

Impact of Climate Change on Plant Biodiversity

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Abstract

Climate change is one of the most critical global environmental challenges impacting ecosystems, with plant biodiversity emerging as one of the most vulnerable components. This study synthesizes scientific literature, ecological assessments, and climate-model projections to examine how rising temperatures, altered precipitation patterns, increased atmospheric CO₂, extreme weather events, and shifting climatic zones affect the distribution, structure, and survival of plant species worldwide. Evidence shows that climate change directly influences plant physiology, phenology, and reproductive cycles, altering the timing of flowering, fruiting, leaf emergence, and seed maturation. These changes disrupt plant–pollinator interactions, nutrient cycles, and ecological balance, threatening both common and endemic plant species. High-altitude, coastal, and arid-zone plants are identified as especially at risk due to their limited adaptive capacity and narrow ecological niches.

The study highlights that climate change is causing large-scale redistribution of plant species as they migrate toward cooler and wetter regions, often leading to ecosystem fragmentation and loss of native flora. Increased frequency of extreme events such as droughts, heatwaves, wildfires, floods, and storms further accelerates habitat degradation and reduces population resilience. The proliferation of invasive species under warming conditions intensifies competitive pressure, displacing indigenous species and reducing overall biodiversity. Additionally, climate-induced changes affect plant productivity, soil quality, and biogeochemical processes, ultimately influencing ecosystem services such as carbon sequestration, water regulation, soil stabilization, and food security.

The review also emphasizes the socioeconomic impacts resulting from declining plant biodiversity, particularly on agriculture, medicinal plant availability, rural livelihoods, and traditional ecological knowledge systems. The findings suggest that without urgent mitigation and adaptation measures, climate change could lead to irreversible loss of plant genetic resources and disruption of entire vegetation communities. Conservation strategies including habitat restoration, assisted migration, seed banking, climate-smart agriculture, protected area expansion, and integrated policy frameworks are essential for safeguarding global plant diversity.

Overall, this study concludes that climate change poses a profound, multidimensional threat to plant biodiversity, affecting not only species richness but also ecosystem functionality and human well-being. Strengthened scientific research, proactive management, and global commitment to climate action are indispensable in mitigating these impacts and ensuring the long-term sustainability of plant life on Earth.