Global wildfire plume-rise dataset and parameterizations for climate model applications

www.nrfirescience.org/resource/22919

The fire plume height (smoke injection height) is an important parameter for calculating the transport and lifetime of smoke particles, which can significantly affect regional and global air quality and atmospheric radiation budget. To develop an observation?based global fire plume?rise dataset, a modified one?dimensional...

Author(s): Ziming Ke, Yuhang Wang, Yufei Zou, Yongjia Song, Yongqiang Liu

Year Published: 2021

Type: Document

Book or Chapter or Journal Article

Could the exception become the rule? 'Uncontrollable' air pollution events in the US due to wildland fires

www.nrfirescience.org/resource/22894

Exceptional events occur when air pollution in a specific location exceeds the National Ambient Air Quality Standards (NAAQS) due to an event that cannot be reasonably attributed to human activities, such as a wildland fire. Ground-level ozone (O3) and particulate matter (PM) are Environmental Protection Agency (EPA) criteria...

Author(s): Liji M. David, A. R. Ravishankara, Steven J. Brey, Emily V. Fischer, John Volckens, Sonia M. Kreidenweis

Year Published: 2021

Type: Document

Book or Chapter or Journal Article

Characterization of occupational smoke exposure among wildland firefighters in the midwestern United States

www.nrfirescience.org/resource/22783

Wildland firefighters are repeatedly exposed to elevated levels of wildland fire smoke (WFS) while protecting lives and properties from wildland fires. Studies reporting personal exposure concentrations of air pollutants in WFS during fire suppression or prescribed burn activities have been geographically limited to the western and...

Author(s): Chieh-Ming Wu, Chi Song, Ryan Chartier, Jacob Kremer, Luke P. Naeher, Olorunfemi Adetona

Year Published: 2021

Type: Document

Book or Chapter or Journal Article

The U.S. EPA wildland fire sensor challenge: performance and evaluation of solver submitted multi-pollutant sensor systems

www.nrfirescience.org/resource/22763

Wildland fires can emit substantial amounts of air pollution that may pose a risk to those in proximity (e.g., first responders, nearby residents) as well as downwind populations. Quickly deploying air pollution measurement capabilities in response to incidents has been limited to date by the cost, complexity of implementation, and...

Author(s): Matthew S. Landis, Russell W. Long, Jonathan Krug, Maribel Colón, Robert Vanderpool, Andrew Habel, Shawn P. Urbanski

Year Published: 2021

Type: Document

Book or Chapter or Journal Article

Record-setting climate enabled the extraordinary 2020 fire season in the western United States

The 2020 fire season in the western United States (the West) has been staggering: over 2.5 million ha have burned as of 31 September, including over 1.5 million ha in California (3.7% of the state), in part from five of the six largest fires in state history; over 760,000 ha have burned in Oregon and Washington, most occurring...
Author(s): Philip E. Higuera, John T. Abatzoglou
Year Published: 2021
Type: Document
Book or Chapter or Journal Article

Statistical downscaling with spatial misalignment: application to wildland fire PM2.5 concentration forecasting

Fine particulate matter, PM2.5, has been documented to have adverse health effects, and wildland fires are a major contributor to PM2.5 air pollution in the USA. Forecasters use numerical models to predict PM2.5 concentrations to warn the public of impending health risk. Statistical methods are needed to calibrate the numerical...
Author(s): Suman Majumder, Yawen Guan, Brian J. Reich, Susan M. O'Neill, Ana G. Rappold
Year Published: 2021
Type: Document
Book or Chapter or Journal Article

Zonal-based emission source term model for predicting particulate emission factors in wildfire simulations

A physics/chemistry-based numerical model for predicting the emission of fine particles from wildfires is proposed. This model implements the fundamental mechanisms of soot formation in a combustion environment: soot nucleation, surface growth, agglomeration, oxidation, and particle fragmentation. These mechanisms occur on a scale...
Author(s): Alexander J. Josephson, Daniel Castaño, Eunmo Koo, Rodman Linn
Year Published: 2021
Type: Document
Book or Chapter or Journal Article

Wildland firefighter exposure to smoke and COVID-19: A new risk on the fire line

Throughout the United States, wildland firefighters respond to wildfires, performing arduous work in remote locations. Wildfire incidents can be an ideal environment for the transmission of infectious diseases, particularly for wildland firefighters who congregate in work and living settings. In this review, we examine how exposure...
Author(s): Kathleen M. Navarro, Kathleen A. Clark, Daniel J. Hardt, Colleen Reid, Peter Lahm, Joseph W. Domitrovich, Corey Butler, John R. Balmes
Year Published: 2021
Type: Document
Book or Chapter or Journal Article

Wildfire smoke exposure: Covid19 comorbidity?

Air pollution, particularly fine and ultrafine particulate matter aerosols, underlies a wide range of communicable and non-communicable disease affecting many systems including the cardiopulmonary and immune systems, and arises primarily from transportation and industry. A number of air pollution

driven diseases also are Covid19...
Author(s): Ira Leifer, Michael T. Kleinman, Donald R. Blake, David Tratt, Charlotte Marston
Year Published: 2021
Type: Document
Book or Chapter or Journal Article

Creating clean air spaces during wildland fire smoke episodes: web summit summary

Effective strategies to reduce indoor air pollutant concentrations during wildfire smoke events are critically needed. Worldwide, communities in areas prone to wildfires may suffer from annual smoke exposure events lasting from days to weeks. In addition, there are many areas of the world where high pollution events are common and...
Author(s): Gilliane Davison, Karoline K. Barkjohn, Gayle Hagler, Amara L. Holder, Sarah Coefield, Curtis W. Noonan, Beth Hassett-Sipple
Year Published: 2021
Type: Document
Book or Chapter or Journal Article

The changing risk and burden of wildfire in the United States

Recent dramatic and deadly increases in global wildfire activity have increased attention on the causes of wildfires, their consequences, and how risk from wildfire might be mitigated. Here we bring together data on the changing risk and societal burden of wildfire in the United States. We estimate that nearly 50 million homes are...
Author(s): Marshall Burke, Anne Driscoll, Sam Heft-Neal, Jiani Xue, Jennifer Burney, Michael Wara
Year Published: 2021
Type: Document
Book or Chapter or Journal Article

Estimation of local daily PM2.5 concentration during wildfire episodes: integrating MODIS AOD with multivariate linear mixed effect (LME) models

Seasonal peaks of air pollution from wildfires are increasing in frequency and severity in the western provinces of Canada. During these episodes, populations are exposed to adverse short-term health effects due to elevated levels of fine particulate matter, which is the primary pollutant associated with smoke. The spatial...
Author(s): Mojgan Mirzaei, Stefania Bertazzon, Isabelle Couloigner, Babak Farjad, Roland Ngom
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Modelling hourly spatio-temporal PM2.5 concentration in wildfire scenarios using dynamic linear models

Particulate matter with aerodynamic diameter < 2.5 ?m (PM2.5) is one of the main pollutants generated in wildfire events with negative impacts on human health. In research involving wildfires and air quality, it is common to use emission models. However, the commonly used emission approach can generate errors and...
Author(s): Joseph Sánchez-Balseca, Agustí Pérez-Foguet
Year Published: 2020
Type: Document

The effectiveness of adding fire for air quality benefits challenged: A case study of increased fine particulate matter from wilderness fire smoke with more active fire management

www.nrfirescience.org/resource/20792

The Lion Fire 2011 (LF11) and Lion Fire 2017 (LF17) were similar in size, location, and smoke transport. The same locations were used to monitor both fires for ground level fine particulate matter (PM2.5). Ground level PM2.5 is used to determine the relative smoke exposure from fire management tactics used during LF11 and LF17. The...

