

Climate change and its impact on forests - will forests migrate?

Forests play a key role in maintaining a wide range of delicate relationships with nature and its ecosystems. Impacts on the well being of forests likely to be caused by climate change will therefore have a dramatic effect. For example, according to the latest projections, changes in climate will mean that by 2050 the world's ecosystems, including its all important forests, will be releasing more carbon than they are capable of absorbing

Over the last 30 years the world has experienced significant temperature increases, particularly in the northern hemisphere. Meanwhile more climate variability is predicted, with increased precipitation in some areas and extreme dry and hot periods in other regions. Such events will have a substantial effect on forests.

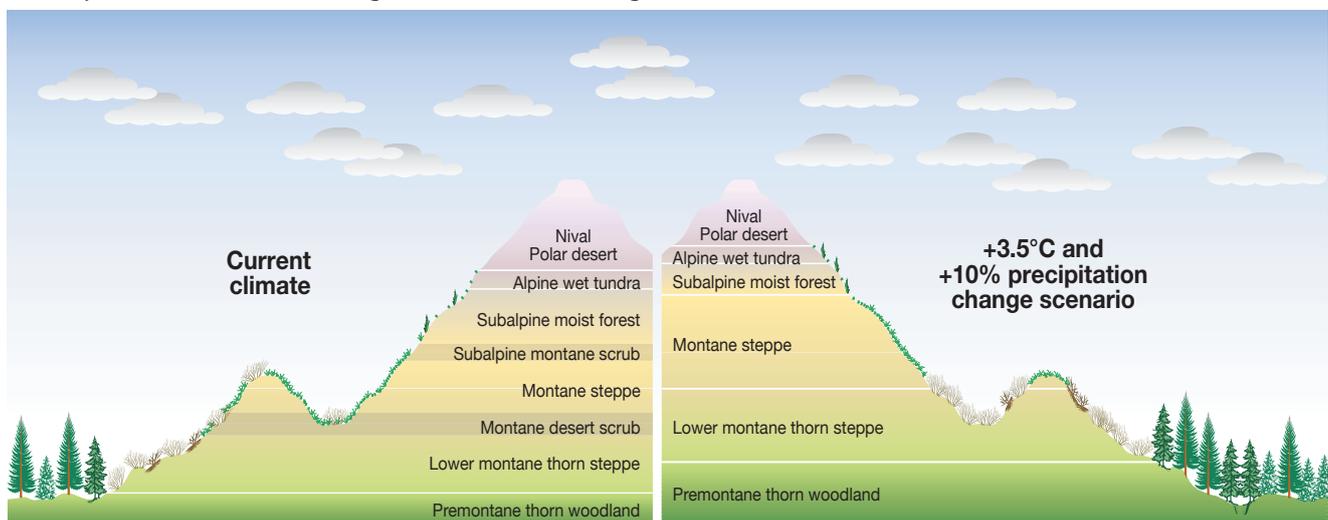
Rising temperatures force many living organisms to migrate to cooler areas, while new organisms arrive. Such movements involve all species, including plants. Some species will seek higher altitudes, others will move further polewards. In temperate regions, plant and tree species can migrate naturally by 25 to 40 kilometres a century. However if, for example, there was a 3°C increase in temperature over a hundred year period in a par-

ticular region, the conditions in that area would undergo dramatic change, equivalent in ecological terms to a shift of several hundred kilometres (Jouzel and Debroise 2007).

In the last few decades scientists have observed the first signs of this process taking place in the northern hemisphere caused, it seems, by temperature rises linked to climate change.

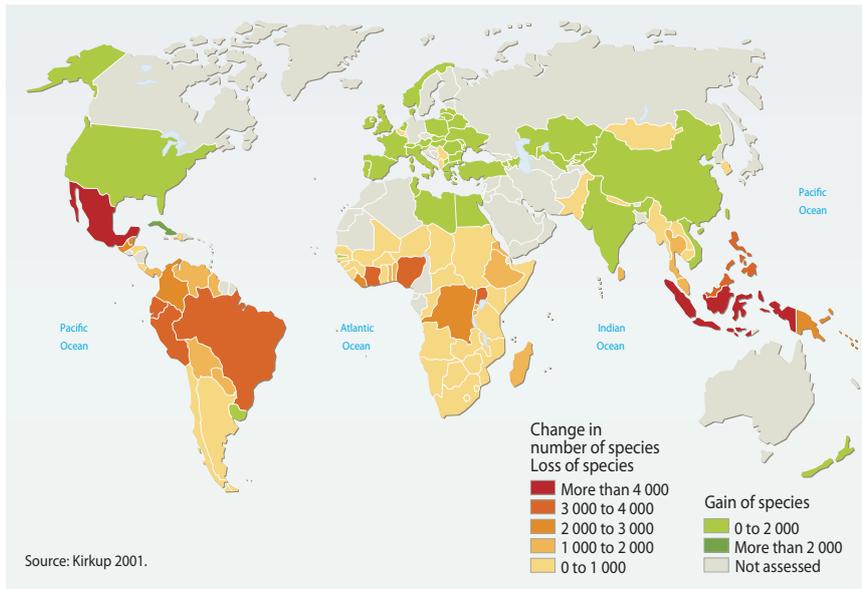
Various studies have noted that a number of bird, tree, scrub and herb species have migrated by an average of six kilometres every ten years, or have sought higher altitudes of between one and four metres (Parmesan 2003). Botanists have also noted that many trees and plants in the northern hemisphere tend to flower increasingly early – on average advancing by two days every ten years – thereby increas-

