Conservation Biology

Editorial

Bolder Thinking for Conservation

Should conservation targets, such as the proportion of a region to be placed in protected areas, be socially acceptable from the start? Or should they be based unapologetically on the best available science and expert opinion, then address issues of practicality later? Such questions strike to the philosophical core of conservation. Ambitious targets are often considered radical and value laden, whereas modest targets are ostensibly more objective and reasonable. The personal values of experts are impossible to escape in either case. Conservation professionals of a biocentric bent might indeed err on the side of protecting too much. Anthropocentric bias, however, more commonly affects target setting. The pro-growth norms of global society foster timidity among conservation professionals, steering them toward conformity with the global economic agenda and away from acknowledging what is ultimately needed to sustain life on Earth.

The 2010 Nagoya Conference of the Convention on Biological Diversity demonstrates the pitfalls of timidity. Rands et al. (2010) summarized the calamitous global decline of biodiversity (which they defined as "the variety of genes, species, and ecosystems that constitute life on Earth") and challenged participants at the Nagoya Conference to develop a strategy to confront this crisis. Unfortunately, the biodiversity targets for the year 2020 developed at Nagoya fall short of what is needed to maintain the "ecosystem services" upon which Perrings et al. (2010) suggest human welfare and economic well-being depend. These targets are even less likely to maintain the full breadth of biodiversity. Targets for 2020 set at the Nagoya Conference include protected areas covering 17% of terrestrial areas and inland waters, 10% of marine and coastal areas, and restoration of at least 15% of degraded ecosystems (Convention on Biological Diversity 2010). These targets are woefully below what the results of most scientific studies show are necessary to meet widespread conservation goals such as maintaining viable populations of native species, representing ecosystems across their range of variation, and promoting resilience of ecosystems to environmental change (Noss & Cooperrider 1994).

Set Targets Designed to Achieve Goals

Biodiversity is on a downward slide, and those best equipped to say why and how this must be stopped are not being assertive. Conservation scientists and practitioners were not always so shy about developing conservation strategies. In the early 20th century Victor Shelford and colleagues in the Ecological Society of America proposed a continent-wide network of protected areas that would establish "a nature sanctuary with its original wild animals for each biotic formation" (Croker 1991). In the 1980s, when the promise of sustainable development seemed real, the Brundtland Commission (1987) set a target of tripling the amount of Earth's surface then protected (approximately 4%). Such progress was followed in 1992 by global treaties signed in Rio de Janeiro at the Convention on Biological Diversity's Earth Summit, which promised to address human-caused climate change and halt biodiversity loss. The goals were commendable, but their implementation faltered.

By 2005 it was clear that these conventions and commissions were not meeting their stated goals (Millennium Ecosystem Assessment 2005). Shortly thereafter, the Intergovernmental Panel on Climate Change stated bluntly: "The resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, insects, ocean acidification), and other drivers of global change (e.g., land-use change, pollution, overexploitation of resources)" (Parry et al. 2007). According to the 2010 IUCN Red List, an estimated 20% of Earth's vertebrates are now threatened with extinction (IUCN 2010). We suggest these profound failures to achieve conservation goals are partly due to the reluctance of conservation professionals to articulate a bolder and more honest vision.

Protect at Least 50% Globally

Empirical data, models, and prioritization algorithms can be used to set quantitative and transparent conservation targets. The proportion of a region needed to meet a given set of conservation goals will vary widely depending on physical heterogeneity, degree of endemism, past land-use decisions, and many other factors (Noss 1996). Almost universally, when conservation targets are based on the research and expert opinion of scientists they far exceed targets set to meet political or policy goals (Svancara et al. 2005). In contrast to policy-driven targets, scientific studies and reviews suggest that some 25–75%

