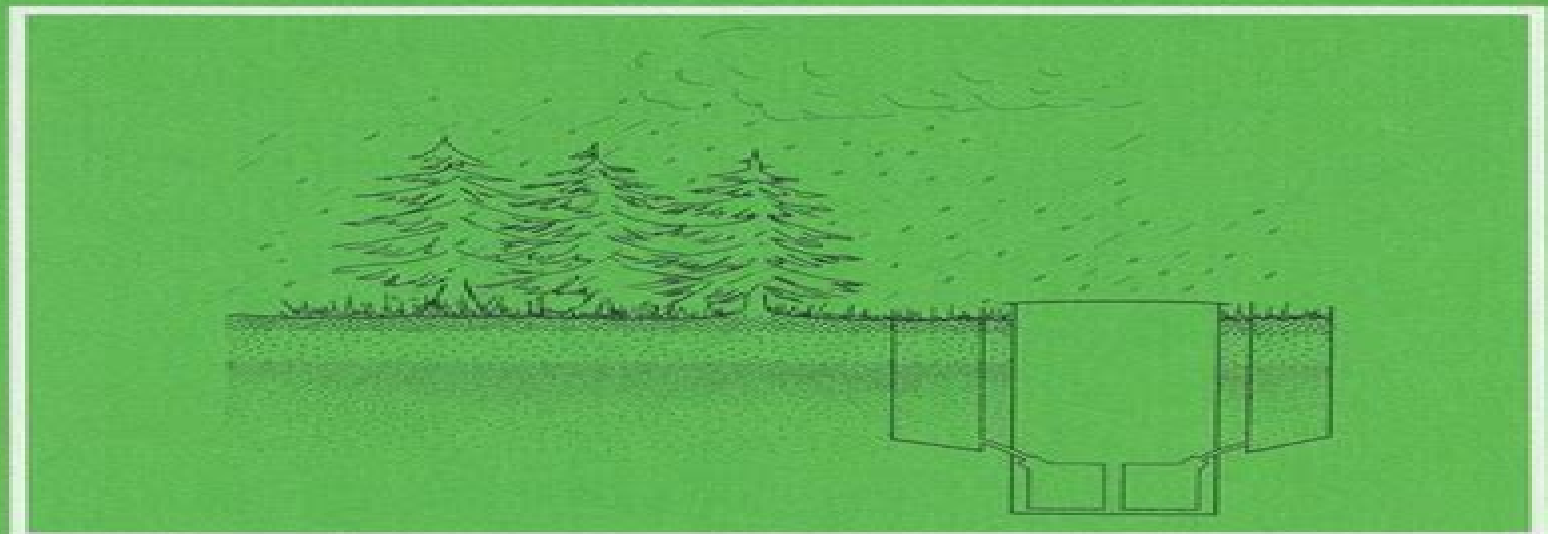


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**Gunnar Abrahamsen  
Arne O. Stuanes  
Bjørn Tveite**     **Editors**

**Long-Term  
Experiments  
with Acid Rain in  
Norwegian Forest  
Ecosystems**



**Springer-Verlag**

# Long Term Experiments With Acid Rain In Norwegian Forest Ecosystems

**Jose Moreno, Walter C. Oechel**



## **Long Term Experiments With Acid Rain In Norwegian Forest Ecosystems:**

**Long-Term Experiments with Acid Rain in Norwegian Forest Ecosystems** Gunnar Abrahamsen, Arne O. Stuanes, Bjørn Tveite, 2012-12-06 Acid rain is a serious international environmental problem. Scandinavian forests have suffered especially severe damage and have been the focus of considerable research on the causes and impacts of atmospheric pollution. This book presents the results of long term studies on acid rain in Norwegian forests. This research examined soil chemistry and biology, the impacts of acid rain on tree growth and nutrition and its influence on ground vegetation, fungi, and seedling germination and development. Long Term Experiments with Acid Rain in Norwegian Forest Ecosystems is a lasting contribution to the literature on acid precipitation and will be of interest to researchers in ecology, air pollution, forestry, and environmental chemistry.

