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# Wildland Fire in Ecosystems

## Effects of Fire on Air



# Wildland Fire In Ecosystems Effects Of Fire On Air

**U. S. Department Agriculture, Forest  
Service**



## **Wildland Fire In Ecosystems Effects Of Fire On Air:**

*Wildland Fire in Ecosystems*, 2003 This state of knowledge review about the effects of fire on air quality can assist land fire and air resource managers with fire and smoke planning and their efforts to explain to others the science behind fire related program policies and practices to improve air quality Chapter topics include air quality regulations and fire characterization of emissions from fire the transport dispersion and modeling of fire emissions atmospheric and plume chemistry air quality impacts of fire social consequences of air quality impacts and recommendations for future research

**Wildland Fire in Ecosystems** David V. Sandberg, 2003 This state of knowledge review about the effects of fire on air quality can assist land fire and air resource managers with fire and smoke planning and their efforts to explain to others the science behind fire related program policies and practices to improve air quality Chapter topics include air quality regulations and fire characterization of emissions from fire the transport dispersion and modeling of fire emissions atmospheric and plume chemistry air quality impacts of fire social consequences of air quality impacts and recommendations for future research

**Wildland Fire in Ecosystems** David V. Sandberg, Roger D. Ottmar, Janice L. Peterson, 2012-10 Wildland fire is an integral part of ecosystem management and is essential in maintaining functional ecosystems but air pollutants emitted from those fires can be harmful to human health and welfare Because of the public and governmental concerns about the possible risk of wildland fire smoke to public health and safety as well as nuisance visibility ozone generation and regional haze impacts increasingly effective smoke management programs and air quality policies are being implemented with support from research and land management agency programs This state of knowledge review of what is known about the effects of fire on air quality has been prepared to assist those in the fire and air quality management communities for future discussion of management policy and science options for managing fire and air quality *Wildland Fire on Ecosystems Effects of Fire on Air* U. S. Department Agriculture, Forest Service, 2017-07-21 Wildland fire is an integral part of ecosystem management and is essential in maintaining functional ecosystems but air pollutants emitted from those fires can be harmful to human health and welfare Because of the public and governmental concerns about the possible risk of wildland fire smoke to public health and safety as well as nuisance visibility ozone generation and regional haze impacts increasingly effective smoke management programs and air quality policies are being implemented with support from research and land management agency programs This state of knowledge review of what is known about the effects of fire on air quality has been prepared to assist those in the fire and air quality management communities for future discussion of management policy and science options for managing fire and air quality The introduction sets up a framework in which to discuss the interaction between pollutants emitted from fire and air quality at the national State and local levels applied to air resource management fire management and geographical scale components Wildland Fire in Ecosystems Joint Fire Sciences Program, U. S. Department Of Agriculture, Forest Service, U. S. Department of the Interior, U. S.