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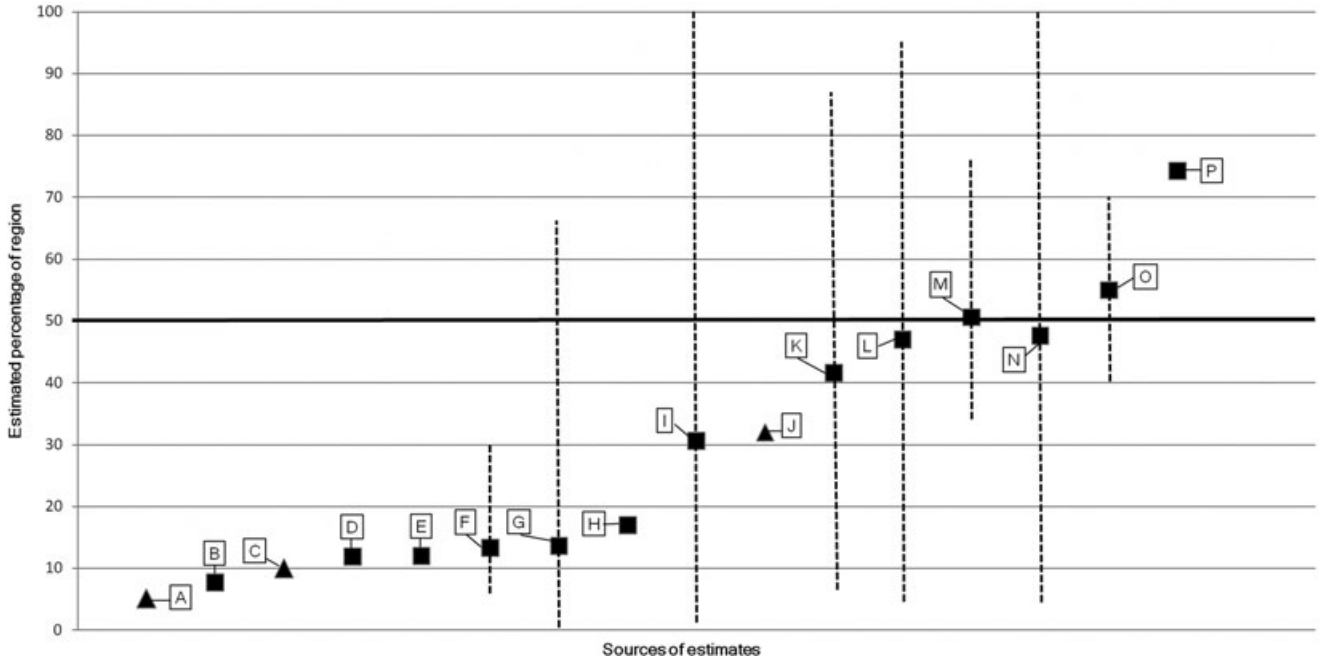

Figure 1. Estimates of the percentage of terrestrial region required to meet conservation goals on the basis of various sources (A-P) arranged from left to right in increasing order of percentage of area conserved. Current protected areas and political conservation targets (e.g., based on international conventions; triangles) tend to be smaller (left portion of graph) than targets derived from scientific research, reviews, and expert opinion (right portion of graph). Vertical lines are ranges of values within published studies and points are reported means or medians of range. Estimates are from Brooks et al. (2004) (land area covered by protected areas designated explicitly for biodiversity conservation, IUCN categories I through IV); Rodrigues and Gaston (2001) (land area needed to represent all higher vertebrate species at least once); Myers (1979) and Miller (1984) (goal of area in protected status set by Bali Action Plan); Brooks et al. (2004) (extent of land currently covered by all protected areas); Brundtland Commission (1987) (new goal of area in protected status); Svancara et al. (2005) (mean target derived from policy-driven assessments, n = *17 published and unpublished references); Rodrigues and Gaston (2001) (mean of the minimum percentage of the area needed to represent all species,* n = *21 published and unpublished studies); Convention on Biological Diversity (2010) (goal for area of land and inland waters in protected status); Svancara et al. (2005) (mean from assessments of evidence-based conservation plans,* n = *112 published and unpublished references); Convention on Biological Diversity (2010) (sum of targets for protected areas and restored land); Svancara et al. (2005) (mean from evidence-based threshold assessments,* n = *33 published and unpublished references); Schmiegelow et al. (2006) (mean of percentage-based targets,* n = *24 published and unpublished studies); Soule and Sanjayan (1998) (mean of the minimum area needed for biodiversity protection,* n = *4 published and unpublished studies); Noss and Cooperrider (1994) (median of range of conservation targets,* n = *11 published and unpublished studies); DellaSala et al. (2011) (median of range of area of temperate and boreal rainforests needed for biodiversity protection,* n = *8 published and unpublished studies); Rodrigues & Gaston (2001) (global land area needed to represent all terrestrial plant species once). References are available as Supporting Information.*

of a typical region must be managed with conservation of nature as a primary objective to meet goals for conserving biodiversity (Fig. 1). These results echo earlier models of habitat loss and fragmentation, in which the transition from one continuous patch to multiple patches of decreasing size and increasing isolation begins after around 40% loss of original habitat (Andrén 1994).

From a strict scientific point of view, the only defensible targets are those derived from empirical data and rigorous analyses. The people who develop conservation strategies and global treaties prefer to set targets *a priori*. When establishing global targets, as at Nagoya, it would be prudent to consider the range of evidence-based estimates of "how much is enough" from many regions and set a target on the high side of the median as a buffer against uncertainty. From this precautionary perspective, 50%—slightly above the mid-point of recent evidence-based estimates (Fig. 1)—is scientifically defensible as a global target. We suggest that conservation targets and plans be regularly updated and synthesized into

country- and continent-wide strategies, accompanied by specific steps and a timetable for implementation.