**Successes, Limitations, and Frontiers in Ecosystem Science** Michael L. Pace, Peter M. Groffman, 2013-12-01 Research on the ecosystems has emerged in recent decades as a vital, successful, and sometimes controversial approach to environmental science. Ecosystem science has addressed issues such as human alteration of biogeochemical cycles, ecological complexity, and biodiversity, and ecological response to climate change. As a central and integrating science, ecosystem level studies have been highly successful. This book emphasizes the idea that much of the progress in ecosystem research has been driven by the emergence of new environmental problems that could not be addressed by existing approaches. By focusing on successes, limitations, and frontiers in ecosystem studies, it will be welcomed by students and scientists throughout the ecological and environmental communities.

Biogeochemistry of Forested Catchments in a Changing Environment Egbert Matzner, 2013-06-29 Forest ecosystems represent a major type of land use in Germany and in Europe. They provide a number of functions or ecosystem services beneficial to humans, namely biomass production, regulation of the water and energy cycle, C and N sequestration, erosion control, recreation, and they act as habitat for numerous species. The stability of forest ecosystems in Europe, as influenced by the deposition of air pollutants, has been a matter of debate for more than 20 years. Besides atmospheric deposition, other environmental conditions affecting forest ecosystems, such as temperature, CO<sub>2</sub> content of the atmosphere, and precipitation, have significantly changed in the past and continue to change in the future. Quantifying and predicting the effects of these changes on ecosystem functioning are a challenge to ecosystem research and also a requirement to establish sustainable use of forest ecosystems in the future. This book summarizes results of long term interdisciplinary ecosystem research conducted in two forested catchments and coordinated at the Bayreuth Institute of Terrestrial Ecosystem Research (BIT K) University of Bayreuth, Germany. It does not aim to summarize all the research of BIT K in the past decade, which would go far beyond the studies in these two catchments. Instead, we concentrate here on the long term developments in the biogeochemistry of carbon and mineral elements and on the water cycle at both the plot and the catchment scale.

Global Change and Forest Soils, 2019-11-23 Global Change and Forest Soils: Cultivating Stewardship of a Finite Natural Resource, Volume 36 provides a state of the science

summary and synthesis of global forest soils that identifies concerns issues and opportunities for soil adaptation and mitigation as external pressures from global changes arise Where how and why some soils are resilient to global change while others are at risk is explored as are upcoming train wrecks and success stories across boreal temperate and tropical forests Each chapter offers multiple sections written by leading soil scientists who comment on wildfires climate change and forest harvesting effects while also introducing examples of current global issues Readers will find this book to be an integrated up to date assessment on global forest soils Presents sections on boreal temperate and tropical soils for a diverse audience Serves as an important reference source for anyone interested in both a big picture assessment of global soil issues and an in depth examination of specific environmental topics Provides a unique synthesis of forest soils and their collective ability to respond to global change Offers chapters written by leading soil scientists Prepares readers to meet the daily challenges of drafting multi resource environmental science and policy documents **Acid Rain** Karl Schneider,1995

*The Productivity and Sustainability of Southern Forest Ecosystems in a Changing Environment* Robert Mickler,Susan Fox,2012-12-06 In conclusion current year first flush foliage of branches grown in 525 d 1 1 and 700 J Lll I of carbon dioxide had much greater rates of Pm ax compared to the P max of foliage grown in 350 J Lll I carbon dioxide These findings are similar to other long term field studies with loblolly pine Teskey 1995 Murthy 1995 Elevated carbon dioxide concentration was also significantly affected the G max however higher rates were only found at the 525 J Ll 1 I carbon dioxide concentration Generally the total chlorophyll content decreased as the carbon dioxide concentration was increased The data presented here represent first year responses to the carbon dioxide and cultural treatments This experiment will continue to determine whether increased maximum net photosynthetic rate resulting from elevated carbon dioxide will persist over the life of the foliage and over an anticipated greater range of moisture and nutrient availability than existed during the first year of the study In addition to this determination evidence will also be collected to test for the possibility of downward acclimation of photosynthesis by foliage exposed to long term elevated carbon dioxide concentrations Detailed phenology measurements of branches and whole trees are expected to further the knowledge of how loblolly pine trees growing at the edge of the natural range respond to variations in carbon dioxide concentration water and nutrient supply **Acid rain** **2000** Kenichi Satake,2012-12-06 The Acid Rain 2000 Conference in Tsukuba Japan held 10 16 December 2000 was the sixth such conference in the series starting with Columbus Ohio USA in 1975 and including Sandefjord Norway in 1980 Muskoka Canada in 1985 Glasgow UK in 1990 and G teborg Sweden in 1995 This series of International Conferences on the acid rain problem has made a very important contribution to the process of summarising the state of current understanding and making this information available In the 6th Conference approximately 600 papers were presented including talks and posters About 300 peer reviewed papers from the presentation appear in this volume and will provide readers with a comprehensive review of the history and scientific aspects of the acid rain problem The papers appear in three volumes the

