

Fire weather drives daily area burned and observations of fire behavior in mountain pine beetle affected landscapes

www.nrfirescience.org/resource/21279

In the western United States, mountain pine beetles (MPBs) have caused tree mortality across 7% of the forested area over the past three decades, leading to concerns of increased fire activity in MPB-affected landscapes. While fire behavior modeling suggests MPB-associated changes in fuels may influence fire behavior, retrospective...

Author(s): Sarah J. Hart, Daniel L. Preston

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Evaluation of Global Fire Weather Database reanalysis and short-term forecast products

www.nrfirescience.org/resource/21175

Daily Fire Weather Index (FWI) System components calculated from the NASA Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2), are compared to FWI calculations from a global network of weather stations over 2004–2018, and short-term, experimental (8 d) daily FWI forecasts are evaluated for their...

Author(s): Robert Field

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Anthropogenic and lightning-started fires are becoming larger and more frequent over a longer season length in the U.S.A.

www.nrfirescience.org/resource/21088

Aim: Over the past several decades, wildfires have become larger, more frequent, and/or more severe in many areas. Simultaneously, anthropogenic ignitions are steadily growing. We have little understanding of how increasing anthropogenic ignitions are changing modern fire regimes. Location: Conterminous United States. Time period...

Author(s): Megan E. Cattau, Carol A. Wessman, Adam L. Mahood, Jennifer Balch

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Synoptic weather patterns for large wildfires in the northwestern United States-a climatological analysis using three classification methods

www.nrfirescience.org/resource/21812

Wildfire regimes respond to atmospheric variability on multiple time scales from interannual variations of drought to daily fluctuations of humidity and wind. Synoptic weather patterns effectively link both short- and long-term atmospheric variability, and thus, understanding fire-prone synoptic patterns is an integral part of fire...

Author(s): Shiyuan Zhong, Lejiang Yu, Warren Heilman, Xindi Bian, Hannah Fromm

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Reducing wooden structure and wildland-urban interface fire disaster risk through dynamic risk assessment and management

www.nrfirescience.org/resource/20965

In recent years, severe and deadly wildland-urban interface (WUI) fires have resulted in an increased

focus on this particular risk to humans and property, especially in Canada, USA, Australia, and countries in the Mediterranean area. Also, in areas not previously accustomed to wildfires, such as boreal areas in Sweden, Norway, and...

Author(s): Torgrim Log, Vigdis Vandvik, Liv G. Velle, Maria-Monika Metallinou

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Fire and rain are one: extreme rainfall events predict wildfire extent in an arid grassland

www.nrfirescience.org/resource/21749

Assessing wildfire regimes and their environmental drivers is critical for effective land management and conservation. We used Landsat imagery to describe the wildfire regime of the north-eastern Simpson Desert (Australia) between 1972 and 2014, and to quantify the relationship between wildfire extent and rainfall. Wildfires...

Author(s): Elise M. Verhoeven, Brad R. Murray, Christopher R. Dickman, Glenda M. Wardle, Aaron C. Greenville

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Flash Characteristics and Precipitation Metrics of Western U.S. Lightning-Initiated Wildfires from 2017

www.nrfirescience.org/resource/20795

This study examines 95 lightning-initiated wildfires and 1170 lightning flashes in the western United States between May and October 2017 to characterize lightning and precipitation rates and totals near the time of ignition. Eighty-nine percent of the wildfires examined were initiated by negative cloud-to-ground (CG) lightning...

Author(s): Brittany R. MacNamara, Christopher J. Schultz, Henry E. Fuelberg

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Linking forest flammability and plant vulnerability to drought

www.nrfirescience.org/resource/21684

Globally, fire regimes are being altered by changing climatic conditions. New fire regimes have the potential to drive species extinctions and cause ecosystem state changes, with a range of consequences for ecosystem services. Despite the co-occurrence of forest fires with drought, current approaches to modelling flammability...

Author(s): Rachael H. Nolan, Chris J. Blackman, Víctor Resco de Dios, Brendan Choat, Belinda Medlyn, Ximeng Li, Ross A. Bradstock, Matthias M. Boer

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Earlier fall precipitation and low severity fire impacts on cheatgrass and sagebrush establishment

www.nrfirescience.org/resource/20672

In arid and semiarid ecosystems, invasion by exotic grasses may be driving state changes in vegetation defined by losses of native shrub communities. Changes in wildfire regimes and fall precipitation timing related to climate change may promote fluctuations in resource availability that reinforces invasion and state changes in...

Author(s): Tara B. B. Bishop, Baylie C. Nusink, Rebecca Lee Molinari, Justin B. Taylor, Samuel B. St. Clair
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Meteorological Profiling in the Fire Environment Using UAS

www.nrfirescience.org/resource/21614

With the increase in commercially available small unmanned aircraft systems (UAS), new observations in extreme environments are becoming more obtainable. One such application is the fire environment, wherein measuring both fire and atmospheric properties are challenging. The Fire and Smoke Model Evaluation Experiment offered the...

Author(s): Matthew J. Brewer, Craig B. Clements
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Exploring fire response to high wind speeds: fire rate of spread, energy release and flame residence time from fires burned in pine needle beds under winds up to 27 m s⁻¹

www.nrfirescience.org/resource/20664

The relationship between wildland fire spread rate and wind has been a topic of study for over a century, but few laboratory studies report measurements in controlled winds exceeding 5 m s⁻¹. In this study, measurements of fire rate of spread, flame residence time and energy release are reported for fires burning under...