Author(s): Don Schweizer, Ricardo Cisneros, Kathleen M. Navarro

Year Published: 2020

Type: Document

Summer PM2.5 pollution extremes caused by wildfires over the western United States during 2017-2018

www.nrfirescience.org/resource/21825

Using observations and model simulations (ESM 4.1) during 1988–2018, we show large year?to?year variability in western U.S. PM2.5 pollution caused by regional and distant fires. Widespread wildfires, combined with stagnation, caused summer PM2.5 pollution in 2017 and 2018 to exceed 2 standard deviations over long?term...

Author(s): Yuanyu Xie, Meiyun Lin, Larry W. Horowitz

Year Published: 2020

Type: Document

Fire and climate change: conserving seasonally dry forests is still possible

www.nrfirescience.org/resource/21761

The destructive wildfires that occurred recently in the western US starkly foreshadow the possible future of forest ecosystems and human communities in the region. With increases in the area burned by severe wildfire in seasonally dry forests expected to result from climate change, judicious, science?based fire and restoration...

Author(s): Scott L. Stephens, Anthony L. Westerling, Matthew D. Hurteau, M. Zachariah Peery, Courtney Schultz, Sally Thompson

Year Published: 2020

Type: Document

Using Digital Technology to Protect Health in Prolonged Poor Air Quality Episodes: A Case Study of the AirRater App during the Australian 2019–20 Fires

www.nrfirescience.org/resource/21612

In the southern hemisphere summer of 2019–20, Australia experienced its most severe bushfire season on record. Smoke from fires affected 80% of the population, with large and prolonged exceedances of the Australian National Air Quality Standard for fine particulate matter (PM2.5) recorded in all major population centers. We...

Author(s): Sharon L. Campbell, Penelope J. Jones, Grant J. Williamson, Amanda J. Wheeler, Christopher Lucani, David M. J. S. Bowman, Fay H. Johnston

Year Published: 2020

Type: Document

Peat burning - an important source of pyridines in the earth atmosphere

www.nrfirescience.org/resource/21494

Studies of the chemical composition of atmospheric aerosols, rain water and snow in various regions of the globe quite often show the presence of pyridine and a number of its low mass derivatives. Nevertheless, the sources of those compounds in the environment have not yet been established and definitely require elucidation,...

Author(s): Dmitry S. Kosyakov, Nikolay V. Ul'yanovskii, Tomas B. Latkin, Sergey A. Pokryshkin, Valeria R. Berzhonskis, Olga V. Polyakova, Albert T. Lebedev

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Estimating wildfire fuel consumption with multitemporal airborne laser scanning data and demonstrating linkage with MODIS-derived fire radiative energy

www.nrfirescience.org/resource/22455

Characterizing pre- and post-fire fuels remains a key challenge for estimating biomass consumption and carbon emissions from wildfires. Airborne laser scanning (ALS) data have demonstrated effectiveness for estimating canopy, and to a lesser degree, surface fuel components at fine-scale (i.e., 30 m) across landscapes. Using pre- and...

Author(s): T. Ryan McCarley, Andrew T. Hudak, Aaron M. Sparks, Nicole M. Vaillant, Arjan J. H. Meddens, Laura Trader, Francisco Mauro, Jason Kreitler, Luigi Boschetti

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Smoke in the Great Plains, USA: an increasing phenomenon with potential policy and health implications

www.nrfirescience.org/resource/21270

In recent decades, as wildland fire occurrence has increased in the United States, concern about the emissions produced by wildland fires has increased as well. This growing concern is evidenced by an increase in scientific articles investigating effects of wildland smoke on public health, and ongoing research projects assessing...

Author(s): Heath D. Starns, Douglas R. Tolleson, Robert J. Agnew, Elijah G. Schnitzler, John R. Weir

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

The changing nature of wildfires: impacts on the health of the public

www.nrfirescience.org/resource/22419

[from the text] The danger of catastrophic wildfires is increasing around the globe, with large fires occurring in Australia, Canada, Chile, Indonesia, Portugal, Russia, as well as in the United States over the past decade. A major driver globally is climate change, which is expected to increase the frequency and severity of...

Author(s): John R. Balmes

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

AQVx - an interactive visual display system for air pollution and public health

www.nrfirescience.org/resource/20990

Fine particulate matter emissions (PM2.5) from landscape biomass fires, both prescribed and wild, pose a significant public health risk, with smoke exposure seasonally impacting human populations through both highly concentrated local plumes, and more dispersed regional haze. A range of technologies now exist for mapping and...
Author(s): Grant J. Williamson, Christopher Lucani
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Tamm review: The effects of prescribed fire on wildfire regimes and impacts: A framework for comparison

www.nrfirescience.org/resource/22243

Prescribed fire can result in significant benefits to ecosystems and society. Examples include improved wildlife habitat, enhanced biodiversity, reduced threat of destructive wildfire, and enhanced ecosystem resilience. Prescribed fire can also come with costs, such as reduced air quality and impacts to fire sensitive species. To...
Author(s): Molly E. Hunter, Marcos D. Robles
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Measuring acute pulmonary responses to occupational wildland fire smoke exposure using exhaled breath condensate

www.nrfirescience.org/resource/20850

Wildland firefighters are directly exposed to elevated levels of wildland fire (WF) smoke. Although studies demonstrate WF smoke exposure is associated with lung function changes, few studies that use invasive sample collection methods have been conducted to investigate underlying biochemical changes. These methods are also either...
Author(s): Chieh-Ming Wu, Anna M. Adetona, Chi Song, Luke P. Naeher, Olorunfemi Adetona
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Smoke and Roadway Safety Guide

www.nrfirescience.org/resource/22041

The Smoke and Roadway Safety Guide provides wildland fire personnel the tools and methods to effectively plan and forecast for roadway smoke impacts and to monitor, respond to, and mitigate smoke on roadways to reduce the risk to the public and fire personnel. This publication: •Outlines a sequential process which readers may...
Author(s): Gary M. Curcio, David Mueller, Peter Lahm, Mark Fitch, Joshua C. Hyde
Year Published: 2020
Type: Document
Technical Report or White Paper

Predicting Emission Source Terms in a Reduced-Order Fire Spread Model—Part 1: Particulate Emissions

www.nrfirescience.org/resource/20800

A simple, easy-to-evaluate, surrogate model was developed for predicting the particle emission source term in wildfire simulations. In creating this model, we conceptualized wildfire as a series of flamelets, and using this concept of flamelets, we developed a one-dimensional model to represent the structure of these flamelets which...

Author(s): Alexander J. Josephson, Troy M. Holland, Sara Brambilla, Michael J. Brown, Rodman Linn
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Quantifying how sources of uncertainty in combustible biomass propagate to prediction of wildland fire emissions

Smoke emissions from wildland fires contribute to concentrations of atmospheric particulate matter and greenhouse gases, influencing public health and climate. Prediction of emissions is critical for smoke management to mitigate the effects on visibility and air quality. Models that predict emissions require estimates of the amount...
Author(s): Maureen C. Kennedy, Susan J. Prichard, Donald McKenzie, Nancy H. F. French
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Wildland fire emission factors in North America: synthesis of existing data, measurement needs and management applications

Field and laboratory emission factors (EFs) of wildland fire emissions for 276 known air pollutants sampled across Canada and the US were compiled. An online database, the Smoke Emissions Repository Application (SERA), was created to enable analysis and summaries of existing EFs to be used in smoke management and emissions...
Author(s): Susan J. Prichard, Susan M. O'Neill, Paige C. Eagle, Anne Andreu, Brian Drye, Joel Dubowy, Shawn P. Urbanski, Tara Strand
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

The COVID-19 pandemic and wildfire smoke: potentially concomitant disasters

As we enter the wildfire season in the northern hemisphere, the potential for a dangerous interaction between SARS-CoV-2 and smoke pollution should be recognized and acknowledged. This is challenging because the public health threat of COVID-19 is immediate and clear, whereas the public health threat of wildfire smoke seems distant...
Author(s): Sarah B. Henderson
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

3D video semantic segmentation for wildfire smoke

Wildfires are a serious threat to ecosystems and human life. Usually, smoke is generated before the flame, and due to the diffusing nature of the smoke, we can detect smoke from a distance, so wildfire smoke detection is especially important for early warning systems. In this paper, we propose a 3D convolution-based encoder–...
Author(s): Guodong Zhu, Zhenxue Chen, Chengyun Liu, Xuewen Rong, Weikai He
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

In-situ measurement of pyrolysis and combustion gases from biomass burning using swept wavelength external cavity quantum cascade lasers

Broadband high-speed absorption spectroscopy using swept-wavelength external cavity quantum cascade lasers (ECQCLs) is applied to measure multiple pyrolysis and combustion gases in biomass burning experiments. Two broadly-tunable swept-ECQCL systems were used, with the first tuned over a range of 2089-2262 cm?1 (4.42–4.79 µm)...