first containing the plenary and keynote papers and the other two the remaining scientific papers Volume 1 ISBN 0 7923 7132 1 Volume 2 ISBN 0 7923 7133 X Volume 3 ISBN 0 7923 7134 8 The Conference was arranged under the joint auspices of The Science Council of Japan The Japanese Society of Limnology representative academic society Japan Association of Aerosol Science and Technology The Japan Society for Analytical Chemistry Japan Society for Atmospheric Environment Chemical Society of Japan The Ecological Society of Japan The Japanese Society of Environmental Education Society of Environmental Science Japan The Japanese Forestry Society Japanese Society of Snow and Ice Japanese Society of Soil Science and Plant Nutrition and Japan Society on Water Environment with the cooperation of Ibaraki Prefecture and Japan Environment Agency

**Sustainable Use of Forest Biomass for Energy** Dominik Röser, Antti Asikainen, Karsten Raulund-Rasmussen, Inge Stupak, 2008-03-05 From time immemorial firewood has been a very important source of energy for mankind Later in history wood for energy decreased its importance because of other more convenient and cheaper sources mainly fossil fuels Today focus is again on use of forests as a producer of energy with main drivers being climate change shortage and increasing prices of fossil fuel sources and safety in energy supplies However intensive use of forest biomass is questioned since fundamental ecological processes may be influenced negatively thus making up a trade off with the benefits of using an otherwise sustainable source of energy In this book selected aspects of intensive use of forest biomass for energy is treated with main focus on ecological aspects like maintenance of soil fertility recycling of the combustion ash influence on biodiversity and pests and economical aspects both at forest owners level and for society Another focus point is the implementation of this knowledge into decision support recommendations and guidelines The geographical scope is mainly the Nordic and Baltic region The EU financed project Wood for Energy a contribution to the development of sustainable forest Management WOOD EN 1 MAN make up the frame for the book Seven partners participated in the project Forest Landscape Denmark Swedish University of Agricultural Sciences Finnish Forest Research Institute Norwegian Forest and Landscape Institute Lithuanian Forest Research Institute Latvian State Forestry Research Institute and Estonian University of Life Sciences with Forest Landscape Denmark as coordinator

**Forest Decline and Ozone** Heinrich Sandermann, Alan R. Wellburn, Robert L. Heath, 2012-12-06 The idea for this book arose in 1993 after the Free State of Bavaria through its Bayrisches Staatsministerium für Landesentwicklung und Umweltfragen Bavarian Ministry of Regional Development and the Environment decided to discontinue both the Bavarian project management PBWU for forest decline research and the multidisciplinary field research on the Wank Mountain in the Alps near Garmisch Forest decline through the action of ozone and other photooxidants was a main topic of the supported research in the Alps and will be a topic of new investigations in the Bavarian Forest Many interesting results were obtained but the researchers involved have not had sufficient time to allow reliable conclusions to be drawn It was therefore decided to ask international experts for contributions in order to summarize the best available evidence of a possible link between ozone and forest decline a topic which has been studied in

the USA since the late 1950s and in Europe since the early 1980s The original idea of Waldsterben as an irreversible large scale dieback of forests in Germany was soon recognized to be wrong Forschungsbeirat 1989 However the new criteria used for the official German and European damage inventories loss or yellowing of needles or leaves tree morphology indicate that persistently high percentages of damaged spruce and pine remain and there is an increasing percentage of damaged beech and oak with a high proportion of biotic disease Forschungsbeirat 1989 UN ECE 1995

