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Article 12:**(Essay) Reserves: How Much Is Enough and How Do We Get There From Here?**By John Terborgh, *Duke University*

Is the human species doing enough to conserve the rest of the world's species for posterity? If not, then how much is enough? This is a key question, and opinions about the correct answer vary widely. An industry spokesperson is likely to ask, "Don't they (the conservationists) have enough already?" "How much do they want, anyway?" This is a typical but inappropriate response, first, because the issue is really a scientific one, and second, because it puts conservationists in the awkward position of having to say that reserving a certain amount of habitat will be sufficient to save nature.

The only correct answer from a scientific standpoint is, "all of it." That is how much of Earth was available to nature before modern man entered the picture. Since then, at least half of Earth's terrestrial environment has been degraded or completely transformed to support the human enterprise. We know that half or more of Earth's native habitat cannot be eliminated without endangering large numbers of species. In fact, more than 100 species have gone extinct in the U.S. alone since the Endangered Species Act (ESA) was approved by Congress. An additional 1200+ species are currently listed as endangered, and an even larger number of unlisted candidate species lurks in the background. This should be warning enough that humans are pushing our luck in preempting Earth's resources for ourselves. Thus, the best answer to the question, "How much do they want?" is "Everything that is left." Admittedly, this is a tall order, but it should be the goal that conservationists set for themselves.

If everything that is left is the goal (roughly 50% globally), how far are we from reaching it? Clearly, a very long way, but at this point definitions become important. If one means the strictest category of protected areas (equivalent to U.S. national parks), the global value is around 6% (for the U.S. it is 1.5%). From this perspective, the effort to conserve nature has barely begun. Nevertheless, in parts of the world there remain great expanses of unprotected land that continue to support natural vegetation and wildlife (much of the Amazon Basin, for example, and much of Siberia). Little of this land holds much promise for agriculture, so there should be no compelling reason to destroy it. The fate of these lands will depend more on politics than on social or economic necessity.

Thanks to a series of historical accidents, the U.S. is in a fortunate position. Roughly 40% of the national territory consists of public lands belonging to the federal or state governments. If it were not for these public lands, it is fair to say that the state of biodiversity in the U.S. would be vastly worse than it is. The use of public lands, especially federal lands, is a hotly contested political issue. Ranchers, miners, and loggers lobby for greater access to these lands, as do a variety of recreationists. Conservationists counter with pleas for less-intensive use and higher degrees of protection. To put the debate into context, it is relevant to note that only 15% of U.S. wood production and 2% of beef production currently derive from federal lands (Gullison et al. 2001; Wuerthner and Matteson 2002). Is foregoing these benefits too high a price to pay for conserving biodiversity? Lobbyists for extractive industries say "Yes," whereas polls indicate that a majority of the public says, "No."

At one level, the debate over the use of public lands is a classic political conflict between competing interest groups, but at a deeper level, it is a debate over what is meant by "sustainable development." Many definitions can be imagined, and quite a few of them can be supported by valid arguments. For example, to a logger, sustainable development might entail sustaining a certain level of timber production, although this might imply the use of highly selected strains of trees and the application of chemical fertilizers and pesticides. In contrast, a conservationist, might advocate sustaining biological diversity and the aesthetic appeal of the land, a set of values that are largely incompatible with the logger's goals. When the values held by different segments of society clash, politics provides the resolution. How the politics of public lands plays out over time will largely determine how well the U.S. succeeds in conserving its biodiversity.

If the conservation ethic continues to gain ground in the U.S., which seems likely, then in the future much of the public land estate will be managed in ways that are more biodiversity-friendly. It might then be possible to claim that as much as 40% of the U.S. was being left to nature. The additional 10% needed to bring the total to half could be made up of lands owned and managed by private conservation organizations such as The

Nature Conservancy (TNC), and private lands under conservation easement. The 50% goal is thus not simply a utopian dream, but a practical target that seems attainable within a generation or so.

