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Fire in the Tropical Biota

Ecosystem Processes and Global
Challenges

With 116 Figures



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21 Global Change: Effects on Forest Ecosystems and Wildfire Severity

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21.1 Introduction

Climate change, as a result of the greenhouse effect, is expected to take place within the next 100 years – a time span comparable to the planting-to-harvest interval of many commercial tree species. The predicted increases of temperature are expected to be comparable to those that have taken place since the end of the last ice age 15,000 years ago. The 5°C warming that occurred between 15,000 and 7000 years ago resulted in major changes in the location and abundance of North America's tree species (Bernabo and Webb 1977). The rate of temperature change predicted from the increase in greenhouse gases, that is 5°C in 100 years as compared to the rate experienced in the early Holocene, is unprecedented in history. There is thus a great need to determine the impact of this predicted change on North America's ecosystems and, in particular, on our forest resources.

Our concern is not only with global warming from the greenhouse effect, but also with the various stresses these ecosystems will experience as a result of changed precipitation patterns, trauma such as fire, insects, disease, and air pollution, ultraviolet radiation as a result of stratospheric ozone depletion, and from changes in the ability of all species, plants, animals, and microorganisms to compete for limited energy, water, and nutrients.

21.2 Scientific Bases for the Greenhouse Effect

The greenhouse theory is based on the energy balance between incoming solar energy and the energy radiated to space from the earth. If there is not a balance between the incoming and outgoing energy, then the earth would either warm or cool. The energy from the sun reaches the earth primarily as visible light. Some of this incoming energy is reflected back to space from clouds, a small portion is absorbed by the atmosphere, approximately 43% reaches the earth's surface, where it is absorbed. This absorbed energy warms the earth. A portion

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