BSR

Making the Invisible Visible:

Analytical Tools for Assessing Business Impacts & Dependencies Upon Ecosystem Services

January 2015 UPDATE

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This working paper was written by Sissel Waage and Corinna Kester. The detailed tool-tracking tables were developed by Corinna Kester.
It emerged from the efforts of BSR's Ecosystem Services Working Group, which was formally launched in January 2007. At the end of the initiative's first year, it was clear to the group's corporate members that a new suite of analytical tools were being developed to support decision-making that integrates ecosystem services. Corporate members asked BSR to informally track the emergence of these new tools and assess their robustness, credibility, and relevance to business settings.

Therefore, from late 2007 to the present, BSR's Ecosystem Services Working Group has tracked the full suite of tools that are being created in the ecosystem services domain and has issued periodic updates in the form of working papers.

This paper was originally issued in January 2013 and has been revised to include new developments through the end of December 2013. Its purpose is to help corporate employees understand the full range of analytical tools that have been (and are being) developed to identify, measure, assess, and, in some cases, value multiple ecosystem services concurrently within decision-making processes. We hope that it will help corporate representatives to understand their full range of options in selecting analytical tools to assess a company's ecosystem services impacts and dependencies.

The scope of this paper is restricted to decision-making aids that consider multiple ecosystem service metrics concurrently. Therefore, it does ***not*** include carbon calculators, water usage measurement tools, and other aids that consider only one metric. We focus on tools that seek to optimize across multiple parameters in one application of the analytical approach.

In researching this paper, we conducted both a literature review, primarily based on online documents, and interviews with thought and practice leaders. Our intent has been to generate the most inclusive list (of which we are aware) of current and emerging, multivariate ecosystem services tools and decision-making aids.

We are grateful for support and input from the corporate members of BSR's Ecosystem Services Working Group, including (in no particular order): Sarah Connick, Rich Woods, Laura Napoli, Nina Springer, Greg Biddinger, Joanna Cochrane, Mikkel Kallesoe, Sachin Kapila, Roberto Bossi, David Norris, Ann George, Cristian Strickler, Teague Raica, Shirley Oliveira, Rachel Kennedy, Mark Johnston, Maarten Kuijper, Judy Gunderson, Mark Weick, Jonathan DiMuro, Rich Helling, Melissa Barbanell, Gail Ross, Nathan Monash, Tabby Resane, Nick Cotts, and Craig Duxbury.

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Introduction

Has your company started fielding questions about impacts and dependencies on natural capital and ecosystem services? If so, what measures should you use? Which analytical approaches should you apply? Why?

These questions are becoming more common within corporate meeting rooms as interest in natural capital and ecosystem services rises. The evidence of this building wave includes:

- **The Dow Jones Sustainability Indices** (DJSI) takes into consideration whether or not companies in some industries, such as forestry, have processes in place to understand their impacts and dependencies on ecosystem services.[1]
- **The International Finance Corporation** (IFC) conducts due diligence based on a range of factors, including impacts and dependencies on biodiversity and ecosystem services.
- **Seventy-nine global financial institutions** referred to as the Equator Banks are factoring ecosystem services impacts and dependencies into their due diligence practices.
- **Forty-one financial institutions, as well as the global Association of Chartered Certified Accountants (ACCA)**, have signed the Natural Capital Declaration to "demonstrate our commitment to the eventual integration of natural capital considerations into private sector reporting, accounting, and decision-making, with standardization of measurement and disclosure of natural capital use by the private sector."
- More than **16 national and regional governments** are addressing ecosystem services in public sector actions or even policy.
- At least **24 nations** are deploying some form of natural capital accounting.

Ecosystem Services

Ecosystem services are the benefits provided by functioning ecosystems to people. Though they seldom acknowledge them, people realize these benefits in terms of factors that contribute to personal health, jobs, and safety.

The 2005 Millennium Ecosystem Assessment (MEA) organized ecosystem services into four overarching categories:

- **Provisioning services,** which are goods or products produced by ecosystems (e.g., food, freshwater, wood and fiber, etc.)
- **Regulating services,** which are natural processes regulated by ecosystems (e.g., climate regulation, food regulation, disease regulation, water purification, etc.)
- **Cultural services,** which are nonmaterial benefits obtained from ecosystems (e.g., aesthetic, spiritual, educational, recreational, etc.)
- **Supporting services**, which are functions that maintain all other services (e.g., nutrient cycling, soil formation, primary production, etc.)

Source: Millennium Ecosystem Assessment, www.maweb.org.

[1] Personal communication via email from Mattias Mueller of DJSI's research entity, Sustainable Asset Management (SAM), who refers to page 82 of the 2012 SAM "Sustainability Yearbook," and the forestry and paper sector as an example of where ecosystem services criterion is applied.

As interest grows, corporate decision-makers would be well advised to understand how they can begin to measure and manage their businesses' impacts and dependencies on ecosystem services.

Numerous companies have indeed begun to explore applications of ecosystem services concepts. Corporate practice currently covers a wide range of applications—though many efforts are in the early stages. Some initiatives seek to integrate ecosystem services into accounting, while other efforts hinge on new reporting approaches. Other companies are focused on assessing current or possible future ecosystem services impacts and dependencies, in order to factor these findings into new project planning, impact assessment, and/or risk management. The full spectrum, as well as a list of specific companies that are taking particular actions, is laid out in a separate BSR report on corporate uptake of ecosystem services concepts and approaches.

The findings of the first known set of independent interviews with corporate leaders on ecosystem services applications, which BSR reported on and continued through 2013, indicate that an ecosystem services approach can offer decision-makers a more complete picture. In particular, business leaders report that ecosystem services assessments have provided information about environmental dependencies that have not been considered traditionally in corporate decision-making. For example, an ecosystem services assessment can uncover questions such as:

- Will the water that a company needs to operate in a particular area be available, given projected rainfall patterns, underground aquifer recharge rates, demands of other users in the watershed, and other dynamics that may affect water flows and access over time?
- Are operations at risk from current or future impacts and dependencies on ecosystem services, particularly when considered in terms of total availability of those ecosystem service 'flows' over time?
- Is a major capital investment judicious in that particular area, in light of current and future availability of and dependencies on ecosystem services?

As more companies explore what ecosystem services concepts can offer in practice, BSR's interviews with early adopters new and emerging tools have uncovered numerous questions, such as:

- **What indicators should be measured and analyzed in an ecosystem services approach?** How? With what data (or data-gathering methods) and what assessment tools?
- **Why should companies select certain tools instead of others?**
- **Have the ecosystem services tools been verified and validated?** Have they undergone a third-party examination? If so, was the process itself scrutinized and supported? By whom?
- **Do these tools mesh neatly with existing corporate performance measurement and management systems?**
- **What are the costs and benefits of applying these tools in private sector settings?**
- **Are there documented case studies of a particular tool's application in the private sector?** If so, do these cases specify the appropriate application context? Do they demonstrate that the tool results in new insights that improve business decisions (such as by decreasing risk, increasing competitiveness, improving operational efficiencies, addressing customer needs, etc.)? Do they document the costs of applying the tools?
- **Can corporate managers feel confident that they are selecting a credible measurement and assessment approach *and* that the benefits will outweigh its costs?**

Few of these questions have clear answers. While this situation is unsurprising given the field's emerging nature, it presents challenges to corporate managers who are tasked with deciding how their companies will assess their impacts and dependencies on ecosystem services.

In response, BSR has developed this report to assist the businesspeople who are asking questions about ecosystem services. It is intended to help corporate decision-makers understand and assess the current state of play within the ecosystem services tool landscape.

Our analysis is based on seven years of tracking the field and collaborating in what is (to the best of our knowledge) the world's only comparative tool testing, conducted by BSR's Ecosystem Services Working Group in collaboration with the U.S. Geological Survey (USGS) and the U.S. Bureau of Land Management (BLM). The results were laid out in a 2013 paper published in a peer reviewed journal.

Based on years of past work on ecosystem services tools, this Working Paper offers a unique view of the full suite of existing and emerging tools. It also suggests potentially promising areas of corporate application and summarizes the challenges that private sector representatives reported during interviews in 2011, 2012, and 2013. Finally, the report lays out a few pathways forward that could accelerate pilot testing, as well as the process of verifying and validating ecosystem services tools.

Overall, this Working Paper depicts an emerging tool domain. The tools available today may (or may not) be those that companies will be applying several years from now. Because history is still being written, this Working Paper offers a point-in-time assessment.

At present, many companies look first at the World Resources Institute's (WRI) Corporate Ecosystem Services Review (ESR), which is a do-it-yourself structured methodology available through a free Excel spreadsheet that can be downloaded from the WRI website. Beyond this initial step, there are a wide range of opinions, as laid out in the appendix.

For corporate decision-makers, the takeaway message is that key stakeholders are increasingly looking at ecosystem services. They will likely have more and more questions about a company's impacts and dependencies on ecosystem services. Therefore, it would be wise for corporate representatives to begin identifying and testing robust and feasible ways to integrate ecosystem services into decision-making processes. The private sector has an opportunity to engage with the thought leaders and tool developers, ideally through pilot testing of tools in corporate settings. This work is an essential part of forging a path forward.

We welcome comments on this Working Paper, as well as about other BSR analyses of applications of ecosystem services in corporate contexts. Please email your thoughts and suggestions to Sissel Waage (swaage (at) bsr.org).

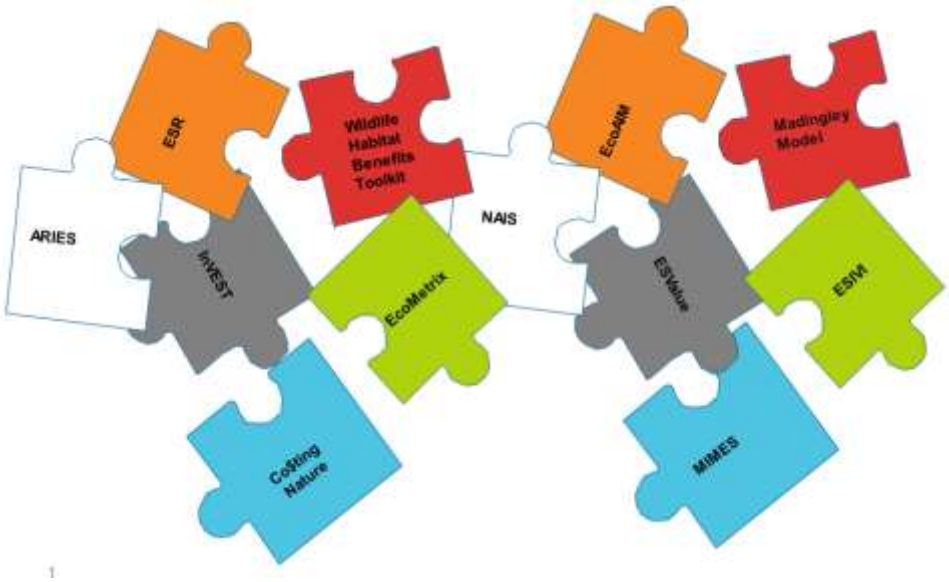
The Emerging Tool Landscape

The ecosystem services tool domain is rapidly expanding. Tools have emerged from academic institutions, nonprofit organizations, public sector agencies, and companies around the world. Some are global in scope; others were developed to be applied in specific regions. Some tools are based on a set of questions that are organized in an Excel spreadsheet; others require users to enter quantitative ecological data into a format that can generate geographic information system (GIS) maps.

The range of approaches to assessing corporate impacts and dependencies on ecosystem services is wide and growing. (For a detailed list of tools and descriptions of the various approaches of each, please see a recent peer-reviewed article on the topic, as well as past BSR reports, such as "New Business Decision-Making Aids in an Era of Complexity, Scrutiny, and Uncertainty.")

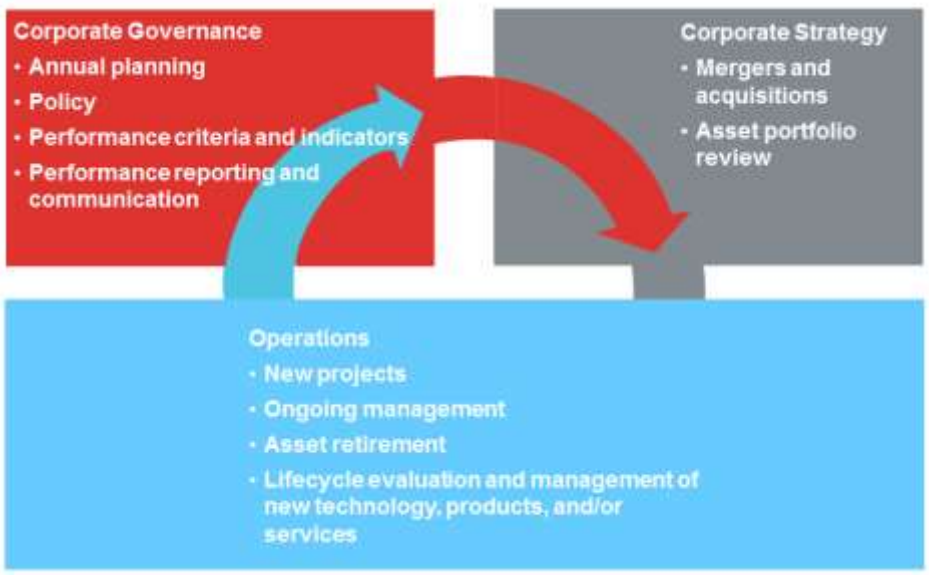
This proliferation has resulted in a complex tool landscape. Some people describe it as difficult to navigate, while others assert that it is overwhelming. Many tool developers use similar language to describe very different approaches and distinct analytical architectures upon which their tools are based. As the figures below depict, it is unclear to many newcomers how, if at all, many tools relate to one another, as well as to existing corporate decision-making processes and protocols.