Government, 2017-12-30 This state of knowledge review about the effects of fire on flora and fuels can assist land managers with ecosystem and fire management planning and in their efforts to inform others about the ecological role of fire Chapter topics include fire regime classification autecological effects of fire fire regime characteristics and postfire plant community developments in ecosystems throughout the United States and Canada global climate change ecological principles of fire regimes and practical considerations for managing fire in an ecosystem context Keywords ecosystem fire effects fire management fire regime fire severity fuels habitat plant response plants succession vegetation In 1978 a national workshop on fire effects in Denver Colorado provided the impetus for the Effects of Wildland Fire on Ecosystems series Recognizing that knowledge of fire was needed for land management planning state of the knowledge reviews were produced that became known as the Rainbow Series The series consisted of six publications each with a different colored cover describing the effects of fire on soil water air flora fauna and fuels The Rainbow Series proved popular in providing fire effects information for professionals students and others Printed supplies eventually ran out but knowledge of fire effects continued to grow To meet the continuing demand for summaries of fire effects knowledge the interagency National Wildfire Coordinating Group asked Forest Service research leaders to update and revise the series To fulfill this request a meeting for organizing the revision was held January 4-6 1993 in Scottsdale Arizona The series name was then changed to The Rainbow Series The five volume series covers air soil and water fauna flora and fuels and cultural resources The Rainbow Series emphasizes principles and processes rather than serving as a summary of all that is known The five volumes taken together provide a wealth of information and examples to advance understanding of basic concepts regarding fire effects in the United States and Canada As conceptual background they provide technical support to fire and resource managers for carrying out interdisciplinary planning which is essential to managing wildlands in an ecosystem context Planners and managers will find the series helpful in many aspects of ecosystem based management but they will also need to seek out and synthesize more detailed information to resolve specific management questions Chapter 1 Introduction and Fire Regimes Chapter 2 Fire Autecology Chapter 3 Fire in Northern Ecosystems Chapter 4 Fire in Eastern Ecosystems Chapter 5 Fire in Western Forest Ecosystems Chapter 6 Fire in Western Shrubland Woodland and Grassland Ecosystems Chapter 7 Fire in Tropical and Subtropical Ecosystems Chapter 8 Global Change and Wildland Fire Chapter 9 Ecological Principles Shifting Fire Regimes and Management Considerations Wildland Fire in Ecosystems, 2000 **Wildland fire in ecosystems**, 2003 This state of knowledge review about the effects of fire on air quality can assist land fire and air resource managers with fire and smoke planning and their efforts to explain to others the science behind fire related program policies and practices to improve air quality Chapter topics include air quality regulations and fire characterization of emissions from fire the transport dispersion and modeling of fire emissions atmospheric and plume chemistry air quality impacts of fire social consequences of air quality impacts and recommendations for future research Wildland Fires and Air Pollution Andrzej Bytnerowicz, 2009 Wildland

fires are one of the most devastating and terrifying forces of nature. While their effects are mostly destructive, they also help with regeneration of forests and other ecosystems. Low intensity fires clear accumulating biomass, reducing risk of catastrophic crown fires and can be used as an effective management tool. This book presents current understanding of wildland fires and air quality as well as their effects on human health, forests and other ecosystems. In the first section of the book, the basics of wildland fires and resulting emissions are presented from the perspective of changing global climate, air quality impairment and effects on environmental and human health and security. In the second section, effects of wildland fires on air quality, visibility and human health in various regions of the Earth are discussed. The third section of the book deals with complex issues of the ecological impacts of fires and air pollution in forests and chaparral in North America. The fourth section discusses various management issues facing land and fire managers which are related to wildfires, use of prescribed fires and air quality. This section also presents various modeling systems used for describing fire dangers and behavior as well as smoke and air pollution predictions applied in the risk assessment analysis. The book concludes with a series of expert recommendations for wildland fire and atmospheric research.

**Wildland Fire in Ecosystems** James Kerr Brown, Jane Kapler Smith, 2000      Wildland Fire in Ecosystems, 2000      Wildland Fire in Ecosystems, 2005      **Wildland Fire in Ecosystems**, 2000      *Wildland Fire in Ecosystems* U. S. Department Of Agriculture, Forest Service, 2012-10

This state of knowledge review about the effects of fire on flora and fuels can assist land managers in planning for ecosystem management and fire management and in their efforts to inform others about the ecological role of fire. Chapter 1 presents an overview and a classification of fire regimes that is used throughout the report. Chapter 2 summarizes knowledge of fire effects on individual plants including susceptibility to mortality of aerial crowns, stems and roots, vegetative regeneration, seedling establishment from on site and off site seed sources, seasonal influences such as carbohydrates and phenological stage and factors affecting burn severity. Five chapters describe fire regime characteristics such as fire severity, fire frequency and fire intensity and postfire plant community responses for ecosystems throughout the United States and Canada. Typical fuel compositions, fuel loadings and fire behavior are described for many vegetation types. Vegetation types including Forest Range Environmental Study (FRES) Kuchler and Society of American Foresters (SAF) types are classified as belonging to understory, mixed or stand replacement fire severity regime types. The severity and frequency of fire are described for the pre Euro American settlement period and contrasted with current fire regimes. Historic fire frequencies ranged from a fire every 1 to 3 years in some grassland and pine types to a fire every 500 to 1 000 years in some coastal forest and northern hardwood types. In many vegetation types characterized by understory fire regimes, a considerable shift in fire frequency and fire severity occurred during the past century. Successional patterns and vegetation dynamics following disturbance by fire and in some cases related grazing and silvicultural treatments are described for major vegetation types. Management considerations are discussed especially for the application of prescribed fire. A chapter on global climate change