The public lands tradition is stronger in the U.S. than in most of the rest of the world. Many countries simply have no land use categories comparable to U.S. national forests and Bureau of Land Management (BLM) lands, although there is a growing worldwide trend in the creation of such lands. The advantage of public ownership is that land use is fixed by law, so that forest lands, for example, cannot be cleared and grasslands cannot be plowed. However, management policies are often vaguely worded, leaving decision-makers with much latitude to respond to social or economic pressures in setting management goals. Although harsh management practices may too often be the reality, public lands favor the survival of biodiversity because even a forest battered by logging will retain vastly more biodiversity than a tree plantation.

Whereas the U.S. may be a model in retaining a large fraction of its land estate in the public sector, other countries have been much more generous in declaring national parks for the combined purposes of conserving biodiversity and promoting tourism. It was mentioned above that only 1.5% of the U.S. is included in national parks, whereas the figure for some countries is 10 times greater. Venezuela, for example, is a world leader, with 46% of its national territory under some form of protection, and 18% in national parks.

Willingness to invest in nature conservation has not simply been a matter of national income or the amount of available wildland. Brazil now boasts the world's eighth largest economy, and its sovereign over vast undeveloped expanses of the Amazon Basin, yet has lagged in creating protected areas in comparison with its less affluent neighbors. Russia, with its vast Siberian forest—the largest in the world—could also do much better.

Near the top of the list lies the Dominican Republic. A small Caribbean nation about the size of Vermont and New Hampshire combined, the Dominican Republic occupies the eastern two-thirds of the island of Hispaniola. With a dense and growing population, one of the lowest per capita incomes in the hemisphere, and few natural resources other than its land base and some mineral deposits, the Dominican Republic would not seem a likely country in which to find a model conservation program. Yet, with 67 protected areas encompassing 32% of its national territory, its commitment to protect what remains of its natural environment is one of the strongest in the world. How did that come about?

Historical accident seems to have played a major role. For more than 30 years, the country suffered under the heavy hand of a dictator, Raphael Trujillo, whose avarice knew no bounds. At the end of his reign of terror, he and his family owned nearly two-thirds of the land in the entire Republic. When he seized power in the early 1930s, much of the country was covered in virgin forest. When he was assassinated in 1963, most of the virgin forest was gone, having been ravaged for his personal gain. Vast fires followed in the wake of rapacious logging, exposing steep mountain slopes to erosion. Siltation and accelerated runoff caused once reliable rivers to run dry, wreaking havoc with farmers who depended on the water for irrigation.

This history of excess and abuse was not lost on the generation of leaders that followed. A 40-year ban on logging was instituted in 1965, and trees were planted on deforested slopes to revive damaged watersheds. To this day the country has no timber industry, though a political decision will soon be made on whether to continue the logging ban. Meanwhile, the construction industry has learned to do without a domestic wood supply, importing sparingly for furniture and trim, and substituting other materials for the major structural components of housing.

In the heyday of Trujillo's logging boom, nearly all the houses in the country were built out of wood, but most of these have since yielded to termites and the weather. One can ask in retrospect, was it worth destroying a rich and majestic primary forest for the sake of constructing houses that would be torn down and replaced a few decades later? The example demonstrates that the profligate use of wood is not necessary to build comfortable homes or to sustain an economy. Wood is the preferred material only when it is cheaper than the alternatives. Wood extracted from virgin forests is the cheapest wood of all, for no one invested in planting the trees, or waited a lifetime for them to grow. Here is the "Tragedy of the Commons" as it applies to old-growth forests.

Biologically, the Dominican Republic is a jewel, replete with high levels of endemism in birds, reptiles, plants, and other groups. The country is traversed by four mountain ranges and includes the highest peak in the Caribbean: 3175-m Pico Duarte. It holds rainforests, cloud forests, pine forests, karst (limestone) forests, dry forests, savannas, deserts, even a hypersaline sub-sea level rift valley lake—adding up to more ecoregions (life zones) than any other island in the Caribbean. Thanks to some astute local conservation leaders and a willing government, essentially all remaining natural habitat in the country is now conserved in perhaps the most comprehensive and best planned protected area system in the world.