Author(s): Bret W. Butler, Steve Quarles, Christine Standohar-Alfano, Murray Morrison, Daniel M. Jimenez, Paul Sopko, Cyle E. Wold, Larry S. Bradshaw, Loren Atwood, Justin Landon, Joseph J. O'Brien, Benjamin Hornsby, Natalie S. Wagenbrenner, Wesley G. Page
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Seasonality and trends in human- and lightning-caused wildfires ? 2 ha in Canada, 1959-2018

www.nrfirescience.org/resource/21477

We examined the seasonal distribution of lightning- and human-caused wildfires ? 2 ha in Canada for two time periods: 1959-2018 and 1981-2018. Furthermore, we investigated trends in seasonality, number of fires per year and number of days with fire starts per year for human- and lightning-caused fires. Nationally, lightning...

Author(s): Sean C. P. Coogan, Xinli Cai, Piyush Jain, Michael D. Flannigan
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

The Hot-Dry-Windy Index: A new tool for forecasting fire weather

www.nrfirescience.org/resource/21180

Accurate predictions of how weather may affect a wildfire's behavior are needed to protect crews on the line and efficiently allocate firefighting resources. Since 1988, fire meteorologists have used a tool called the Haines Index to predict days when the weather will exacerbate a wildfire. Although the Haines Index is widely...

Author(s): Andrea Watts, Brian E. Potter, Joseph J. Charney, Alan F. Srock
Year Published: 2020
Type: Document

LES simulation of terrain slope effects on wind enhancement by a point source fire

www.nrfirescience.org/resource/21102

Fire-driven flows associated with wind intervention can dangerously threaten buildings in bushfire-prone areas by increasing pressure load on the structures through fire-wind enhancement phenomenon. This phenomenon through which wind is enhanced by interacting with fire is exacerbated when the affected terrain is located in a...

Author(s): Esmaeel Eftekharian, Maria Rashidi, Maryam Ghodrat, Yaping He, Kenny C.S. Kwok

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Interaction of wind and cold-season hydrologic processes on erosion from complex topography following wildfire in sagebrush steppe

www.nrfirescience.org/resource/20983

Wildfire is a natural component of sagebrush (*Artemisia* spp.) steppe rangelands that induces temporal shifts in plant community physiognomy, ground surface conditions, and erosion rates. Fire alteration of the vegetation structure and ground cover in these ecosystems commonly amplifies soil losses by wind? and water?driven...

Author(s): Samantha P. Vega, C. Jason Williams, Erin S. Brooks, Frederick B. Pierson, Eva K. Strand, Peter R. Robichaud, Robert E. Brown, Mark S. Seyfried, Kathleen A. Lohse, Kayla Glossner, Jennifer L. Pierce, Clay Roehner

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Wildfire and drought moderate the spatial elements of tree mortality

www.nrfirescience.org/resource/21762

Background tree mortality is a complex process that requires large sample sizes and long timescales to disentangle the suite of ecological factors that collectively contribute to tree stress, decline, and eventual mortality. Tree mortality associated with acute disturbance events, in contrast, is conspicuous and frequently studied,...

Author(s): Tucker J. Furniss, Andrew J. Larson, Van R. Kane, James A. Lutz

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Weather, Risk, and Resource Orders on Large Wildland Fires in the Western US

www.nrfirescience.org/resource/20807

Research Highlights: Our results suggest that weather is a primary driver of resource orders over the course of extended attack efforts on large fires. Incident Management Teams (IMTs) synthesize information about weather, fuels, and order resources based on expected fire growth rather than simply reacting to observed fire growth....

Author(s): Jude Bayham, Erin J. Belval, Matthew P. Thompson, Christopher J. Dunn, Crystal S. Stonesifer, David E. Calkin

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Use of NWP models to identify convective outflows for fire weather forecasting - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/20784

Abrupt changes in wind direction and speed can dramatically impact wildfire development and spread. Most importantly, such changes can pose significant problems to firefighting efforts and have resulted in a number of fire fatalities over the years. Frequent causes of such wind shifts are thunderstorm and convective system outflows...

Author(s): Jordan G. Powers, Jim Bresch, Craig S. Schwartz, Janice L. Coen, Ryan A. Sobash

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Evaluating the Ability of FARSITE to Simulate Wildfires Influenced by Extreme, Downslope Winds in Santa Barbara, California

www.nrfirescience.org/resource/21619

Extreme, downslope mountain winds often generate dangerous wildfire conditions. We used the wildfire spread model Fire Area Simulator (FARSITE) to simulate two wildfires influenced by strong wind events in Santa Barbara, CA. High spatial-resolution imagery for fuel maps and hourly wind downscaled to 100 m were used as model inputs,...

Author(s): Katelyn Zigner, Leila M. V. Carvalho, Seth H. Peterson, Francis M. Fujioka, Gert-Jan Duine, Charles Jones, Dar A. Roberts, Max A. Moritz

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Post-fire aspen (*Populus tremuloides*) regeneration varies in response to winter precipitation across a regional climate gradient

www.nrfirescience.org/resource/20665

Altered climate and changing fire regimes are synergistically impacting forest communities globally, resulting in deviations from historical norms and creation of novel successional dynamics. These changes are particularly important when considering the stability of a keystone species such as quaking aspen (*Populus tremuloides* Michx...

Author(s): Susan K. McIlroy, Douglas J. Shinneman

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Wildfire decision support tools: an exploratory study of use in the United States

www.nrfirescience.org/resource/21587

In the United States, many decision support tools exist to provide fire managers with weather and fire behaviour information to inform and facilitate risk-based decision-making. Relatively little is known about how managers use these tools in the field and when and how they may serve to influence decisions. To address this gap, we...