Figure 1. Growing Set of Tools with Unclear Complementarities and Distinctions



Note: The specific tools shown in this figure are illustrative and intended to represent the expanding range of tools that are available.

Figure 2. Lack of Clarity about How Tools Mesh with Existing Corporate Decision-Making Processes



Despite the many existing questions, it is increasingly clear that corporate managers will need to craft a feasible approach for responding to requests from investors, corporate ranking organizations, and other stakeholders around disclosing information about their companies' impacts and dependencies on ecosystem services.

In light of this situation, a myriad of questions face corporate managers, with few answers, most notably:

» *What tool should a company select? Why?*

» *How confident can a corporate manager feel about these tools—in terms of both the accuracy of the resulting analysis and the value they add to the company's decision-making processes, particularly in relation to tool application costs?*

» *Have these tools been verified and validated in robust and transparent processes? Which tools are credible? According to what metrics?*

This Working Paper suggests some answers to these questions, insofar as anyone can provide answers about an emerging domain. The paper's real value, however, lays in the most up-to-date list of tools (that we know of) relevant to the private sector for identifying, measuring, assessing, considering trade-offs, and, in some cases, valuing ecosystem services.

In terms of scope, we have included only those tools that have been developed to examine multiple ecosystem services concurrently. These tools have been designed to understand impacts and dependencies on ecosystem services within complex, interrelated systems. Therefore, this report does *not* include single-issue analytical tools, such as carbon calculators, water calculators, or approaches that only measure biodiversity. While these single-parameter tools are important, they do not easily enable users to take an integrated, systems approach—which is the core distinguishing feature of an ecosystem services assessment approach.

Combining these screening criteria with the potential for application in private sector settings, we have developed a series of tables that lay out the current tools and decision-making aids. Given the number of tools, we have grouped them into the following categories (in the form of separate tables):

- **Table 1:** Framework Tools for High-Level Screening
- **Table 2:** Landscape- and Watershed-Level Tools
- **Table 3:** Site-Specific and Parcel-Level Tools
- **Table 4:** Product-Level Tools
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We hope that these tables will help corporate decision-makers ask more informed questions about ecosystem services concepts, approaches, indicators, and assessment approaches. In addition, we have provided high-level suggestions about potential corporate applications in the past, which may also be useful in developing a pathway forward.

Verification and Validation

Key Definitions

The Institute of Electrical and Electronics Engineers (IEEE) defines the terms as follows:

Validation *[is] the assurance that a product, service, or system meets the needs of the customer and other identified stakeholders. It often involves acceptance and suitability with external customers.*

Verification *[is] the evaluation of whether or not a product, service, or system complies with a regulation, requirement, specification, or imposed condition. It is often an internal process.*

Note: Excerpted from the "IEEE Guide to Project Management."

The Verified Carbon Standard (VCS), for example, applies these concepts by asserting that:

All projects and credits under the VCS Program must be independently audited to ensure compliance with rigorous VCS requirements for environmental integrity. This is a central aspect of VCS quality assurance. Under VCS, auditors known as validation/verification bodies (VVBs) are tasked with validating project descriptions and verifying actual emission reductions. Currently, more than three dozen VVBs are located across five continents. VVBs are accredited to work in specific sectors, known in the industry as sectoral scopes, ranging from energy to agriculture and forestry.

Note: Excerpted from a discussion on the VCS website.

The ecosystem services tool domain, while maturing, remains a young field. The reason is simple. Few, if any, of today's tools have been subjected to a robust, transparent, independent verification and validation process, particularly in terms of applications in private sector settings. These processes are key to assuring the intended users that particular tools are accurate and consistent. And thus, they are essential for establishing credibility and supporting widespread adoption.

Specifically, the verification process focuses on ensuring that a tool performs as intended and that its equations and analytical components are free of errors. Such a verification process would ideally be part of the development of all new tools. However, in practice, available funding may limit tool verification.

In addition, tool developers would ideally validate or test their tools to compare their conceptual models against real-world data and ensure that their tools are both free of errors and effective at achieving the desired results. Some elements that can be useful for validating tools include:

» **Clear validation plan:** One of the requirements, for example, of the U.S. Food and Drug Administration's Principles of Software Validation is that developers create and follow a plan to guide the overall validation process.

» **Process transparency:** When tool developers transparently communicate their tool verification and validation processes, stakeholders can evaluate and develop trust in these processes.

» **Reliability:** To test a new measurement tool, social scientists typically assess the reliability of its results across multiple users and in multiple settings. Ecologists use statistical approaches to determine the necessary sample sizes and whether the pilot results show that the tool is adequately rigorous.

» **Standards:** In more heavily regulated areas, standards are a common way to validate tools and approaches. The Financial Accounting Standards Board (FASB), for example, outlines standards for how to conduct processes, what internal documentation must take place, and what information must be shared.

» **Peer review:** Used for both professional practice and academic literature, the peer-review process is a common validation method. Though practices vary, the usual approach is to submit an article or study to at least two reviewers, who follow a clearly defined, transparently communicated review process. If it passes the review process, the journal then publishes it.

» **Consensus:** Though not strictly necessary for a market-facing tool, best practice in standards development, as outlined by the International Organization for Standards (ISO), is based on expert, multistakeholder consensus. Some tool developers may seek consensus in order to further strengthen their tool.

These principles can be used to inform verification and validation processes for ecosystem services tools. Without such processes, many corporate decision-makers will likely have concerns that a tool's conclusions may later prove erroneous and thus could lead to poor decisions.

Numerous areas of practice underscore the importance of verifying and validating analytical approaches, standards, and/or tools. For example, these approaches are applied to software and computer systems, as well as to monitor

the safety of food, pharmaceuticals, medical devices, motor vehicles, and traffic and transport processes, among other areas.

By way of illustration, in the climate domain around carbon transactions, the Verified Carbon Standard (VCS) asserts that: "[I]ndependent auditing ensures all reductions are verified by professional, third-party validation/verification bodies."[2] In addition, the Climate, Community, and Biodiversity Alliance (CCBA) has developed standards that "must be used through a two-step process [of]: [1] *validation* [that] demonstrates good project design to generate significant climate, community, and biodiversity benefits [and] [2] *verification,* [which] is a rigorous independent endorsement of the quality of project implementation and the delivery of multiple benefits."

Overall, validation and verification are commonly understood terms and processes that are applied to a wide range of sectors and issues. These processes are widely perceived as an essential component of establishing credibility.

While there are numerous peer-reviewed articles on ecosystem services tools, such as the InVEST tool[3] (Integrated Valuation of Environmental Services and Tradeoff, see Table 2), few tools (if any) have been subjected to an independent, robust, transparent process of verification and validation that follows multiple guiding principles, such as those outlined above.

Looking forward, it will be important that a respected entity establish a clear process, which can be used to review tools and ultimately lead to validation and verification. Numerous entities, such as the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), the U.S. National Academy of Sciences, or a coalition of respected UN entities and NGOs, such as those that led the Millennium Ecosystem Assessment (MEA) which was coordinated by the World Resources Institute (WRI).

In the interim, corporate decision-makers should conduct more pilot tests of ecosystem services concepts and tools within private sector contexts. A few potential contexts for corporate applications of ecosystem services are laid out in the box below. Ideally, companies would document their applications and detail the methods used, costs incurred, skills required for application, and the insights the company gained, and make them available within publicly available materials.

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[2] VCS, "What Is a GHG Program?" http://v-c-s.org/GHG_program.

[3] For example, see: http://www.tandfonline.com/doi/abs/10.1080/21513732.2011.647835, as well as http://onlinelibrary.wiley.com/doi/10.1111/j.1749-6632.2009.04152.x/abstract;jsessionid=9B355939B5C764602AD47C7816DD07A1.d02t01 and http://www.naturalcapitalproject.org/pubs/tradeoffs-2012.pdf. In addition, numerous other publications by the Natural Capital Project, developers of the InVEST tool, which pertain to the tool, are listed at: http://www.naturalcapitalproject.org/publications.html.

Box 1: Potential Corporate Application Sites for Tools

Discussions among BSR's Ecosystem Services Working Group members indicate some promising applications of ecosystem services tools within companies, such as:

- **New project planning and development,** particularly in terms of impact assessment and permitting processes, to show companies, governments, and other stakeholders where and how impacts or co-benefits may result
- **Real estate strategy** and management
- **Property portfolio priority-setting exercises** to assess relative risk and opportunity for property retention, disposition, remediation, restoration, and other options
- **Ongoing management and decommissioning** of operations
- **Valuation** of the impacts on or benefits to ecosystem services
- **Corporate performance and communication dashboard or scorecard,** in terms of measuring performance and progress toward a corporate-level ecosystem services goal
- **Scenario planning and modeling,** such as developing a strategy for adapting to climate change
- **Project planning** within a landscape-level context, in terms of the use of natural resources, beneficiaries, and minimum ecological parameters for the continued flow of ecosystem services
- Outlining additional relevant areas for inclusion in **environmental and social impact assessments** (ESIAs)
- Assessment of products' **lifecycle ecological impacts**
- Selection of **potential building sites**
- Understanding the functions of ecosystem services at the **facility level**
- Identifying corporate dependencies on ecosystem services at various geographical and supply chain sites as a part of **supply chain management**
- Exploring new potential corporate **strategies**
- Optimizing the **sourcing of natural resources**
- **Engaging stakeholders** in at least some of the aforementioned contexts

Looking Forward

The ecosystem services tools domain is still emerging. In the coming years, it will become essential for a respected international entity to define and launch a process for verifying and validating ecosystem services tools based on a clear, transparent, and independent process.

It is unclear whether the tools of today will be the tools of tomorrow. Which tools prove useful depends upon what the coming review processes unearth, both in terms of analytical approaches and applications.

Looking forward, ecosystem services concepts and tools will continue to be developed and tested, as well as ultimately verified and validated. In the process, the tool domain as a whole will mature. However, the arena will likely remain crowded and confusing as more tools are developed in the coming years.

A few scenarios could accelerate both corporate engagement and pilot testing:

» **If a growing set of national or subnational regulations focused on ecosystem services impacts and dependencies were passed, then there would likely be a need for clear tools and measurement approaches.** Government exploration of ecosystem services issues has been on the rise (as documented in BSR's public policy tracking Working Paper), but developing policy and enforcing new regulations takes time. Calamitous events can, however, trigger new policy or even regulation. A few more big storms submerging or significantly disrupting coastal metropolitan areas around the world could spark government action around restoration of natural storm buffers, as well as other elements associated with well-functioning ecosystems. Governments would ideally also allocate funds to support review and assessment of tools to assess progress on flows of ecosystem services over time.

» **If lenders and/or insurance companies changed their lending practices based on new insights about risks presented to a project's (or company's) ecosystem services impacts and dependencies, then work on ecosystem services measurement tools would quickly mature—with financial services assessment tools leading this trend.** The approaches and tools needed by financial services analysts would likely include both a set of questions or checklists on whether a company has a process in place, as well as more granular quantitative and map-based (GIS) data on regional ecosystem services flows, demand, and other relevant trends. To get these analytical tools in place, financial services firms and insurance companies could jointly fund the granular analytical tools and databases to enable all players to better understand risk.

» **If the private sector pilot tested more tools and shared their results publicly, then it would drive improvements in tools and provide greater clarity about which ones add value to what application contexts.** Both ecosystem services tools and business decision-makers could benefit from the tools' pilot test applications and refinement in business settings. Such private sector testing is essential to understanding the value the tools add, as well as for building the support for application within companies. Specifically, developers need to refine tools so that businesses are better able to mesh these new analytical processes with their existing corporate decision-making processes.

Essential Tool Attributes

Based on discussions within BSR's Ecosystem Services Working Group, corporate decision-makers assert that ideally they want tools to have the following attributes:

» **Scalability, adaptability, and repeatability** for different locations, conditions, types of company activity, etc.

