fishing Foundation / USFWS. U.S. Customs and Border Patrol conducting welfare checks on people who have been cut off by flood waters, Kindred, North Dakota, 4-15-2011. Photo by Michael Rieger / FEMA. Three Common blue butterflies (*Polyommatus icarus*). Photo by Visser Ruud.

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A document arising from the Ecosystem Services Valuation Workshop held July 8-9 2013 at Portland State University, an event sponsored by Portland State University's Institute for Sustainable Solutions, the Cascadia Ecosystem Services Partnership, and Defenders of Wildlife.

Contents

EXECUTIVE SUMMARY

Ecosystem services are the benefits that nature provides. Myriad assessments of the value of nature's benefits are being conducted by public and private organizations, and they vary considerably in their coverage of ecological, social, and economic effects, and the rigor with which the values are assessed.

> *Achieving sustainability is a systems challenge that cannot be addressed by separately optimizing pieces of the system.*
> (Graedel et al, 2013, p. vii)

The 10 guiding principles in this document encourage interdisciplinary approaches to assessing the social, ecological, and economic benefits of ecosystems and biodiversity, and their interdependent relationships. Practitioners, resource managers, academics, policy makers, local communities and other stakeholders—including the environment—stand to benefit from a set of principles guiding the emerging approaches to assessments of ecosystem service values. Following these principles will lead to more comprehensive, credible and consistent assessments that can improve public and private decisions and the well-being of current and future generations.

> *This shift in focus from complex modeling and nonmarket valuation to more direct collaboration with managers, ecologists, and biophysical scientists in participatory decision-making describes a revised role for economists.*
> (Kline et. al, 2013, p. 153)

This document reports on guiding principles developed at a collaborative multi-sector workshop held in July 2013 at Portland State University in Portland, Oregon. The intended audience for these principles is individuals who make or influence natural resource decisions. They include policy makers at the local, state, and federal levels; natural resource agencies and tribes; non-profit organizations; academics and consultants who conduct ecological, social, and economic studies; and private businesses. This report can also provide context for conservation, business and trade organizations, the media, and interested, engaged citizens.

> *The basic economic model is, in general, too narrow to give reliable guidance for environmental policies involving the distant future or large-scale ecosystem changes.*
> (Parks and Gowdy, 2013, p. e6)

Student at Wetzel Woods in the Tualatin River National Wildlife Refuge. Photo courtesy of the Friends of Tualatin River NWR.

INTRODUCTION

The overarching purpose of this report is to foster comprehensive assessments of nature's ecological, social and economic benefits. Such assessments will consistently produce sound resource management decisions that improve ecological integrity, reinforce trust and engagement among stakeholders, and increase long-term social and economic well-being.

What are ecosystem services?

Biodiversity—the variability among living organisms within and between structures at the genetic, species and ecosystem levels and the variety in their composition and function—underpins the proper functioning of ecosystems and ensures the delivery of ecosystem services (Reyers et al 2013; World Economic Forum, 2013). The relationship between biodiversity and ecosystem services is complex and includes win-win, win-lose and win-neutral situations (Reyers et al 2013). For example, attempts to increase the provision of food and timber may well lead to decreases in biodiversity, while other efforts, such as natural habitat protection, may enhance the provision of regulating and cultural ecosystem services, such as carbon sequestration and recreation.

Ecosystems and the biodiversity they embody constitute "environmental capital" on which human well-being heavily depends. The services provided by ecosystems include formation of soil and renewal of its fertility, consistent flows of fresh water, maintenance of the composition of the atmosphere, pollination of flowers and crops, control of the distribution and abundance of pests and pathogens, production of fish and wildlife, aesthetic, recreational and spiritual values from natural landscapes, maintenance of a "genetic library" of global biodiversity as a source of future insights and innovations benefitting humankind, and important contributions to keeping climatic conditions in the range to which human society and current ecosystems are adapted (PCAST, 2011).

> *There is an urgent need for the community to move beyond the either biodiversity or ecosystem services debate to one that acknowledges that both biodiversity and ecosystem services—both intrinsic and instrumental values—are important arguments in stemming the tide of biodiversity loss.* (Reyers, et.al, 2012, p. 506)

Ecosystems have inherent value, in addition to their direct utility to individuals. For example, a healthy, functioning aquatic ecosystem supports fish and other species, whether we catch them or not. At the same time, nature provides goods, such as food and fiber, and services, such as flood control and air filtration, that support human life on earth. Some of nature's contributions to humans have significant economic value that can be quantified and monetized. Nature also provides social value to humans, such as spiritual or cultural enrichment, that may not be quantified or monetized, but nonetheless can be rigorously analyzed with qualitative methods.