Author(s): Claire Rapp, Emily Rabung, Robyn S. Wilson, Eric L. Toman

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Net precipitation in burned and unburned subalpine forest stands after wildfire in the northern Rocky Mountains

www.nrfirescience.org/resource/20283

Wildfire can exert considerable influence on many watershed processes, including the partitioning of precipitation by forest canopies. Despite general acknowledgement that canopy interception is reduced following wildfire, effects on net rainfall and snow accumulation have not been quantified. The objectives of this study were to...

Author(s): Chris H. S. Williams, Uldis Silins, Sheena A. Spencer, Michael J. Wagner, Micheal Stone, Monica B. Emelko

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Development and Evaluation of a Reynolds-Averaged Navier-Stokes Solver in WindNinja for Operational Wildland Fire Applications

www.nrfirescience.org/resource/20085

An open source computational fluid dynamics (CFD) solver has been incorporated into the WindNinja modeling framework widely used by wildland fire managers as well as researchers and practitioners in other fields, such as wind energy, wind erosion, and search and rescue. Here we describe incorporation of the CFD solver and evaluate...

Author(s): Natalie S. Wagenbrenner, Jason M. Forthofer, Wesley G. Page, Bret W. Butler

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Future changes in fire weather, spring droughts, and false springs across U.S. National Forests and Grasslands

www.nrfirescience.org/resource/19880

Public lands provide many ecosystem services and support diverse plant and animal communities. In order to provide these benefits in the future, land managers and policy makers need information about future climate change and its potential effects. In particular, weather extremes are key drivers of wildfires, droughts, and false...

Author(s): Sebastian Martinuzzi, Andrew J. Allstadt, Anna M. Pidgeon, Curtis H. Flather, William Matt Jolly, Volker C. Radeloff

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Calculation of critical water flow rates for wildfire suppression

www.nrfirescience.org/resource/19381

Predicting water suppression requirements and its impacts on firefighting strategies and logistics within the urban environment has been the subject of many previous studies, however the same level of research has yet to be applied in the realm of wildfire suppression. To work towards addressing this knowledge gap, this paper...

Author(s): Greg Penney, Daryoush Habibi, Marcus Cattani, Murray Carter

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Interactions between wind and fire disturbance in forests: Competing amplifying and buffering effects

www.nrfirescience.org/resource/19280

Many studies of ecological disturbance highlight the unexpected impact that compounded disturbances have on communities. One of the well-studied mechanisms by which forest wind and fire disturbances

interact is that wind damage increases flammable fuels-amplifying the effects of fire-leading to unexpected changes in vegetation...

Author(s): Jeffery B. Cannon, Suzanne K. Henderson, Michael H. Bailey, Chris J. Peterson

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

On the merits of sparse surrogates for global sensitivity analysis of multi-scale nonlinear problems: application to turbulence and fire-spotting model in wildland fire simulators

www.nrfirescience.org/resource/19162

Many nonlinear phenomena, whose numerical simulation is not straightforward, depend on a set of parameters in a way which is not easy to predict beforehand. Wildland fires in presence of strong winds fall into this category, also due to the occurrence of firespotting. We present a global sensitivity analysis of a new sub-model for...

Author(s): Andrea Trucchia, Vera N. Egorova, Gianni Pagnini, M. C. Rochoux

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Wildfire refugia in forests: severe fire weather and drought mute the influence of topography and fuel age

www.nrfirescience.org/resource/20433

Wildfire refugia (unburnt patches within large wildfires) are important for the persistence of fire-sensitive species across forested landscapes globally. A key challenge is to identify the factors that determine the distribution of fire refugia across space and time. In particular, determining the relative influence of climatic...

Author(s): Luke Collins, Andrew F. Bennett, Steven W.J. Leonard, Trent D. Penman

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Post-fire forest regeneration shows limited climate tracking and potential for drought-induced type conversion

www.nrfirescience.org/resource/19037

Disturbance such as wildfire may create opportunities for plant communities to reorganize in response to climate change. The interaction between climate change and disturbance may be particularly important in forests, where many of the foundational plant species (trees) are long-lived and where poor initial tree establishment can...

Author(s): Derek J. N. Young, Chhaya M. Werner, Kevin R. Welch, Truman P. Young, Hugh Safford, Andrew Latimer

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

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

www.nrfirescience.org/resource/20164

Most of the previous investigations on the relationship between PM_{2.5} 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

Impacts of growing-season climate on tree growth and post-fire regeneration in ponderosa pine and Douglas-fir forests

www.nrfirescience.org/resource/19945

We studied the impacts of climate variability on low-elevation forests in the U.S. northern Rocky Mountains by quantifying how post-fire tree regeneration and radial growth varied with growing-season climate. We reconstructed post-fire regeneration and radial growth rates of *Pinus ponderosa* and *Pseudotsuga menziesii* at 33...

Author(s): Lacey Hankin, Philip E. Higuera, Kimberley T. Davis, Solomon Z. Dobrowski

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

Season of fire influences seed dispersal by wind in a serotinous obligate seeding tree

www.nrfirescience.org/resource/19343

In temperate ecosystems, fire management involving prescribed burning and wildfire suppression often causes a shift in fire season from hot and dry summer conditions to cooler, moister conditions in spring or autumn. The effects of this change on seed dispersal by wind after fire are unknown. However, calmer wind conditions and...