Author(s): Mark C. Phillips, Tanya L. Myers, Timothy J. Johnson, David R. Weise

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Haze emissions from smouldering peat: the roles of inorganic content and bulk density

Smouldering peat fires are reported across continents and their emissions result in regional haze crisis (large scale accumulation of smoke at low altitudes) and large carbon foot prints. Inorganic content (IC) and bulk density vary naturally in peatlands and are among the important parameters governing peat fires. However, their...

Author(s): Yuqi Hu, Wuquan Cui, Guillermo Rein

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Atmospheric remobilization of natural and anthropogenic contaminants during wildfires

Globally, wildfires are increasing in frequency and severity, exposing populations to toxic trace elements stored within forests. Trace element and Pb isotope compositions in aerosols (n = 87) from four major wildfires near Sydney, Australia (1994-2004) were evaluated (Mood's median test) to determine any significant differences...

Author(s): Cynthia F. Isley, Mark Patrick Taylor

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Traffic exhaust to wildfires: PM2.5 measurements with fixed and portable, low-cost LoRaWAN-connected sensors

Air pollution with PM2.5 (particulate matter smaller than 2.5 micro-metres in diameter) is a major health hazard in many cities worldwide, but since measuring instruments have traditionally been expensive, monitoring sites are rare and generally show only background concentrations. With the advent of low-cost, wirelessly connected...

Author(s): Hugh Forehead, Johan Barthelemy, Bilal Arshad, Nicolas Verstaevel, Owen F. Price, Pascal Perez

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Prescribed fires may mean safer smoke

Inhaling wildfire smoke can be harmful, but smoke from unintended wildfires may be worse than smoke from prescribed burns, according to a study published in 2019. That means the health risks from wildfires — like the ones that have destroyed millions of acres and turned the sky blood orange this fall in California, Oregon and...
Author(s): Casey Crownhart
Year Published: 2020
Type: Document
Technical Report or White Paper

Standing dead trees contribute significantly to carbon budgets in Australian savannas

www.nrfirescience.org/resource/20945

Previous estimates of greenhouse gas emissions from Australian savanna fires have incorporated on-ground dead wood but ignored standing dead trees. However, research from eucalypt woodlands in southern Queensland has shown that the two pools of dead wood burn at similar rates. New field data from semiarid savannas across northern...
Author(s): Garry D. Cook, Adam C. Liedloff, Carl P. Meyer, Anna E. Richards, Steven G. Bray
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Quantification of organic aerosol and brown carbon evolution in fresh wildfire plumes

www.nrfirescience.org/resource/22162

Significance: Wildfire emissions in the western United States have had increasingly larger impacts on air quality, health, and climate forcing in recent decades. However, our understanding of how wildfire plume composition evolves remains incomplete. Particularly, the evolution of carbonaceous material, including fine particle mass...
Author(s): Brett B. Palm, Qiaoyun Peng, Carley D. Fredrickson, Ben H. Lee, Lauren A. Garofalo, Matson A. Pothier, Sonia M. Kreidenweis, Delphine K. Farmer, Rudra P. Pokhrel, Yingjie Shen, Shane M. Murphy, Wade Permar, Lu Hu, Teresa L. Campos, Samuel R. Hall, Kirk Ullmann, Xuan Zhang, Frank Flocke, Emily V. Fischer, Joel A. Thornton
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Assessing relative differences in smoke exposure from prescribed, managed, and full suppression wildland fire

www.nrfirescience.org/resource/19522

A novel approach is presented to analyze smoke exposure and provide a metric to quantify health-related impacts. Our results support the current understanding that managing low-intensity fire for ecological benefit reduces exposure when compared to a high-intensity full suppression fire in the Sierra Nevada of California. More...
Author(s): D.W. Schweizer, Haiganoush K. Preisler, Ricardo Cisneros
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Machine learning models accurately model ozone exposure during wildfire events

www.nrfirescience.org/resource/20492

Epidemiologists use prediction models to downscale (i.e., interpolate) air pollution exposure where monitoring data is insufficient. This study compares machine learning prediction models for ground-level ozone during wildfires, evaluating the predictive accuracy of ten algorithms on the daily 8-h

maximum average ozone during a 2008...
Author(s): Gregory L. Watson, Donatello Telesca, Colleen Reid, Gabriele G. Pfister, Michael Jerrett
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

An examination of fuel moisture, energy release and emissions during laboratory burning of live wildland fuels

www.nrfirescience.org/resource/19261

A series of small-scale laboratory fires were conducted to study the relationship between fuel type, moisture content, energy released and emissions during the combustion process of live wildland fuels. The experimental design sought to understand the effects that varying moisture content of different fire-promoting plant species...
Author(s): Nathaniel W. May, Evan Ellicott, Michael J. Gollner
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Fixing a snag in carbon emissions estimates from wildfires

www.nrfirescience.org/resource/20432

Wildfire is an essential earth?system process, impacting ecosystem processes and the carbon cycle. Forest fires are becoming more frequent and severe, yet gaps exist in the modeling of fire on vegetation and carbon dynamics. Strategies for reducing carbon dioxide (CO_2) emissions from wildfires include increasing tree harvest,...
Author(s): Jeffrey E. Stenzel, Kristina J. Bartowitz, Melannie D. Hartman, James A. Lutz, Crystal A. Kolden, Alistair M. S. Smith, Beverly E. Law, Mark E. Swanson, Andrew J. Larson, William J. Parton, Tara W. Hudiburg
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Machine learning models accurately predict ozone exposure during wildfire events

www.nrfirescience.org/resource/20351

Epidemiologists use prediction models to downscale (i.e., interpolate) air pollution exposure where monitoring data is insufficient. This study compares machine learning prediction models for ground-level ozone during wildfires, evaluating the predictive accuracy of ten algorithms on the daily 8-h maximum average ozone during a 2008...
Author(s): Gregory L. Watson, Donatello Telesca, Colleen Reid, Gabriele G. Pfister, Michael Jerrett
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

A statistical model for predicting PM2.5 for the western United States

www.nrfirescience.org/resource/20303

A new statistical model for predicting daily ground level fine scale particulate matter (PM2.5) concentrations at monitoring sites in the western United States was developed and tested operationally during the 2016 and 2017 wildfire seasons. The model is site-specific, using a multiple linear regression schema that relies on the...
Author(s): Amy Marsha, Narasimhan K. Larkin
Year Published: 2019
Type: Document

Book or Chapter or Journal Article

The impact of wildfires on particulate carbon in the western U.S.A

Most of the previous investigations on the relationship between PM2.5 chemical characteristics and wildfire focused on the predictions of particle components concentrations or future pollution scenarios. Little research has focused on trends analyses based on large temporal datasets. Our research addresses this gap by quantifying...
Author(s): Weeberb J. Requia, Brent A. Coull, Petros Koutrakis
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Laboratory and numerical modeling of the formation of superfog from wildland fires