» Ability to generate and compare **scenarios**

» **Ease of use** (related to time and resources)

» Generation of **spatially explicit display of information** (e.g., maps)

» **Transparency,** in terms of tool inputs, operation, and outputs that are easy to understand and communicate

» **No need for new metrics reported in aggregate across the entire company,** unless there is a corporate-wide policy that names ecosystem services

» **Ability to integrate the tool into existing corporate decision-making processes** (e.g., ESIAs or site restoration)

Ultimately, tool developers will need to demonstrate the benefits that companies will realize from applying these new ecosystem services tools and decision aids. In addition, business managers will need clarity about how, when, and why to apply tools to particular business activities and issues, most notably including environmental, social, and health impact assessments (ESHIAs) and lifecycle assessments (LCAs). Having clear evidence of tool credibility and widespread support—based on the tools' verification and validation—will also be essential to justify applying ecosystem services concepts and tools in corporate settings.

Corporate representatives and ecosystem services tool developers have an opportunity to engage and explore what will add value to corporate decision-making processes, particularly in terms of identifying business risks and opportunities.

Appendix: Categories of Tools

Updated January 2015. Please note that, wherever possible, the tool description is a direct quotation from the tool developer.
When applicable, the key phrases in a description are highlighted in boldface.

Table 1: Framework Tools for High-Level Screening

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
Approach for reporting on ecosystem services *(under development)*	**Target audience:** Corporate decision-makers and reporting staff **Ideal application:** Draft that may inform and ultimately be shaped to guide implementation of and reporting on ecosystem services activities **Tool type:** List of questions and parameters to report on	"The Global Reporting Initiative (GRI) has been assessing opportunities to translate emerging thinking around ES [ecosystem services] into **sustainability reporting indicators and approaches** that can be used as a starting point by organizations in all sectors."	Global Reporting Initiative
Biodiversity and Ecosystem Services Assessment Tool *(under development)*	**Target audience:** Corporate decision-makers **Ideal application:** Company-wide assessment of risks and opportunities **Tool type:** To be determined	The tool "provides business managers quick access to information on **potential corporate risks and opportunities related to BES** [biodiversity and ecosystem services]. Using global maps and indicators, it aims to help managers improve corporate visioning and goal setting, prioritization of global BES risks and opportunities, and alert individual business units of potential BES risks and opportunities in their areas."	The Nature Conservancy and The Dow Chemical Company
Ecosystem Services Benchmark	**Target audience:** Financial asset managers and insurers **Ideal application:** Assessing companies within an investment portfolio **Tool type:** Framework (Excel-based)	"The Natural Value Initiative (NVI) has developed a toolkit to (1) **enable the finance sector to evaluate how well . . . [target] sectors are managing biodiversity and ecosystem services risks and opportunities** and (2) engage with . . . companies to reduce their risk exposure through the responsible management and harvesting of natural resources." The published version of the benchmark focuses on the food and beverage sector, but the framework has also been applied to the extractives and pharmaceutical sectors. It assesses company policies, programs, and risks.	The Natural Value Initiative
Ecosystem Services Review	**Target audience:** Corporate managers **Ideal application:** Identifying risks and opportunities and outlining strategies **Tool type:** Guidance document and Excel-based questionnaire	"The Ecosystem Services Review is a structured methodology for corporate managers to proactively develop strategies for **managing business risks and opportunities** arising from their company's dependence and impact on ecosystems."	World Resources Institute (WRI)

Ecosystem Services Review for Impact Assessment	**Target audience:** Corporate impact assessment experts and decision-makers **Ideal application:** Integrating ecosystem services into impact assessments **Tool type:** Framework (Excel-based)	"The Ecosystem Services Review for Impact Assessment provides practical instructions to environmental and social practitioners on **how to incorporate ecosystem services throughout environmental and social impact assessment,** including (1) a conceptual framework of how the project, ecosystem services, and human well-being are linked and (2) step-by-step instructions to systematically incorporate ecosystem services." It is supported by a more detailed document, "Weaving Ecosystem Services into Impact Assessment: A Step-by-Step Method." It also features a Technical Appendix designed for ESIA practitioners who require a detailed understanding of the ESR for IA, walking them through each step and sub-step of the method using an illustrative case study.	World Resources Institute (WRI)
Ecosystem Services Screening Criteria Framework	**Target audience:** Conservation practitioners **Ideal application:** To determine if conditions are favorable for an ecosystem services approach to conservation **Tool type:** Framework	This framework can be used **"to determine if conditions are favorable for an environmental services approach to conservation.** Screening will help evaluate key strengths, weaknesses, and information gaps that need to be addressed if an environmental services approach is taken forward." It lists 10 screening criteria for an organization to consider when using an ecosystem services approach, with key questions related to each.	Natural Capital Project (NatCap) and The Nature Conservancy
Environmental Risk, Opportunity and Valuation Assessment *added in 2014*	**Target audience:** Business leaders **Ideal application:** Evaluation of natural capital risks, opportunities, and trade-offs **Tool type:** Framework	"It is an **analytical framework tool** that integrates an Ecosystem Services Review approach with a Corporate Ecosystem Valuation approach. A key advantage of the tool is that it can be adapted for many different business applications for any sector."	Sustain Value
E.Valu.A.Te (Externality Valuation Assessment Tool)	**Target audience:** Business leaders **Ideal application:** Evaluation of environmental externalities at the site level **Tool type:** Framework	"An online tool that provides interactive, **step-by-step guidance to help corporates complete a site-specific evaluation of environmental externalities**. This includes a complete case study that details the decisions, data, models, and results made by a company at each step of the tool."	University of Cambridge Natural Capital Leaders Platform

Table 2: Landscape- and Watershed-Level Tools

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
ARIES (Artificial Intelligence for Ecosystem Services)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment and management **Tool type:** Computer model	"ARIES is a web-based technology offered to users worldwide to assist rapid **ecosystem service assessment and valuation.** Its purpose is to make environmental decision-making easier and more effective. ARIES helps users discover, understand, and quantify environmental assets and the factors influencing their values, for specific geographic areas and based on user needs and priorities."	Gund Institute for Ecological Economics, University of Vermont
Co$ting Nature	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Regional ecosystem assessment and planning **Tool type:** Computer model	"Co$ting Nature is a web-based tool for **analyzing the ecosystem services** provided by the natural environment, **identifying the beneficiaries of these services, and assessing the impacts of human interventions.** This PSS [policy support system] is a test bed for the development and implementation of conservation strategies focused on sustaining and improving ecosystem services. The PSS incorporates detailed spatial data sets at 1 square kilometer and 1 hectare resolution for the entire world, spatial models for biophysical and socioeconomic processes along with scenarios for climate and land use. The PSS calculates a baseline for current ecosystem services provision and allows a series of interventions (policy options) or scenarios of change to be used to understand their impact on ecosystem service delivery." "The version 1 model covers water, carbon, hazard mitigation, nature-based tourism, biodiversity, and conservation priority, as well as current pressures and future threats. It currently does not include land use and climate scenarios."	King's College London and AmbioTEK
Decision Analysis for a Sustainable Environment, Economy, and Society (DASES)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Multicriteria decision analysis **Tool type:** Web-based model	"An open-source, web-based decision analysis framework that **takes into account the environmental, economic, and societal aspects of issues.** This includes impacted stakeholders as well as the physical, chemical, and biological aspects of ecosystems."	U.S. Environmental Protection Agency (EPA)
EcoAIM (Eco Asset, Inventory, and Management)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment and management **Tool type:** Computer model	"EcoAIM is a tool developed to 1) **inventory ecological services and help in making decisions** regarding development, transactions, and ecological restoration; 2) develop specific estimates of ecosystem services in a geographically relevant context; and 3) evaluate trade-offs among ecosystem services that result from resource management decisions."	Exponent

EcoServ-GIS	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment and management **Tool type:** Computer model	"EcoServ-GIS is a geographic information systems (GIS) toolkit that generates fine scale (10 or 50 m resolution) maps illustrating the **requirement for each ecosystem service as well as the capacity for service provision,** using scientifically-based, standardized methods and widely available data sets. The EcoServ-GIS toolkit has been made freely available to all Wildlife Trusts. Other organizations wishing to use the toolkit for noncommercial use are encouraged to approach their local trusts and local authorities to develop a joint project plan."	Durham Wildlife Trust
Ecospace *(under development)*	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment via mapping **Tool type:** Mapping	"This project is funded by the European Research Council and aims to **develop new methods and insights for the mapping of and accounting for ecosystem services**. The project is implemented in the Netherlands (Limburg Province), Indonesia (Central Kalimantan Province), and Norway (Telemark Fylke). For these three provinces, specific maps are being produced for ecosystem services and ecosystem assets, in both physical and monetary units. In addition, ecosystem services are linked to land use management options, which are defined on the basis of stakeholder consultation." Ecospace is one of three ecosystem accounting methodologies piloted by the WAVES (Wealth Accounting and the Valuation of Ecosystem Services) experts committee.	Wageningen UR (University and Research Centre)
Eco-Synergy	**Target audience:** Business managers **Ideal application:** Ecosystem services assessment **Tool type:** Analytical tool and service	"Eco-Synergy is a design philosophy, combined with a set of analytic tools, which **helps companies to systematically identify beneficial synergies between their operations and the surrounding ecological resources**. The approach is based on a mutual value proposition: Industrial systems can be designed to work in harmony with natural ecosystems so that both can flourish. The Eco-Synergy approach begins by analyzing the demand and supply of ecosystem services within a selected boundary, e.g., a local site, town, or region. Demand is estimated from resource use and emissions, while supply is estimated from ecosystem characteristics. This provides insight into potential mismatches between the demand for specific services and the capacity of ecosystems within the boundary."	Center for Resilience, Ohio State University
Ecosystem Management Decision Support (EMDS)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment and management **Tool type:** Computer model	"The Ecosystem Management Decision Support [EMDS] system is an application framework for knowledge-based **decision support of ecological assessments at any geographic scale.** The system provides a very general solution method (e.g., a framework) for conducting environmental assessments. In order to conduct an assessment with EMDS, the user constructs a **data catalog** that identifies the sources of all GIS themes that can enter into an assessment, and constructs a **knowledge base** that describes the relations among all the ecosystem states and processes of interest to the assessment."	The EMDS Consortium is comprised of the U.S. Forest Service, InfoHarvest, and The University of Redlands.

Ecosystem Services Evaluation Tool (EcoSET) *(under development)*	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment **Tool type:** Computer model	"The aim of this project is to generate a user-friendly automatic ecosystem service evaluation tool to calculate on-demand **maps of ecosystem service provision anywhere globally.**"	Biodiversity Institute Oxford
Ecosystem Services Identification, Valuation, and Integration (ESIVI)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment and management **Tool type:** Excel model	"The ESIVI tool **provides an integrated and flexible approach to identifying, valuing, and integrating ecosystem services** into project and policy decisions. The ESIVI framework uses a mix of qualitative and quantitative inputs and scoring metrics to guide users through a three-stage ecosystem services assessment involving scoping, impact assessment, and mitigation. The tool can be used by a wide range of users for projects and policies anywhere in the world and at any stage in their development. The output is a comprehensive and transparent assessment which can be integrated into existing frameworks (such as environmental and social impact assessments) or used as the basis for a standalone report to inform the development of policies and strategies."	URS
EnviroAtlas	**Target audience:** General audience **Ideal application:** Understanding benefits from nature **Tool type:** Web-based model	"EnviroAtlas is a **collection of tools and resources that provides geospatial data, maps, research, and analysis** on the relationships between nature, people, health, and the economy. Using EnviroAtlas, you can see and explore information related to the benefits that humans receive from nature." "We intend to link the Final Ecosystem Goods and Services Classification System (FEGS-CS) with the EnviroAtlas. By integrating and using the two products together, a user can benefit from a standardized classification framework which can be connected to spatially explicit information relating to a particular place."	U.S. Environmental Protection Agency (EPA)
ESValue	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment and management **Tool type:** Computer model	"ESValue measures the relative value of each key ecosystem service rather than the absolute monetary value, which can be controversial and subject to uncertainty. The tool has two primary components: 1) the ecological effects model, which uses commonly available data to **model the effect of development on ecosystem services,** and 2) the ecosystem services valuation model, which **uses input by stakeholders to model the relative value of ecosystem services** to stakeholders."	Cardno ENTRIX

