

FOREWORD: CLIMATE-DISTURBANCE INTERACTIONS IN BOREAL FOREST ECOSYSTEMS

Extreme environmental events over the last few years, such as the recent hurricane in the Gulf Coast of the United States, the heat waves and prolonged drought in Europe, the Tsunami in Southeast Asia, and flooding in many different places remind us how vulnerable human society is to variations in environmental conditions. While not all of these events are attributable to human-induced change, they should serve as warnings about the potential climatic impacts of our activities. Boreal and Arctic ecosystems are particularly sensitive to global warming and at the same time play an important part in the feedback pathways of the Earth System that determine the dynamics of the climate system. Disturbances are especially important in the dynamics of these ecosystems, and alterations in climatic conditions, whether human-induced or part of nature's variability, have an important influence on the disturbance regime. The conference "*Climate-Disturbance Interactions in Boreal Forest Ecosystems*", held in Fairbanks Alaska 3–6 May 2004 was convened as a joint effort of the International Boreal Forest Research Association (IBFRA, see Shvidenko and Apps, in press) and the Bonanza Creek Long Term Ecological Research Program (LTER) to focus specifically on these issues.

The circumpolar boreal forest, second only to the tropical forests in areal extent, represents a wood resource of global significance that is an important part of the cultural and economic wealth of northern countries. During the relatively brief (10,000 yr) history of the boreal forest in its current location, it has experienced substantial changes in climate, vegetation, and fauna. Warming during the last 30 years has been associated with warming and melting of permafrost, changes in growth rates of dominant trees, increased area burned, insect outbreaks, and changes in vertebrate populations. The causal links among these changes and their implications for the functioning of the boreal forest and the people who inhabit this region are not completely understood. The structure and functioning of the boreal forest determines and is influenced by its disturbance regime. Fire, insect outbreaks, timber harvest, and flooding are important disturbances. The extent and distribution of these disturbances are changing rapidly as climate warms, human populations grow, and socioeconomic conditions change. To understand the current and future structure, diversity, and functioning of the boreal forest, it is important to understand how climate and disturbance interact and the implications of these interactions for ecological, economic, and cultural sustainability of the boreal forest.

At the conference, nearly two hundred researchers, students, forest managers and industry leaders from 12 countries heard presentations and contributed to discussions on topics that spanned the range of issues facing boreal ecosystems in the context of climate-disturbance interactions. As with other IBFRA conferences (See Apps et al., in press; Apps, 2002; Shaw and Apps 2002; Stocks 2002; Karjalainen

2002; Conard 2000; Woxhilt 1999; Korpilahti et al. 1996; Pisarenko and Strakhov 1996; Apps et al. 1995), the conference papers are shared with the larger scientific community in special issues of peer-reviewed journals. Due to the breadth of scope of the papers, these are being published in two different journals, each focusing on different aspects of *Climate-Disturbance Interactions in Boreal Forest Ecosystems*. In addition to the present special issue of *Mitigation and Adaptation Strategies for Global Change* (MITI), which focuses on material of interest to decision makers at various scales and those who advise them, a special issue of the *Canadian Journal of Forest Research* (CJFR) has also been published. The CJFR issue contains 20 papers that focus on how the function and structure of boreal ecosystems are influenced by climatic variability and disturbance. Readers of MITI are invited to go to http://pubs.nrc-cnrc.gc.ca/cgi-bin/rp/rp2_desc_e?cjfr for access to the special issue of CJFR.

The papers in this special issue of MITI fall into three groups. One group focuses on evaluating atmospheric and simulation approaches to improving our understanding of carbon dynamics in high latitude regions during recent decades (Dargaville et al., this volume; Kimball et al., this volume; Thompson et al., this volume). A second group focuses on interactions of climate, disturbance, and vegetation dynamics in the boreal zone during the past and over the next century (Hu et al., this volume; Flannigan et al., this volume; Tchebakova et al., this volume). The third group of papers focuses on human responses to climate change and disturbance in the boreal forest at local (Valendik et al., this volume); regional (Vlassova, this volume), and pan-boreal scales (Straussfogel, this volume).

The papers in the two special issues examine the spectrum of global change issues influencing boreal ecosystem structure and function, and are representative of processes acting from fine to coarse temporal and spatial scales that influence the outcome of management decisions. It is notable that three of the nine papers in this special issue are by Russian authors. Similarly, one-quarter of the 20 papers in the CJFR special issue are focused on the effects of climate and disturbance on boreal ecosystems in Russia. The substantial proportion of published Russian papers from a conference held in North America identifies progress in the ability of IBFRA conferences to provide a forum in which the diversity of research communities in the different countries mirrors the diversity of ecosystems, economic conditions and social policies in the circumpolar boreal zone. Other IBFRA publications cited earlier exhibit similar interaction and collaboration throughout the circumpolar zone. Although the differences in the ecology, economics, and cultural backgrounds seem large, so are the similarities: there are ongoing opportunities – and need – for shared scientific approaches to the common challenges of global change facing all ecosystems across the boreal zone. This special issue represents the latest chapter in the continuing record of this collaboration, and together with the companion special issue of CJFR provides the current state-of-understanding of *Climate Disturbance Interactions in Boreal Forest Ecosystems*.

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