Smoke from human-induced fires such as prescribed fires can occasionally cause significant reduction in visibility on highways in the southern United States. Visibility reduction to less than three meters has been termed 'superfog' and environmental conditions that lead to its formation have been proposed previously. Accurate...
Author(s): Christian Bartolome, M. Princevac, David R. Weise, Shankar M. Mahalingam, Masoud Ghasemian, Akula Venkatram, Henry Vu, Guillermo Aguilar
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Comparing modeled emissions from wildfire and prescribed burning of post-thinning fuel: A case study of the 2016 Pioneer Fire

Prescribed fire is often used by land managers as an effective means of implementing fuel treatments to achieve a variety of goals. Smoke generated from these activities can put them at odds with air quality regulations. We set out to characterize the emission tradeoff between wildfire and prescribed fire in activity fuels from...
Author(s): Joshua C. Hyde, Eva K. Strand
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Wildland firefighter smoke exposure and risk of lung cancer and cardiovascular disease mortality

Wildland firefighters are exposed to wood smoke, which contains hazardous air pollutants, by suppressing thousands of wildfires across the U. S. each year. We estimated the relative risk of lung cancer and cardiovascular disease mortality from existing PM2.5 exposure-response relationships using measured PM4 concentrations from...
Author(s): Kathleen M. Navarro, Michael T. Kleinman, Chris E. Mackay, Timothy E. Reinhardt, John R. Balmes, George A. Broyles, Roger D. Ottmar, Luke P. Naher, Joseph W. Domitrovich
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

The FireFlux II experiment: a model-guided field experiment to improve understanding of fire–atmosphere interactions and fire spread

www.nrfirescience.org/resource/19449

The FireFlux II experiment was conducted in a tall grass prairie located in south-east Texas on 30 January 2013 under a regional burn ban and high fire danger conditions. The goal of the experiment was to better understand micrometeorological aspects of fire spread. The experimental design was guided by the use of a coupled fire–...

Author(s): Craig B. Clements, Adam K. Kochanski, Daisuke Seto, Braniff Davis, Christopher Camacho, Neil Lareau, Jonathan Contezac, Joseph C. Restaino, Warren Heilman, Steven K. Krueger, Bret W. Butler, Roger D. Ottmar, Robert E. Vihnanek, James Flynn, Jean-Baptiste Filippi, Toussaint Barboni, Dianne E. Hall, Jan Mandel, Mary Ann Jenkins, Joseph J. O'Brien, Benjamin Hornsby, Casey Teske

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Black carbon in the Lower Fraser Valley, British Columbia: impact of 2017 wildfires on local air quality and aerosol optical properties

www.nrfirescience.org/resource/20449

Exposure to wildfire smoke is a public health issue of increasing prominence in North America, particularly in western states and provinces. In this study, Aethalometer data collected at six sites in the Lower Fraser Valley (LFV), British Columbia, from September 2016 through August 2017 were analyzed to investigate the relative...

Author(s): Robert M. Healy, Jonathan M. Wang, Uwayemi Sofowote, Yushan Su, Jerzy Debosz, Michael Noble, Anthony Munoz, Cheol-Heon Jeong, Nathan Hilker, Greg J. Evans, Geoff Doerksen

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Contribution of wildland-fire smoke to US PM2.5 and its influence on recent trends

www.nrfirescience.org/resource/19113

Seasonal-mean concentrations of particulate matter with diameters smaller than 2.5 ?m (PM2.5) have been decreasing across the United States (US) for several decades, with large reductions in spring and summer in the eastern US. In contrast, summertime-mean PM2.5 in the western US has not significantly decreased. Wildfires, a large...

Author(s): Katelyn O'Dell, Bonne Ford, Emily V. Fischer, Jeffrey R. Pierce

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Accessing the life in smoke: a new application of unmanned aircraft systems (UAS) to sample wildland fire bioaerosol emissions and their environment

www.nrfirescience.org/resource/20412

Wildland fire is a major producer of aerosols from combustion of vegetation and soils, but little is known about the abundance and composition of smoke's biological content. Bioaerosols, or aerosols derived from biological sources, may be a significant component of the aerosol load vectored in wildland fire smoke. If bioaerosols...

Author(s): Leda N. Kobziar, Melissa R.A. Pingree, Adam C. Watts, Kellen N. Nelson, Tyler J. Dreaden, Mary Ridout

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

A dataset on human perception of and response to wildfire smoke

www.nrfirescience.org/resource/20317

Wildfire smoke presents a growing threat in the Western U.S.; and human health, transportation, and economic systems in growing western communities suffer due to increasingly severe and widespread fires. While modelling wildfire activity and associated wildfire smoke distributions have substantially improved, understanding how...

Author(s): Mariah Fowler, Arash Modaresi Rad, Stephen Utych, Andrew Adams, Sanazsadat Alamian, Jennifer L. Pierce, Philip E. Dennison, John T. Abatzoglou, Amir AghaKouchak, Luke Montrose, Mojtaba Sadegh

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Measuring light absorption by freshly emitted organic aerosols: Optical artifacts in traditional solvent-extraction-based methods

www.nrfirescience.org/resource/20188

Recent studies have shown that organic aerosol (OA) could have a nontrivial role in atmospheric light absorption at shorter visible wavelengths. Good estimates of OA light absorption are therefore necessary to better estimate radiative forcing due to these aerosols in climate models. One of the common techniques used to measure OA...

Author(s): Nishit J. Shetty, Apoorva Pandey, Stephen P. Baker, Wei Min Hao, Rajan K. Chakrabarty

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Correction to: A case study comparison of LANDFIRE fuel loading and emissions generation on a mixed conifer forest in Northern Idaho, USA

www.nrfirescience.org/resource/20041

Following publication of the original article (Hyde et al., 2015), the authors have noticed two errors in the summarizing of our results and wish to point out the following corrections: – The LANDFIRE-FCCS layer showed a 200% higher duff loading relative to measured loadings, not the "300%" stated in the abstract – The 200...

Author(s): Joshua C. Hyde, Eva K. Strand, Andrew T. Hudak, Dale Hamilton

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

A Multipollutant Smoke Emissions Sensing and Sampling Instrument Package for Unmanned Aircraft Systems: Development and Testing

www.nrfirescience.org/resource/19760

Poor air quality arising from prescribed and wildfire smoke emissions poses threats to human health and therefore must be taken into account for the planning and implementation of prescribed burns for reducing contemporary fuel loading and other management goals. To better understand how smoke properties vary as a function of fuel...

Author(s): Kellen N. Nelson, Jayne M. Boehmler, Andrey Y. Khlystov, Hans Moosmuller, Vera Samburova, Chiranjivi Bhattarai, Eric M. Wilcox, Adam C. Watts

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

A review of community smoke exposure from wildfire compared to prescribed fire in the United States

www.nrfirescience.org/resource/17896

Prescribed fire, intentionally ignited low-intensity fires, and managed wildfires—wildfires that are allowed to burn for land management benefit—could be used as a land management tool to create forests that are resilient to wildland fire. This could lead to fewer large catastrophic wildfires in the future. However, we must...

Author(s): Kathleen M. Navarro, D.W. Schweizer, John R. Balmes, Ricardo Cisneros

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Optimizing smoke and plume rise modeling approaches at local scales

www.nrfirescience.org/resource/17793

Heating from wildfires adds buoyancy to the overlying air, often producing plumes that vertically distribute fire emissions throughout the atmospheric column over the fire. The height of the rising wildfire plume is a complex function of the size of the wildfire, fire heat flux, plume geometry, and atmospheric conditions, which can...