Why will guiding principles help the emerging field of ecosystem services?

The process of measuring the benefits derived from ecosystem services raises some challenges. The first is that a wide variety of valuation studies have been conducted in recent years using methods that may not necessarily follow scientifically accepted theories and

techniques. The second challenge relates to efforts to place credible "value" on all benefits from natural resources. Despite the challenges in measuring and monetizing ecological and social benefits, they can and should be rigorously analyzed with quantitative and qualitative methods. This view mirrors a recommendation from the U. S. Environmental Protection Agency's Scientific Advisory Board: **"Consider the use of a wider range of possible valuation methods, either to provide information about multiple sources and concepts of value or to better capture the full range of contributions stemming from ecosystem protection."** (USEPA, 2009, p.3)

Application of the following principles will help provide a more complete and holistic evaluation of potential benefits, costs and risks of managing natural resources. If broadly implemented, the principles outlined in this report can help ensure that:

- The economic, social, and ecological benefits derived from ecosystems are given appropriate consideration in decision making by all types of organizations.
- Decision makers and other members of society are informed about the importance of functioning ecosystems.
- Ecosystems, and their ability to contribute to human well-being now and in the future, are conserved.
- Assessments help to avoid unintended consequences, improve the quality and durability of management decisions, and potentially reduce antagonism among constituent groups.

Why assess the total value[1] of ecosystem services?

In any given decision involving the management of natural resources there will be tradeoffs in ecological, social and economic benefits across a range of potential outcomes. It is rarely possible to maximize all possible benefits at the same place simultaneously. But without assessments that inform decision makers of the broad range of ecological, social and economic values that exist, degradation and destruction of the ecological resources supporting those services is a probable outcome (Heal et al, 2005). An ecosystem services approach conveys our reliance on nature. With that in mind, sound resource management decisions should advance human well-being without impairing the long term ecological function that helps generate that well-being.

Virtually any discussion about ecosystem services ultimately reveals a fundamental difference in the underlying perspectives that people hold about nature. Those with a bio-centric view place more emphasis on the importance of maintaining the overall integrity of ecosystems that produce a variety of plants, animals, beautiful landscapes, clean air and water, and other attributes upon which all organisms depend. Those with a more utilitarian perspective tend to define ecosystem services as the flows of direct, generally measurable, and often monetized, naturally derived benefits for human communities.

Without a set of principles to guide comprehensive assessments of ecosystem services, there is a tendency for economists, ecologists, businesses, governments and other organizations to focus on single issues or projects, engage a limited group of stakeholders, or overlook important considerations. Therefore, we propose an integrated approach. Developing this integration will require advances in participatory research and practice, guided by the principles articulated below.

How were these principles developed?

Over July 8-9, 2013 the Cascadia Ecosystem Services Partnership, Portland State University's Institute for Sustainable Solutions and Defenders of Wildlife convened an ecosystem services valuation workshop of 30 experts and practitioners. A facilitated process produced remarkable alignment among the diverse group of participants on a set of draft principles to guide ecosystem service value assessments. Over the subsequent two months, a broader group of reviewers provided feedback resulting in the principles presented in this report. See the appendix at the end of this document and the website http://www.pdx.edu/sustainability/ecosystem-services-valuation-workshop for further detail on the workshop.

[1] In this paper, 'total value' refers to assessing in monetary and other quantitative and qualitative terms the multiple social, ecological, and economic benefits of an ecosystem as they pertain to a particular decision point.

Principles Guiding Assessments of Ecosystem Service Values

To foster comprehensive assessments of nature's ecological, social and economic benefits that consistently produce sound resource management decisions, ecosystem service assessments should:

1. Articulate a clear purpose for the assessment and a rationale for the methods used.

2. Reflect a fair and honest effort to represent ecosystems and all of the benefits they provide without intent to produce a predetermined outcome.

3. Identify and engage all interested and affected stakeholders in a transparent, inclusive manner.

4. Use interdisciplinary approaches to address the landscape attributes, ecological functions, and stakeholder perspectives at scales that allow decision makers to understand the full range of benefits, costs, and potential solutions.

5. Assess the full suite of ecological, social, and economic costs and benefits in quantitative and qualitative terms using credible methods, while avoiding the double counting of monetized values.

6. Consider resilience and the ability to maintain biodiversity and sustain ecosystems for current and future generations.