InVEST (Integrated Valuation of Environmental Services and Tradeoffs)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment and management **Tool type:** Computer model	"InVEST is a family of tools to **map and value the goods and services from nature** that are essential for sustaining and fulfilling human life. InVEST enables decision-makers to assess the trade-offs associated with alternative choices and to identify areas where investment in natural capital can enhance human development and conservation in terrestrial, freshwater, and marine ecosystems." "In 2014, NatCap launched InVEST 3.0.0, the first version of InVEST with standalone versions for of all but one of our 16 ecosystem service models and analysis tools. This major milestone lowers a number of critical barriers to using InVEST: costly ArcGIS software is no longer necessary, our tools run more quickly, and are infinitely more flexible. Accompanying the model set, InVEST 3.0.0 now includes a number of accessory tools to make ecosystem service analyses easier. InVEST 3.0.0 now includes a tool for scenario generation that will help users get started comparing the ecosystem service outcomes of possible futures. InVEST 3.0.0 also includes a tool for hydrological routing that is faster and easier to use than routing in ArcGIS, and a Python scripting toolset, which makes it easier for programmers to modify InVEST models to suit their needs."	Natural Capital Project (NatCap)
InVEST for Impact Assessment *(under development)*	**Target audience:** Land managers and project developers **Ideal application:** Inclusion of ecosystem services in impact assessment **Tool type:** Computer model	"The Natural Capital Project (NatCap) is developing a **tailored software tool that draws on InVEST models to incorporate ES into ESIAs** and impact-offset decisions. A beta tool is expected in mid-2014."	Natural Capital Project
Land Change Modeler for ArcGIS	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Modeling land change **Tool type:** GIS software extension	"Land Change Modeler for ArcGIS is an innovative **land planning and decision support software extension to ArcGIS**. Widely used for the prioritization of conservation and planning efforts, Land Change Modeler allows you to rapidly analyze land cover change, simulate future land change scenarios, model REDD emission scenarios, and model species impacts and biodiversity."	Clark Labs
Land Utilisation and Capability Indicator (LUCI)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Modeling ecosystem services **Tool type:** GIS software extension	"LUCI **explores the capability of a landscape to provide a variety of ecosystem services**, such as agricultural production, erosion control, carbon sequestration, flood mitigation, habitat provision, etc. It compares the services provided by the current utilization of the landscape to estimates of its potential capability, and uses this information to identify areas where change might be beneficial, and where maintenance of the status quo might be desirable. LUCI is a second generation extension and accompanying software implementation of the Polyscape framework; it requires ESRI's ArcGIS 10.1."	Victoria University of Wellington

Local Ecological Footprinting Tool (LEFT)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem assessment **Tool type:** Online mapping tool	"LEFT presents a simple yet effective method for **mapping ecologically important landscapes beyond protected areas.** The method uses existing globally available web-based databases and models to provide an ecological score based on five key ecological features (biodiversity, fragmentation, threat, connectivity, and resilience) for every 300-meter pixel within any given region in the world. Coordinates (latitude and longitude) of the site location are all that are required as input and the resulting output is a colored map indicating ecological value across the landscape."	Biodiversity Institute Oxford
Madingley Model	**Target audience:** Policy analysts and scientists **Ideal application:** Modeling terrestrial and marine ecosystems **Tool type:** Computer model	"Ecologists, biologists and environmental scientists at Microsoft Research and the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), have spent 3 years **developing the world's first 'General Ecosystem Model', or GEM, a model that simulates all life on Earth** (land and oceans). The model is the first to couple all of the key biological processes that underpin the life cycle and behaviour of all of the millions of trillions of the planet's organisms – photosynthesis, feeding, metabolism, reproduction, dispersal, and death – in order to attempt to capture how such processes lead to the structure and function of whole ecosystems. In some ways, what we have begun to do is build the equivalent of the climate models that are used to predict the future of the earth's atmosphere and oceans, but for ecosystems."	Microsoft Research and the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)
Madrona	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Land and ocean assessment **Tool type:** Computer model	"Madrona provides software developers with a set of building blocks that can be mixed and matched to create cutting-edge, web-based tools for **decision support and spatial planning at any scale.** It can be used in sectors ranging from natural resource management to ocean and land use planning, urban and community planning, energy, transportation, health care, and more."	EcoTrust
Marine Integrated Decision Analysis System (MIDAS)	**Target audience:** Marine managers, policy analysts, and scientists **Ideal application:** Land and ocean assessment **Tool type:** Computer model	MIDAS "was developed to assist the MMA [Marine Managed Areas] users and managers in understanding the critical factors that influence MMA effects so that they can plan accordingly, to estimate likely MMA effects based on the ecological, socioeconomic, and governance conditions, and finally, to advise management plan revisions that will result in optimization of outcomes and outputs." "MIDAS-SeaPlan is a marine spatial decision support system for Massachusetts. Its underlying modeling framework is MIMES [Multi-scale Integrated Models of Ecosystem Services], which enables dynamic spatial modeling. When completed, MIDAS-SeaPlan will demonstrate a suite of **scenarios involving human use trade-offs to help inform marine spatial planning."**	Boston University
MEASURES	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment and management **Tool type:** Computer model	MEASURES "provides an **estimate of ecosystem services such as water quality and carbon sequestration associated with a proposed change of land use** based on user-entered criteria, which can help planners, landowners, and citizens determine how to mitigate any negative impacts that would result from a proposed change." MEASURES has been integrated into a free software program, called InFOREST, available to anyone interested in learning about the effects of changing land use on a particular tract of forest or farmland in Virginia.	Virginia Tech

Multi-scale Integrated Models of Ecosystem Services (MIMES)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment and management **Tool type:** Computer model	"The Multi-scale Integrated Models of Ecosystem Services (MIMES) is a suite of **models for land use change and marine spatial planning decision-making.** The models quantify the effects of land and sea use change on ecosystem services and can be run at global, regional, and local levels. The MIMES use input data from GIS sources, time series, etc., to simulate ecosystem components under different scenarios defined by stakeholder input."	AFORDable Futures (Accounting FOR Desirable Futures)
NatureServe Vista	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Land use planning **Tool type:** Computer model	"NatureServe Vista is a powerful, flexible, and free decision-support system that **helps users integrate conservation with land use and resource planning of all types.** Planners, resource managers, scientists, and conservationists can use NatureServe Vista to integrate conservation values with other planning and assessment activities, such as land use, transportation, energy, natural resource, and ecosystem-based management."	NatureServe
Operationalizing Ecosystem Services for Restoration	**Target audience:** Conservation practitioners **Ideal application:** Integrating ecosystem services into conservation projects **Tool type:** Framework	"Through this guided step-by-step approach, practitioners are able to create a link between ecosystems, the provision of services, and human well-being. The framework provides a **structured methodology to easily include ecosystem services into conservation projects** by considering and adding the human component. It is adaptive, compatible with, and applicable to existing planning processes, and can be used at different temporal and spatial scales."	Harte Research Institute (HRI)
Polyscape *(under development)*	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Land use planning **Tool type:** Computer model	"A **GIS framework designed to explore spatially explicit synergies and trade-offs amongst ecosystem service**s to support landscape management (from individual fields through to catchments of 10,000 km^2 scale)." Learn more on the Polyscape website.	Victoria University of Wellington
Regional Vulnerability Assessment Environmental Decision Toolkit	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Estimating the large-scale changes that might result from policy actions **Tool type:** Computer model	"EPA's Regional Vulnerability Assessment program is designed to produce the methods needed to understand a region's environmental quality and its spatial pattern. The objective is to **assist decision-makers** in making more informed decisions and in **estimating the large-scale changes that might result from their actions.**"	U.S. Environmental Protection Agency (EPA)
Resource Investment Optimization System (RIOS)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Watershed planning **Tool type:** Computer model	". . . a free and open-source software tool that supports the design of cost-effective investments in watershed services. RIOS provides a **standardized, science-based approach to watershed management**. It combines biophysical, social, and economic data to help users identify the best locations for protection and restoration activities in order to maximize the ecological return on investment, within the bounds of what is socially and politically feasible."	Natural Capital Project (NatCap)

SAORES	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem planning **Tool type:** Computer model	"The concept of ecosystem services (ES) has become mainstreamed in environmental planning and management recently, and with that various tools for quantifying ecosystem services have emerged. However, designing the tools for integrated assessment and optimization of multiple ES has become a challenging task. In order to promote the efficiency of ecosystem planning and management, we develop a spatial decision support tool named SAORES, which provides a **platform for exploratory scenario analysis and optimal planning design, rather than ES assessment**."	Chinese Academy of Sciences
Social Values for Ecosystem Services (SolVES)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Integrating social concerns into ecosystem services valuation **Tool type:** Computer model	"SolVES is a geographic information system [GIS] application designed to **use data from public attitude and preference surveys to assess, map, and quantify social values for ecosystem services.** SolVES calculates and maps a 10-point Value Index representing the relative perceived social values of ecosystem services such as recreation and biodiversity for various groups of ecosystem stakeholders. SolVES output can also be used to identify and model relationships between social values and physical characteristics of the underlying landscape."	Rocky Mountain Geographic Science Center and Colorado State University
Soil and Water Assessment Tool (SWAT)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Modeling watershed and land use impacts **Tool type:** Computer model	"The Soil and Water Assessment Tool (SWAT) is a public domain model jointly developed by USDA Agricultural Research Service (USDA-ARS) and Texas A&M AgriLife Research, part of the Texas A&M University system. SWAT is a **small watershed to river basin-scale model to simulate the quality and quantity of surface and groundwater** and predict the environmental impact of land use, land management practices, and climate change. SWAT is widely used in assessing soil erosion prevention and control, non-point source pollution control, and regional management in watersheds." It is currently being piloted by the WAVES project.	Texas A&M University
STAR (Surface temperature and runoff) tools	**Target audience:** Urban planners, policy analysts, and scientists **Ideal application:** Understanding ecosystem service impacts of green infrastructure **Tool type:** Computer model	"The decision support tool STAR enables **assessment of temperature and flood regulation ecosystem services** via a surface temperature tool and a surface runoff tool. The STAR tool allows assessment of the potential of green infrastructure in adapting a specified urban area to climate change. The STAR tool can be used at a neighborhood scale to test the impact of different land cover scenarios of greening and development on surface temperatures and runoff, under different temperature and precipitation scenarios."	The University of Manchester

Triple Value Model *added in 2014*	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Understanding scenarios for watersheds **Tool type:** Computer model	"The Triple Value Model is an innovative framework that **depicts the dynamic linkages and resource flows among industrial, societal, and environmental systems**. The U.S. EPA has begun using this model to support transdisciplinary research projects that focus upon water resources, communities, and other broad sustainability themes. One recent application addresses opportunities for mitigation of nutrient impairment in the Narragansett Bay watershed, and has produced a policy simulation tool that enables evaluation of alternative sustainable solutions."	U.S. EPA

Table 3: Site-Specific and Parcel-Level Tools

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
Ecosystem Services Identification & Inventory (ESII) Tool *added in 2014*	**Target audience:** Business decision makers **Ideal application:** Assess the value from nature on lands **Tool type:** Data collection and land assessment tool	"The Ecosystem Services Identification & Inventory (ESII) Tool **will allow businesses to estimate the business value from nature from lands on and adjacent to their sites**, as well as the public value from lands on-site."	The Dow Chemical Company and The Nature Conservancy
EcoMetrix	**Target audience:** Managers in research and development, operations, remediation, and sustainability **Ideal application:** Provide quantified values related to the potential impacts and/or benefits of decisions on landscapes and affected communities **Tool type:** Customizable software tool	"EcoMetrix is an **environmental measurement and modeling tool** that supports sustainable infrastructure, restoration projects, and enterprise-level decision-making. It models and quantifies changes within an ecosystem, enabling users to evaluate the positive or negative effects of different scenarios on ecosystem services."	EcoMetrix Solutions Group and Parametrix
LandServer	**Target audience:** Landowners **Ideal application:** Assessing conservation funding opportunities **Tool type:** Web-based analysis tool	"LandServer is a web-based tool that provides farmers and woodland owners with a quick and easy natural resource assessment and an evaluation of their property's potential to receive payments for implementing conservation actions. LandServer will generate a conservation report specific to your property. LandServer will also **evaluate the ecosystem services that your land provides and help determine your eligibility for payments for ecosystems services and other conservation funding opportunities.** Currently available to residents in Maryland and Delaware, LandServer will be available in Virginia, Pennsylvania, New York, and West Virginia soon."	Pinchot Institute for Conservation