Author(s): Derek V. Mallia, Adam K. Kochanski, Shawn P. Urbanski, John C. Lin

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Review of emissions from smouldering peat fires and their contribution to regional haze episodes

www.nrfirescience.org/resource/17692

Smouldering peat fires, the largest fires on Earth in terms of fuel consumption, are reported in six continents and are responsible for regional haze episodes. Haze is the large-scale accumulation of smoke at low altitudes in the atmosphere. It decreases air quality, disrupts transportation and causes health emergencies. Research on...

Author(s): Yuqi Hu, Nieves Fernandez-Anez, Thomas E. L. Smith, Guillermo Rein

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Contiguous United States wildland fire emission estimates during 2003-2015

www.nrfirescience.org/resource/18828

Wildfires are a major source of air pollutants in the United States. Wildfire smoke can trigger severe pollution episodes with substantial impacts on public health. In addition to acute episodes, wildfires can have a marginal effect on air quality at significant distances from the source, presenting significant challenges to air...

Author(s): Shawn P. Urbanski, Matthew C. Reeves, Rachel E. Corley, Robin P. Silverstein, Wei Min Hao

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

NWCG Smoke Management Guide for Prescribed Fire

www.nrfirescience.org/resource/17372

The NWCG Smoke Management Guide for Prescribed Fire contains information on prescribed fire smoke management techniques, air quality regulations, smoke monitoring, modeling, communication,

public perception of prescribed fire and smoke, climate change, practical meteorological approaches and smoke tools. The primary focus of this...
Author(s): Janice L. Peterson, Peter Lahm, Mark Fitch, Michael H. George, Dennis V. Haddow, Mark A. Melvin, Joshua C. Hyde, Ellen Eberhardt
Year Published: 2018
Type: Document
Technical Report or White Paper

Scaling nonreactive cross flow over a heated plate to simulate forest fires

www.nrfirescience.org/resource/18331

The paper reports visualization of the flow of smoke over a flat surface inside of a low-speed wind tunnel. A heating plate flush mounted on the wind tunnel floor simulated a spreading line fire that produces uniform heat flux under constant wind speed condition. A paper-thin cloth was soaked with commercially available Vaseline and...
Author(s): Nikolay Gustenyov, Nelson K. Akafuah, Ahmad Salaimeh, Mark A. Finney, Sara S. McAllister, Kozo Saito
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Synthesis of comprehensive emissions measurements and multi-scale modeling for understanding secondary organic aerosol chemistry in wildland smoke plumes - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/18254

The air quality and fire management communities are faced with increasingly difficult decisions regarding critical fire management activities, given the potential contribution of wildland fires to fine particulate matter (PM2.5). Unfortunately, in model frameworks used for air quality management, the ability to represent PM2.5 from...
Author(s): Kelley C. Barsanti, Brian K. Lamb, Robert J. Yokelson
Year Published: 2018
Type: Document
Technical Report or White Paper

Studying the effects of a changing climate on wildfires and the impacts to the United States' air quality

www.nrfirescience.org/resource/18179

Under the scope of a 2014 Joint Fire Science Program Grant, we are currently investigating future wildfire activity and consequences on air quality over the United States. In this study, we focus on major air pollutants, such as PM2.5 and ozone, and employ the global Community Earth System Model (CESM) using an unprecedented fine...
Author(s): Maria Val Martin, Jeffrey R. Pierce, Colette L. Heald
Year Published: 2018
Type: Document
Research Brief or Fact Sheet

Scientists aim to smoke out wildfire impacts

www.nrfirescience.org/resource/17915

Scientists this summer are taking to the air in an ambitious effort to better understand the chemistry, behavior, and health impacts of wildfire smoke. The flights in an instrument-packed C-130 airplane belonging to the National Science Foundation will be followed in 2019 by flights on a NASA DC-8 research jet by scientists with...

Author(s): Warren Cornwall
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Air quality impacts from prescribed fire and wildfire: How do they compare?

Prescribed fires are regulated by states and are always subject to strict air-quality standards. Their use must be planned carefully to keep the smoke they produce at acceptable levels. Managers can predict the direction of smoke plumes by relying on meteorological reports and using computer models. Managers avoid smoke-sensitive...
Author(s): Carrie Berger, Stephen A. Fitzgerald, Daniel Leavell, Janice L. Peterson
Year Published: 2018
Type: Document
Research Brief or Fact Sheet

Joint Fire Science Program Smoke Science Plan, 2010–2016: Results and Impacts

The Smoke Science Plan (SSP) was built upon personal interviews and an extensive web-based needs identification with scientists, fire managers, and air quality managers using online questionnaires (Riebau and Fox 2010a, 2010b). It is structured around four themes, which are conceptualized as complementary investigative areas to...
Author(s): Allen R. Riebau, Douglas G. Fox, Cindy Huber
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Carbon cycle and climate effects of forcing from fire-emitted aerosols

Aerosols emitted by landscape fires affect many climatic processes. Here, we combined an aerosol–climate model and a coupled climate-carbon model to study the carbon cycle and climate effects caused by fire-emitted aerosols (FEA) forcing at the top of the atmosphere and at the surface. This forcing ('best guess' present-day values...
Author(s): Jean-Sebastien Landry, Antti-Ilari Partanen, H. Damon Matthews
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

The role of composition and particle size on the toxicity of wildfire emissions - JFSP Final Report

Acute and chronic exposure to wildfire smoke can cause numerous documented cardiopulmonary effects, although determining the casual components within the thousands of different chemicals found in both the particle and gas phases remains a toxicological challenge. Specifically, little work has been done to evaluate and predict...
Author(s): M. Ian Gilmour
Year Published: 2018
Type: Document
Technical Report or White Paper

Fire intensity impacts on post-fire temperate coniferous forest net primary productivity

www.nrfirescience.org/resource/17364

Fire is a dynamic ecological process in forests and impacts the carbon (C) cycle through direct combustion emissions, tree mortality, and by impairing the ability of surviving trees to sequester carbon. While studies on young trees have demonstrated that fire intensity is a determinant of post-fire net primary productivity, wildland...

Author(s): Aaron M. Sparks, Crystal A. Kolden, Alistair M. S. Smith, Luigi Boschetti, Daniel M. Johnson, Mark A. Cochrane

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Can air quality management drive sustainable fuels management at the temperate wildland-urban interface?

www.nrfirescience.org/resource/18327

Sustainable fire management has eluded all industrial societies. Given the growing number and magnitude of wildfire events, prescribed fire is being increasingly promoted as the key to reducing wildfire risk. However, smoke from prescribed fires can adversely affect public health. We propose that the application of air quality...

Author(s): David M. J. S. Bowman, Lori D. Daniels, Fay H. Johnston, Grant J. Williamson, William Matt Jolly, Sheryl Magzamen, Ana G. Rappold, Michael Brauer, Sarah B. Henderson

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

The impact of US wildland fires on ozone and particulate matter: a comparison of measurements and CMAQ model predictions from 2008 to 2012

www.nrfirescience.org/resource/18246

Wildland fire emissions are routinely estimated in the US Environmental Protection Agency's National Emissions Inventory, specifically for fine particulate matter (PM2.5) and precursors to ozone (O3); however, there is a large amount of uncertainty in this sector. We employ a brute-force zero-out sensitivity method to estimate the...

Author(s): Joseph L. Wilkins, George A. Pouliot, Kristen Foley, Wyat Appel, Thomas E. Pierce

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Quantifying wildfire growth rates using smoke plume observations derived from weather radar

www.nrfirescience.org/resource/18054

Fast-moving wildfires can result in substantial losses of infrastructure, property and life. During such events, real-time intelligence is critical for managing firefighting activities and public safety. The ability of fixed-site weather radars to detect the plumes from fires has long been recognized; however, quantitative methods...