7. Be based on the best scientific information available while disclosing uncertainties that bear on the decision, and provide analysis on the potential effects of those uncertainties.

8. Apply robust methodologies and approaches that strive to be consistent, repeatable, and transparent, while encouraging the improvement of ecosystem services assessment methodologies and tools.

9. Provide a rationale for the exclusion of any social, ecological, or economic attributes relevant to the management decision that were not included in the assessment, and make the full assessment available for technical review.

10. Use language that is relevant to the intended audience and sparing in its use of acronyms and abbreviations to make valuation results accessible for non-technical stakeholders.

Commentary on the principles

To ensure that assessments of ecosystem service values are comprehensive, credible, and produce sound resource management decisions, ecosystem service assessments should:

1. **Articulate a clear purpose for the assessment and a rationale for the methods used.**

Connecting valuation efforts and results to policy processes and decision-making is crucial to the usefulness of ecosystem service concepts and frameworks. Studies to assess ecosystem service values should be motivated by and developed to address salient decision needs—and the analysis methods utilized should be driven by those needs. For example, a study using methods that only incorporates quantitative economic data should inform decision-makers as to why methods that derive qualitative values were not part of the assessment. Ideally, an interdisciplinary team should lead the process from problem formulation through the analysis of values (US EPA, 2009).

2. **Reflect a fair and honest effort to represent ecosystems and all of the benefits they provide without intent to produce a predetermined outcome.**

Valuation efforts should be conducted with the same integrity and commitment to objectivity that is standard in other areas of research. The credibility of ecosystem service values assessment is prefaced by the motivations and methods used. Ultimately, its usefulness is determined by the perception of objectivity and lack of bias implicit in the assessment.

Voices
from the ecosystem services valuation workshop:

What comes out of this workshop should be policy relevant, otherwise we haven't done our jobs
– Sara Vickerman, Defenders of Wildlife.

Voices
from the ecosystem services valuation workshop:

Ecosystem services analysis has the power to be a silo-buster
– Steve Whitney, the Bullitt Foundation.

3. **Identify and engage all interested and affected stakeholders in a transparent, inclusive manner.**

Decision makers should engage affected and interested stakeholders early in the assessment process to identify the ecosystem attributes, services and benefits that matter to them, and seek to understand why they matter. It is critical that a comprehensive picture of the values in play and the tradeoffs between them are explicated, and that assessments be expanded to include ecological and social perspectives alongside economic ones.

4. **Use interdisciplinary approaches to address the landscape attributes, ecological functions, and stakeholder perspectives at scales that allow decision makers to understand the full range of benefits, costs, and potential solutions.**

Ecosystem processes and the flow of ecosystem services and biodiversity inherently span various spatial scales. The spatial context in which ecosystem services and their benefits are studied varies widely, from a single inner city park, to a watershed, to a region, to the entire planet. While the resources available for each study may vary also, they should provide information relevant to the decision-making context that acknowledges the spatial and social context in which ecosystem processes and communities function together. For example, if studied from a single disciplinary perspective or with too narrow a spatial lens, a proposal asking decision makers to weigh the costs and benefits of converting a forested area located in the watershed of a community's water supply into a business park will likely exclude other quantitative and qualitative water quality benefits that forest provides to that community. The resulting decision could lead to unintended consequences such as health risks and higher

water rates. Assessing the proposal with an interdisciplinary approach at a scale that recognizes the importance of this watershed and the benefits derived from its vegetated land cover would provide a more accurate picture of the proposals costs and benefits (Graedel et al, 2013).

5. **Assess the full suite of ecological, social, and economic costs and benefits in quantitative and qualitative terms using credible methods, while avoiding the double counting of monetized values.**

Ecosystem services cover a wide spectrum of benefits, with different methods for generating values that should be included in a comprehensive assessment. The valuation spectrum includes:

- **Quantified:** Many costs and benefits can be quantified, for example the number of lives saved through disaster planning and recovery. Biodiversity and ecological integrity are notoriously difficult to quantify, and though a variety of metrics are available, improved metrics are needed. However, it may be considered inappropriate to put dollar values on a human life or nature in certain situations.
- **Monetized:** Some benefits are already monetized, typically because they are traded in the market with observable prices, for example food, timber and energy. Other services, such as flood mitigation or the social cost of greenhouse gas emissions, may not be traded in the market, but their monetary values can be estimated.
- **Qualitatively analyzed:** Other benefits derived from ecosystems, especially cultural benefits, may hold significant value. However, these values are not readily quantifiable and may more appropriately be analyzed qualitatively with interview and survey data.

