

Recent Climatic Trends in the Boreal Forest

by Teja Singh

The boreal forest, in addition to the tropical forest and the northern temperate zone forest, is one of the largest areas of the forests which remain on earth. In North America, it covers the continent as a broad band immediately south of the tundra. The climate of the boreal forest, although slightly more moderate, is almost as severe as that of the tundra.

The "greenhouse effect" caused by global accumulation of carbon dioxide from burning of fossil fuels has received increased attention during recent years. The two reports: "Can We Delay a Greenhouse Warming?" by the U.S. Environmental Protection Agency, and "Changing Climate" by the U.S. National Academy of Sciences, have both projected changes in the future global climate. These projections suggest a gradual warming trend that is due primarily to the solar energy that is trapped by carbon dioxide when it is radiated back to the atmosphere from earth's surface. Researchers at the Goddard Institute of Space Administration have computed a global mean temperature rise of 0.1 degree Celsius for the decade 1970-1980; a rise of 0.2 to 0.3 degree Celsius is predicted for the 1980s.

The projected warming trend has led to studies in different parts of the world to assess its impact. In Canada, the Canadian Climate Impacts Program is under way to study the complex ramifications of future climatic trends.

A study undertaken by the author, at the Northern Forest Research Centre, analyzed the available climatic records to document any recent climatic variations in the boreal forest of the prairie provinces of western Canada. This was based on temperature and precipitation data from 101 climatic stations located in the three main subregions of the boreal forest zone. The majority of stations was situated in the predominantly forest subregion, the main timber-producing belt, as compared with the forest-grassland and forest-tundra transitions located to the south and north, respectively. The predominantly forest subregion showed an average rise of 0.019 degree Celsius per year during the period 1880-1981. Although small, the change was highly significant in statistical terms. The warming trends were also significant for the forest-grassland and forest-tundra transitions

which showed increased average rates of 0.012 and 0.014 degree Celsius per year, respectively.

The average rate of change (1880-1981) for the boreal forest is consistent with the calculations quoted in the National Academy of Sciences report. It stated that, for the past 100 years, the expected carbon dioxide-induced temperature changes may amount to "a few tenths of a degree to more than one-and-a-half degrees" Celsius.

Several factors have been identified as being responsible for the projected global change in earth's climate. These are: increased carbon dioxide concentrations, alterations in the concentrations of trace gases (nitrous oxide, methane, ozone, and chlorofluoromethanes), atmospheric aerosols, role of the oceans in slowing down the rise of surface temperature, fluctuations in solar radiance, and the cloud effects on climate sensitivity. Estimating their individual and combined effects is not an easy task because of the interactions and dependencies among the many causal factors.

The steadily increasing deforestation that has accompanied the growth in human population in the past and in the present century has also influenced the carbon dioxide concentrations. Considerable loss of forest cover in many parts of the world has led to a reduction in the capacity of forests to consume carbon dioxide and release oxygen. The global changes in forest biomass due to large-scale clearings for agricultural land and timber have many climate-related impacts.

Forestry practices, including regeneration over extensive clearcuts or

burned areas, are quite sensitive to even slight changes in temperature and precipitation; so are the major watersheds that are the prime sources of water for irrigation and power. Since the boreal forest is one of the large, essentially continuous tracts of forest land on earth, the consequences of extensive alterations to it need to be monitored carefully to keep abreast of the climatic changes that are now being predicted with increased certainty.

REFERENCES

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