



Distribution of species – many pressures

Throughout the world, wild species are being displaced for many reasons. The greatest of these is human land use leading to habitat loss and/or fragmentation. Overhunting, invasive species, and pollution are also major threats. Climate change closely follows.

The WWF has quantified the threat to species across all regions as:

- 50% - Changes in land and sea use
- 24% - Overexploitation of species
- 13% - Invasive species and disease
- 7% - Pollution
- 6% - Climate Change



Quantifying the effect of climate on individual species

The critically endangered Chinese giant salamander is the world's largest amphibian. Scientists evaluated the sustainability of existing nature reserves now and into the future. They concluded that the 65.6% of loss was due to human population, 18% due to climate change and 18.4% due to the overlapping effects of both human population and climate change.

The Caspian desert monitor is a threatened subspecies living in Iran, Afghanistan, Pakistan and Turkmenistan. Much of the land previously inhabited by the monitor has been turned into farmland. Analysis of the effect of climate change in the past 6000 years was used to predict changes to the species distribution into the future in Iran. Current conservation areas will become unsuitable in the future due to climate change. However, there will be an overall increase in suitable habitat due to warming, as this desert species is currently limited by cold weather in winter. Modelling suggests that the current habitat area of 158 000 km² could increase to approximately 250 000 km² by 2050. The newly suitable areas are rarely in current conservation areas.

Crucial ecological relationships can be disrupted as animals and plants respond differently to climate change. The endangered migratory bat *Leptonycteris nivalis* pollinates agave plants as it migrates from central Mexico to the southern US. Models of agave distribution change, due to climate change, indicate that these plants may be reduced by 75% along the migratory route of the bat, possibly leading to extinction of *L. nivalis*. The range of agaves will retreat north, while the range of the bat will retreat south. Without a vital pollinator, the agave plants will decline even further, leading to increased erosion and reduced agave for human use.





Patterns of change

As temperature increases, species move toward higher latitudes or toward higher elevation. These shifts allow animals and plants to continue existing within their preferred temperature range. Species distributions are shifting to higher elevations at a rate of 11.0 m per decade and to higher latitudes at a rate of 16.9 km per decade. The distances are highest in areas with highest warming and even greater in the oceans. Marine species are shifting towards the poles at a rate of 78 km per decade.

Species can migrate to a more suitable area if there is available habitat linked to their current distribution. Land-use changes, particularly the availability of natural forests, limits the ability of plants and animals to migrate to new areas. Researchers found that tropical species are particularly vulnerable to the combined effects of changing land use and warming climate.

Animals and plants do not move as intact ecosystems, as we noted for the bats and agave plants. Species that depended on each other for food and shelter are being forced apart and species that never mingled are now interacting. Disease-spreading mosquitoes are spreading out from equatorial regions and posing a greater threat to humans and livestock.

Questions

1. Explain how ONE other threat to species is related to climate change. _____

2. Assess the effectiveness of current conservation areas in the future as Earth warms. Use examples to support your judgement. _____

3. Outline overall changes in species distribution due to climate change. _____

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4. What factors can make it difficult for species to move to new areas? _____

5. How do changes in species ranges impact humans? _____

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