ECOLOGY

The Convention on Biological Diversity's 2010 Target

Andrew Balmford, Leon Bennun, Ben ten Brink, David Cooper, Isabelle M. Côté, Peter Crane, Andrew Dobson,* Nigel Dudley, Ian Dutton, Rhys E. Green, Richard D. Gregory, Jeremy Harrison, Elizabeth T. Kennedy, Claire Kremen, Nigel Leader-Williams, Thomas E. Lovejoy, Georgina Mace, Robert May, Phillipe Mayaux, Paul Morling, Joanna Phillips, Kent Redford, Taylor H. Ricketts, Jon Paul Rodríguez, M. Sanjayan, Peter J. Schei, Albert S. van Jaarsveld, Bruno A. Walther

Most of the time, most of us behave as if our ongoing destruction of biological diversity and natural ecosystems has a net beneficial effect on our personal well-being. This is because it often has—locally, in the short term, and for people with the most power. However, when a longer-term view is taken, conserving biodiversity and the services it provides emerges as essential to human self-interest (*1*, *2*). Representatives of 190 countries at the 2002 Johannesburg World Summit on Sustainable Development committed themselves to "…achieving by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional, and national level…" (*3*). By adopting the 2010 target, governments are explicitly recognizing the value of biodiversity, setting goals for its conservation, and holding themselves accountable (*4*, *5*).

These undertakings present conservation scientists with a great challenge. The 2010 target can only catalyze effective conservation if systems are in place to tell governments, businesses, and individuals about the consequences of their actions. Yet we have so far identified only a fraction of the earth's biological diversity and have just a rudimentary understanding of how biological, geophysical, and geochemical processes interact to contribute to human well-being. How can we present our knowledge in ways that are useful to decision-makers and in time to contribute to achieving the 2010 target?

Author affiliation in order listed: Cambridge University and University of Cape Town; BirdLife International; Netherlands Environmental Assessment Agency (RIVM); Convention on Biological Diversity (CBD) Secretariat; University of East Anglia; Royal Botanic Gardens, Kew; Princeton University; Equilibrium; The Nature Conservancy; Royal Society for the Protection of Birds and Cambridge University; Royal Society for the Protection of Birds; United Nations Environment Programme (UNEP) World Conservation Monitoring Centre; Conservation International; Princeton University; University of Kent; Heinz Center for Science, Economics and the Environment; Zoological Society of London; Oxford University; European Commission (EC) Joint Research Center; Royal Society for the Protection of Birds (twice); Wildlife Conservation Society; World Wildlife Fund, USA; Instituto Venezolano de Investigaciones Científicas; Diversitas and Fridtjof Nansen Institute; The Nature Conservancy; Stellenbosch University; Cambridge University. The views expressed in this article are the authors' and do not necessarily reflect the views of the organizations to which they are affiliated.

*Author for correspondence. E-mail: dobber@princeton.edu

The Need for Indicators

Part of the answer lies in establishment of indicators of biodiversity and ecosystem functions and services that are rigorous, repeatable, widely accepted, and easily understood. Conservation scientists have a lot to learn in this regard from economists, who have long had a set of common and clear indicators for tracking and influencing market development. Recently, biologists adopted a similar approach by producing composite indicators from population time series data on widely studied groups such as birds and other vertebrates (*3*, *6–10*). One of these, the U.K. Wild Bird Index, has already been adopted by the U.K. government as an indicator of quality of life and a measure of how well environmental policies are working (*6*, *11*); because of well-understood links with farming practices (*12*), this index could soon be extended to the European Union (EU) to inform the reshaping of its Common Agricultural Policy (*6*).

The first step toward developing global indicators has already been taken. In early 2004, parties to the Convention on Biological Diversity (CBD) established a framework for assessing progress on the 2010 target [United Nations Environment Programme (UNEP) (*13*); see table, p. 213]. For these indicators to gain wider scientific respect and be used more broadly, they will require continuing independent scientific assessment and input. In July 2004, the Royal Society (U.K.) invited more than 60 scientists from governments, academia, and global and national conservation organizations (representing 15 countries) to a workshop designed to review the indicators and to explore how such input could be provided.

Workshop participants concluded that the 18 indicators already identified are likely to provide useful information but also will leave important gaps in our understanding of biodiversity loss. Additional indicators were proposed that could provide some of the missing information by 2010. A comprehensive set of indicators may need to be larger still [e.g., see 102 indicators for taking the pulse of U.S. ecosystems (*14*)]. However, workshop participants recognized that developing indicators would not be enough.

Broadening the Science

Fundamentally, we need to develop models that describe how the human, biological, physical, and chemical components of the earth system interact. Sketching the scope of such models (see SOM) brings home the fact that while we have little detailed and quantitative information on many components of the system, we know even less about how the linkages between them work. Developing models would guide data collection, help quantify how ecosystems benefit humans, clarify mechanisms by which activities and policies affect biodiversity and the services it provides, and allow improved projections about what might happen in the future. Part of the work of the Millennium Ecosystem Assessment (*15*) is to build models of this kind, but this effort needs to be continued and extended.