Author(s): Thomas J. Duff, Derek M. Chong, Trent D. Penman

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Public use of information about smoke emissions: application of the risk information seeking and processing (RISP) model

www.nrfirescience.org/resource/16281

In the last few decades, the number of people living in fire-prone ecosystems has increased, placing more people and private property at risk to future fire events. Substantial research has demonstrated consistent public support for the use of prescribed fires in fuel-reduction efforts; however, continuing public concern regarding...
Author(s): Kathleen M. Rose, Eric Toman, Christine Olsen
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

How smoke from fires can affect your health

www.nrfirescience.org/resource/17800

Smoke is made up of a complex mixture of gases and fine particles produced when wood and other organic materials burn. The biggest health threat from smoke is from fine particles. These microscopic particles can penetrate deep into your lungs. They can cause a range of health problems, from burning eyes and a runny nose to...
Year Published: 2017
Type: Document
Research Brief or Fact Sheet

Airborne measurements of western U.S. wildfire emissions: Comparison with prescribed burning and air quality implications

www.nrfirescience.org/resource/15367

Wildfires emit significant amounts of pollutants that degrade air quality. Plumes from three wildfires in the western U.S. were measured from aircraft during the Studies of Emissions and Atmospheric Composition, Clouds and Climate Coupling by Regional Surveys (SEAC4RS) and the Biomass Burning Observation Project (BBOP), both in...
Author(s): Xiaoxi Liu, L. Gregory Huey, Robert J. Yokelson, Vanessa Selimovic, Isobel J. Simpson, Markus Muller, Jose L. Jimenez, Pedro Campuzano-Jost, Andreas J. Beyersdorf, Donald R. Blake, Zachary Butterfield, Yonghoon Choi, John D. Crounse, Douglas A. Day, Glenn S. Diskin, Manvendra K. Dubey, Edward Fortner, Thomas F. Hanisco, Weiwei Hu, Laura E. King, Lawrence Kleinman, Simone Meinardi, Tomas Mikoviny, Timothy B. Onasch, Brett B. Palm, Jeff Peischl, Ilana B. Pollack, Thomas B. Ryerson, Glen W. Sachse, Arthur J. Sedlacek, John E. Shilling, Stephen Springston, Jason M. St. Clair, David J. Tanner, Alexander P. Teng, Paul O. Wennberg, Armin Wisthaler, Glenn M. Wolfe
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

U.S. EPA Smoke Emissions, Chemistry, and Transport Modeling - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/17028

Photochemical grid models such as the Community Multiscale Air Quality Model (CMAQ) are used to estimate local to continental scale O3, PM, and haze for scientific and regulatory assessments. Field data from specific and well characterized wildland fires is critically important to improve wildland fire emissions estimation...
Author(s): Kirk R. Baker, Thomas E. Pierce
Year Published: 2017
Type: Document
Technical Report or White Paper

Wildland Fire Smoke Health Effects on Wildland Firefighters and the Public - Final Report to the Joint Fire Science Program

Wildland fire smoke is a complex mixture of air contaminants that have the potential cause adverse health effects. Individuals can be exposed occupationally if they work as wildland firefighters or public exposure from ambient air that is contaminated with smoke from a nearby or distant wildland fire. Previous studies of public...
Author(s): Joe Domitrovich, George Broyles, Roger D. Ottmar, Timothy E. Reinhardt, Luke P. Naeher, Michael T. Kleinman, Kathleen M. Navarro, Christopher E. Mackay, Olorunfemi Adetona
Year Published: 2017
Type: Document
Technical Report or White Paper

Estimating the Effects of Changing Climate on Fires and Consequences for U.S. Air Quality, Using a Set of Global and Regional Climate Models - Final Report to the Joint Fire Science Program

Emissions of aerosols and gases from fires have been shown to adversely affect US air quality at local to regional scales as well as downwind regions far away from the source. In addition, smoke from fires negatively affects humans, ecosystems, and climate. Recent observations have shown an upward trend of area burned over western...
Author(s): Jeffrey R. Pierce, Maria Val Martin, Colette L. Heald
Year Published: 2017
Type: Document
Technical Report or White Paper

Wildfire smoke exposure and human health: significant gaps in research for a growing public health issue

Understanding the effect of wildfire smoke exposure on human health represents a unique interdisciplinary challenge to the scientific community. Population health studies indicate that wildfire smoke is a risk to human health and increases the healthcare burden of smoke-impacted areas. However, wildfire smoke composition is complex...
Author(s): Carolyn Black, Yohannes Tesfaigzi, Jed A. Bassein, Lisa A. Miller
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Phase dynamics of wildland fire smoke emissions and their secondary organic aerosols

Biomass burning is an important source to the atmosphere of carbonaceous particulate matter that impacts air quality, climate, and human health. The semivolatile nature of directlyemitted organic particulate matter can result in particle evaporation as smoke plumes dilute. Further, oxidation of emitted and volatilized precursors can...
Author(s): Sonia M. Kreidenweis, Jeffrey R. Pierce
Year Published: 2017
Type: Document
Technical Report or White Paper

Accelerating awareness, understanding, and adoption of wildland fire science information - Final Report to the Joint Fire Science Program

Smoke from wildland fires has a significant impact on public health and transportation safety and

presents a serious complication for air regulators seeking to design effective and efficient emission control strategies to meet and maintain air quality standards. Wildland fires produce numerous hazardous air pollutants and criteria...
Author(s): Shawn P. Urbanski
Year Published: 2017
Type: Document
Technical Report or White Paper

Hierarchical 3D fuel and consumption maps to support physics-based fire modeling - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/17007

To meet the data requirements of physics-based fire models and FASMEE objectives, traditional fuel and consumption measures need to be integrated with spatially explicit, three-dimensional data. One of the challenges of traditional fuel measurement techniques is that they must either remove or alter the fuels that are a primary...
Author(s): Andrew T. Hudak, Susan J. Prichard, Robert E. Keane, E. Louise Loudermilk, Russell A. Parsons, Carl A. Seielstad, Eric Rowell, Nick Skowronski
Year Published: 2017
Type: Document
Technical Report or White Paper

Emissions from prescribed burning of agricultural fields in the Pacific Northwest

www.nrfirescience.org/resource/16554

Prescribed burns of winter wheat stubble and Kentucky bluegrass fields in northern Idaho and eastern Washington states (U.S.A.) were sampled using ground-, aerostat-, airplane-, and laboratory-based measurement platforms to determine emission factors, compare methods, and provide a current and comprehensive set of emissions data for...
Author(s): Amara L. Holder, Brian K. Gullett, Shawn P. Urbanski, Robert Elleman, Susan M. O'Neill, Dennis Tabor, William Mitchell, Kirk R. Baker
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Critical assessment of wildland fire emissions inventories: methodology, uncertainty, effectiveness - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/15585

The project addressed the following tasks: 1) Review and summarize the technical details of major FEIS. 2) Quantify the uncertainty of the components of burned area, fuel loading, and emission factors of each FEIS. 3) Quantify the uncertainty of emissions estimated by each FEIS at scales relevant to modeling ozone, PM2.5 NAAQS, and...
Author(s): Wei Min Hao, Shawn P. Urbanski, Helen T. Naughton
Year Published: 2016
Type: Document
Technical Report or White Paper

Air-quality impacts and intake fraction of PM2.5 during the 2013 Rim Megafire

www.nrfirescience.org/resource/19466

The 2013 Rim Fire was the third largest wildfire in California history and burned 257 314 acres in the Sierra Nevada Mountains. We evaluated air-quality impacts of PM2.5 from smoke from the Rim Fire on receptor areas in California and Nevada. We employed two approaches to examine the air-quality impacts: (1) an evaluation of PM2....