Author(s): Bianca Dunker, C. Michael Bull, David A. Keith, Don A. Driscoll

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Spatial, Temporal and Electrical Characteristics of Lightning in Reported Lightning-Initiated Wildfire Events

www.nrfirescience.org/resource/19294

Analysis was performed to determine whether a lightning flash could be associated with every reported lightning-initiated wildfire that grew to at least 4 km². In total, 905 lightning-initiated wildfires within the Continental United States (CONUS) between 2012 and 2015 were analyzed. Fixed and fire radius search methods showed that...

Author(s): Christopher J. Schultz, Nicholas J. Nauslar, J. Brent Wachter, Christopher R. Hain, Jordan R. Bell

Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Wildfire detection and communication-aerospace applications-trade study

www.nrfirescience.org/resource/19177

Wildfires have increased in frequency, duration, and intensity worldwide. Climate change, drought, and other factors have not only increased susceptibility to wildfires, but have also increased the duration of the season. There are a number of factors affecting wildfires: detection, speed of communication/response time, resources/...

Author(s): Setrige W. Crawford, Kamran Eftekhari Shahroudi

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Origins of abrupt change? Postfire subalpine conifer regeneration declines nonlinearly with warming and drying

www.nrfirescience.org/resource/19044

Robust tree regeneration following high-severity wildfire is key to the resilience of subalpine and boreal forests, and 21st century climate could initiate abrupt change in forests if postfire temperature and soil moisture become less suitable for tree seedling establishment. Using two widespread conifer species, lodgepole pine (...)

Author(s): Winslow D. Hansen, Monica G. Turner

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

The Hot-Dry-Windy Index: A New Fire Weather Index

www.nrfirescience.org/resource/18025

Fire weather indices are commonly used by fire weather forecasters to predict when weather conditions will make a wildland fire difficult to manage. Complex interactions at multiple scales between fire, fuels, topography, and weather make these predictions extremely difficult. We define a new fire weather index called the Hot-Dry-...

Author(s): Alan F. Srock, Joseph J. Charney, Brian E. Potter, Scott L. Goodrick

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Interpolation framework to speed up near-surface wind simulations for data-driven wildfire applications

www.nrfirescience.org/resource/17889

Local wind fields that account for topographic interaction are a key element for any wildfire spread simulator. Currently available tools to generate near-surface winds with acceptable accuracy do not meet the tight time constraints required for data-driven applications. This article presents the specific problem of data-driven...

Author(s): O. Rios, W. Jahn, Elsa Pastor, M.M. Valero, E. Planas

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

U.S. Geological Survey Sage-Grouse and Sagebrush Ecosystem Research Annual Report for 2018

www.nrfirescience.org/resource/21258

The sagebrush (*Artemisia* spp.) ecosystem extends across a large portion of the Western United States, and the greater sage-grouse (*Centrocercus urophasianus*) is one of the iconic species of this ecosystem. Greater sage-grouse populations occur in 11 States and are dependent on relatively large expanses of sagebrush-dominated habitat...

Author(s): Steven E. Hanser

Year Published: 2018

Type: Document

Technical Report or White Paper

Data Descriptor: TerraClimate, a high-resolution global dataset of monthly climate and climatic water balance from 1958-2015

www.nrfirescience.org/resource/17794

We present TerraClimate, a dataset of high-spatial resolution ($1/24^\circ$, ~4-km) monthly climate and climatic water balance for global terrestrial surfaces from 1958–2015. TerraClimate uses climatically aided interpolation, combining high-spatial resolution climatological normals from the WorldClim dataset, with coarser resolution...

Author(s): John T. Abatzoglou, Solomon Z. Dobrowski, Sean A. Parks, Katherine C. Hegewisch

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Human influences superseded climate to disrupt the 20th century fire regime in Jasper National Park, Canada

www.nrfirescience.org/resource/18402

To enhance understanding of how climate and humans influenced historical fire occurrence in the montane forests of Jasper National Park, we crossdated fire-scar and tree age samples from 172 plots. We tested effects of drought and climatic variation driven by the El Niño-Southern Oscillation (ENSO) and Pacific North American (PNA)...

Author(s): Raphael D. Chavardes, Lori D. Daniels, Ze'ev Gedalof, David W. Anderson

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Some Requirements for Simulating Wildland Fire Behavior Using Insight from Coupled Weather—Wildland Fire Models

www.nrfirescience.org/resource/17610

A newer generation of models that interactively couple the atmosphere with fire behavior have shown an increased potential to understand and predict complex, rapidly changing fire behavior. This is possible if they capture intricate, time-varying microscale airflows in mountainous terrain and fire-atmosphere feedbacks. However, this...

Author(s): Janice L. Coen

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

The weather conditions for desired smoke plumes at a FASMEE burn site

www.nrfirescience.org/resource/18365

Weather is an important factor that determines smoke development, which is essential information for

planning smoke field measurements. This study identifies the synoptic systems that would favor to produce the desired smoke plumes for the Fire and Smoke Model Evaluation Experiment (FASMEE). Daysmoke and PB-Piedmont (PB-P) models...

Author(s): Yongqiang Liu, Scott L. Goodrick, Gary Achtemeier

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Biological and geophysical feedbacks with fire in the Earth system

www.nrfirescience.org/resource/17407

Roughly 3% of the Earth's land surface burns annually, representing a critical exchange of energy and matter between the land and atmosphere via combustion. Fires range from slow smouldering peat fires, to low-intensity surface fires, to intense crown fires, depending on vegetation structure, fuel moisture, prevailing climate, and...

Author(s): Sally Archibald, Caroline E. R. Lehmann, Claire M. Belcher, William J. Bond, Ross A.

Bradstock, Anne Laure Daniau, K. G. Dexter, Elisabeth J. Forrestel, M. Greve, Tianhua He, Steven I.