Table 4: Product-Level Tools

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
Eco-LCA	**Target audience:** Lifecycle assessment (LCA) professionals **Ideal application:** Incorporating ecosystem concerns into LCAs **Tool type:** Computer model	"Eco-LCA is a framework to **account for the role of ecosystem goods and services in the lifecycle of economic activities.** Conventional LCA focuses mainly on quantifying lifecycle emissions and their impact, and some resources. This approach has at least two shortcomings that Eco-LCA addresses: (a) It does not account for the role of ecosystem goods and services such as the biogeochemical cycles, pollination, carbon sequestration, climate regulation, etc. (b) For interpreting emissions data, conventional LCA uses sophisticated impact assessment methods to reduce dimensionality and assist in decision-making. Similar aggregation and interpretation methods are not commonly used to account for resources. Consequently, despite their crucial role, resource use and the role of nature in making resources available does not receive as much attention as the impact of emissions."	Ohio State University
Land Use Impacts on Biodiversity and Ecosystem Services in the Life-Cycle Impact Assessment	**Target audience:** Scientists and lifecycle assessment (LCA) professionals **Ideal application:** Incorporating ecosystem concerns into LCAs **Tool type:** Principles and guidance	"In Phase 1 of the initiative, the working group on lifecycle impact assessment (LCIA) of land use worked out and agreed on set of principles for LCIA of land use. After this long process of consensus building on framing the methodology, the working group has been working out a **practicable LCIA method to assess the use of land anywhere on the globe.** Output of this group in the second phase will be a handbook on LCIA of global land use and operational characterization factors for biodiversity and ecosystem services impacts."	University of Bayreuth
Natural Capital Management System (NCMS)	**Target audience:** Corporate managers **Ideal application:** Assessing product and supply chain dependencies on natural capital **Tool type:** Service	"This system aims to **help companies manage natural capital assets by providing them with data on their dependence on natural capital;** the hidden costs within their supply chains, in order that they can go beyond natural capital accounting towards action-oriented management. Two methodologies underlie our NCMS technology. The first, multiregional input–output lifecycle assessment (MRIO-LCA), measures the environmental impacts throughout a global supply chain and models the location in the value chain where they occur. The second, natural capital valuation (NCV), allows calculated impacts to be valued, compared, and managed using a consistent unit of measure: the financial value of depleted natural capital."	Climate Earth
Trucost's LCA Valuation Methodology	**Target audience:** Corporate managers **Ideal application:** Increasing the specificity of LCAs **Tool type:** Service	"Trucost's LCA Valuation solution has been created to **enhance traditional LCA impact category metrics with region specific natural capital valuations**. For example, Trucost's natural capital valuation of smog quantifies the local cost of ozone generating substances to health, crops and ecosystems; Trucost's natural capital valuation of water quantifies the cost of water use to local communities by considering, among other factors, local water scarcity; and Trucost's natural capital valuation of land use quantifies the local cost of environmental services that are lost when land is converted to business use."	Trucost

Table 5: Valuation Tools

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
Coral Reef Valuation Tool	**Target audience:** Marine policy makers and scientists **Ideal application:** Valuing coastal ecosystems **Tool type:** Excel-based valuation tool	The tool provides "a way for policymakers, civil society, or other interested parties to **assess the value to their economies of goods and services provided by coral reefs** and to aid in setting coastal management policies." It assesses the value of fisheries and tourism/recreation. Although it was developed for the Caribbean region, it can likely be used in other marine areas.	World Resources Institute (WRI)
Environmental Profit and Loss (EP&L) Methodology	**Target audience:** Corporate accountants and sustainability staff **Ideal application:** Assessing environmental profit and loss **Tool type:** Guidance document	"The B Team is a plan with a single purpose: to make business work better. How? By shifting the focus from just financial gains towards environmental and social gains as well. Our founding leaders are Sir Richard Branson (founder of Virgin Group and Virgin Unite) and Jochen Zeitz (director of Kering and chairman of the board's sustainable development committee). One of the issues the B Team is seeking to address is that in the ordinary course of accounting and measurement, business doesn't value 'natural capital'—the planet, nor does it pay for the true cost of its environmental impact. The B Team is currently **incubating a consortium to advance a solution—the Environmental Profit and Loss** (EP&L)."	B Team
Green Infrastructure Valuation Toolkit	**Target audience:** Land managers and planners **Ideal application:** Assessing the value of green infrastructure **Tool type:** Benefit calculator	"The green infrastructure valuation toolkit has been developed . . . to help local stakeholders make good decisions about the value of different options for change. It provides a simple **framework that can help identify and broadly assess the benefits of proposed green investments** and existing green assets—whether those benefits directly contribute to a local economy, or provide wider nonmarket returns for society and the environment. It provides insight in[to] key evidence and concepts from a wide range of sectors, including economic development and regeneration, public health, [and] nature conservation—providing a strong platform for improved mutual understanding and cooperation."	Natural Economy Northwest and Natural England
Green Infrastructure—Valuation Tools Assessment	**Target audience:** Land managers and planners **Ideal application:** Assessing the value of green infrastructure **Tool type:** Compilation of resources	"There are an increasing number of tools available that aim to value green infrastructure. Many of these focus on specific services provided by the green infrastructure and estimate the economic value of these services. This report was commissioned to draw together a number of the most widely used tools and assess them against research standards for natural science and economics. The **aim is to help people wanting to value green infrastructure choose the best tool** for them."	Natural England

Guidance Manual for the Valuation of Regulating Services	**Target audience:** Valuation experts **Ideal application:** Valuation of ecosystem services **Tool type:** Guidance document	"The objectives of this manual are: » to identify and evaluate different methodologies for valuing regulating services in economic terms; to provide guidance on the main issues that need to be considered and addressed when using these different valuation methodologies; and » to demonstrate, through case studies, the application of these **methodologies to the valuation of regulating services** and the scope for incorporating these values into decision-making processes."	UN Environment Programme (UNEP)
Guide to Corporate Ecosystem Valuation	**Target audience:** Corporate decision-makers **Ideal application:** Understanding whether and how to undertake corporate ecosystem valuation **Tool type:** Framework	The guide is "a **framework for improving corporate decision-making through valuing ecosystem services** and a set of resources to navigate through related jargon and techniques."	World Business Council for Sustainable Development (WBCSD)
Intrinsic Value Exchange (IVE)	**Target audience:** Finance sector **Ideal application:** Trading natural asset values **Tool type:** Stock exchange	"IVE is an **online natural asset stock exchange designed to value natural and societal assets**—assets like clean air and water, ecosystems, wildlife, human health, and potential. IVE is one part financial exchange and one part social movement. The IVE is a place where inputs are collected from the countless professionals, academics, activists, organizations, and agencies focused on researching these natural assets and producing data with respect to their value. The information we aggregate is then translated into assets and systems, "IVE Elements" that we want to value: for example, Lake Tahoe, blue fin tuna, the Mississippi Delta, and healthy children, and then the public "votes" on the value by investing and trading in these IVE Elements. This system functions much like a traditional stock exchange, where the market digests information and sets prices through trading."	Intrinsic Value Exchange
Marine and Coastal Ecosystem Services: Valuation Methods and Their Practical Application	**Target audience:** Valuation experts **Ideal application:** Valuing marine and coastal ecosystem services **Tool type:** Guidance document	"Economic valuation **of marine and coastal ecosystem services** is increasingly being considered to be of critical importance for informed decision-making and effective management of marine and coastal resources. This report provides an **overview of the main methods of economic valuation,** their strengths and weaknesses, and practical applications. Theoretical concepts are illustrated with a number of practical examples throughout this report, to demonstrate how these approaches can be of practical use across all scales, in policy development, decision-making, and communication. Practical guidance on how to implement a valuation exercise and how to overcome common challenges is also provided."	UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)

Natural Assets Information System (NAIS)	**Target audience:** Land managers **Ideal application:** Assessing and valuing ecosystem services **Tool type:** Proprietary computer model	"The Natural Assets Information System was developed by Spatial Informatics Group, LLC (SIG) to estimate ecosystem service values (ESVs) **using state-of-the-art value-transfer methods and geospatial science.** Value transfer involves the adaptation of existing valuation information to new policy contexts where valuation data is absent or limited. For ESVs, this involves searching the literature for valuation studies on ecosystem services associated with ecological resource types (e.g., forests, wetlands, etc.) present at the policy site. Value estimates are then transferred from the original study site to the policy site based on the similarity of ecological resources at the policy site. Value transfer is a 'second-best' approach for gathering information about the value to humanity of ecosystem goods and services. However, the alternative, primary valuation research, is extremely costly and is rarely feasible in the context of the policy and planning process. Therefore, value transfer integrated with geospatial science has proven to be a critical tool in decision-making and planning."	Spatial Informatics Group
The OSLO Valuation Methodology	**Target audience:** Policy analysts and scientists **Ideal application:** Linking land management and economic development **Tool type:** Guidance document	"The aim of this project is to create a methodology capable of illustrating the **mechanisms through which sustainable land management can offer significant returns** and contribute to economic growth while simultaneously underpinning livelihoods, particularly for the poor, who often rely heavily on ecosystem goods and services."	The Offering Sustainable Land-Use Options (OSLO) Consortium
Total Impact Measurement and Management	**Target audience:** Investors and corporate managers **Ideal application:** Assessing and valuing a company's environmental impacts **Tool type:** Analytical service for corporate decision making	"TIMM **enables management to develop a better understanding of the social, fiscal, environmental, and economic impacts of their activities**, while still, of course, making a profit. TIMM gives management the ability to compare strategies and make business decisions such as investment choices using quantified data, and evaluate the total impact of each decision and choice they make. Being able to measure, understand, and compare the trade-offs between different options means decisions can be made with more complete knowledge of the overall impact they will have and a better understanding of which stakeholders will be affected by which decisions."	PwC
Trucost	**Target audience:** Investors and corporate managers **Ideal application:** Assessing and valuing a company's environmental impacts **Tool type:** Analytical service for assessing impacts	"Trucost has developed a **comprehensive approach to calculating environmental impacts** across operations, supply chains, and investment portfolios . . . Trucost has built an environmental profile for 464 [global] sectors. These profiles quantify the environmental impacts associated with a sector, based on the nature of its business activities. This data model is the foundation for the assessment that Trucost does of an organization's environmental impacts . . . Trucost also **converts quantity data into financial values.** The price applied to each impact is formulated by our academic panel and derived from environmental economics literature. The price reflects the damage each environmental impact causes and the consequential costs borne by society." Trucost analyses have been utilized in generating environmental profit and loss (EP&L) statements, such as those produced by Kering.	Trucost

True Price Method *(under development)*	**Target audience:** Investors and corporate managers **Ideal application:** Assessing and valuing corporate and product impacts **Tool type:** Analytical service for assessing impacts	"We are developing an open-source method: a **framework for the valuation of environmental and social impacts at [the] company- and product-level**. This process involves our partners from business, the public sector, civil society, and academia. We are looking at impacts that society incurs during production and consumption, but that are not paid for. The most important ecological costs are climate change due to emissions, biodiversity loss, land and water use, depletion of minerals and other materials, and pollution and waste. On the social side, we need to consider underpayment, indecent labor conditions, health risks on the job, insurance gaps, impact on local communities, and health effects on consumers."	True Price Foundation
Wildlife Habitat Benefits Estimation Toolkit	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Valuation of wildlife habitat **Tool type:** Excel-based valuation tool	"The Wildlife Habitat Benefits Estimation Toolkit is a set of user-friendly Excel models that allows users to generate **quantitative estimates of the economic values generated by specific natural areas** of interest to them." Over the next one to two years, the toolkit, which is also known as the Benefit Transfer and Use Estimating Model Toolkit, will be updated and migrated to the USGS [U.S. Geological Survey] website.	Defenders of Wildlife and Colorado State University

Table 6: Classification Systems

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
Common International Classification of Ecosystem Services (CICES)	**Target audience:** Policy makers, accountants, and scientists **Ideal application:** Ecosystem accounting, assessing ecosystem services **Tool type:** List of indicators	"The Common International Classification of Ecosystem Services (CICES) developed from the work on environmental accounting undertaken by the European Environment Agency (EEA). It supports their contribution to the revision of the System of Environmental-Economic Accounting (SEEA), which is currently being led by the United Nations Statistical Division (UNSD). The idea of a common international classification is an important one, because it was recognized that if ecosystem accounting methods were to be developed and comparisons made, then some **standardization in the way we describe ecosystem services** was needed . . . It has now become clear that in addition to the need for standardization in the context of environmental accounting, work on mapping and valuing ecosystem services and ecosystems assessments more generally would benefit from **more systematic approaches to naming and describing ecosystem services**."	European Environment Agency (EEA)
Final Ecosystem Goods and Services Classification System (FEGS-CS)	**Target audience:** Resource managers and land planners **Ideal application:** Identifying relevant ecosystem services of wetlands, estuaries, and streams **Tool type:** List of indicators	The FEGS-CS includes **metrics for 338 components from nature enjoyed, used, or experienced by humans**. The FEGS-CS matrices are being translated into an internet-based tool that allows users to query and customize FEGS information.	U.S. Environmental Protection Agency (EPA)
Multiple ecosystem services landscape index *added in 2014*	**Target audience:** Resource managers and land planners **Ideal application:** Synthesizing multiple ecosystem services into one indicator **Tool type:** Indicator	"We propose a new **integrative environmental indicator** based on the ecosystem services provided by the landscape and named "multiple ecosystem services landscape index" (MESLI). Because synergies and trade-offs between ecosystem services are produced at regional or local levels, MESLI was developed at municipality level."	University of the Basque Country

National Ecosystems Goods and Services Classification System (NEGSCS) *(under development)*	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem assessment **Tool type:** List of indicators	"[The] EPA is developing the National Ecosystem Goods and Services Classification System (NEGSCS), an online database. In the past, there has been a lack of a system of measurement to compare functions across different geographical locations—an acre of wetland here will not contain the same kinds of natural functions as an acre of wetland there, for example. This research will develop a **standardized measurement system for ecosystem goods and services** that will allow researchers to compare functions in different environments and better understand the link between ecosystem changes and human health and welfare. In addition, the NEGSCS will quantify lost or impaired natural environments and allow for a form of ecosystem goods and services 'trading,' where one could 'make up for' ecosystem damages."	U.S. Environmental Protection Agency (EPA)

