ATMOSPHERIC INFLUENCES ON THE 1994–1995 EXTREME FIRE SEASONS IN THE NORTHWEST TERRITORIES, CANADA

Bohdan Kochtubajda
Meteorological Service of Canada, 4999 - 98 Avenue, Edmonton, AB T6B 2X3, Canada

Michael D. Flannigan
Canadian Forest Service, Northern Forestry Centre, 5320 - 122 Street, Edmonton, AB T6H 3S5, Canada

John R. Gyakum
Department of Atmospheric and Oceanic Sciences, McGill University, 805 Sherbrooke Street West, Montreal, QC H3A 2K6, Canada

Ronald E. Stewart
Meteorological Service of Canada, 4905 Dufferin Street, Downsview, ON MH3 5T4, Canada

ABSTRACT

Forest fires are a common disturbance within the boreal ecosystem of the Mackenzie Basin during the warm season. These fires threaten human life, property, and valuable commercial resources, and pose the greatest danger for fire managers. Fire is the dominant disturbance regime in Canadian forests and is the primary process organizing the physical and biological attributes of the boreal biome over most of its range, shaping landscape diversity and influencing energy flows and biogeochemical cycles, particularly the global carbon cycle.

Weather is a critical driver for forest fires. It plays a significant role in the ignition of fires through the production of lightning, but it also influences fire behavior. Strong winds, high temperatures, and low relative humidity all, for example, accelerate the rate of fire growth. Atmospheric instability, another important factor in fire growth, can influence the spread and intensity of wildfires.

In this study, the fire regime of the Northwest Territories jurisdiction of the Mackenzie Basin is presented with particular emphasis on the summers of 1994–1995, the worst 2-year period on record. Over the past 30 years, fires in this region have consumed approximately 675,000 ha annually. During the summers of 1994 and 1995, forest fires burned 3 Mha and 2.8 Mha, respectively.

The atmospheric influences on the fire behavior during these extreme fire seasons will be described. In particular, the frequency of fires and large fires (>200 ha) will be related to the Haines index (Lower Atmosphere Severity Index), other stability indices, and the continental-scale atmospheric environment. Some evidence will be shown for the existence of a complex interaction between the circulation patterns, the thunderstorms, the polarity of the ensuing lightning, the forest fires, and the associated smoke that acts to enhance forest fire activity.

Citation: Kochtubajda, B., M.D. Flannigan, J.R. Gyakum, and R.E. Stewart. 2004. Atmospheric influences on the 1994–1995 extreme fire seasons in the Northwest Territories, Canada [abstract]. Page 238 *in* R.T. Engstrom, K.E.M. Galley, and W.J. de Groot (eds.). Proceedings of the 22nd Tall Timbers Fire Ecology Conference: Fire in Temperate, Boreal, and Montane Ecosystems. Tall Timbers Research Station, Tallahassee, FL.