Higgins, William A. Hoffmann, Byron B. Lamont, D. J. McGlenn, G. R. Moncrieff, Colin P. Osborne, Juli

G. Pausas, Owen F. Price, Brad S. Ripley, Brendan M. Rogers, Dylan W. Schwilk, M. F. Simon, Merritt

R. Turetsky, Guido R. Van der Werf, Amy E. Zanne

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

An evaluation of NDFD weather forecasts for wildland fire behavior prediction

www.nrfirescience.org/resource/18326

Wildland fire managers in the United States currently utilize the gridded forecasts from the National Digital Forecast Database (NDFD) to make fire behavior predictions across complex landscapes during large wildfires. However, little is known about the NDFDs performance in remote locations with complex topography for weather...

Author(s): Wesley G. Page, Natalie S. Wagenbrenner, Bret W. Butler, Jason M. Forthofer, Chris Gibson

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Tree water balance drives temperate forest responses to drought

www.nrfirescience.org/resource/18273

Intensifying drought is increasingly linked to global forest diebacks. Improved understanding of drought impacts on individual trees has provided limited insight into drought vulnerability in part because tree moisture access and depletion is difficult to quantify. In forests, moisture reservoir depletion occurs through water use by...

Author(s): A. B. Berdanier, J. S. Clark

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

How do weather and terrain contribute to firefighter entrapments in Australia?

www.nrfirescience.org/resource/17122

Adverse weather conditions and topographic influences are suspected to be responsible for most entrapments of firefighters in Australia. A lack of temporally and spatially coherent set of data however, hinders a clear understanding of the contribution of each weather type or terrain driver on these events. We investigate coronial...

Author(s): Sébastien Lahaye, J. Sharples, Stuart Matthews, Simon Heemstra, Owen F. Price, Rachel Badlan
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Decreasing fire season precipitation increased recent western US forest wildfire activity

www.nrfirescience.org/resource/18161

Western United States wildfire increases have been generally attributed to warming temperatures, either through effects on winter snowpack or summer evaporation. However, near-surface air temperature and evaporative demand are strongly influenced by moisture availability and these interactions and their role in regulating fire...

Author(s): Zachary A. Holden, Alan Swanson, Charles H. Luce, William Matt Jolly, Marco Maneta, Jared W. Oyster, Dyer A. Warren, Russell A. Parsons, David L.R. Affleck
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

The Haines Index – it's time to revise it or replace it

www.nrfirescience.org/resource/18014

The Haines Index is used in wildland fire management to evaluate the potential for 'large and/or erratic' fire behaviour. Published in 1988 as the Lower Atmospheric Severity Index, it was widely adopted and has become popular among fire managers, especially in the United States. Meteorologists have questioned its validity,...

Author(s): Brian E. Potter
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Climate change and future wildfire in the western USA: An ecological approach to nonstationarity

www.nrfirescience.org/resource/21259

We developed ecologically based climate-fire projections for the western United States. Using a finer ecological classification and fire-relevant climate predictors, we created statistical models linking climate and wildfire area burned for ecosections, which are geographic delineations based on biophysical variables. The...

Author(s): Jeremy S. Littell, Donald McKenzie, Ho Yi Wan, Samuel A. Cushman
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Landscape Topographic Features Create Refugia from Drought and Insect Disturbance in a Lodgepole and Whitebark Pine Forest

www.nrfirescience.org/resource/18867

Droughts and insect outbreaks are primary disturbance processes linking climate change to tree mortality in western North America. Refugia from these disturbances—locations where impacts are less severe relative to the surrounding landscape—may be priorities for conservation, restoration, and monitoring. In this study,...

Author(s): Jennifer Cartwright

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Human-related ignitions concurrent with high winds promote large wildfires across the USA

www.nrfirescience.org/resource/17823

Large wildfires (>40 ha) account for the majority of burned area across the contiguous United States (US) and appropriate substantial suppression resources. A variety of environmental and social factors influence wildfire growth and whether a fire overcomes initial attack efforts and becomes a large wildfire. However, little is...

Author(s): John T. Abatzoglou, Jennifer Balch, Bethany A. Bradley, Crystal A. Kolden

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Effect of woody debris on the rate of spread of surface fires in forest fuels in a combustion wind tunnel

www.nrfirescience.org/resource/17730

The treatment of the contribution of woody debris (WD, such as branches or small logs >6–50 mm diameter) to the rate of forward spread of a fire in current operational forest fire spread models is inconsistent. Some models do not take into account this fuel at all (i.e. only consider the combustion of fine fuels (< 6 mm...

Author(s): Andrew L. Sullivan, N. C. Surawski, Daniel A. Crawford, Richard J. Hurley, Liubov Volkova, Christopher J. Weston, Carl P. Meyer

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Evaluating the influence of prior burn mosaics on subsequent wildfire behavior, severity, and fire management options - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/18369

The Reburn Project was motivated by a need to better understand wildfires as fuel reduction treatments and to assess the impacts of decades of wildland fire suppression activities on forested landscapes. Our study examined three areas, located in the inland Pacific Northwest, central Idaho and interior British Columbia. Each area...

Author(s): Susan J. Prichard, Paul F. Hessburg, Robert W. Gray, Nicholas A. Povak, R. Brion Salter, Camille Stevens-Rumann, Penelope Morgan

Year Published: 2018

Type: Document

Technical Report or White Paper

Optimizing precipitation thresholds for best correlation between dry lightning and wildfires

www.nrfirescience.org/resource/17429

This work examines how to adjust the definition of 'dry lightning' in order to optimize the correlation between dry lightning flash count and the climatology of large (>400 km²) lightning-ignited wildfires over the contiguous United States (CONUS). The National Lightning Detection Network™ and National Centers for...