Table 7: Data Sources

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
Data Basin	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Spatial analysis of ecosystems **Tool type:** Spatial data sets	"Data Basin is a free system that connects you with **spatial data sets, nontechnical tools, and a network of scientists and practitioners.** You can explore and download a vast library of data sets, connect to external data sources, upload and publish your own data sets, connect to experts, create working groups, and produce customized maps that can be easily shared."	Conservation Biology Institute (CBI)
Digital Observatory for Protected Areas (DOPA) Explorer	**Target audience:** Protected area managers, policy makers, and scientists **Ideal application:** Data collection for protected areas **Tool type:** Data sets	"DOPA Explorer (beta) is a first web-based assessment tool where global data sets, including 9,000 protected areas covering almost 90 percent of the global protected surface, have been processed automatically to generate a set of indicators on ecosystems, climate, phenology, species, ecosystem services, and pressures. DOPA Explorer can **help identify the protected areas with the most unique ecosystems** and species and assess the pressures they are exposed to because of human development. Ecological data derived from near real-time earth observations are also made available."	Institute for Environment and Sustainability (IES)
Earth Observation (EO) Services for Ecosystem Valuation	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** As a data source for valuations based on the benefits-transfer method **Tool type:** Ecosystem assessment data source	"The EO Services for Ecosystem Valuation project seeks to **demonstrate the value of EO-based information products for the emerging sector of ecosystem services valuation.**"	European Space Agency (ESA)
Ecosystem Goods and Services Production Function Library *(under development)*	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Assessing ecosystem services **Tool type:** Ecosystem services data source	"EPA scientists are developing production functions for ecosystem services and benefits for numerous areas in the United States. These production functions are being catalogued so that this information will be easily accessible for [the] EPA, other agencies, NGOs, and others interested in considering the ecosystem services trade-offs associated with changes in environmental conditions or decision alternatives. This work will result in a searchable database, the Ecosystem Goods and Services Production Function Library, that provides the best available information about **how to estimate the distribution and value of ecosystem services,** including how they might change under alternative future scenarios."	U.S. Environmental Protection Agency (EPA)

Ecosystem Service Indicators Database (ESID)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** To identify relevant ecosystem services indicators **Tool type:** Indicators database	"The Ecosystem Service Indicators Database [ESID] was created to **make ecosystem services metrics and indicators readily available** for use in policy dialogues and decisions, in ecosystem assessments, and in natural resource management decisions. ESID is an online searchable database where users can find—and contribute—indicators that have been used to apply ecosystem services approaches or hold promise for doing so. Indicator descriptions and other supporting information about how the indicator has been or could be applied are also provided."	World Resources Institute (WRI)
Ecosystem Services Valuation Database	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services valuation **Tool type:** Valuation database	As part of The Economics of Ecosystems and Biodiversity report, researchers developed the **Ecosystem Services Valuation Database**, which has continued to be maintained and now contains more than 1350 data-points from 300-plus case studies. The user manual for the database can be found here.	The Economics of Ecosystems and Biodiversity (TEEB)
Ecosystem Valuation Toolkit	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services valuation **Tool type:** Valuation database and collaboration platform	"The Ecosystem Valuation Toolkit offers the world's first global ecosystem services values-exchange platform with a comprehensive library of bibliographic information on published and gray literature, primarily ecosystem service valuation studies. A component of the Ecosystem Valuation Toolkit, SERVES (Simple and Effective Resource for Valuing Ecosystem Services) is "a subscription-based self-service natural capital appraisal tool for natural resource managers to **estimate the value of a specific area's ecosystem services.**" SERVES aims to be the world's first global values exchange platform allowing ecosystem service researchers to see and comment on each other's work.	Earth Economics
ENVALUE environmental valuation database	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Valuation data source **Tool type:** Ecosystem assessment data source	"The ENVALUE environmental valuation database, developed by the NSW EPA and first released in 1995, is a **systematic collection of environmental valuation studies** presented in an online database. It is expected that the ENVALUE database will assist decision-makers in government and industry, as well as academics, consultants, and environmental groups, to incorporate environmental values into cost-benefit analyses, environmental impact statements, project appraisals, and overall valuation of changes in environmental quality."	Department of Environment and Climate Change, New South Wales
Environmental Valuation Reference Inventory (EVRI)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** As a data source for valuations based on the benefits-transfer method **Tool type:** Valuation database	"The EVRI [Environmental Valuation Reference Inventory] is a **searchable storehouse of empirical studies** on the economic value of environmental benefits and human health effects. It has been developed as a tool to help policy analysts use the benefits-transfer approach. Using the EVRI to do a benefits-transfer is an alternative to doing new valuation research."	Environment Canada

Geographic Ecosystem Monitoring and Assessment Service (G-ECO-MON)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Remote data collection **Tool type:** Ecosystem assessment data source	"The Geographic Ecosystem Monitoring and Assessment Service (G-ECO-MON) project aims to **extend the use of Earth Observation-based information for multiple applications.** These could include impact assessments, supply chain management, ecosystem management, payments for ecosystem services, natural wealth accounting, emergency management, or public policy. Demonstration studies are under way; these seek to highlight the efficacy of using remote sensing to measure and monitor ecosystem services."	European Space Agency (ESA)
Global Map of Human Impacts to Marine Ecosystems	**Target audience:** Marine managers, policy analysts, and scientists **Ideal application:** Identifying human impacts on marine ecosystems **Tool type:** Ecosystem assessment data source	"The goal of the research presented here is to estimate and visualize, for the first time, the **global impact humans are having on the ocean's ecosystems."**	National Center for Ecological Analysis and Synthesis (NCEAS)
Global Socioeconomic Monitoring Initiative for Coastal Management	**Target audience:** Marine managers and scientists **Ideal application:** Data for community-based socioeconomic monitoring **Tool type:** Data source	"The Global Socioeconomic Monitoring Initiative for Coastal Management (SocMon) works through regional and local partners to facilitate **community-based socioeconomic monitoring.** Household- and community-level data are collected to inform dependence on coral reef resources, perceptions of resource conditions, threats to marine and coastal resources, and support for marine management strategies such as marine protected areas. To date, over 60 assessments have been completed in 30 countries."	National Oceanic and Atmospheric Administration (NOAA) and The WorldFish Center
Marine Ecosystem Services Partnership Valuation Library	**Target audience:** Marine managers, policy analysts, and scientists **Ideal application:** Valuing marine ecosystems **Tool type:** Ecosystem valuation data source	"The Marine Ecosystem Services Partnership is a virtual center for information and communication on the human uses of marine ecosystems around the world. [We offer an] extensive **database of valuation studies.**"	Marine Ecosystem Services Partnership (MESP)
Marinexplore	**Target audience:** Marine managers, policy analysts, and scientists **Ideal application:** Managing marine data **Tool type:** Ecosystem data source	"**Making sense of the increasing volume of complex ocean data** is a difficult and time-consuming task. Marinexplore is a 'big data platform' to help offshore industry, marine logistics, scientists, and government organizations reduce data processing time and make informed decisions faster. Marinexplore handles all spatial data types; relates data to location, depth, and time; and allows for visualization and analysis of diverse data types on a single platform."	Marinexplore Inc.

Multipurpose Marine Cadastre	**Target audience:** Marine managers, policy analysts, and scientists **Ideal application:** Assessing marine ecosystems **Tool type:** Ecosystem assessment data source	"The Multipurpose Marine Cadastre is an integrated **marine information system** that provides legal, physical, ecological, and cultural information in a common geographic information system (GIS) framework. All organizations considering an offshore activity can benefit from this comprehensive, visual approach to data analysis."	National Oceanic and Atmospheric Administration (NOAA)
National Ocean Economics Program	**Target audience:** Marine managers, policy analysts, and scientists **Ideal application:** Assessing marine ecosystems **Tool type:** Ecosystem assessment data source	"The National Ocean Economics Program (NOEP) provides a full range of the **most current policy-relevant economic and demographic information available on changes and trends along the U.S. coast**, Great Lakes, and coastal waters. NOEP will soon expand to international data sets to support the broader mission of its new host, the Center for the Blue Economy (CBE) to 'promote ocean and coastal sustainability.' "	Center for the Blue Economy
ReefBase	**Target audience:** Marine managers and scientists **Ideal application:** Data for community-based socioeconomic monitoring **Tool type:** Data source	"ReefBase gathers **available knowledge about coral reefs** into one information repository. It is intended to facilitate analyses and monitoring of coral reef health and the quality of life of reef-dependent people, and to support informed decisions about coral reef use and management."	Global Coral Reef Monitoring Network (GCRMN), International Coral Reef Action Network (ICRAN), and The WorldFish Center
The Earth Genome *added in 2014*	**Target audience:** Land/marine managers, policy analysts, and scientists **Ideal application:** Assessing ecosystem assets **Tool type:** Ecosystem assets data source	"We have identified a need for **an integrated global framework of data collection, environmental and economic analytics, and planning centers** to rally future conservation, restoration, and development efforts. This project, recently christened The Earth Genome, is in the early stages of planning and software/hardware prototyping."	The Natural Capital Project
Towards a Global Map of Natural Capital: Key Ecosystem Assets	**Target audience:** Land/marine managers, policy analysts, and scientists **Ideal application:** Assessing ecosystem assets **Tool type:** Ecosystem assets data source	"The UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) has produced a **composite map of the marine and terrestrial ecosystem assets of the world**. The map, published in the report titled 'Towards a Global Map of Natural Capital: Key Ecosystem Assets,' combines a number of existing spatial data sets to provide physical assessment of stocks in six main areas: freshwater resources, soil quality for plant growth, terrestrial carbon, terrestrial biodiversity, marine biodiversity, and marine fisheries."	UNEP-WCMC

Table 8: Data Sources for Specific Regions

Tool Name	Description	Tool Developer
EcoRegions (United States)	"A team of EPA scientists, together with partners from state, federal, and private organizations, is developing a detailed map **identifying California "EcoRegions," areas defined by the type, quality, and quantity of their environmental resources.** With funding from EPA's Regional Applied Research Effort (RARE), the scientists analyzed spatial patterns of geology, physiology, vegetation, climate, soils, land use, wildlife, and hydrology across California to identify 177 ecoregions. The ecoregions can be used systematically categorize geographically distinct assemblages of natural communities and species and to provide an effective tool to evaluate and predict ecosystem response to disturbance."	U.S. Environmental Protection Agency
EcoSpatial Information Database *(under development)*	"This project will collate existing sources of information to produce a database containing **ecological and spatial information** for portions of the Bureau of Ocean Energy Management's **Atlantic Region.** This database will be the EcoSpatial Information Database (ESID, pronounced *EE-sid*) and will be designed to accept additional ecological information for all marine and coastal areas of the United States."	Bureau of Ocean Energy Management (BOEM)
Ecosystem Service Mapping Gateway (United Kingdom)	The new Ecosystem Service Mapping Gateway complies a database of projects focused on **mapping United Kingdom ecosystem service delivery at the landscape level.**	Natural Environment Research Council (NERC)
ESTIMAP (Europe)	"OpenNESS partners recently published a free-access paper entitled 'ESTIMAP: a GIS-based model to map ecosystem services in the European Union'. The paper introduces the Ecosystem Services Mapping tool (ESTIMAP), a collection of spatially explicit models to support the mapping and modelling of ecosystem services at European scale. Its main objective is to **support EU policies with spatial information on where ecosystem services are provided and consumed**."	OpenNESS
GecoServ (Gulf of Mexico)	"The two main goals of the GecoServ database are to allow for the distribution and sharing of information about **ecosystem services valuation studies relevant to the Gulf of Mexico region** and to identify current gaps in the ES literature. The studies summarized here are for habitats that are relevant to the gulf region even though they may have been conducted elsewhere."	Harte Research Institute (HRI)
Lakes Ecosystem Services Database and Online GIS (Northeast USA) *(under development)*	"The Lakes Ecosystem Services Database provides unique identification numbers for more than 28,000 geographically referenced lakes in the **Northeast United States.** These data include standard physical-chemical measures of water quality and subjective assessments (e.g., appeal, integrity, etc.) of lakes. These data form the basis of EPA research efforts on lakes ecosystem services." "The Lakes Ecosystem Services Online GIS [geographic information system] provides geospatial visualization, query, and analysis tools. With the various tools provided in the Online GIS, users can make and print maps from the data sets provided, query and display data with different cut points, conduct buffer analyses around lakes, summarize key data sets, and generate multivariate radar graphs of water-quality data."	U.S. Environmental Protection Agency (EPA)