Author(s): Kathleen M. Navarro, Ricardo Cisneros, Susan M. O'Neill, Narasimhan K. Larkin, Don Schweizer, John R. Balmes
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Emissions from prescribed burning of timber slash piles in Oregon

www.nrfirescience.org/resource/14886

Emissions from burning piles of post-harvest timber slash (Douglas-fir) in Grande Ronde, Oregon were sampled using an instrument platform lofted into the plume using a tether-controlled aerostat or balloon. Emissions of carbon monoxide, carbon dioxide, methane, particulate matter (PM2.5), black carbon, ultraviolet absorbing PM,...
Author(s): Johanna Aurell, Brian K. Gullett, Dennis Tabor, Nick Yonker
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Non-deforestation fire vs. fossil fuel combustion: the source of CO2 emissions affects the global carbon cycle and climate responses

www.nrfirescience.org/resource/14328

Non-deforestation fire – i.e., fire that is typically followed by the recovery of natural vegetation – is arguably the most influential disturbance in terrestrial ecosystems, thereby playing a major role in carbon exchanges and affecting many climatic processes. The radiative effect from a given atmospheric CO2 perturbation is...
Author(s): Jean-Sebastien Landry, H. Damon Matthews
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Modeling study of the contribution of fire emissions on BC concentrations and deposition rates

www.nrfirescience.org/resource/15578

Regional air quality simulations were performed to evaluate the contributions of wildland fires to inter-annual variability of black carbon (BC) concentrations and to assess the contributions of wildfires vs. prescribed fires to BC concentrations and deposition rates to glacier areas and snow-covered surfaces in the western US....
Author(s): Serena H. Chung, Brian K. Lamb, Farren Herron-Thorpe, Rodrigo Gonzalez-Abraham, Vikram Ravi, Tsengel Nergui, Joseph K. Vaughan, Narasimhan K. Larkin, Tara Strand
Year Published: 2015
Type: Document
Technical Report or White Paper

A case study comparison of LANDFIRE fuel loading and emissions on a mixed conifer forest in northern Idaho, USA

www.nrfirescience.org/resource/13750

The use of fire as a land management tool is well recognized for its ecological benefits in many natural systems. To continue to use fire while complying with air quality regulations, land managers are often tasked with modeling emissions from fire during the planning process. To populate such models, the Landscape Fire...
Author(s): Joshua C. Hyde, Eva K. Strand, Andrew T. Hudak, Dale Hamilton
Year Published: 2015
Type: Document

Six basic smoke management practices for prescribed burning

www.nrfirescience.org/resource/12384

Smoke management has become one of the leading challenges facing prescribed fire practitioners in the Southeast and the continued use of prescribed fire in the region may depend on effective smoke and emission mitigation practices. While not a comprehensive list of smoke management strategies, the 2011 USFS-NRCS guide to Basic Smoke...

Author(s): David R. Godwin, Alan J. Long, Peter Lahm

Year Published: 2014

Type: Document

Research Brief or Fact Sheet

Impacts of mega-fires on large U.S. urban area air quality under changing climate and fuels

www.nrfirescience.org/resource/15569

Mega-fires can adversely impact air quality in the United States and the impacts are likely to become more serious in the future due to the possibility of more frequent and intense mega-fires in response to the projected climate change. This study investigated U.S. mega-fires and fuel conditions and their environmental impacts under...

Author(s): Yongqiang Liu, Scott L. Goodrick, John A. Stanturf, Hanqin Tian

Year Published: 2014

Type: Document

Technical Report or White Paper

Gas-particle partitioning of primary organic aerosol emissions: 3. Biomass burning

www.nrfirescience.org/resource/13476

Atmospheric organic aerosol concentrations depend in part on the gas-particle partitioning of primary organic aerosol (POA) emissions. Consequently, heating and dilution were used to investigate the volatility of biomass-burning smoke particles from combustion of common North American trees/shrubs/grasses during the third Fire Lab...

Author(s): Andrew A. May, Ezra Levin, Christopher J. Hennigan, Ilona Riipinen, Taehyoung Lee, Jeffrey L. Collett, Jose L. Jimenez, Sonia M. Kreidenweis, Allen L. Robinson

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

The merits of prescribed fire outweigh potential carbon emission effects

www.nrfirescience.org/resource/12426

While North American ecosystems vary widely in their ecology and natural historical fire regimes, they are unified in benefitting from prescribed fire when judiciously applied with the goal of maintaining and restoring native ecosystem composition, structure, and function. On a modern landscape in which historical fire regimes...

Author(s): Association for Fire Ecology, International Association of Wildland Fire, Tall Timbers Research Station, The Nature Conservancy

Year Published: 2013

Type: Document

Technical Report or White Paper

Fuel moisture influences on fire-altered carbon in masticated fuels: an experimental study

www.nrfirescience.org/resource/12021

Biomass burning is a significant contributor to atmospheric carbon emissions, but may also provide an avenue in which fire-affected ecosystems can accumulate carbon over time, through the generation of highly resistant fire-altered carbon. Identifying how fuel moisture, and subsequent changes in the fire behavior, relates to the...
Author(s): Nolan W. Brewer, Alistair M. S. Smith, Jeff A. Hatten, Philip E. Higuera, Andrew T. Hudak, Roger D. Ottmar, Wade T. Tinkham
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Combustion efficiency and emission factors for wildfire-season fires in mixed conifer forests of the northern Rocky Mountains, US

www.nrfirescience.org/resource/13481

In the US, wildfires and prescribed burning present significant challenges to air regulatory agencies attempting to achieve and maintain compliance with air quality regulations. Fire emission factors (EF) are essential input for the emission models used to develop wildland fire emission inventories. Most previous studies quantifying...
Author(s): Shawn P. Urbanski
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Climate and vegetation influences on fire impacts in Alaskan boreal forest: implications for carbon and fire management

www.nrfirescience.org/resource/15688

Boreal forest fires are an important source of terrestrial carbon emissions, particularly during years of widespread wildfires. Most carbon emission models parameterize wildfire impacts and carbon flux to area burned by fires, therein making the assumption that fires consume a spatiotemporally homogeneous landscape composed of...
Author(s): Crystal A. Kolden, John T. Abatzoglou
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Emissions of air pollutants by Canadian wildfires from 2000 to 2004

www.nrfirescience.org/resource/14707

A wildfire emission model, based on the Canadian Forest Fire Behaviour Prediction System and the Canadian weather forecast Global Environmental Multiscale model, was applied to forest fires that occurred in Canada between 2000 and 2004. Emissions of 21 chemical species and injection heights were calculated hourly for a regular 0.4...
Author(s): David Lavoue, Brian J. Stocks
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

The wildland fire emission inventory: western United States emission estimates and an evaluation of uncertainty

www.nrfirescience.org/resource/8356

Biomass burning emission inventories serve as critical input for atmospheric chemical transport models that are used to understand the role of biomass fires in the chemical composition of the atmosphere, air quality, and the climate system. Significant progress has been achieved in the development of regional

and global biomass...
Author(s): Shawn P. Urbanski, Wei Min Hao, Bryce L. Nordgren
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

Prescribed fire as a means of reducing forest carbon emissions in the western United States

www.nrfirescience.org/resource/8328

Carbon sequestration by forested ecosystems offers a potential climate change mitigation benefit. However, wildfire has the potential to reverse this benefit. In the western United States, climate change and land management practices have led to increases in wildfire intensity and size. One potential means of reducing carbon...
Author(s): Christine Wiedinmyer, Matthew D. Hurteau
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

The validity and utility of MODIS data for simple estimation of area burned and aerosols emitted by wildfire events

www.nrfirescience.org/resource/8371

Wildfire emissions are challenging to measure and model, but simple and realistic estimates can benefit multiple disciplines. We evaluate the potential of MODIS (Moderate Resolution Imaging Spectroradiometer) data to address this objective. A total of 11,004 fire pixels detected over 92 days were clustered into 242 discrete fire...
Author(s): Sarah B. Henderson, Charles Ichoku, Benjamin J. Burkholder, Michael Brauer, Peter L. Jackson
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