The entire range of benefits should be included, or at least addressed, in a values assessment in order to present a comprehensive picture of the viable options that are available. Double counting—when the same benefit is counted twice and its value is erroneously inflated—becomes an issue when there is a need to assign monetary value to specific services. But it is not the same as counting multiple benefits from different services. For example, a forest may provide water quality and carbon sequestration services. Valuing both services captures a broader range of benefits, and is not double counting.

In this case, a complete valuation may include some monetization, some quantification of ecosystem values, and some qualitative descriptions.

6. **Consider resilience and the ability to maintain biodiversity and sustain ecosystems for current and future generations.**

Assessments should help public and private organizations understand dependencies and impacts between natural and human systems. They should also characterize the risks and opportunities associated with changes in the nature and characteristics of biodiversity while identifying opportunities to enhance ecosystems, their adaptive capacities (Walker and Salt, 2006), and their ability to contribute to the well-being of future generations.

Voices
from the ecosystem services valuation workshop:

I'm glad I live in a society in which economics is not the only lens.
– John Loomis, Colorado State University.

7. **[Assessments should] be based on the best scientific information available while disclosing uncertainties that bear on the decision, and providing analysis on the potential effects of those uncertainties.**

It is important that ecosystem service assessments draw on the most relevant, accurate and robust information available. More collaboration within and between fields such as ecology, economics, other social sciences, and geographic information systems may support the development and deployment of increasingly higher quality information. However, ecosystem service concepts and frameworks are relatively new and our

knowledge is not yet perfect. For example, uncertainty and limitations may come from any or all of the following sources in the same assessment project: uncertainty of the data interpreting how the ecosystem functions; how precisely the models and methods used can estimate the costs and benefits; the confidence in the results subject to external shocks; and the applicability of that study to other areas or contexts. To build the trust of resource managers in ecosystem services concepts and frameworks, it is imperative to recognize and disclose the uncertainties encountered and to analyze and describe the potential impacts those uncertainties could bring to bear on the decision.

Voices
from the ecosystem services valuation workshop:

We need to understand the characteristics of the landscape, the functions nature performs and upon which the services necessary for survival and life quality depend. Those services have value
– Kevin Halsey, EcoMetrix Solutions.

8. **Apply robust methodologies and approaches that strive to be consistent, repeatable, and transparent, while encouraging the improvement of ecosystem services methodologies and tools.**

Ecosystem services valuation is an emergent, interdisciplinary field that draws from a range of ideological and methodological sources for guidance. A variety of methods are used today and more are likely to arise over time. In order to provide confidence in the results of ecosystem service value assessments, the methods should be tested, vetted, peer-reviewed and discussed to the point that there is general acceptance on how a particular method works, how its results are generated and interpreted, and in what situations, scales or contexts that method is useful or feasible. However, this emphasis on accepted methods should not discourage the discovery, development and debate of new knowledge and innovative methods that can be proposed and made available for scrutiny and testing.

9. **Provide a rationale for the exclusion of any social, ecological or economic attributes relevant to the management decision that were not included in the assessment, and make the full assessment available for technical review.**

Organizations undertaking valuation to support decision making face limits on how much time, budget, and staff are available to carry out the assessment. While ecosystem services methods seek to expand and integrate information, there will always be limits on the justifiable levels of effort available. Valuation efforts should note these limits and their impacts, and explicitly state if they feel more resources could have significantly improved the valuation process. At the same time, some values or users may fall outside of the jurisdictions, authorities, or business lines of an organization, even though these values are important to society. In these cases, organizations should note these omitted values, the reasons for not analyzing them and, if known, describe future actions such as research and data collection that might address them. Assessments should also be available for technical review to ensure that, as the ecosystem services field grows, so too does the collective wisdom of practitioners, resource managers, academics, policy makers, and local communities.

10. **Use language that is relevant to the intended audience and sparing in its use of acronyms and abbreviations to make valuation results accessible for non-technical stakeholders.**

Findings should be presented in a way that is relatable, useful, credible, and transparent for a clearly intended audience. Because engagement with stakeholders who receive the benefits derived from ecosystem services is critical to the credibility of the assessment and its usefulness to support the decision-making process, those stakeholders should be able to access the report and understand its content. Sparing use of acronyms and jargon in the assessment report will achieve this without affecting the rigor or credibility of the study.