↓ Impact of climate change on mountain vegetation zones

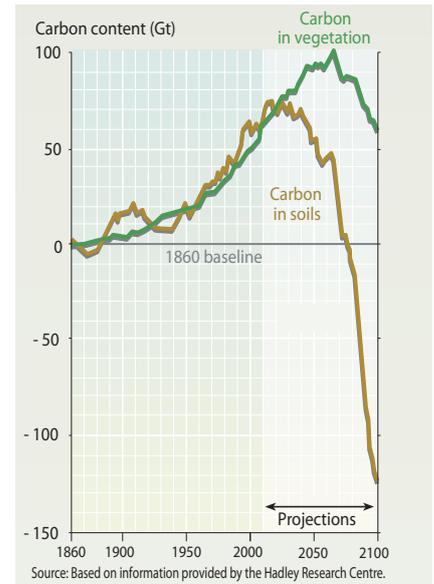


Sources: UNEP/GRID-Arendal 2008; Benitson 1994; Watson et al. 1995.

↓ Estimated loss of plant species, 2000-2050



↓ Carbon stocks trends and projections compared to 1860



ing the risk of buds being killed by late frost.

Slightly higher temperatures and a greater accumulation of CO₂ in the atmosphere accelerate growth rates of species in forest ecosystems (WRI 2008b). It is estimated that forests in temperate regions have seen a 15 per cent productivity gain since the beginning of the 20th century (Medlyn *et al.* 2000). In addition, CO₂ fertilization plus increased nitrogen levels and more soil moisture, have all contributed to greater forest productivity over the last century.

Loss of species

Paradoxically, while increased CO₂ levels and other factors have led to forest growth in some regions, the present environmental situation – heavily influenced by climate change – could lead to a massive destruction of forests and the extinction of countless species. For example, modelling focusing on the Amazon region has indicated that 43 per cent of 193 representative plant species could become non-viable by the year 2095 due to the fact that changes in climate will have fundamentally altered the composition of species habitats (Miles *et al.* 2004).

Global warming is likely to increase

the extent of forest fires, as occurred recently in Russia, southern Europe and California. A recent study of various forest conditions in Russia suggests that a 2°C rise in temperature could increase the area affected by forest fires by a factor of between one and a half and two (Mollicone *et al.* 2006).

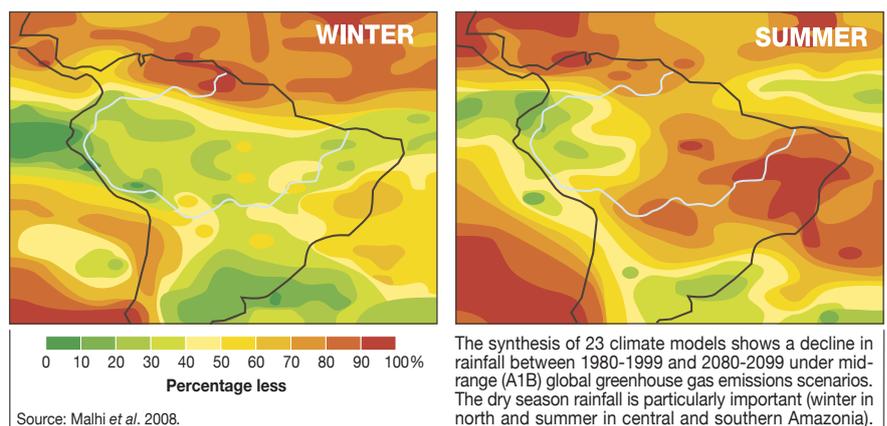
Climate variability may also cause plant productivity to drop. During the 2003 heat wave in Europe, there was a 30 per cent fall in plant productivity in continental Europe as a whole. On the other hand mild winters mean that there will be more pests and diseases. Following a series of mild winters in Canada from the 1960s onwards, growing numbers of pine beetles recently caused severe

damage to more than 13 million hectares of forest (Brown 2008).

The direct physical effects on forests caused by climate change, such as droughts, storms, fires and insect infestations, could also hurt the productivity of managed forests (WRI 2008b). Both the supply of and demand for forests products will be affected by climate change related events, as will the lives of millions of people – many of them very poor – who are often wholly dependent on forests and associated resources for survival.

→ See also pages 48

↓ Estimated loss of rainfall in Amazonia in the next century



The synthesis of 23 climate models shows a decline in rainfall between 1980-1999 and 2080-2099 under mid-range (A1B) global greenhouse gas emissions scenarios. The dry season rainfall is particularly important (winter in north and summer in central and southern Amazonia).