The Dominican Republic offers a telling example of what can be accomplished when citizens work with the government to implement a vision for the future. The fact that a poor, crowded Caribbean country has achieved so much belies the argument that conservation is a luxury that only wealthy countries can afford. Instead, the example of the Dominican Republic teaches that the essential ingredient for successful conservation is not impressive national income statistics, but simply political will.

What can be done to advance conservation when governments lack the necessary resolve? Of course, one option is to bide one's time and hope for better luck in the next

election. But waiting for the next election is likely to be a losing strategy because conservation is a time-limited endeavor.

For guidance on this point, it is instructive to consider the history of conservation in the U.S. during the twentieth century. Great progress was made during the term of Theodore Roosevelt (1901–1909). Under Roosevelt, several new national parks were declared, the U.S. Forest Service was formally established, and the first federal wildlife refuge was created. These were radical and visionary innovations to be enacted by a Congress still imbued with a get-rich-quick frontier mentality. Was it Roosevelt's remarkable force of personality that persuaded the Congress, or was Roosevelt able to ride a wave of political sentiment?

The answer is doubtless that Roosevelt's legendary powers of persuasion and the public mood both contributed. Massive clear-cutting of Appalachian forests in the 1880s led to the famously destructive flooding of Johnstown, Pennsylvania in 1889 when more than 2200 people drowned. This was the decisive historical event that led subsequently to the birth of our system of national forests. During the same period, herons and egrets were being slaughtered to provide plumes to adorn ladies' hats. When egrets had been decimated so thoroughly that there remained just one large breeding colony within the U.S., Roosevelt stepped in to declare Pelican Island in Florida to be a federal refuge, thereby initiating a system that now includes more than 500 refuges. As in the Dominican Republic, massive abuses led to reform, but only after the public became aroused by crises.

The next great surge of conservation progress waited 50 years until Rachel Carson alerted the nation to the imminent extinction of the Bald Eagle (*Haliaeetus leucocephalus*), our national symbol. Prior to her book, *Silent Spring* synthetic pesticides had been hailed as miracle chemicals, as revolutionary as antibiotics, and people employed them freely, often following the maxim that "if a little is good, then a lot must be better." Only when it was discovered that these chemicals were causing disastrous declines in some of our most emblematic birds—Bald Eagle, Peregrine Falcon (*Falco peregrinus*) and Brown Pelican (*Pelicanus occidentalis*)—did the public begin to demand action, prompting the Congress pass legislation banning the most toxic pesticides.

The surge of awareness and public activism inspired by *Silent Spring* led to the founding of "Earth Day" and brought Richard Nixon and the Congress together to pass an extraordinary series of bills, among them, the Clean Air Act, Clean Water Act, National Environmental Policy Act, and the ESA. The Nixon administration also created the Environmental Protection Agency (EPA) and appointed the President's Council on Environmental Protection as an elite advisory body reporting directly to the president on environmental matters.

After this remarkable burst of activity, little more of consequence was to happen at the federal level for another 20 years, when again a national scandal was required to focus the attention of the government on a major conservation issue. This time it was the rampant clear-cutting and accompanying fragmentation of federally-owned forests in the Pacific Northwest. Harvesting of old-growth timber in the 1980s reached a level that greatly exceeded rates of regrowth, in violation of the National Forest Policy Act, so that judges began to declare injunctions on further cutting. Moreover, the presence of two old-growth-dependent birds, the Spotted Owl (*Strix occidentalis*) and Marbled Murrelet (*Brachyramphus marmoratus*), triggered provisions of the ESA, resulting in more court cases and injunctions.

The result was an impasse that put conservationists on one side and economic interests on the other. The dispute engaged the national attention to such a degree that President Clinton himself was prompted to fly to Seattle to mediate between the various stakeholders. The outcome was the declaration of a partial moratorium on further cutting of old growth in the national forests of the Northwest. Later, Michael Dombek, Chief of the Forest Service, approved regulations declaring that henceforth most federal roadless areas would remain roadless and that most remaining old growth on federal lands would be conserved. Currently, these regulations are being undermined by the Bush administration.

