



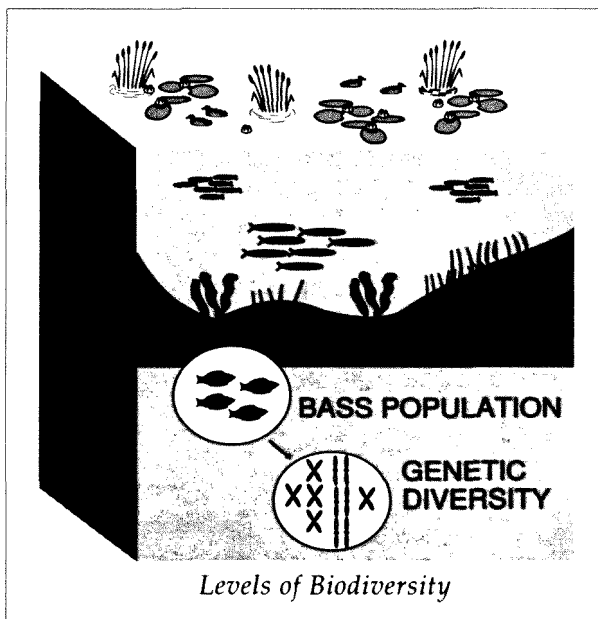
Climate Change

Discussion Series

Biodiversity

Biodiversity, also called "biological diversity" or "ecological diversity," refers to the variety of life on earth. Biodiversity is often assessed at three levels—ecosystem, species, and genetic. An ecosystem includes all the plants and animals in an area, together with their physical-chemical environment. Examples include a forested watershed, a freshwater pond, a salt marsh, or a coral reef. The species level refers to populations of individual species, such as white-tailed deer or large-mouth bass. The genetic level is the gene pool found within each population. That gene pool is the result of gradual adaptation to climatic and other changes over time.

Existing patterns of biodiversity reflect gradual adaptations to changes over thousands of years. Future rates of climatic change may include global warming of 1.5° to 4.5°C (3° to 8°F) within a century. This would be far too rapid for plant ad-



Value of Biodiversity

Biodiversity is a national and global resource. In many parts of the world, biodiversity is being reduced by population pressure and consequent overharvesting, deforestation, or desertification. Rapid climate change will accelerate these losses, with significant economic consequences. One of the main benefits of slowing the rate of climate change is protection and preservation of biodiversity.

Ecosystem Values

A healthy ecosystem, with its full complement of plants and animals, provides many services to society. A forest ecosystem can prevent soil erosion, reduce flooding, detoxify chemicals in air and water, improve the local climate, and sequester carbon that would otherwise contribute to global climate change. A coral reef may protect beaches, serve as a tourist attraction, and provide habitats for interesting and valuable species of fish, clams, and lobster.

Species Values

Society may place special value on large or colorful species, especially if they have been so reduced in numbers that they are listed as threatened or endangered on the local, national, or global scales. These species are often of exceptional scientific and educational interest, and may serve as the basis for "ecotourism," bringing a significant influx of foreign exchange to a country.

Genetic Values

The genetic material in wild plants and animals represents the raw material required for traditional selective breeding of improved domestic varieties of crops and livestock. It also provides the genetic codes for bioengineering and the field or laboratory production of many chemicals with great potential value in medicine and industry. Finally, genetic diversity now present in small populations may be of great future value because those populations have already adapted to climatic conditions that will be widely prevalent in years to come.

NOTE: Climate change refers to potential modification of the earth's climate resulting from increasing atmospheric concentrations of greenhouse gases such as carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and chlorofluorocarbons (CFCs). Through a naturally occurring process known as the "greenhouse effect," these gases act to warm the earth by trapping heat in the atmosphere. This process plays an important role in maintaining the earth's current temperature and climate. By increasing concentrations of greenhouse gases, human activities are trapping more heat in the atmosphere and potentially changing the earth's climate.



aptation, leading to die off of forests and loss of animals dependent on forests. Similarly, species populations in coastal ecosystems may decline from the combined effects of pollution, warming, and sea level rise. Natural and man-made barriers may increase biodiversity loss by blocking migration (e.g. by blocking the north-

ward movement of forest species and the inland movement of those in coastal wetlands.)

Those populations increasing in ecosystems stressed by climate change often will be pestilent, such as bark beetles attacking weakened trees or toxic algae displacing other coastal plant life. In regions where

droughts become more extensive or prolonged, habitats required by ducks, frogs, and many other species dependent on ponds and streams will continue to decline. Forests will become more susceptible to forest fires, eliminating certain species but creating conditions suitable for others adapted to the post-fire environment.

Options to Preserve Biodiversity

Individuals, public and private organizations, industry, and all levels of government, can help protect biodiversity by supporting policies such as those discussed below.

Manage Forests Sustainably

Tropical and temperate forests are important treasure houses of biodiversity. They should be managed to maintain those values as well as the other goods and services they provide.

Reduce Pollution Stress on Ecosystems

Ecosystems stressed by air or water pollution are more likely to suffer additional degradation from the stress of rapid climate change. Therefore, reducing acid deposition, ground-level ozone, toxic metals, and other pollutants that damage terrestrial and freshwater ecosys-

tems, and reducing run-off of sediments, nutrients, and biocides into freshwater and coastal ecosystems can help preserve biodiversity.

Expand and Link Parks and Preserves

Many species of birds and mammals need large natural areas to ensure their survival. When full protection ("wilderness" status) is not possible, it may be possible to create buffer zones in which resource extraction does not have adverse effects on the wide-ranging species. In addition, corridors of natural vegetation linking preserves can partially compensate for the problems of habitat fragmentation by helping ensure dispersal, recolonization, and gene flow.

Restore Degraded Habitats

Reforestation programs planting

a wide variety of native trees can greatly enhance the biodiversity of abandoned croplands. Similarly, restoring freshwater and coastal wetlands can provide habitats for waterfowl and many other species.

Maintain Species in Aquaria, Zoos, Gardens, and Seed Banks

This policy is especially appropriate when natural habitats have been destroyed. It permits preservation of genetic diversity and provides a source for reintroduction of species when habitats have recovered or have been restored.

Support Conservation Organizations

There are many different organizations working to identify preserve, and use biodiversity. Individuals can help by supporting such organizations and participating in their activities.

Based on EPA's Report to Congress, *The Potential Effects of Global Climate Change on the United States*, 1989; Intergovernmental Panel on Climate Change, *Policymakers' Summaries*, 1990; National Academy of Sciences publications, *Biodiversity*, 1988; and *Policy Implications of Greenhouse Warming*, 1991; Izaak Walton League's, *Unprecedented Risks: The Effects of Global Climate Change on U.S. Wildlife Resources*, 1991; World Resources Institute's, *Drowning the National Heritage: Climate Change and U.S. Coastal Biodiversity*, 1991.

EPA's Climate Change Outreach Program is designed to raise awareness about climate change and provide assistance to state and local governments, industry, and non-governmental organizations in the evaluation of cost-effective response strategies. For further information about this program, please contact Joel Smith at 202/260-8825.

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