EXAMPLE 1: Considering a proposed floodplain development

Historically, many of the floodplains in the U.S. were converted to other uses, such as housing and industrial development—and this conversion continues. However, floodplains are natural systems that can deliver a diverse array of ecosystem services, including food production, flood control, pollution filtration, wildlife habitat, cultural and spiritual experiences, and more.

Some of the benefits are easily quantified and monetized, such as crop values and reduced flood damages. Others may just be credibly quantified, as for endangered species habitat, while still others may only be described qualitatively, such as cultural and spiritual experiences. Following the principles proposed here assures that, if a land use authority were asked to consider housing or other development on such a floodplain, the full suite of ecosystem services—whether captured in monetary, quantitative or qualitative terms—would enter a values assessment.

The approach begins with understanding the biophysical attributes of the system and engaging with interested and affected stakeholders to identify all the salient ecosystem services impacted by the proposal. This comprehensive scoping process may add time and expense, but it can avert problems when impacted groups are left out and enter later to challenge the decision. Once all economic, ecologic and social impacts are identified, rigorous analytical methods can be used to assess the value of each impact.

The ecosystem goods and services susceptible to credible monetization—either using market prices or nonmarket valuation techniques—become the final set of economic impacts. But the analysis does not stop there. Social impacts, such as the loss of recreational access for nearby low-income residents and spiritual values of the area held by Native Americans, may be qualitatively analyzed using interviews and surveys. Ecological effects, such as loss of fish and wildlife habitat and hydrologic function necessary for the maintenance of the system, may be quantified using biological metrics. Although the economic, social, or ecological values are expressed in different units, tradeoffs can be illuminated. For example, the land use authority may elect to preserve the floodplain for its ecological function and/or recreation access by low-income groups if the imputed social value of guaranteeing those uses exceeds the economic benefit of development.

Photo, above: Montane near-boreal floodplain system flanking a gravel barren, Saco River, New Hampshire. Photo by Dan Sperduto, New Hampshire Division of Forests and Lands.

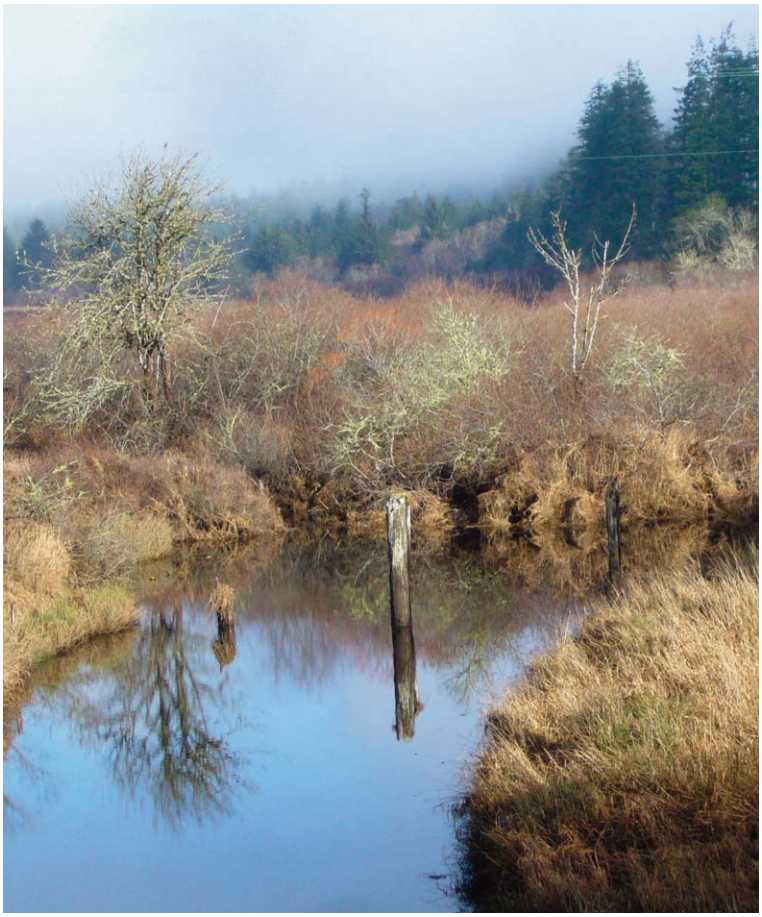
The President's Council of Advisors on Science and Technology

In July 2011, the President's Council of Advisors on Science and Technology (PCAST) issued a report entitled *Sustaining Environmental Capital: Protecting Society and the Economy*. It provided the president with six recommendations to rapidly improve the quality and availability of data on ecosystem function, and for more integrated approaches to valuing the services they provide. Recommendation 4 of that report has direct relevance to the principles advanced in this report:

Federal agencies with responsibilities relating to ecosystems and their services […] should be tasked with improving their capabilities to develop valuations for the ecosystem services affected by their decision-making and factoring the results into analyses that inform their major planning and management decisions. This will entail expanding current efforts on ecosystem-service valuation […] as well as generating new knowledge about the ecosystem-service impacts (in both physical and value terms) of activities taking place on both public and private lands. The Office of Management and Budget (OMB), Office of Science and Technology Policy (OSTP), and Council on Environmental Quality (CEQ) should ensure that the methodologies are developed collaboratively across agencies (PCAST 2011, p iii).

Photos, clockwise from left: Red fox pup by Cheryl L. Peterson. Boy holding the day's catch, White Deer Creek, Pennsylvania. Photo by Michael Thomas / USFWS. Riparian wood rat. Moose Peterson / USFWS.

EXAMPLE 2: Considering quantitative and qualitative data in flood mitigation



In a small Pacific Northwest watershed, five ecosystem services were determined to be a priority: agricultural production, salmon and shellfish production, flood mitigation, water flow, and pollination. The study focused on the costs and benefits of installing wider riparian buffers on agricultural land upstream of a town that frequently floods in the rainy season. The costs of taking land out of agricultural production were weighed against the benefits of downstream flood mitigation, in addition to the other potential ecosystem service benefits.

Applying the guiding principles in this paper would have augmented the quantitative economic analysis by incorporating ecological and social concerns and adding a qualitative filter to the final analysis. For example, several specific benefits were identified as potentially flowing from increased riparian buffers, but no consideration was given to any effects on biodiversity, a critical underpinning to many ecosystem services (Tilman and Polasky, 2005). Additionally, salmon and shellfish are included for their economic production value, but not for their cultural importance, particularly for local tribes. While this cultural significance was considered, the focus— as with many valuations—was quantitative, leading to the exclusion of a critical ecosystem service value. These principles create space for equivalency of quantitative and qualitative analyses that are economically, ecologically, and socially relevant.

Photos, left to right: Beaver pond, photo by Bruce Taylor. Male Redwing blackbird at the William Finley National Wildlife Refuge. Photo by George Gentry / USFWS.

EXAMPLE 3: Landscape-scale assessments of ecosystem services

The principles outlined in this paper are fully compatible with approaches that facilitate an interdisciplinary dialogue on ecosystem services that cross multiple geographical and political/ownership boundaries. They may help government and private actors to address management challenges that must be addressed at a broad scale, such as climate change, fire, hydrological functions, invasive species, connectivity for migrating species, and threatened resources of all types. Application of these principles to a landscape or regional scale assessment will help to foster more durable decisions around complex socio-environmental topics. Ideally, the process will be managed as a public-private partnership.

The principles might be implemented using the following process:

1. Conduct an ecological assessment to characterize the natural resources and ecosystem processes along with the goods and services that they produce.
2. Assess the vulnerability of the ecosystem to the adverse impacts of fire, flood, climate change and other natural and man-made stressors.
3. Engage with the local, regional and federal agencies, businesses and private landowners whose decisions affect the functioning of the ecosystem to develop a shared understanding of the cumulative impacts and opportunities for aligning resource management.
4. Communicate with other interested local, regional, and national-level stakeholders to determine the relevant ecological, social, and economic interests and expectations in the assessment area.
5. Facilitate collaboration among scientists, landowners, community members, decision makers and other stakeholders to conduct quantitative and qualitative assessments of a range of potential ecosystem goods and services to inform discussions about trade-offs.
6. Throughout the process, keep stakeholders informed, consult with them on preferred solutions and outcomes, determine what worked and what didn't work, and make improvements in subsequent applications based on lessons learned.

Photo, above: Beaver pond in Multnomah Channel, near Portland, Oregon. Photo by Bruce Taylor.

EXAMPLE 4: Putting cultural values on the map

Cultural values are often difficult to put into a land or resource management decision matrix. However, the significance of those values sometimes manifest after a decision is made, when stakeholders seek to have that decision reversed or modified. A visual technique referred to as landscape mapping, community values mapping, or cultural values mapping is emerging that can illuminate those values before a decision is made.

A recent study in the Olympic Peninsula in the state of Washington invited local residents reflective of a broad range of stakeholder groups to participate in a cultural values mapping exercise (McLain et al, 2013). Subsequent pilot mapping projects have used a modified version of this technique to obtain cultural values data from visitors, Latino forest workers, and key stakeholder groups.