The National Atlas for Sustainability and The Urban Atlas *(under development)*	"The National Atlas for Sustainability is a web-based, easy-to-use, mapping application that allows users to view and analyze multiple ecosystem services in a specific region. The atlas will provide users with a visual method for interpreting ecosystem services and understanding how they can be conserved and enhanced for a sustainable future." "The Urban Atlas component of the National Atlas will provide fine-scale information linking human health and well-being to environmental conditions, such as urban heat islands, near-road pollution, resource use, access to recreation, drinking water quality, and other quality-of-life indicators. Researchers are working to develop the Urban Atlas initially for **50 cities and towns** of varying size, location, demographic makeup, and environmental and health risks. The first version of the Urban Atlas will be released in 2013, with subsequent releases following as more data become available. In future years, an additional 100 to 200 cities will be included, dependent upon available funding and program success."	U.S. Environmental Protection Agency (EPA)
Ocean Data Viewer	"The purpose of this Ocean Data Viewer is to provide an overview and **access to a range of data and relevant conventions, which are available to help inform decisions** that are important for the conservation of marine and coastal biodiversity."	UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)
SERVIR	"SERVIR will improve environmental management and resilience to climate change by strengthening the capacity of governments and other key stakeholders to integrate earth observations and geospatial technologies into decision-making for sustainable development. SERVIR is a platform for collaboration and cross-agency coordination, international partnerships, and delivery of web-based information services and applications." It is a regional visualization and monitoring system for **Mesoamerica, East Africa, and the Himalayas.**	National Aeronautics and Space Administration (NASA) and U.S. Agency for International Development (USAID)
Sistema de Informação sobre a Biodiversidade Brasileira (SiBBr) (Brazil)	"The online survey, a program of Brazil's Ministry of Science, Technology, and Innovation, aims to integrate **diverse biological, cartographic, and bibliographic data** into a format useful for research and policy formulation."	Ministério da Ciência, Tecnologia e Inovação

Table 9: Tools for Specific Types of Ecosystems

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
Forests			
High Conservation Value (HCV) Forest Toolkit	**Target audience:** Government, NGOs, and land managers **Ideal application:** Forest management planning **Tool type:** Framework and process overview	This toolkit provides a framework for **assessing whether forests are of high conservation value,** including their ecological and economic benefits.	High Conservation Value (HCV) Resource Network
Global Forest Watch 2.0	**Target audience:** Government, NGOs, and land managers **Ideal application:** Forest management planning **Tool type:** Remote monitoring system	The interactive, **real-time forest monitoring system** will use satellite technology, data collected with remote sensors, and human observation to aid forest management efforts. While not directly framed in an ecosystem services lens, these types of tools will likely have a significant impact on companies' abilities to measure and manage ecosystem impacts.	Google and World Resources Institute (WRI)
Natural Infrastructure: Investing in Forested Landscapes for Source Water Protection in the United States	**Target audience:** Government, NGOs, and land managers **Ideal application:** Water planning **Tool type:** Guidance document	"Staff in water utilities, municipalities, businesses, and local conservation groups can use this reference and guidance document to **advance important dialogue around investing in forests for source water protection in their watersheds** and to guide early design and implementation efforts like convening stakeholders, identifying sources of finance, and prioritizing investments across the landscape."	World Resources Institute (WRI)
OpenTreeMap	**Target audience:** Government, NGOs, and land managers **Ideal application:** Urban forestry management **Tool type:** Interactive mapping tool	"OpenTreeMap is a **collaborative platform for crowdsourced tree inventory, ecosystem services calculations, urban forestry analysis, and community engagement**. To calculate the ecosystem benefits generated by the trees, we use the i-Tree Streets software developed by the U.S. Forest Service. i-Tree Streets calculates ecosystem benefits using the species and diameter of the tree and the i-Tree climate zone in which the tree is located."	Azavea
Oceans and Coasts			
Coastal Resilience 2.0	**Target audience:** Coastal planners, policy makers, and scientists **Ideal application:** Coastal planning **Tool type:** Online interactive resource	"Coastal Resilience 2.0 is a **suite of tools that enables decision-makers to assess risk and identify nature-based solutions to reduce socioeconomic vulnerability to coastal hazards**. These tools allow you to interactively examine storm surge, sea level rise, natural resources, vulnerable communities, and assets and to develop risk reduction and restoration solutions."	The Nature Conservancy

Global Survey of Tools Used for Marine Spatial Planning	**Target audience:** Marine managers, scientists, and policy makers **Ideal application:** Understanding available tools **Tool type:** Resource list	The EBM Tools Network and OpenChannels conducted a **survey of marine spatial planning practitioners** worldwide to learn what tools they are using in the field and how well those tools are working. They've published the results as a blog series: "Global Survey of Tools Used for Marine Spatial Planning."	EBM (Ecosystem-Based Management) Tools Network and OpenChannels
TEEB Oceans and Coasts Knowledge Portal	**Target audience:** Marine managers, scientists, and policy makers **Ideal application:** Ocean and coastal ecosystem services assessment and valuation **Tool type:** Data source and resource portal	"The Knowledge Portal will consist of a web-based platform to monitor, over the long term, the **changes in value of ocean and coastal ecosystem services** around the world. It will also promote information and knowledge sharing, assist capacity-building facilitation, and provide a platform for continued knowledge development. The aim of the portal is to help provide end-users with a resource to explore, evaluate, synthesize, and learn about ocean and coastal ecosystem valuation at multiple levels of details." "The Knowledge Portal will contain environmental, natural/physical scientific, socioeconomic, and social-ecological data sets amongst others. It will also contain synthesis products of the TEEB for Oceans and Coasts study, tailored for specific user-focused functions for a particular country, region, site, or business. The portal will also provide intelligent links to other resources and tools."	GRID-Arendal and the UN Environmental Programme (UNEP)
Tools for Coastal Climate Adaptation Planning: A Guide for Selecting Tools to Assist with Ecosystem-Based Climate Planning	**Target audience:** Marine managers and policy makers **Ideal application:** Climate adaptation planning **Tool type:** Data source and resource portal	"The purpose of Tools for Coastal Climate Adaptation Planning is to provide the information necessary for coastal natural resource managers and community planners to select appropriate tools for their projects. This guide focuses on **spatially explicit solutions for climate-related planning.** It provides detailed information on a set of key tools that either alone or used in conjunction with other tools can facilitate multisector climate adaptation planning (i.e., climate adaptation planning that incorporates elements of ecosystem health and social well-being) and describes the utility and role of tools in relevant planning processes."	NatureServe
U.S. map of coastal protection from natural habitats	**Target audience:** Marine managers and policy makers **Ideal application:** Assessing coastal protection **Tool type:** Coastal data and model	The Natural Capital Project published a study offering the first comprehensive **U.S. map of coastal protection from different natural habitats.** The map covers the entire U.S. coastline down to a 1-kilometer-square resolution. The hazard model takes account ecosystem data, projected climate scenarios, socioeconomic data, and property values to identify where habitats offer the greatest coastal protection.	Natural Capital Project (NatCap)
Water, Wetlands, Estuaries, and Streams			
Global Wetland Observing System (GWOS) *(under development)*	**Target audience:** Resource managers and land planners **Ideal application:** Wetlands planning **Tool type:** Resource center and database	"Information about the geographic extent, status (e.g., land cover, hydrology, and biodiversity), and use of wetlands is scattered, difficult to locate, and more difficult to incorporate into multidisciplinary analyses that can inform conservation and management strategies. To address this problem, the Ramsar Convention on Wetlands has proposed the development of a Global Wetland Observing System (GWOS)—**a network and portal for organizing information on wetlands and their wise use.**"	Wetlands International

Integrated Wetland Assessment Toolkit	**Target audience:** Resource managers and land planners **Ideal application:** Wetlands planning **Tool type:** Framework and process overview	"This toolkit sets out a process for integrated assessment and provides a set of methods that can be used to investigate the links among biodiversity, economics, and livelihoods in wetlands and to identify and address potential conflicts of interest between conservation and development objectives. The integrated approach presented in the toolkit also enables practitioners to **assess a wetland in terms of its combined biodiversity, economic, and livelihood values.** It has a particular focus on strengthening pro-poor approaches to wetland management." "It is intended to help overcome the current methodological and information gaps in wetland assessment, thereby facilitating the factoring of wetland values into conservation and development decision-making and management planning. It can be applied to all sorts of wetlands and at all scales."	International Union for Conservation of Nature (IUCN)
Wetlands-At-Risk Protection Tool (WARPT)	**Target audience:** Local government and NGOs **Ideal application:** Wetlands planning **Tool type:** Framework and process overview	The Wetlands-At-Risk Protection Tool [WARPT] **helps users assess local wetlands** and develop a plan for protecting at-risk wetlands and their functions. The basic steps of the process include quantifying the extent of at-risk wetlands, documenting the benefits they provide at various scales, and using the results to select the most effective protection mechanisms.	U.S. Environmental Protection Agency (EPA) and Center for Watershed Protection (CWP)
Urban Environments			
Creating Value through Ecosystem Service Management in Urban and Suburban Landscapes	**Target audience:** Urban and suburban land managers and planners **Ideal application:** Landscape planning and management **Tool type:** Guidance document	"The document describes the **ecosystem services approach and how it relates to managed landscapes**. It reviews the economic, environmental, and social benefits derived from managed landscapes with a focus on seven ecosystem services: aesthetic and recreation opportunities, water quality, air quality, carbon sequestration, local climate control, water retention, and soil retention. These services can be quantified and economically valued using existing methods. The document proposes a conceptual ecosystem service framework for managed landscapes to aid in operationalizing and eventually standardizing these considerations into landscape management."	World Resources Institute (WRI) and Cardno ENTRIX
The Nature of Mainstreaming: A local integrated planning toolkit for biodiversity and ecosystem services	**Target audience:** Local governments **Ideal application:** Including BES in city planning **Tool type:** Guidance document	The Nature of Mainstreaming Toolkit provides important guidance for local governments to ensure that awareness and consideration of **biodiversity and ecosystem services are integrated across departments and into city planning and decision-making**.	ICLEI

Table 10: Sector-Specific Tools

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
Chemicals			
"Biodiversity and Ecosystem Services: What Are They All About?"	**Target audience:** Companies in the chemical sector **Ideal application:** Understanding ecosystem services impacts and dependencies **Tool type:** Guidance document	"This guide aims to help both large and small companies in the **chemicals sector to get started in integrating biodiversity and ecosystem services** in their strategy and daily operations."	CEFIC
Construction and Land Development			
Leadership in Energy and Environmental Design for Building Design and Construction (LEED BD&C)	**Target audience:** Building designers **Ideal application:** Building construction **Tool type:** Rating system	LEED BD&C version 4 includes draft credits **encouraging sourcing from "manufacturers that have publicly released a report from their raw material suppliers,** including the following: » raw material supplier extraction locations, » a commitment to long-term ecologically responsible land use, » a commitment to reducing environmental harms from extraction and/or manufacturing processes, [and] » a commitment to meeting applicable standards or programs voluntarily that address responsible sourcing criteria."	U.S. Green Building Council (USGBC)
Offset Portfolio Analyzer and Locator *added in 2014*	**Target audience:** Infrastructure developers **Ideal application:** Assessing ecosystem service impacts and potential offsets **Tool type:** Software tool	"OPAL (Offset Portfolio Analyzer and Locator) enables users to **estimate the impacts of development activities on terrestrial ecosystems and several of the services they provide**, and then to select offsets to efficiently mitigate losses. OPAL tracks how people are affected by the environmental impacts of development and mitigation activities, making the consequences of development more transparent and enabling mitigation portfolios to be designed in a way that maintains or restores environmental benefits in a socially equitable manner."	Natural Capital Project
QuickScan	**Target audience:** Policy makers **Ideal application:** Assessing policies regarding green infrastructure **Tool type:** GIS tool	"It is a flexible and modular modeling environment currently being developed in the European Environment Agency. It allows the users to explore the **different implications and trade-offs that occur when developing and implementing policy options for Europe.** Green infrastructure can be explored either as a purely structural theme, by looking at different land cover types and administrative declarations, or it can be explored with a more functional approach, which seeks to identify areas and networks that might not be measured using purely mechanical means."	European Environment Agency (EEA)

Sustainable Sites Initiative	**Target audience:** Land developers **Ideal application:** Implementing sustainable land development and site management practices **Tool type:** Rating system	"The Sustainable Sites Initiative is dedicated to fostering a **transformation in land development and management practices** that will bring the essential importance of ecosystem services to the forefront. For the purposes of the initiative, land practices are defined as sustainable if they enable natural and built systems to work together to 'meet the needs of the present without compromising the ability of future generations to meet their own needs.'"	Sustainable Sites Initiative