Maintain or Restore Connectivity across Large Landscapes

Large contiguous reserves should be functionally connected to allow movement of organisms and genes, for example the migratory and dispersal movements of large animals (Berger 2004) and distributional shifts of multiple species in response to climate change. Although a well-managed landscape matrix may provide connectivity and other conservation benefits (Franklin & Lindenmayer 2009), it cannot be assumed to conserve biodiversity unless legally binding and enforced regulations keep land use compatible with conservation objectives. This is usually not the case.

To date, only 3 countries—Bhutan, India, and Tanzania—have identified major corridors at national extents. In Australia a national conversation about connectivity includes a proposed 2800-km corridor from Queensland to Victoria (New South Wales Government 2010), mirroring the Yellowstone to Yukon corridor (3200 km) in the United States and Canada (Yellowstone to Yukon Conservation Initiative 2010). We recommend that other countries carry out similar transboundary assessments and develop implementation plans that transcend political demarcations.

Focus Attention on the Greatest Threat

An exclusive focus on global climate change, the current rage, may obscure other pressing conservation problems and divert funding from combating them. As a direct global threat to species and ecosystems, climate change is currently dwarfed by land-use change in response to human population growth and conversion of wild lands to agricultural use (Jetz et al. 2007). Current rates of land-use change will make adaptation of species to climate change virtually impossible. Conversely, protecting native ecosystems can increase their resilience and their ability to store carbon (Bunker et al. 2005).

Demonstrate the Value of Nature to Humans

Biodiversity should be managed as a public good (Rands et al. 2010), but it is narrow minded to dwell exclusively on its material benefits to people. Discussions about human development and ecosystem services need to delve deeper and communicate more effectively. The broader values of nature to humans are exemplified by the Transition Towns movement in the United Kingdom, the practice of Shinrin-yoku ("forest bathing") in Japan, and the weak relation between material wealth and happiness (Happy Planet Index 2010). Conservation professionals should not assume that only economic and utilitarian values determine people's attitudes toward conservation. Many people value nature for its own sake.

Natural history and conservation education must be expanded at all levels from preschool children to political leaders. Educators must explicitly recognize the importance of teaching people of all ages about basic ecological and evolutionary concepts–and getting them outdoors. The focus of education must be on whole organisms and ecosystems; otherwise, conservation professionals risk losing the interest in the living world of generations of students of all ages worldwide.

Popularize the Idea That Conservation Can Be Achieved

When continental-level conservation was proposed in the 1990s (Soulé & Terborgh 1999), it was viewed by many as unrealistic, just as Victor Shelford's ambitious proposals were seen as inappropriate by some of his peers (Croker 1991). This view is changing. The United States Department of the Interior has initiated 21 Landscape Conservation Cooperatives that cover the entire nation, and the Obama Administration has recently launched the America's Great Outdoors Initiative to encourage public use and appreciation of natural areas. Such efforts have the potential to rescue conservation professionals from their defeatist mentality and draw out the interest and enthusiasm of citizens.

The conservation science community, as well as the broader circle of conservation professionals, must do a much better job communicating a compelling vision across traditional disciplinary and societal boundaries. The media, in turn, has a role in promoting biodiversity as an indispensable public value. The BBC's *Planet Earth* and National Geographic's *Great Migrations* series show the promise of this approach. Conservation professionals of all varieties should invest more effort in explaining and marketing biodiversity conservation in compelling ways. When people understand and appreciate the value of biodiversity, they will be more likely to think about conservation when they vote, make purchases, or decide about uses of land and natural resources.

Reasonable Targets

If the conservation community sets protection targets based on preconceived notions of what is socially or politically acceptable or on assumptions of inevitable population and economic growth, we will make very limited headway in stemming extinction. We suggest that strategies for conservation be passed first through a biological

filter. Those options with a high probability of sustaining biodiversity are retained, whereas those with a lower probability are seen as incremental. The next step, however, is not to pass the remaining strategies through a political filter because most would fail to pass in the current political climate. Rather, conservation professionals must become part of the constituency that promotes life on Earth. Our task is not to be beaten down by political reality, but to help change it. Nature needs at least 50%, and it is time we said so.

Supporting Information

A list of the references referred to in Fig. 1 is available online (Appendix S1). The authors are responsible for the content and functionality of these materials. Queries (other than the absence of the material) should be directed to the corresponding author.

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