

OPENING REMARKS

PLANT CONSERVATION GLOBALLY AND LOCALLY

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What I want to do here is to paint the broadest picture possible of the current crisis in biological conservation around the world, and in particular in the United States. This crisis is so extreme, and so important to us all, that I want to stimulate thinking about the issues involved and invite dialogue about strategies for combating the problem.

Our planet is four and a half billion years old and life has existed for at least 3.8 billion years, as far as we can tell. During that time, five great extinction events have occurred. The first three were restricted entirely to marine life. The fourth occurred at the end of the Permian, approximately 280 million years ago. This event changed the character of life on Earth, and led into the Mesozoic, the era of dinosaurs and cycads. During this era, angiosperms and other modern groups evolved and life on Earth became more and more complex. The fifth great extinction event occurred at the end of the Mesozoic, 65 million years ago.

The fifth extinction was probably precipitated by a meteorite, which landed somewhere in the vicinity of the Yucatan in Mexico. The result was an opaque cloud that restricted photosynthesis and disrupted life; two-thirds of the terrestrial species became extinct and the character of life on land again changed completely. Approximately ten million years went by before recovery of the evolutionary pathways that led to modern groups. It's estimated that, after the extinction, there were 500,000 to 1,000,000 terrestrial species remaining. Currently, the Earth is estimated to house between 7 and 10 million species of eukaryotic organisms. Of these, only one in four has a valid name. In the tropics, the ratio is much less, around one in twenty. Even for the described species of organisms, our knowledge of relationships and ecosystem dynamics is extremely limited.

Homo sapiens appeared on Earth approximately 200,000 years ago. During the past 200,000 years, our species has developed agriculture, migrated around the world, and increased in popu-

lation to approximately six billion. Much of this population increase has occurred during the past century. Human population growth has been fueled by the use of oil, gas, and coal, causing tremendous atmospheric destruction. In the coming century, we are faced with the important questions: can we achieve sustainability and can we maintain the Earth's biological diversity? These questions are two sides of the same coin; the results of the past 50 years are not encouraging.

Americans first became aware of the concept of biodiversity in the 1980s. At this time, biodiversity was thought of as a kind of inventory of species, but gradually, the definition expanded to include all relationships and biological variations within communities and within ecosystems. In 1992, Americans became acutely aware of this situation, when President George Bush declined to sign the treaty "International Convention on Biological Diversity" at the World Summit held in Rio de Janeiro. At this convention, the United States was one of only seven countries to decline ratification.

Over the last fifty years, the population in the United States has increased from 135 million to 270 million. Also during this time, approximately 25% of the world's topsoil has been lost permanently, and 15–20% of the world's agricultural land has been lost to forces such as urban sprawl and deforestation. In addition, carbon dioxide levels have increased more than 30% and the stratospheric ozone layer has been depleted by 8%. Most seriously, there has been a drastic increase in the proportion of biological extinction in the past fifty years. We know from documented extinctions of birds and mammals that we can expect any given species to last about two million years. Since the Renaissance, extinction rates have increased hundreds of times. Current extinction rates are $1,000 \times$ background rate and are accelerating towards $10,000 \times$ background rate in the next century. Stuart Pimm of the University of Tennessee, using island biogeography models, has calculated that 1/3 of all tropical species will be extinct or nearly extinct within the next 25 years, and that 3/4 of all tropical species will be extinct or nearly extinct by the end of the next century.

It has been projected that, worldwide, 2/3 of all organisms will be extinct by the end of the next century. One species, *Homo sapiens*, is driving an extinction event comparable in scope and intensity to the one 65 million years ago, which completely

changed the character of life on Earth. Nothing we could do could be more short-sighted or damaging to our own future, since we depend on the 350,000 species of photosynthetic organisms for all productivity in the biosphere.

We say that the 21st century will be the “Age of Biology,” but how can it be if we are eliminating species at a rate comparable to the great extinctions of the past? How can we harness the power of genetic variability of organisms, which we are only just beginning to understand, when we are driving extinction rates to such phenomenal levels? Doesn’t it make sense for us to be interested in sustainability? Doesn’t it make sense for us to be interested in the rest of the world? Over the past 50 years, the industrialized world’s population has fallen from 30% to 20%, but that 20% controls 85% of the world’s economy and creates 80–90% of the world’s pollution. The United States, as the wealthiest nation, can and must make a difference in reversing this trend for the benefit of ourselves and the rest of the planet.

What can we, as citizens, as scientists, do to maintain a world in which beauty, music, poetry, philosophy, literature, biological diversity, and all the things that we cherish can thrive? What do we have to do to create a world that will go on? It is important that we create a world that can continue to function sustainably. It is important that we not lose the biological diversity that would sustain us in the future. Our future depends on how we live now, on the choices we make. If we want to be optimistic about the world’s future, we need to exercise our personal determination to do something about it. We should: (1) be leaders in developing new forms of energy conservation and alternative sources of energy; (2) pay attention to internationalism and acknowledge that the people living in non-industrialized countries are of profound importance to the earth’s future; (3) vote, and encourage others to do so; (4) support like-minded conservation groups that are devoted to sustainability and internationalism; and (5) make wise choices and decrease our personal levels of consumption.

New Englanders have always looked to the world far beyond conventional boundaries. New Englanders have traditionally understood the world from a perspective of trading, knowledge, culture, and art. This is a great and traditionally defined region of our country, and one that has made wonderful contributions, and is set to make wonderful contributions for the future. In that vein, I hope that the remarks I have offered here have given you something to think about and to act on.



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