On a large map, participants marked areas of the peninsula they considered particularly meaningful and described what kinds of values they derived from those places – recreational, aesthetic, intrinsic, educational, a place of cultural or spiritual meaning, etc. A second round of mapping was done for the outdoor activities they pursue in the Peninsula. The resulting maps gave a visual representation of the frequency, spatial density and diversity of cultural values that existed across the study area. This study did not seek to assign a quantitative weight or dollar amount to those values. These cultural values maps can provide decision makers with information on who the key stakeholder groups are, the types of values held for the area, their geographic pattern and frequency, and how their patterns overlap with the biophysical attributes. In doing so, they add more dimensions to standard economic value assessments.

Photo: Petroglyph at the V-Bar-V Ranch Heritage Site. Photo by James Young for the Yavapai County Arizona Centennial.

APPLYING THE PRINCIPLES

Assessments following the principles proposed here are likely to produce outcomes that are superior to assessments that consider a limited range of ecological, social and economic benefits and costs. Given the complexity and expense that an integrated, comprehensive approach can involve, it will not be possible to conduct a full values assessment for every single decision. It may be more cost-effective to address ecosystem services at a broad enough scale to inform many smaller, project-specific decisions. Convening interdisciplinary teams and working with community partners to conduct assessments that cross-jurisdictional boundaries may be a reliable and efficient approach.

Some potential applications of these principles are outlined below:

- In line with the PCAST's 2011 report to the President, Federal agencies could adopt the principles to guide the development of their valuation capabilities and the execution of their ecosystem services programs. Examples of federal agency initiatives that complement the principles include the recent management and planning guidance issued by the Bureau of Land Management, the USDA Forest Service, and Federal Emergency Management Agency (U.S. Department of Interior, 2013; USDA Forest Service, 2012; U.S. Environmental Protection Agency, 2009; U.S. Department of Homeland Security, 2013).
- Inform payment for ecosystem services programs, natural infrastructure feasibility studies, land use and development decisions, and environmental and social impact assessments.
- Develop new values assessment tools or improvements to existing tools consistent with the principles.
- Guide future research that would fill knowledge gaps in ecosystem values assessment. The principles could be applied to previous studies to evaluate differences and improvements in the results, and provide guidance for future assessments.
- Improve corporate environmental management, accounting and performance reporting, risk assessments, and inform strategy and supply chain decisions (Waage and Kester, 2013).
- Encourage philanthropic organizations and other funders to favorably consider proposals to conduct comprehensive ecosystem service valuation assessments that conform to the principles.
- Insert language pertaining to the principles into new legislation regarding water, land management, and other natural resources, related program appropriations, etc.
- Share principles with environmental management professionals to encourage them to follow them in valuation studies for private or public sector clients.
- Use the principles to encourage more inclusive and effective engagement efforts with stakeholders to develop education and outreach products that improve society's understanding of the benefits nature provides and the practice of measuring the values of those benefits.
- Incorporate the principles into university environmental science and management, economics, sociology, engineering, planning, architecture, business, and other curricula and projects working with ecosystem services concepts.

CONCLUSION

The primary reason to conduct an assessment of ecosystem service values is to inform important natural resource, land use, economic and other decisions affecting the environment. The overarching purpose of this report is to foster comprehensive assessments of nature's ecological, social, and economic benefits that consistently produce sound resource management decisions to improve ecological integrity, reinforce trust and engagement among stakeholders, and increase long-term social and economic well-being.

The 10 guiding principles in this document encourage an interdisciplinary approach to assessing ecosystem services that recognizes the social, ecological and economic benefits of ecosystems and biodiversity, and their interdependent relationships.

Completing comprehensive valuations of ecosystem services can be a daunting undertaking, but a better understanding of the complete suite of services that nature supplies our increasingly challenged environment is required for better decisions that impact our surroundings, including biodiversity conservation. The principles laid out in this report were developed in a collaborative, interdisciplinary manner with the intention of providing a framework for a rigorous and inclusive valuation process.

Practitioners, resource managers, academics, policy makers, local communities, businesses, and other stakeholders—including the environment—stand to benefit from a set of principles guiding the emerging approaches to ecosystem service assessments.

Professionals working on valuations and lawmakers wrestling with complex decisions should apply these principles to resource assessments. Wide dissemination and discussion of these principles and the comprehensive assessments that will result from their adoption and application can only improve their integrity to decision making.