**Landscape Disturbance and Biodiversity in Mediterranean-Type Ecosystems** Philip W. Rundel, Gloria Montenegro, Fabian M. Jaksic, 2013-04-17 Human impact on natural landscapes through urbanization and agricultural expansion are becoming more and more dramatic and are the cause of serious environmental problems This volume examines the effect of landscape disturbance on plant and animal diversity in the five mediterranean climate regions of the world It begins with three introductory chapters broadly reviewing the issues of landscape degradation Further contributions describe regional land use conflicts in each of the five regions Landscape disturbance and plant diversity and landscape disturbance and animal diversity are treated in separate chapters Four contributions deal with demography and ecophysiology in vegetation succession following disturbance The volume closes with a consideration of the future addressing aspects of environmental politics

*Fire, Climate Change, and Carbon Cycling in the Boreal Forest* Eric S. Kasischke, Brian J. Stocks, 2012-08-22 In boreal forests which contain large amounts of the world's terrestrial organic carbon fire is a natural and fundamental disturbance regime essential in controlling many ecosystem processes As a result of predicted climate change in the future the fire regime and consequently the forest cover and carbon storage of boreal regions will undergo dramatic alterations This volume discusses the direct and indirect mechanisms by which fire and climate interact to influence carbon cycling in North American boreal forests The first section summarizes the information needed to understand and manage fire's effects on the ecology of boreal forests and its influence on global climate change issues Following chapters discuss in detail the role of fire in the ecology of boreal forests Subsequent sections present data sets on fire and the distribution of carbon discuss the use of satellite imagery in monitoring these regions and discuss approaches to modeling the relevant processes The book offers the following new results improved estimates of carbon released during fires at a variety of scales from individual sites to the entire North American boreal forest region direct evidence of enhanced soil respiration after fire in Alaskan boreal forests studies of the influence of fire on long term forest succession patterns modeling results of the effects of climate warming on the fire regime examples of the use of satellite imagery to monitor surface characteristics important in carbon cycling modeling results of how climate change will interact with the fire regime to influence carbon storage

Global Change and Mediterranean-Type Ecosystems Jose Moreno, Walter C. Oechel, 2012-12-06 Regions with Mediterranean type climates include parts of California South America Australia and of course Europe The effect of global climate change on these heavily populated areas will have major social and political ramifications This volume addresses issues in these areas from processes

at the leaf level to the individual ecosystem and landscape levels This book will serve to raise awareness on the significance of these types of ecosystems and on their sensitivity to the threat that global change represents *High-Latitude Rainforests and Associated Ecosystems of the West Coast of the Americas* Richard G. Lawford,1996 Regional intercomparisons between ecosystems on different continents can be a powerful tool to better understand the ways in which ecosystems respond to global change Large areas are often needed to characterize the causal mechanisms governing interactions between ecozones and their environments Factors such as weather and climate patterns land ocean and land atmosphere interactions all play important roles As a result of the strong physical north south symmetry between the western coasts of North and South America the similarities in climate coastal oceanography and physiography between these two regions have been extensively documented *High Latitude Rain Forests and Associated Ecosystems of the West Coast of the Americas* presents current research on West Coast forest and river ecology and compares ecosystems of the Pacific Northwest with those of South America *Pests Control and Acarology* Dalila Haouas,Levente Hufnagel,2020-02-19 *Pests Control and Acarology* presents novel methods adopted in pest management for cereal crops and fruit trees Each chapter was written by experts in their respective areas and provides a rigorous review and outline of current trends and future needs to expedite progress in the field The book was structured in three sections as follows The first section introduces the topics and defines concepts of Integrated Pest Management and Biological Control The second section includes two chapters the first one discusses a new trap barrier system for rodent pest control in rice and the second one presents methods used in the management of stem borers in cereal crops The third section presents various topics within the area of Acarology