Author(s): Brian Vant-Hull, Tollisha Thompson, William Koshak

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Observations and predictability of gap winds in the Salmon River Canyon of Central Idaho, USA

www.nrfirescience.org/resource/18337

This work investigates gap winds in a steep, deep river canyon prone to wildland fire. The driving mechanisms and the potential for forecasting the gap winds are investigated. The onset and strength of the gap winds are found to be correlated to the formation of an along-gap pressure gradient linked to periodic development of a...

Author(s): Natalie S. Wagenbrenner, Jason M. Forthofer, Chris Gibson, Abby Indreland, Brian K. Lamb, Bret W. Butler

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

The sensitivity of US wildfire occurrence to pre-season soil moisture conditions across ecosystems

www.nrfirescience.org/resource/17379

It is generally accepted that year-to-year variability in moisture conditions and drought are linked with increased wildfire occurrence. However, quantifying the sensitivity of wildfire to surface moisture state at seasonal lead-times has been challenging due to the absence of a long soil moisture record with the appropriate...

Author(s): Daniel Jensen, John T. Reager, Brittany Zajic, Nick Rousseau, Matthew Rodell, Everett Hinkley

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Avian demographic responses to drought and fire: a community-level perspective

www.nrfirescience.org/resource/18277

Drought stress is an important consideration for wildlife in arid and semiarid regions under climate change. Drought can impact plant and animal populations directly, through effects on their physiology, as well as indirectly through effects on vegetation productivity and resource availability, and by creating conditions conducive...

Author(s): James F. Saracco, Stephen M. Fetting, George L. San Miguel, David W. Mehlman, Brent E. Thompson, Steven K. Albert

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Fine-scale spatial climate variation and drought mediate the likelihood of reburning

www.nrfirescience.org/resource/21736

In many forested ecosystems, it is increasingly recognized that the probability of burning is substantially

reduced within the footprint of previously burned areas. This self-limiting effect of wildland fire is considered a fundamental emergent property of ecosystems and is partly responsible for structuring landscape heterogeneity...

Author(s): Sean A. Parks, Marc-Andre Parisien, Lisa M. Holsinger, L. Scott Baggett, Carol Miller

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Effects of fuels management on fire intensity, rate of spread, severity, and resultant forest structure within the 2013 Rim Fire landscape - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/18259

Large wildfires with uncharacteristically high severity are occurring more frequently in western U.S. forests. The increasing size and severity of wildfires has been attributed to both an increase in weather conducive to fire spread and changes to forest structure and fuel loads due to management practices that included fire...

Author(s): Brandon M. Collins, Jamie M. Lydersen, Van R. Kane, Nicholas A. Povak, Matthew L.

Brooks, Douglas F. Smith

Year Published: 2018

Type: Document

Technical Report or White Paper

Some requirements for simulating wildland fire behavior using insight from coupled weather-wildland fire models

www.nrfirescience.org/resource/17104

A newer generation of models that interactively couple the atmosphere with fire behavior have shown an increased potential to understand and predict complex, rapidly changing fire behavior. This is possible if they capture intricate, time-varying microscale airflows in mountainous terrain and fire-atmosphere feedbacks. However, this...

Author(s): Janice L. Coen

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Wildland fires behaviour: wind effect versus Byram's convective number and consequences upon the regime of propagation

www.nrfirescience.org/resource/18133

With fuel moisture content and slope, wind velocity (UW) is one of the major physical parameters that most affects the behaviour of wildland fires. The aim of this short paper was to revisit the relationship between the rate of spread (ROS) and the wind velocity, through the role played by the two forces governing the trajectory of...

Author(s): D. Morvan, N. Frangieh

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Human exposure and sensitivity to globally extreme wildfire events

www.nrfirescience.org/resource/15038

Extreme wildfires have substantial economic, social and environmental impacts, but there is uncertainty whether such events are inevitable features of the Earth's fire ecology or a legacy of poor management and planning. We identify 478 extreme wildfire events defined as the daily clusters of fire radiative power from MODIS,...

Author(s): David M. J. S. Bowman, Grant J. Williamson, John T. Abatzoglou, Crystal A. Kolden, Mark A. Cochrane, Alistair M. S. Smith
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Climate adaption and post-fire restoration of a foundational perennial in cold desert: Insights from intraspecific variation in response to weather

www.nrfirescience.org/resource/16523

1) The loss of foundational but fire-intolerant perennials such as sagebrush due to increases in fire size and frequency in semi-arid regions has motivated efforts to restore them, often with mixed or even no success. Seeds of sagebrush *Artemisia tridentata* and related species must be moved considerable distances from seed source to...

Author(s): Martha M. Brabec, Matthew J. Germino, Bryce A. Richardson
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Trend analysis of fire season length and extreme fire weather in North America between 1979 and 2015

www.nrfirescience.org/resource/16407

We have constructed a fire weather climatology over North America from 1979 to 2015 using the North American Regional Reanalysis dataset and the Canadian Fire Weather Index (FWI) System. We tested for the presence of trends in potential fire season length, based on a meteorological definition, and extreme fire weather using the non-...

Author(s): Piyush Jain, Xianli Wang, Michael D. Flannigan
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Evidence of fuels management and fire weather influencing fire severity in an extreme fire event

www.nrfirescience.org/resource/17228

Following changes in vegetation structure and pattern, along with a changing climate, large wildfire incidence has increased in forests throughout the western United States. Given this increase, there is great interest in whether fuels treatments and previous wildfire can alter fire severity patterns in large wildfires. We assessed...

