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Climate Change

Global climate change and biodiversity

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Climate is an integral part of ecosystems and organisms have adapted to their regional climate over time. Climate change is a factor that has the potential to alter ecosystems and the many resources and services they provide to each other and to society. Human societies depend on ecosystems for the natural, cultural, spiritual, recreational and aesthetic resources they provide. In various regions across the world, some high-altitude and high-latitude ecosystems have already been affected by changes in climate. The Intergovernmental Panel on Climate Change reviewed relevant published studies of biological systems and concluded that 20 percent to 30 percent of species assessed may be at risk of extinction from climate change impacts within this century if global mean temperatures exceed 2-3 °C (3.6-5.4 °F) relative to pre-industrial levels (IPCC, 2007). These changes can cause adverse or beneficial effects on species. For example, climate change could benefit certain plant or insect species by increasing their ranges. The resulting impacts on ecosystems and humans, however, could be positive or negative depending on whether these species were invasive (e.g., weeds or mosquitoes) or if they were valuable to humans (e.g., food crops or pollinating insects). The risk of extinction could increase for many species, especially those that are already endangered or at risk due to isolation by geography or human development, low population numbers, or a narrow temperature tolerance range.

Observations of ecosystem impacts are difficult to use in future projections because of the complexities involved in human/nature interactions (e.g., land use change). Nevertheless, the observed changes are compelling examples of how rising temperatures can affect the natural world and raise questions of how vulnerable populations will adapt to direct and indirect effects associated with climate change.

The composition and geographic distribution of ecosystems will change as individual species respond to new conditions created by climate change. At the same time, habitats may degrade and fragment in response to other human pressures. Species that cannot adapt quickly enough may become extinct- an irreversible loss.

Scientists have observed climate- induced changes in at least 420 physical processes and biological species or communities. Changes include migratory birds arriving earlier in the spring and leaving later in the autumn. Observations, experiments, and models demonstrate that a sustained increase of just 1^{o}C in the global average temperature would affect the functioning and composition of forests. The composition of species in existing forests will change, while new combinations of species, and hence new ecosystems, may be established. Other stresses caused by warming will include more pests, pathogens, and fires. Because higher latitudes are expected to warm more than equatorial ones, boreal forests will be more affected than temperate and tropical forests; Alaska's boreal forests are already expanding northward at the rate of 100 kilometers per degree Centigrade.

They are a major reservoir of carbon, containing some 80% of all the carbon stored in land vegetation, and about 40% of the atmosphere during transitions form one forest type to another if mortality releases carbon fater than regeneration and growth absorbs it. Forests also directly affect climate on the local, regional, and continental scales by influencing ground temperature, evapo- transpiration, surface roughness, albedo (or reflectivity), cloud formation, and precipitation.

With few exceptions, deserts are projected to become hotter but not significantly wetter. Higher temperatures could threaten organisms that now exist near their heat- tolerance limits.

Grasslands support approximately 50% of the world's livestock and are also grazed by wildlife. Shifts in temperatures and precipitation may reshape the boundaries between grasslands, shrublands, forests, and other ecosystems. In tropical regions such changes in the evapo- transpiration cycle could strongly affect productivity and the mix of species.

Creating natural migration corridors and assisting particular species to migrate could benefit forest ecosystems. Reforestation and the integrated management of fires, pests and diseases can also contribute. Rangelands could be supported through the active selection of plant species, controls on animal stocking, and new grazing strategies. Wet lands can be restored and even created. Desertified lands may adapt better if drought- tolerant species and better soil conservation practices are encouraged.