Energy and Extractives			
Cross Sector Biodiversity Initiative (CSBI) Timeline Tool *added in 2014*	**Target industries:** Extractives companies **Ideal application:** Project planning **Tool type:** Guidance document	"The Cross Sector Biodiversity Initiative (CSBI) Timeline Tool has been designed **to assist project planning in the extractives industries** to better align project development, biodiversity impact management, and financial timelines and milestones."	IPIECA, the International Council on Mining and Metals (ICMM), and the Equator Principles Association
EcoNomics	**Target industries:** Utilities, minerals and metals, hydrocarbons, infrastructure, and environment **Ideal application:** Project selection and design **Tool type:** Proprietary computer model	"The EcoNomics assessment process allows users to **quantify and monetize relevant environmental, social, and financial project factors across the asset lifecycle,** allowing project options to be compared on a like-for-like dollar-value basis over a range of possible future conditions. This allows decision-makers to identify optimal solutions for profit and sustainability."	WorleyParsons
IPIECA Biodiversity and Ecosystem Services Guide	**Target audience:** Decision-makers in oil and gas companies **Ideal application:** Identify risks and opportunities related to ecosystem services for oil and gas developments **Tool type:** Guidance document	"The aim of this guide is threefold. Firstly, it explains the relationship among biodiversity, ecosystem services, and the oil and gas industry. Secondly, it provides **a set of checklists to help identify the main ecosystem service dependencies and impacts of oil and gas developments.** Thirdly, it highlights key associated risks and opportunities for oil and gas companies and provides guidance on potential measures for managing them." The guide is supplemented by Managing Biodiversity & Ecosystem Services (BES) issues along the asset lifecycle: 10 Tips for Success in the Oil and Gas Industry.	IPIECA (International Petroleum Industry Environmental Conservation Association)
Finance			
E-RISC: Environmental Risk Integration in Sovereign Credit Analysis	**Target audience:** Investors **Ideal application:** Identify natural capital risks relevant to sovereign credit analysis **Tool type:** Guidance document	"The E-RISC (Environmental Risk in Sovereign Credit Analysis) methodology focuses on the development of **metrics and methods for quantifying natural resource and environmental risks so they can be incorporated into sovereign credit risk assessments.** The methodology relies on the Ecological Footprint and biocapacity metrics to assess a country's resource situation in order to identify how these risks might affect sovereign credit risk. The traditional focus on renewable biological resources by Global Footprint Network (such as fisheries, forests, cropland, and grazing land) is supplemented with data on nonrenewable natural resources, including fossil fuels, metals, and minerals, to provide a more comprehensive definition of natural resources."	UN Environment Programme (UNEP) Finance Initiative and Global Footprint Network
Food, Beverage, and Agriculture			

Biodiversity Risk and Opportunity Assessment (BROA) Tool	**Target audience:** Corporate risk managers and sustainability managers **Ideal application:** Identification of site-specific risks and opportunities and the creation of action plans **Tool type:** Excel-based assessment and tracking tool	"It allows a business to **identify and assess its impacts and dependencies on biodiversity and ecosystem services** (BES), to prioritize and to create action and monitoring plans that address risks and opportunities both for BES conservation and to build greater resilience in [the] agricultural landscape. Because tobacco is grown in mixed agricultural landscapes and is commonly rotated with a variety of crops, including rice, barley, beans, and oats, BROA is not a tool specific to the tobacco crop—it deals with issues generic to many agricultural landscapes."	British American Tobacco Biodiversity Partnership
Fieldprint Calculator (United States only)	**Target audience:** Farm managers **Ideal application:** Assessment of environmental impacts of farming and comparison with baselines and alternative scenarios **Tool type:** Web-based assessment tool	"The Fieldprint Calculator is meant to be an educational resource to **get growers thinking about their operations and how their practices relate to natural-resource management** and sustainability. It will not provide you with a precise evaluation, but [instead will] allow you to generally benchmark your performance against county, state, and national averages. It also helps you to look at different scenarios of practices and see how those changes may affect your overall outcomes." The calculator does not discuss ecosystem services directly, but it allows users to see the impact of different management practices on land use, soil conservation, soil carbon, GHG [greenhouse gas] emissions, energy use, and water use. Additional indicators are under development. The calculator addresses a variety of common crops, including corn, cotton, potatoes, rice, soybeans, and wheat.	Field to Market
Reducing Risk: Landscape Approaches to Sustainable Sourcing	**Target audience:** Sustainability managers and sourcing managers **Ideal application:** Informing sourcing decisions **Tool type:** Guidance document	"This report demonstrates that when sourcing areas are threatened by a constellation of risks that cannot be mitigated solely on-farm or via supply chain programs, landscape approaches offer solutions. **Landscape approaches provide a framework to deliberately work beyond the farm-scale to support food production, ecosystem conservation, and rural livelihoods across** entire landscapes in an integrated manner. The research looked specifically at what agribusinesses stand to gain from a landscape approach and explored the benefits and trade-offs early adopters have experienced. Findings are based on a scoping assessment of 27 landscape approaches and three in-depth case studies."	EcoAgriculture Partners
Forestry			
Natural Forest Standard	**Target audience:** Forestry managers **Ideal application:** Certification of forest conservation and restoration **Tool type:** Standard	"The Natural Forest Standard (NFS) aims to conserve and restore natural forests through actions that benefit local communities and indigenous people. In addition to avoiding [carbon] emissions the **NFS offers a framework for the protection of a range of other ecosystem services,** including provisioning, cultural, and regulating services. It is aimed specifically at certifying the carbon benefits and biodiversity impacts of medium- to large-scale projects aimed at conservation and restoration of natural forests at risk of deforestation and degradation."	Ecosystem Certification Organisation (ECO)
Tourism			

Tourism, Wellbeing, and Ecosystem Services	**Target audience:** Tourism firms and researchers **Ideal application:** Linking tourism and ecosystems **Tool type:** Research initiative	"The ToBeWell project is based on bringing together principles of ecosystem services, which focus on life support systems, with more nonmaterial services such as culture, health, and well-being through tourism. It aims **to link research on well-being provided by ecosystems and their use via tourism, leisure, and recreation activities.** The underpinning issue of this project is to produce new and collaborative research on how and in what way can tourism be a catalyst for improving human health and well-being, by using in a symbiotic and sustainable way natural resources and services provided by ecosystems, as well as exploring the challenges of [e]valuation of such services."	COST (European Cooperation in Science and Technology)

Table 11: Assessment Resources

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
"Ecosystems and Human Well-Being: A Manual for Assessment Practitioners"	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem assessment **Tool type:** Guidance document	"This manual, **"Ecosystems and Human Well-Being: A Manual for Assessment Practitioners,"** allows for the wider adoption of the Millennium Ecosystem Assessment [MEA] conceptual framework and methods. The manual, which contains numerous case studies of best practice, offers a **practical guide for undertaking ecosystem assessments** and includes tools and approaches that can assess options for better managing ecosystems."	UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)
Integrating Ecosystem Services into Development Planning	**Target audience:** Development professionals **Ideal application:** Development planning **Tool type:** Guidance document	"This guide on Integrating Ecosystem Services into Development Planning aims to assist advisors, project staff, and development planners in partner countries in **recognizing the links between nature and development**. It considers the environmental and economic trade-offs associated with development measures and helps to systematically incorporate ecosystem services–related opportunities and risks into the planning and development of strategies."	Deutsche Gesellschaft für Internationale Zusammen-arbeit
MonitoringResources.org	**Target audience:** Marine resource managers, policy analysts, and scientists **Ideal application:** Ecosystem monitoring **Tool type:** Compilation of resources	MonitoringResources.org is a suite of tools that helps investigators plan and implement effective, efficient, high-quality monitoring projects. The tools provide **guidance and support for design and documentation of a monitoring project** from the early design stage through implementation and generation of descriptive statistics.	Pacific Northwest Aquatic Monitoring Partnership (PNAMP)
Toolkit for Ecosystem Service Site-based Assessment (TESSA)	**Target audience:** Land managers, policy analysts, and scientists **Ideal application:** Ecosystem services assessment **Tool type:** Guidance document	"TESSA is a **toolkit for rapid assessment of ecosystem services at sites of biodiversity conservation importance**. It has been developed for use by local nonspecialists, enabling the identification of which ecosystem services may be important at a site, and for evaluating the magnitude of benefits that people obtain from them currently, compared with those expected under alternative land uses."	Birdlife International

Table 12: Training Resources

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
BES and Climate Change Teaching Materials	**Target audience:** Conservation practitioners and business leaders **Ideal application:** Training **Tool type:** Training materials	"To foster a greater understanding of the links between biodiversity conservation, ecosystem services, and climate change, this project aims to **develop training materials and tools to effectively bridge the knowledge gap of early and mid-career conservation practitioners and business leaders** with the potential to facilitate change at a local level, where the greatest impacts of climate change are felt. Training topics focus on climate change impacts on ecosystem services and natural solutions to climate change adaptation and mitigation."	Birdlife International
Business Ecosystems Training (BET)	**Target audience:** Business leaders **Ideal application:** Training **Tool type:** Training materials	"Business Ecosystems Training (BET) course is a **freely-available capacity-building program to increase the knowledge and understanding of the links between ecosystems and business.** The objective of BET course is to equip companies with the skills they need to better manage their impacts and dependencies on ecosystems and the services that they provide."	World Business Council for Sustainable Development (WBCSD)
E.Valu.A.Te: the Game *added in 2014*	**Target audience:** Business leaders **Ideal application:** Training **Tool type:** Online game	"A new game produced by the Cambridge-hosted Natural Capital Leaders Platform introduces natural capital valuation and shows how it can inform commercial decisions that mitigate risk, reduce negative environmental impacts, and create value. Evaluate: the Game challenges players to manage their business risks by making strategic decisions around a limited budget and bank the value created by reducing environmental impact. Those who play the game can not only **increase their understanding of how valuation can help make better business decisions** but it can also give them confidence to explore the business trade-offs that can be informed by valuation."	Natural Capital Leaders Platform
Natural Capital Business Hub *added in 2014*	**Target audience:** Business leaders **Ideal application:** Training **Tool type:** Case studies	"The Hub is a collaborative, **open, and dynamic online platform that aims to help diverse companies** at varying stages of maturity on natural capital issues to evaluate and make the business case for action, benchmark against other companies and evolving best practices, learn from curated company case studies, etc."	Corporate Eco Forum, The Nature Conservancy, and the Natural Capital Coalition
Valuation and Mainstreaming of Biodiversity and Ecosystem Services *added in 2014*	**Target audience:** General audience **Ideal application:** Training **Tool type:** Training	"The goal of this training is to **provide you with an overview of the process of biodiversity valuation and mainstreaming**. This training has three topic areas: valuing biodiversity and ecosystem services—an introduction; valuation and approaches to valuing biodiversity and ecosystem services; and ecosystem services valuation: A step-by-step guide."	The Nature Conservancy

Table 13: Other Resources

Tool Name	Target Audience and Ideal Application	Description	Tool Developer
Climate Tools (data.gov) *added in 2014*	**Target audience:** Governments, nonprofit, business, communities **Ideal application:** Identifying resources for understanding climate change impacts **Tool type:** Compilation of tools	"Government and non-government software **tools to help coastal communities and others analyze and assess vulnerabilities** of sea level rise, storm surges, and sinking lands."	Data.gov
Ecosystem Services Partnership Resource Catalog	**Target audience:** Ecosystem services practitioners **Ideal application:** Identifying ecosystem services resources **Tool type:** Compilation of tools and indicators	The Ecosystem Services Partnership has developed a **repository for data and models on ecosystem services and a source for reports and lists of ES indicators.**	Ecosystem Services Partnership (ESP)
EPA Ecosystems Research: Methods, Models, Tools, and Databases	**Target audience:** Ecosystem services practitioners **Ideal application:** Identifying ecosystem services resources **Tool type:** Compilation of tools and resources	**Resources from the EPA**'s ecosystems research department.	U.S. Environmental Protection Agency (EPA)
Exploring the Future: Review of Spatial Decision Support Tools	**Target audience:** Ecosystem services practitioners **Ideal application:** Identifying ecosystem services resources **Tool type:** Review of tools	The document aims "to undertake a brief **review of existing spatial decision support tools** (sDST), including applications relevant to terrestrial and aquatic systems."	Department for Environment, Food, and Rural Affairs (Defra)
Payments for Ecosystem Services: Catalog of Online Tools and Resources	**Target audience:** Landowners and ecosystem services practitioners **Ideal application:** Identifying ecosystem services resources **Tool type:** Compilation of tools and resources	"As the concepts of ecosystem services and payments for ecosystem services (PES) have gained in popularity, numerous web-based resources have been created to 1) provide and exchange information about ecosystem services, and 2) facilitate transactions between buyers and sellers, or those who provide ecosystem services and those who wish to compensate those providers. We have made a **catalog of these resources** available for others working in the field of ecosystem services, including landowners."	Sustainable Northwest

Tools for Landscape-Level Assessment and Planning *added in 2014*	**Target audience:** Ecosystem services practitioners **Ideal application:** Identifying tools for landscape assessment and planning **Tool type:** Compilation of tools and resources	"NatureServe/EBM Tools Network are very pleased to announce the release of a **guide to tools that support landscape-level conservation in the face of climate change** (Tools for Landscape-Level Assessment and Planning: A Guide for the North Pacific Landscape Conservation Cooperative). The guide focuses on tools currently in use in the North Pacific region of the United States and Canada. Much of the guide is applicable to landscape-scale conservation planning in other regions as well."	NatureServe