A MODIS direct broadcast algorithm for mapping wildfire burned area in the western United States

www.nrfirescience.org/resource/8191

Improved wildland fire emission inventory methods are needed to support air quality forecasting and guide the development of air shed management strategies. Air quality forecasting requires dynamic fire emission estimates that are generated in a timely manner to support real-time operations. In the regulatory and planning realm,...
Author(s): Shawn P. Urbanski, J. Meghan Salmon, Bryce L. Nordgren, Wei Min Hao
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

Filling in the blanks for prescribed fire in shrublands: developing information to support improved fire planning

www.nrfirescience.org/resource/11086

By collecting information on fuel loading, fuel consumption, fuel moisture, site conditions and fire weather on fires in a variety of shrubland types, researchers are developing a fuller knowledge of shrubland fire effects. Results are being integrated into the software package CONSUME, a user-friendly software tool for predicting...
Author(s): Jake Delwiche
Year Published: 2009

Type: Document
Research Brief or Fact Sheet

A comparison of smoke emissions from prescribed burns and wildfires

This thesis describes a means of comparing the potential smoke impacts from prescribed burning versus the possible smoke impacts of a wildfire as if it had occurred in the same given area. The methodology of evaluating these impacts is based on the results of available computer models designed for determining smoke production and...

Author(s): David Frisbey

Year Published: 2008

Type: Document

Dissertation or Thesis

Real time monitoring of the three dimensional distribution of smoke aerosol levels from prescribed fires and wildfires - Final Report to the Joint Fire Science Program

Particulates emitted by wildfires and prescribed fires can severely affect visibility and air quality resulting in car accidents, airport and road closures, and public health problems. Researchers have developed a new remote-sensing instrument (lidar) and are now calibrating and testing this and auxiliary instrumentation and new...

Author(s): Wei Min Hao, Vladimir A. Kovalev

Year Published: 2008

Type: Document

Technical Report or White Paper

Automated forecasting of smoke dispersion and air quality using NASA terra and aqua satellite data (Task 5) - Final Report to the Joint Fire Science Program

This document contains a description of the air quality forecasting system in operation at the Missoula Fire Science Laboratory. This air quality forecasting system has been steadily assimilating new techniques and algorithms as they have been developed over the past four years. Individual components as well as assemblies of...

Author(s): Wei Min Hao, Shawn P. Urbanski

Year Published: 2005

Type: Document

Technical Report or White Paper

Near real-time emissions of trace gases and aerosol particles from biomass burning based on MODIS direct broadcast data

Biomass burning is an important source of many atmospheric trace gases and aerosol particles. Quantitative characterization of biomass burning emissions is critical for modeling atmospheric chemistry and assessing the impact of fires on air quality, tropospheric ozone chemistry, and global climate. However, advancement in...

Author(s): Wei Min Hao, J. Meghan Salmon, Bryce L. Nordgren, Shawn P. Urbanski

Year Published: 2005

Type: Document

Conference Proceedings

Smoke produced from residual combustion

Considerable research has been carried out to estimate the chemical composition and the amount of trace gases and particulate matter emitted during short-duration flaming and smoldering combustion of fuels in the fire-prone forest and grassland ecosystems. For other forest ecosystems, where long-duration residual smoldering...

Author(s): Ronald E. Babbitt, Wei Min Hao

Year Published: 2004

Type: Document

Technical Report or White Paper

Using a MODIS direct broadcast system to monitor fires and smoke, and forecast air quality

The MODIS instrument on the NASA Terra satellite has been conducting routine global measurements of active fires and aerosol optical depths since late 2000. Currently, it takes more than 4 days to acquire MODIS data from the NASA DAAC Center, making it difficult to use the results to understand air quality and the extent of fire and...

Author(s): Wei Min Hao, Yoram J. Kaufman, Jacques Descloitres, Christopher O. Justice, Robert Sohlberg, Thomas Bobbe

Year Published: 2002

Type: Document

Conference Proceedings

Wildland fire in ecosystems: effects of fire on air

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;...

Author(s): David V. Sandberg, Roger D. Ottmar, Janice L. Peterson, John Core

Year Published: 2002

Type: Document

Technical Report or White Paper

Real-time smoke particulate sampling; fire storm 2000

Reports the findings of a study comparing the results of instruments measuring smoke particulate in real time to gravimetric samplers in Missoula and Hamilton, Montana, during the summer of 2000. Real-time, particulate monitoring instruments were evaluated to determine their accuracy when measuring smoke particulate concentrations...

Author(s): Andy Trent, Mary A. Davies, Richard Karsky, Richard W. Fisher

Year Published: 2001

Type: Document

Technical Report or White Paper

Open-path Fourier transform infrared studies of large-scale laboratory biomass fires

A series of nine large-scale, open fires was conducted in the Intermountain Fire Sciences Laboratory (IFSL) controlled-environment combustion facility. The fuels were pure pine needles or sagebrush or mixed fuels simulating forest-floor, ground fires; crown fires; broadcast burns; and slash pile burns. Mid-infrared spectra of the...

Author(s): Robert J. Yokelson, David W. T. Griffith, Darold E. Ward
Year Published: 1996
Type: Document
Book or Chapter or Journal Article

Comparisons of particulate-emissions and smoke impacts from presettlement, full suppression, and prescribed natural fire period in the Selway-Bitterroot Wilderness

www.nrfirescience.org/resource/8216

Total particulate matter (PM) emissions were estimated for recent fires (1979-1990) and the presettlement period (prior to 1935) in the Selway-Bitterroot Wilderness (SBW) in Idaho and Montana. Recent period emissions were calculated by 10-day periods for surface fire and crown fire based on estimates of percentage fuel consumption...
Author(s): James K. Brown, Larry S. Bradshaw
Year Published: 1994
Type: Document
Book or Chapter or Journal Article

Hydrocarbon and biomass fuel fire field tests

www.nrfirescience.org/resource/11021

Biomass and hydrocarbon fuel fires are two common sources of obscuring smoke which present significant operational challenges over a broad range of possible viewing wavelengths. This is especially true of very large fires where the primary smoke particles (approx. 0.1-0.3 um diameter) obscure vision by both scattering and absorption...
Author(s): Lawrence F. Radke, Dean A. Hegg, J. David Nance, Jaime H. Lyons, Krista K. Laursen, R. J. Ferek, Peter V. Hobbs, Raymond E. Weiss
Year Published: 1990
Type: Document
Conference Proceedings

Airborne measurements on smokes from biomass burning

www.nrfirescience.org/resource/8384

Airborne measurements have been made in the smokes from large fires of standing coniferous trees and logging debris, standing chaparral, fallen jack pine, and wheat stubble. Panicle emission factors, particle size distributions, optical properties of the smokes, and trace gas concentrations in the emissions are derived from the...
Author(s): Lawrence F. Radke, Dean A. Hegg, Jaime H. Lyons, Charles A. Brock, Peter V. Hobbs, Raymond E. Weiss, Rei A. Rasmussen
Year Published: 1988
Type: Document
Book or Chapter or Journal Article

Ammonia emissions from biomass burning

www.nrfirescience.org/resource/8302

Measurements in the plumes from seven forest fires show that the concentrations of NH3 were considerably in excess of ambient values. Calculation of NH3 emissions from the fires, based on the ratio of NH3/CO in the plumes and emissions of CO from biomass burning, suggest that biomass burning may be a significant source of...
Author(s): Dean A. Hegg, Lawrence F. Radke, Peter V. Hobbs, Philip J. Riggan
Year Published: 1988
Type: Document
Book or Chapter or Journal Article