**The Role of Fire in Mediterranean-Type Ecosystems** Jose M. Moreno,Walter C. Oechel,2012-12-06 Fire has been recognized as a vital agent influencing the diversity and vigor of landscapes It is particularly important in Mediterranean ecosystems such as those of California This book is of interest to ecologists policy makers and land managers *Rainforest Ecosystems of East Kalimantan* Edi Guhardja,2000 Since the late 1960s the Indonesian state of East Kalimantan has witnessed a marked increase in the impact of human activities chiefly commercial logging and agricultural exploitation Located on the island of Borneo East Kalimantan also was subjected to prolonged droughts and extensive wildfires in 1982 83 and 1997 98 that were linked to the El Nino Southern Oscillation ENSO phenomenon The changes in the rainforest ecosystem in East Kalimantan during this 15 year cycle of severe ENSO events are the subject of this book With an eye toward development of rehabilitation techniques for sustainable forest management the authors examine possible interactive effects of drought fire and human impacts on the flora and fauna of the area *Arctic and Alpine Biodiversity: Patterns, Causes and Ecosystem Consequences* F.Stuart III Chapin,Christian Körner,2013-03-08 As human populations expand and have increasing access to technology two general environmental concerns have arisen First human populations are having increasing impact on the earth system such that we are altering the biospheric carbon pools basic processes of elemental

cycling and the climate system of the earth Because of time lags and feedbacks these processes are not easily reversed These alterations are occurring now more rapidly than at any time in the last several million years Secondly human activities are causing changes in the earth's biota that lead to species extinctions at a rate and magnitude rivaling those of past geologic extinction events Although environmental change is potentially reversible at some time scales the loss of species is irreversible Changes in diversity at other scales are also cause for concern Habitat fragmentation and declines in population sizes alter genetic diversity Loss or introduction of new functional groups such as nitrogen fixers or rodents onto islands can strongly alter ecosystem processes Changes in landscape diversity through habitat modification and fragmentation alter the nature of processes within and among vegetation patches Although both ecological changes altering the earth system and the loss of biotic diversity have been major sources of concern in recent years these concerns have been largely independent with little concern for the environmental causes the ecosystem consequences of changes in biodiversity These two processes are clearly interrelated Changes in ecological systems cause changes in diversity

Crassulacean Acid Metabolism Klaus Winter, J. Andrew C. Smith, 2012-12-06 Crassulacean acid metabolism CAM represents one of the best studied metabolic examples of an ecological adaptation to environmental stress Well over 5 % of all vascular plant species engage in this water conserving photosynthetic pathway Intensified research activities over the last 10 years have led to major advances in understanding the biology of CAM plants New areas of research reviewed in detail in this book include regulation of gene expression and the molecular basis of CAM the ecophysiology of CAM plants from tropical environments the productivity of agronomically important cacti and agaves the ecophysiology of CAM in submerged aquatic plants and the taxonomic diversity and evolutionary origins of CAM

Biodiversity and Ecosystem Processes in Tropical Forests Gordon H. Orians, Rodolfo Dirzo, J. Hall Cushman, 2012-12-06 Although biologists have directed much attention to estimating the extent and causes of species losses the consequences for ecosystem functioning have been little studied This book examines the impact of biodiversity on ecosystem processes in tropical forests one of the most species rich and at the same time most endangered ecosystems on earth It covers the relationships between biodiversity and primary production secondary production biogeochemical cycles soil processes plant life forms responses to disturbance and resistance to invasion The analyses focus on the key ecological interfaces where the loss of keystone species is most likely to influence the rate and stability of ecosystem processes

Biodiversity and Savanna Ecosystem Processes Otto T. Solbrig, Ernesto Medina, Juan F. Silva, 2013-03-07 Savannas are the most widespread ecosystem in the tropics and as such are subjected to great human pressure that may result in massive soil degradation The book addresses the role of species in the function of savanna ecosystems It is shown that savannas are enormously diverse and that four factors determine the function of savanna ecosystems Plant Available Moisture Plant Available Nutrients Fire Herbivores



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