describes the complexity of a changing climate and possible influences on vegetation fuels and fire. The uncertainty of global climate change and its interactions with vegetation means expectations for fire management are general and tentative. Nonetheless, manipulation of wildlands and disturbance regimes may be necessary to ensure continual presence of some species. The last chapter takes a broader, more fundamental view of the ecological principles and shifting fire regimes described in the other chapters. The influences of fire regimes on biodiversity and fuel accumulation are discussed. Strategies and approaches for managing fire in an ecosystem context and sources of technical knowledge that can assist in the process are described. Research needs are broadly summarized.

*Wildland Fire in Ecosystems* U. S. Department of Agriculture, Forest Service, 2017-07-22

Fires affect animals mainly through effects on their habitat. Fire regimes that is patterns of fire occurrence, size, uniformity, and severity have been a major force shaping landscape patterns and influencing productivity throughout North America for thousands of years. Faunal communities have evolved in the context of particular fire regimes and show patterns of response to fire itself and to the changes in vegetation composition and structure that follow fire. Animals' immediate responses to fire are influenced by fire season, intensity, severity, rate of spread, uniformity, and size. Responses may include injury, mortality, immigration, or emigration. Animals with limited mobility such as young are more vulnerable to injury and mortality than mature animals. The habitat changes caused by fire influence faunal populations and communities much more profoundly than fire itself. Fires often cause a short-term increase in productivity, availability, or nutrient content of forage and browse. These changes can contribute to substantial increases in herbivore populations, but potential increases are moderated by animals' ability to thrive in the altered, often simplified structure of the postfire environment. Fires generally favor raptors by reducing hiding cover and exposing prey. Small carnivores respond to fire effects on small mammal populations either positively or negatively. Large carnivores and omnivores are opportunistic species with large home ranges. Their populations change little in response to fire, but they tend to thrive in areas where their preferred prey is most plentiful, often in recent burns. In forests and woodlands, understory fires generally alter habitat structure less than mixed-severity and stand-replacement fires, and their effects on animal populations are correspondingly less dramatic. Stand-replacing fires reduce habitat quality for species that require dense cover and improve it for species that prefer open sites. Many animal fire studies depict a reorganization of animal communities in response to fire, with increases in some species accompanied by decreases in others. Like fire effects on populations, fire effects on communities are related to the amount of structural change in vegetation.

**Wildland Fire in Ecosystems** United States Department of Agriculture, 2015-06-26

This state-of-knowledge review about the effects of fire on soils and water can assist land and fire managers with information on the physical, chemical, and biological effects of fire needed to successfully conduct ecosystem management and effectively inform others about the role and impacts of wildland fire. Chapter topics include the soil resource, soil physical properties, and fire soil chemistry effects, soil biology responses, the hydrologic cycle, and water.