Author(s): Jamie M. Lydersen, Brandon M. Collins, Matthew L. Brooks, John R. Matchett, Kristen L. Shive, Nicholas A. Povak, Van R. Kane, Douglas F. Smith
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Towards improving wildland firefighter situational awareness through daily fire behaviour risk assessments in the US Northern Rockies and Northern Great Basin

www.nrfirescience.org/resource/15489

Wildland firefighters must assess potential fire behaviour in order to develop appropriate strategies and tactics that will safely meet objectives. Fire danger indices integrate surface weather conditions to quantify potential variations in fire spread rates and intensities and therefore should closely relate to observed fire...

Author(s): William Matt Jolly, Patrick H. Freeborn
Year Published: 2017

Type: Document
Book or Chapter or Journal Article

Climate change and the eco-hydrology of fire: will area burned increase in a warming western USA?

www.nrfirescience.org/resource/14916

Wildfire area is predicted to increase with global warming. Empirical statistical models and process-based simulations agree almost universally. The key relationship for this unanimity, observed at multiple spatial and temporal scales, is between drought and fire. Predictive models often focus on ecosystems in which this...

Author(s): Donald McKenzie, Jeremy S. Littell

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

The normal fire environment—Modeling environmental suitability for large forest wildfires using past, present, and future climate normals

www.nrfirescience.org/resource/16643

We modeled the normal fire environment for occurrence of large forest wildfires (>40 ha) for the Pacific Northwest Region of the United States. Large forest wildfire occurrence data from the recent climate normal period (1971–2000) was used as the response variable and fire season precipitation, maximum temperature, slope, and...

Author(s): Raymond J. Davis, Zhiqiang Yang, Andrew Yost, Cole Belongie, Warren B. Cohen

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

An improved canopy wind model for predicting wind adjustment factors and wildland fire behavior

www.nrfirescience.org/resource/16445

The ability to rapidly estimate wind speed beneath a forest canopy or near the ground surface in any vegetation is critical to practical wildland fire behavior models. The common metric of this wind speed is the “mid-flame” wind speed, UMF. However, the existing approach for estimating UMF has some significant shortcomings....

Author(s): William J. Massman, Jason M. Forthofer, Mark A. Finney

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Spatio-Temporal Linkages between Declining Arctic Sea-Ice Extent and Increasing Wildfire Activity in the Western United States

www.nrfirescience.org/resource/17201

We examined relationships between monthly Arctic sea-ice extent (ASIE) and annual wildfire activity for seven regions in the western United States during 1980-2015 to determine if spatio-temporal linkages exist between ASIE, upper-level flow, and surface climatic conditions conducive to western U.S. wildfire activity. Winter ASIE...

Author(s): Paul A. Knapp, Peter T. Soulé

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

How to generate and interpret fire characteristics charts for the U.S. fire danger rating system

www.nrfirescience.org/resource/15371

The fire characteristics chart is a graphical method of presenting U.S. National Fire Danger Rating System (NFDRS) indexes and components as well as primary surface or crown fire behavior characteristics. Computer software has been developed to produce fire characteristics charts for both fire danger and fire behavior in a format...

Author(s): Faith A. Heinsch, Patricia L. Andrews, D. A. Tirmenstein

Year Published: 2017

Type: Document

Technical Report or White Paper

Fire weather conditions and fire-atmosphere interactions observed during low-intensity prescribed fires - Rxcadre 2012

www.nrfirescience.org/resource/16908

The goal of this paper is to describe the overall meteorological measurement campaign design and methods and present some initial results from analyses of two burn experiments.

Author(s): Craig B. Clements, Neil Lareau, Daisuke Seto, Jonathan Contezac, Braniff Davis, Casey Teske, Thomas J. Zajkowski, Andrew T. Hudak, Benjamin C. Bright, Matthew B. Dickinson, Bret W. Butler, Daniel M. Jimenez, J. Kevin Hiers

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Topographic and fire weather controls of contemporary fire refugia in forested ecosystems of northwestern North America

www.nrfirescience.org/resource/18922

Fire refugia, sometimes referred to as fire islands, shadows, skips, residuals, or fire remnants, are an important element of the burn mosaic, but we lack a quantitative framework that links observations of fire refugia from different environmental contexts. Here, we develop and test a conceptual model for how predictability of fire...

Author(s): Meg A. Krawchuk, Sandra L. Haire, Jonathan D. Coop, Marc-Andre Parisien, Ellen Whitman, Geneva W. Chong, Carol Miller

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

The Influence of Climate Model Biases on Projections of Aridity and Drought

www.nrfirescience.org/resource/15624

Global climate models (GCMs) have biases when simulating historical climate conditions, which in turn have implications for estimating the hydrological impacts of climate change. This study examines the differences in projected changes of aridity [defined as the ratio of precipitation (P) over potential evapotranspiration (PET), or...

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Weather, fuels, and topography impede wildland fire spread in western US landscapes

www.nrfirescience.org/resource/14716

As wildland fire activity continues to surge across the western US, it is increasingly important that we understand and quantify the environmental drivers of fire and how they vary across ecosystems. At

daily to annual timescales, weather, fuels, and topography are known to influence characteristics such as area burned and fire...

Author(s): Lisa M. Holsinger, Sean A. Parks, Carol Miller

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

A review of the relationships between drought and forest fire in the United States

www.nrfirescience.org/resource/18719

The historical and presettlement relationships between drought and wildfire are well documented in North America, with forest fire occurrence and area clearly increasing in response to drought. There is also evidence that drought interacts with other controls (forest productivity, topography, fire weather, management activities) to...

