OPINION

The 8 Million Species We Don't Know

By Edward O. Wilson

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Credit...Jillian Tamaki

The history of conservation is a story of many victories in a losing war. Having served on the boards of global conservation organizations for more than 30 years, I know very well the sweat, tears and even blood shed by those who dedicate their lives to saving species. Their efforts have led to major achievements, but they have been only partly successful.

The extinction of species by human activity continues to accelerate, fast enough to eliminate more than half of all species by the end of this century. Unless humanity is suicidal (which, granted, is a possibility), we will solve the problem of climate change. Yes, the problem is enormous, but we have both the knowledge and the resources to do this and require only the will.

The worldwide extinction of species and natural ecosystems, however, is not reversible. Once species are gone, they're gone forever. Even if the climate is stabilized, the extinction of species will remove Earth's foundational, billion-year-old environmental

support system. A growing number of researchers, myself included, believe that the only way to reverse the extinction crisis is through a conservation moonshot: We have to enlarge the area of Earth devoted to the natural world enough to save the variety of life within it.

The formula widely agreed upon by conservation scientists is to keep half the land and half the sea of the planet as wild and protected from human intervention or activity as possible. This conservation goal did not come out of the blue. Its conception, called the Half-Earth Project, is an initiative led by a group of biodiversity and conservation experts (I serve as one of the project's lead scientists). It builds on the theory of island biogeography, which I developed with the mathematician Robert MacArthur in the 1960s.

Island biogeography takes into account the size of an island and its distance from the nearest island or mainland ecosystem to predict the number of species living there; the more isolated an ecosystem, the fewer species it supports. After much experimentation and a growing understanding of how this theory works, it is being applied to the planning of conservation areas.

So how do we know which places require protection under the definition of Half-Earth? In general, three overlapping criteria have been suggested by scientists. They are, first, areas judged best in number and rareness of species by experienced field biologists; second, "hot spots," localities known to support a large number of species of a specific favored group such as birds and trees; and third, broad-brush areas delineated by geography and vegetation, called ecoregions.

All three approaches are valuable, but applying them in too much haste can lead to fatal error. They need an important underlying component to work — a more thorough record of all of Earth's existing species. Making decisions about land protection without this fundamental knowledge would lead to irreversible mistakes.

The most striking fact about the living environment may be how little we know about it. Even the number of living species can be only roughly calculated. A widely accepted estimate by scientists puts the number at about 10 million. In contrast, those formally described, classified and given two-part Latinized names (Homo sapiens for humans, for example) number slightly more than two million. With only about 20 percent of its species known and 80 percent undiscovered, it is fair to call Earth a little-known planet.

Paleontologists estimate that before the global spread of humankind the average rate of species extinction was one species per million in each one- to 10-million-year interval. Human activity has driven up the average global rate of extinction to 100 to 1,000 times that baseline rate. What ensues is a tragedy upon a tragedy: Most species still alive will disappear without ever having been recorded. To minimize this catastrophe, we must focus on which areas on land and in the sea collectively harbor the most species.

Building on new technologies, and on the insight and expertise of organizations and individuals who have dedicated their lives the environment, the Half-Earth Project is

mapping the fine distribution of species across the globe to identify the places where we can protect the highest number of species. By determining which blocks of land and sea we can string together for maximum effect, we have the opportunity to support the most biodiverse places in the world as well as the people who call these paradises home. With the biodiversity of our planet mapped carefully and soon, the bulk of Earth's species, including humans, can be saved.

By necessity, global conservation areas will be chosen for what species they contain, but in a way that will be supported, and not just tolerated, by the people living within and around them. Property rights should not be abrogated. The cultures and economies of indigenous peoples, who are de facto the original conservationists, should be protected and supported. Community-based conservation areas and management systems such as the National Natural Landmarks Program, administered by the National Park Service, could serve as a model.

To effectively manage protected habitats, we must also learn more about all the species of our planet and their interactions within ecosystems. By accelerating the effort to discover, describe and conduct natural history studies for every one of the eight million species estimated to exist but still unknown to science, we can continue to add to and refine the Half-Earth Project map, providing effective guidance for conservation to achieve our goal.

The best-explored groups of organisms are the vertebrates (mammals, birds, reptiles, amphibians, fishes), along with plants, especially trees and shrubs. Being conspicuous, they are what we familiarly call "wildlife." A great majority of other species, however, are by far also the most abundant. I like to call them "the little things that run the world." They teem everywhere, in great number and variety in and on all plants, throughout the soil at our feet and in the air around us. They are the protists, fungi, insects, crustaceans, spiders, pauropods, centipedes, mites, nematodes and legions of others whose scientific names are seldom heard by the bulk of humanity. In the sea and along its shores swarm organisms of the other living world — marine diatoms, crustaceans, ascidians, sea hares, priapulids, coral, loriciferans and on through the still mostly unfilled encyclopedia of life.

Do not call these organisms "bugs" or "critters." They too are wildlife. Let us learn their correct names and care about their safety. Their existence makes possible our own. We are wholly dependent on them.

With new information technology and rapid genome mapping now available to us, the discovery of Earth's species can now be sped up exponentially. We can use satellite imagery, species distribution analysis and other novel tools to create a new understanding of what we must do to care for our planet. But there is another crucial aspect to this effort: It must be supported by more "boots on the ground," a renaissance of species discovery and taxonomy led by field biologists.

Within one to three decades, candidate conservation areas can be selected with confidence by construction of biodiversity inventories that list all of the species within a

given area. The expansion of this scientific activity will enable global conservation while adding immense amounts of knowledge in biology not achievable by any other means. By understanding our planet, we have the opportunity to save it.

As we focus on climate change, we must also act decisively to protect the living world while we still have time. It would be humanity's ultimate achievement.

Edward O. Wilson is a university research professor emeritus and an honorary curator of entomology at Harvard, and a scientist on the Half-Earth Project. He is the author of many books, including "Half-Earth: Our Planet's Fight for Life."

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A Long Way to Go to 'Half Earth'

Land and marine areas that now have a protected status.