Following these principles will lead to more comprehensive, credible and consistent assessments that can improve public and private decisions and the well-being of current and future generations.

Every decision made that affects our ecosystems affects the future of our planet. It is crucial that those decisions be made with a full understanding of the social, ecological and economic context and impacts.

Next Steps

Three logical next steps have been identified and are presented here in no particular order:

- Engage in dialogue regarding the principles among tribes, conservation organizations, academic societies, resource professionals, businesses, industry associations and federal, state, and local governments.
- Establish pilot projects in which resource managers, researchers, and community partners collaborate to apply these principles and work across traditional boundaries to address ecosystem services more comprehensively. Assessments applying these principles would help to determine the difference in outcomes, resources required, and overall social acceptability and utility to decision makers.
- Conduct analyses to determine to what extent government programs and other efforts currently assessing ecosystem service values are compatible with the principles.

APPENDIX

Citations

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Further Readings and Resources

For additional information on ecosystem service valuation, we refer you to the following:

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Further readings, as well as information on the workshop can be accessed from the Portland State University website: http://www.pdx.edu/sustainability/ecosystem-services-valuation-workshop.

Authors

Principal Authors

David Ervin
Senior Fellow, Institute for Sustainable Solutions
Professor of Environmental Management (retired)
Professor of Economics (retired)
Portland State University

Sara Vickerman
Senior Director, Biodiversity Partnerships
Defenders of Wildlife

Contributing authors

Simon Ngawhika
Post-graduate Fellow
Portland State University Institute for Sustainable Solutions

Fletcher Beaudoin
Assistant Director
Portland State University Institute for Sustainable Solutions

Samantha Hamlin
NSF Fellow
Ecosystem Services for Urbanizing Regions IGERT Program, Portland State University

Paul Manson
NSF Fellow
Ecosystem Services for Urbanizing Regions IGERT Program, Portland State University

Jodi Schoenen
NSF Fellow
Ecosystem Services for Urbanizing Regions, IGERT Program, Portland State University

Emily Dietrich
Graduate Research Assistant
Portland State University

Technical Editor: Christina Williams, Portland State University, Institute for Sustainable Solutions
Designer: Kassandra Kelly, Defenders of Wildlife

Reviewers

Ken Bagstadt, USGS; Mark Buckley, ECONorthwest; Frank Casey, USGS; Robert Deal, USDA Forest Service; Sahan T.M. Dissanayake, Colby College; Steve Elliot, University of Sydney; Billy Gascoigne, USGS; Shauna Ginger, US Fish & Wildlife Service; Laura Lopez Hoffman, University of Arizona; Jimmy Kagan, Institute for Natural Resources; Jeff Kline, USDA Forest Service; Noelwah Netusil, Reed College; Lydia Olander, Duke University; JB Ruhl, Vanderbilt University; Nikola Smith, USDA Forest Service; Tom Spies, USDA Forest Service; Steve Whitney, Bullitt Foundation; Guy Ziv, Stanford University.

Workshop Participants

The participants of the July workshop where these principles were conceived, were:

Bill Abadie, US Army Corps of Engineers; David Batker, Earth Economics; Fletcher Beaudoin, Portland State Institute for Sustainable Solutions; Randy Bluffstone, Portland State Economics Department; Mark Buckley, ECONorthwest ; Frank Casey, US Geological Survey; Luca De Stefanis, Senator Jeff Merkley's Office; Emily Dietrich, Portland State Institute for Sustainable Solutions; Sahan T. M. Dissanayake, Colby College; Tania Ellersick, USDA Forest Service; Dave Ervin, Portland State University; Shauna Ginger, US Fish and Wildlife Service; Kevin Halsey, EcoMetrix Solutions Group; Laura Hicks, US Army Corps of Engineers; Jimmy Kagan, Institute for Natural Resources; Jeff Kline, USDA Forest Service; John Loomis, Colorado State University; Noelwah Netusil, Reed College; Nancy Rottle, University of Washington; Nikola Smith, USDA Forest Service; Tom Spies, USDA Forest Service; Tracy Stanton, Earth Economics; Jeffrey Thomas, Puyallup Tribe of Indians; Paul Thompson, Michigan State University; Sara Vickerman, Defenders of Wildlife; Dan Whelan, Senator Jeff Merkley's Office; Steve Whitney, Bullitt Foundation; Barbara Wyse, ENTRIX.

Workshop Facilitator: Marsha Willard, Axis Performance Advisers