resources water quality aquatic biology fire effects on wetland and riparian systems fire effects models and watershed rehabilitation Wildland Fire Smoke in the United States David L. Peterson, Sarah M. McCaffrey, Toral Patel-Weynand, 2022-08-11 This open access book synthesizes current information on wildland fire smoke in the United States providing a scientific foundation for addressing the production of smoke from wildland fires This will be increasingly critical as smoke exposure and degraded air quality are expected to increase in extent and severity in a warmer climate Accurate smoke information is a foundation for helping individuals and communities to effectively mitigate potential smoke impacts from wildfires and prescribed fires The book documents our current understanding of smoke science for 1 primary physical chemical and biological issues related to wildfire and prescribed fire 2 key social issues including human health and economic impacts and 3 current and anticipated management and regulatory issues Each chapter provides a summary of priorities for future research that provide a roadmap for developing scientific information that can improve smoke and fire management over the next decade Wildland Fire in Ecosystems James K. Brown, 2000 Wildland Fire in Ecosystems, 2005 *Forest Fires* Philip Nori Omi, 2005-05-23 From killer fires to ecosystem rehabilitation an exhaustive survey exploring the ecological social and economic consequences of managing fires in U S wildland areas Fire management involves protecting natural resources from fire but also using controlled burning for land management purposes Who are the stewards of land management and the researchers who devote their entire careers studying fire How are ecosystems restored after major fires What are the economic ramifications and what assessment tools are available *Forest Fires A Reference Handbook* explores the historical ecological economic and social dimensions of wildland combustion and their impacts in North America Explaining how legislation and public perception have been shaped by historic fires and fire seasons particular emphasis is placed on the summer of 2000 as a way of understanding and managing future fires *Wildland Fire in Ecosystems* U. S. Department Of Agriculture, Forest Service, 2012-10 Fire is a natural disturbance that occurs in most terrestrial ecosystems It is also a tool that has been used by humans to manage a wide range of natural ecosystems worldwide As such it can produce a spectrum of effects on soils water riparian biota and wetland components of ecosystems Fire scientists land managers and fire suppression personnel need to evaluate fire effects on these components and balance the overall benefits and costs associated with the use of fire in ecosystem management This publication has been written to provide up to date information on fire effects on ecosystem resources that can be used as a basis for planning and implementing fire management activities It is a companion publication to the recently published book *Fire s Effects on Ecosystems* by DeBano and others 1998 In the late 1970s the USDA Forest Service published a series of state of knowledge papers about fire effects on vegetation soils water wildlife and other ecosystem resources These papers collectively called The Rainbow Series because of their covers were widely used by forest fire personnel This publication updates both the Tiedemann and others 1979 paper on fire s effects on water and the Wells and others 1979 paper on soils This publication is

divided into three major parts A B C and an introductory chapter that provides discussions of fire regimes fire severity and intensity and fire related disturbances Part A describes the nature of the soil resource its importance characteristics and the responses of soils to fire and the relationship of these features to ecosystem functioning and sustainability Part A is divided into three main chapters 2 3 and 4 that describe specific fire effects on the physical chemical and biological properties of the soil respectively Likewise Part B discusses the basic hydrologic processes that are affected by fire including the hydrologic cycle water quality and aquatic biology It also contains three chapters which specifically discuss the effect of fire on the hydrologic cycle water quality and aquatic biology in chapters 5 6 and 7 respectively Part C has five chapters that cover a wide range of related topics Chapter 8 analyzes the effects of fire on the hydrology and nutrient cycling of wetland ecosystems along with management concerns The use of models to describe heat transfer throughout the ecosystem and erosional response models to fire are discussed in chapter 9 Chapter 10 deals with important aspects of watershed rehabilitation and implementation of the Federal Burned Area Emergency Rehabilitation BAER program Chapter 11 directs the fire specialists and managers to important information sources including data bases Web sites textbooks journals and other sources of fire effects information A summary of the important highlights of the book are provided in chapter 12 Last a glossary of fire terms is included in the appendix The material provided in each chapter has been prepared by individuals having specific expertise in a particular subject This publication has been written as an information source text for personnel involved in fire suppression and management planners decisionmakers land managers public relations personnel and technicians who routinely and occasionally are involved in fire suppression and using fire as a tool in ecosystem management Because of widespread international interest in the previous and current Rainbow Series publications the International System of Units Systeme International d Unites SI informally called the metric system centimeters cubic meters grams is used along with English units throughout the volume In some instances one or the other units are used exclusively where conversions would be awkward or space does not allow presentation of both units



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