Most of the indicators so far under discussion deal with biodiversity per se and principally involve biologists. Studies linking socio-economic factors and geophysical and geochemical processes with biodiversity are relatively undeveloped. Given the contributions that biodiversity conservation will make toward alleviating poverty (*16*, *17*), it is crucial that indicators and models address all components.

Reducing the rate of loss of a plant or animal species is only a step in the right direction and may not prevent extinction. Likewise, preventing further decline and even allowing modest recovery, for example, of a depleted fish stock, might not be sufficient to allow sustainable exploitation (*18*). Policy-makers may need to consider more ambitious targets, such as halting loss and restoring ecosystems. This was already accepted by the EU Council at its meeting in Göteborg, Sweden, in 2001 and by the European Environment Ministers at Kiev, Ukraine, in 2003 (*19*).

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There are also immediate needs for global extension of monitoring programs and developments in capacity building, design of data collection programs, quality control, and statistical analyses. Most indicators likely to be available in the near future will be based on existing databases and monitoring schemes. However, as the areas richest in biological diversity are often those most lacking resources, current databases and monitoring are usually not fully representative and do not cover a wide enough range of system components. Meta-analyses of other existing, if scattered, data offer considerable scope for plugging some gaps quickly (*20*). Another possibility is the use of remote sensing to measure both currently and retrospectively the extent and condition of biomes. This approach is already well developed for measuring changes globally in forests (*21*).

The Challenge

The 2010 target provides the scientific community the challenge to engage in exciting fundamental science and to participate in what is likely to be the most significant conservation agreement of the early 21st century. Models, indicators, data, and monitoring techniques must be open to scrutiny. Interdisciplinary collaboration will be essential to strengthen the scientific rigor of the indicators, to enhance their relevance to policy, and to raise public awareness of their usefulness. Scientists must act in four key ways: (i) work with the CBD Secretariat and its partners to develop, review, and use the indicators already identified by the CBD Conference of Parties (*22*); (ii) develop research and monitoring programs; (iii) share information and experience regarding development and implementation of monitoring programs, data management, and sharing; and (iv) promote increased availability of funds for long-term research and monitoring programs.

Economic indicators like gross domestic product (GDP) and financial indicators like the Dow Jones have set the precedent. The global imperative to protect biodiversity and ecosystem services must become as politically significant as economic growth, and the reasons for reducing the rate of loss of biological diversity need to be as widely understood and valued by the public and by governments. Well-conceived, robust, and understandable indicators can help achieve this objective. Yet time is fast running out: We are already approaching the half-way mark of this extraordinary chance for global conservation.

CONVENTION ON BIOLOGICAL DIVERSITY'S FRAMEWORK FOR ASSESSMENT BY 2010

Identified indicators	Proposed indicators
Components of biological diversity	
• **Forest area** • **Trends in abundance and distribution of selected species** • **Coverage of protected areas** • Change in status of threatened species • Trends in genetic diversity of domesticated plants and animals • Extent and location of mangroves and seagrass and macroalgal beds • Management effectiveness of protected areas • Investment in protected areas	• Condition of forests • Extent and condition of shrublands, grasslands, and deserts • Extent of wetlands and large water bodies • Catchment condition—extent of riparian vegetation • Percent live coral cover • Extent and condition of estuaries
Sustainable use	
• Area of forest, agriculture, and aquaculture under sustainable management • Proportion of products derived from sustainable sources	
Threats to biodiversity	
• **Nitrogen deposition** • Number and cost of alien invasions	• Marine fishing effort • Road-free area • Epidemic outbreaks among wild species
Ecosystem integrity, goods, and services	
• **Marine trophic index** • **Water quality in inland waters** • Freshwater trophic index • Connectivity and fragmentation of ecosystems • Incidence of human-induced ecosystem failure • Health and well-being of people in biodiversity-dependent communities • Biodiversity use in food and medicine • Fish harvest per unit effort • Timber and fuelwood harvest per unit effort	• Number of dams • Sediment load in rivers • Percent population without potable water • Carbon storage in ecosystems • Market share of nature-based tourism • Hit rates for biodiversity-related website • Pesticide use per unit agricultural harvest • Agricultural harvest per unit effort
Traditional knowledge, innovations, and practices	
• **Status and trends of linguistic diversity and numbers of speakers of indigenous languages**	
Resource transfers	
• **Official development assistance in support of CBD**	

The CBD framework for assessing progress. The 18 indicators already identified for immediate testing (bold) and future development (not bold) are shown plus indicators suggested by the Royal Society workshop and potentially available by 2010. Workshop recommendations can be viewed at www.twentyten.net.

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