Two strong points emerge from this history. First, the U.S. government, and it is safe to say most other governments as well, have rarely enacted important conservation legislation except in a climate of crisis. In normal times, governments are generally occupied by other issues. Second, over the course of an entire century, there were only three widely separated periods when major conservation progress was achieved. Thus, given the pace at which the world's environment is being degraded, a conservation strategy based on waiting for better luck in the next election is almost certainly doomed to fail.

What should the response of conservationists be when governments default on their responsibilities to the environment? There are only two realistic options: to press for political change and to support conservation through private initiatives. When politics fails to produce the desired results, then private initiative remains the sole available course of action. U.S. conservationists were faced with this reality more than 50 years ago when they realized that neither federal nor state governments had programs for conserving native biodiversity. A private organization, TNC, was founded to fill the policy vacuum.

TNC now has chapters in all 50 states and has conserved millions of acres of habitat, primarily through direct purchase using funds contributed by private individuals, corporations, and foundations. Dozens of other more recently founded land conservancy organizations are adding to the effort. Meanwhile, the federal government still has no

comprehensive program for conserving native plant and animal species.

Passed long after the founding of TNC, the ESA has indeed rescued a number of native species from almost certain extinction, but the ESA defines a reactive mechanism that does not go into effect until a species is already severely imperiled. Conserving species, and especially habitat, in a proactive way requires entirely different approaches. In TNC and other land conservancies, the public perceives an intelligent and responsible effort to conserve U.S. biodiversity, and has responded with steadily mounting generosity. Nevertheless, these private efforts remain small compared to what the federal and state governments could accomplish if they were engaged. But, for political reasons, serious proactive engagement of government with biodiversity conservation appears unlikely in the U.S. for the foreseeable future.

Conservationists need to recognize that biodiversity conservation is not a compelling political issue in most countries. Even where well-intentioned government programs do exist, they are seldom sufficient. Many of the world's protected areas, perhaps 90%, are too small to retain top predators and other key species, so will require augmentation if they are not to suffer the effects of fragmentation (see textbook Chapter 7). Only rarely have parks been created according to currently accepted principles of conservation design (see textbook Chapter 14). Thus, there will be a need in almost every country for vigorous and scientifically sophisticated private organizations to engage in conservation planning, land acquisition, and even active management.

Private conservation in developing countries offers bargains that can't be imagined in an industrialized country. Land values—especially in still wild roadless areas—are a tiny fraction of those in the U.S. With globalization and liberalization of land tenure laws, the legal environment is beginning to favor private land conservation in a number of countries. Already philanthropists are buying conservation land in places like Costa Rica, Brazil, Mexico, Argentina, and Chile.

Other promising mechanisms appear to be just around the corner. Conservation International (CI) is exploring an initiative based on the fact that the profits earned by the tropical timber industry per unit area of forest are surprisingly meager. With the backing of some wealthy individuals, CI is organizing a program to bid against timber companies for rights to timber concessions. Instead of logging the concessions, CI will hold them as reserved wildland. The arrangement is doubly attractive to governments, because CI will pay higher royalties than the timber industry, and when the concessions expire, the resource will remain intact. It is exciting to imagine that conservation could outcompete the exploitative industries in the marketplace. That would truly alter the equation.

Through the 1980s and 1990s, enormous wealth has been generated in Silicon Valley and the stock market. The amounts are staggering, in the trillions of dollars. If only a minor fraction of this wealth could be channeled into land protection in developing countries, the world might wind up with a more or less adequate conservation program. Much will depend on the next few decades, for time is of the essence. My own view is one of guarded optimism. Ideas have a way of catching fire, and the idea that nature deserves a place in the future world is a compelling one that is ever more powerfully working its way into the global consciousness. All great accomplishments start with a dream. Maybe the prospect of humans sharing earth 50:50 with nature isn't so outlandish after all.

If the goal of 50:50 seems far fetched you, think of what alternatives you might prefer. If the world were left half to nature, we would all enjoy the luxuries of beautiful scenery and the spectacle of wildlife, while benefiting from clean air, potable water, and nature's cost-free recycling. When you think about it this way, a world that was half nature would be a great world to live in.

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