# Fire in Ecosystems of Boreal Eurasia

#### Edited by

#### JOHANN GEORG GOLDAMMER

Max Planck Institute for Chemistry-Freiburg University, Mainz-Freiburg, Germany

and

#### VALENTIN V. FURYAEV

V.N. Sukachev Institute of Forestry and Timber, Russian Academy of Sciences, Krasnoyarsk, Russia



KLUWER ACADEMIC PUBLISHERS

DORDRECHT / BOSTON / LONDON

## **CONTENTS**

Preface	хi
I. Introduction	es.
Fire in Ecosystems of Boreal Eurasia. Ecological Impacts and Links to the Global System J.G. Goldammer and V.V. Furyaev	1-20
II. Fire in Boreal Ecosystems: History and Patterns	
Wild Hearth. A Prolegomenon to the Cultural Fire History of Northern Eurasia S.J. Pyne	21-44
Retrospective Analysis of Natural Fire Regimes in Landscapes of Eastern Fennoscandia and Problems in Their Anthropogenic Transformation A.N. Gromtsev	45-54
The Impact of Fire on Finnish Forests in the Past and Today J. Parviainen	55-64
The Role of Paleofire in Boreal and Other Cool-Coniferous Forests J.S. Clark and P.J.H. Richard	65-89
Fire and Climate History in the Central Yenisey Region, Siberia T.W. Swetnam	90-104
Reconstruction of Summer Temperatures with a Circumpolar Tree Ring Network F. Schweingruber and K.R. Briffa	105-111
III. Statistics and Dynamics	
Analysis of the Distribution of Forest Fires in Russia G.N. Korovin	112-128
Temporal and Spatial Distribution of Forest Fires in Siberia E.N. Valendik	129-138
Major 1992 Forest Fires in Central and Eastern Siberia.  Satellite and Fire Danger Measurements  B.J. Stocks, D.R. Cahoon, J.S. Levine, W.R. Cofer III, and T.J. Lynham	139-150

# IV. Geographical Analysis

Fire Ecology of Pine Forests of Northern Eurasia S.N. Sannikov and J.G. Goldammer	151-167
Pyrological Regimes and Dynamics of the Southern Taiga Forests in Siberia V.V. Furyaev	168-185
The Role of Fire in Forest Cover, Structure, and Dynamics in the Russian Far East A.S. Sheingauz	186-190
Importance of Fire in Forest Formation under Various Zonal-Geographic Conditions of the Far East M.A. Sheshukov	191-196
Fires in Ecosystems of the Far Northeast of Siberia G.V. Snytkin	197-210
Fire-Induced Transformations in the Productivity of Light Coniferous Stands of the Trans-Baikal Region and Mongolia  M.D. Yevdokimenko	211-218
Forest Fires in the Eastern Trans-Baikal Region and Elimination of their Consequences V.F. Rylkov	219-226
V. Pyrological Classification of Landscapes, Sites and Fuel Types	
Pyrological Zoning: Principles, Methods, and Significance of the Role of the Geographical Factor in the Problem of Wildland Fires M.A. Sofronov	227-238
Forest Fuel Maps A.V. Volokitina	239-252
Sectoral and Zonal Classes of Forest Cover in Siberia and Eurasia as a Basis of Clarifying Landscape Pyrological Characteristics D.I. Nazimova	253-259
VI. Fire Characteristics: Behavior and Modelling	
The Extreme Fire Season in the Central Taiga Forests of Yakutia G.A. Ivanova	260-270

Forest Fire Spread as a Probabilistic Modelling Problem O.Yu. Vorob'ev	271-276
Information Technology for Forest Fire Danger Rating Evaluation  A.I.Sukhinin	^277-284
Mathematical Modelling of Forest Fires  A.M. Grishin	285-302
Mathematical Modelling and Optimization of Forest Fire Localizaton Processes G.A. Dorrer and S.V. Ushanov	303-313
A Mathematical Model of Spread of High-Intensity Forest Fires H.P. Telitsyn	314-325
VII. Ecological Effects of Fire	
Burned Forest Area Type Classification  I.S. Melekhov	326-330
Fires and Soil Formation V.N. Gorbachev and E.P. Popova	331-336
Soil Microbial Biomass: Determination and Reaction to Burning and Ash Fertilization  J. Pietikäinen and H. Fritze	337-349
Ecological Effects of Peat Fire on Forested Bog Ecosystems T.T. Yefremova and S.P. Yefremov	350-357
Effects of Fire on the Regeneration of Larch Forests in the Lake Baikal Basin R.M. Babintseva and Ye.V. Titova	358-365
Post-Fire Mortality and Regeneration of Larix sibirica and Larix dahurica in Conditions of Long-Term Permafrost P.M. Matveev and V.A. Usoltzev	366-371
The Main Trends of Post-Fire Succession in Near-Tundra Forests of Central Siberia  A.P. Abaimov and M.A. Sofronov	372-386
Fire Effects on Larch Forests of Central Evenkia	387-392

Ecological Estimation of Forest Succession Patterns in Central Angara Region	393-403
F.I. Pleshikov and V.A. Ryzhkova	
Forest Formation Processes after Fire in the Volga Region K.K. Kalinin	404-408
Response of the Endemic Insect Fauna to Fire Damage in Forest Ecosystems V.M. Yanovski and V.V. Kiselev	409-413
Simulation of Forest Insect Outbreaks A.S. Isaev, V.V. Kiselev and T.M. Ovchinnikova	414-430
Fire - Vegetation - Wildlife Interactions in the Boreal Forest H. Gossow	431-444
Fire Ecology in Sweden and Future Use of Fire for maintaining Biodiversity A. Granström	445-452
Impacts of Prescribed Burning on Soil Fertility and Regeneration of Scots Pine (Pinus sylvestris L.)  E. Mälkönen and T. Levula	453-464
VIII. Fire, Atmosphere, and Climate Change	
Composition of Smoke from North American Boreal Forest Fires W.R. Cofer III, E.L. Winstead, B.J. Stocks, D.R. Cahoon, J.G. Goldammer, and J.S. Levine	465-475
The Effects of Forest Fires on the Concentration and Transport of Radionuclides S.I. Dusha-Gudym	476-480
Fire Weather Climatology in Canada and Russia  B.J. Stocks and T.J. Lynham	481-487
Colour Plate Section	488-494
Risk Analysis in Strategic Planning.  Fire and Climate Change in the Boreal Forest  M.A. Fosberg, B.J. Stocks, and T.J. Lynham	495-504
Fire-Climate Change Hypotheses for the Taiga R.W. Wein and W.J. de Groot	505-512

525-528

## Annex I

Index

Understanding Boreal Ecosystems Opening Remarks by E.W. Ross, International Conference "Fire in Ecosystems of Boreal Eurasia" (Krasnoyarsk 1993)	4 <sub>4</sub> , 513-515
Annex II	***
International Boreal Forest Research Association (IBFRA) Stand Replacement Fire Working Group	516-517
Annex III  Fire Research in the Boreal Forests of Eurasia:  A Component of a Global Fire Research Program	518-524