Author(s): Jeremy S. Littell, David L. Peterson, Karen L. Riley, Yongqiang Liu, Charles H. Luce

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Spatial coherence of extreme precipitation events in the Northwestern United States

www.nrfirescience.org/resource/15609

The complexity of impacts resulting from extreme precipitation events varies with the spatial extent of precipitation extremes. Characteristics of precipitation extremes, defined by the top 5% of 3-day accumulated precipitation, including their spatial coherence and relationships to two contrasting synoptic phenomena, were examined...

Author(s): Lauren E. Parker, John T. Abatzoglou

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Charred forests accelerate snow albedo decay: parameterizing the post-fire radiative forcing on snow for three years following fire

www.nrfirescience.org/resource/14443

As large, high-severity forest fires increase and snowpacks become more vulnerable to climate change across the western USA, it is important to understand post-fire disturbance impacts on snow hydrology. Here, we examine, quantify, parameterize, model, and assess the post-fire radiative forcing effects on snow to improve hydrologic...

Author(s): Kelly E. Gleason, Anne W. Nolin

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Projected changes in cold hardiness zones and suitable overwinter ranges of perennial crops over the United States

www.nrfirescience.org/resource/15604

Average annual absolute minimum temperatures (TN_n) provide a means of delineating agriculturally relevant climate zones and are used to define cold hardiness zones (CHZ) by the United States Department of Agriculture. Projected changes in TN_n, mean winter minimum temperatures, and CHZs over the conterminous United States (CONUS...

Author(s): Lauren E. Parker, John T. Abatzoglou

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Does prescribed fire promote resistance to drought in low elevation forests of the Sierra Nevada, California, USA?

www.nrfirescience.org/resource/14244

Prescribed fire is a primary tool used to restore western forests following more than a century of fire exclusion, reducing fire hazard by removing dead and live fuels (small trees and shrubs). It is commonly assumed that the reduced forest density following prescribed fire also reduces competition for resources among the...

Author(s): Phillip J. van Mantgem, Anthony C. Caprio, Nathan L. Stevenson, Adrian J. Das

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Contribution of cut-off lows to precipitation across the United States

www.nrfirescience.org/resource/15602

A chronology of cutoff lows (COL) from 1979 to 2014 alongside daily precipitation observations across the conterminous United States was used to examine the contribution of COL to seasonal precipitation, extreme-precipitation events, and interannual precipitation variability. COL accounted for between 2% and 32% of annual...

Author(s): John T. Abatzoglou

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Attribution of extreme weather events in the context of climate change - Report in brief

www.nrfirescience.org/resource/14069

As climate has warmed over recent years, a new pattern of more frequent and more intense weather events has unfolded across the globe. Climate models simulate such changes in extreme events, and some of the reasons for the changes are well understood. Warming increases the likelihood of extremely hot days and nights, favors...

Author(s): Committee on Extreme Weather Events and Climate Change Attribution

Year Published: 2016

Type: Document

Technical Report or White Paper

Effects of drought on forests and rangelands in the United States: a comprehensive science synthesis

www.nrfirescience.org/resource/13910

This assessment provides input to the reauthorized National Integrated Drought Information System (NIDIS) and the National Climate Assessment (NCA), and it establishes the scientific foundation needed to manage for drought resilience and adaptation. Focal areas include drought characterization; drought impacts on forest processes...

Year Published: 2016

Type: Document

Synthesis, Technical Report or White Paper

Development of high-resolution (250 m) historical daily gridded air temperature data using reanalysis and distributed sensor networks for the US Northern Rocky Mountains

www.nrfirescience.org/resource/15620

Gridded temperature data sets are typically produced at spatial resolutions that cannot fully resolve fine-scale variation in surface air temperature in regions of complex topography. These data limitations have become increasingly important as scientists and managers attempt to understand and plan for potential climate change...

Author(s): Zachary A. Holden, Alan Swanson, Anna E. Klene, John T. Abatzoglou, Solomon Z. Dobrowski, Samuel A. Cushman, John Squires, Gretchen Moisen, Jared W. Oyler

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

The effect of wind on burning rate of wood cribs

www.nrfirescience.org/resource/14685

Wood cribs are often used as ignition sources for room fire tests. A wood crib may also apply to studies of burning rate in wildland fires, because wildland fuel beds are porous and three dimensional. A unique aspect of wildland fires is the ubiquitous presence of wind. However, very little is known about what effect the increased...

Author(s): Sara S. McAllister, Mark A. Finney

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Closure to development of soil moisture drought index to characterize droughts

www.nrfirescience.org/resource/15608

This is a discussion article qualifying four issues related to soil moisture drought index (SODI) moisture departure.

Author(s): Mohammad Sohrabi, Jae H. Ryu, John T. Abatzoglou, John Tracy

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Recent advances and remaining uncertainties in resolving past and future climate effects on global fire activity

www.nrfirescience.org/resource/15603

Fire is an integral component of the Earth system that will critically affect how terrestrial carbon budgets and living systems respond to climate change. Paleo and observational records document robust positive relationships between fire activity and aridity in many parts of the world on interannual to millennial timescales....

Author(s): A. Park Williams, John T. Abatzoglou

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Ecological implications of drought for forests in the United States

www.nrfirescience.org/resource/14110

The relationships among drought, surface water flow, and groundwater recharge are not straightforward for most forest ecosystems due to the strong role that vegetation plays in the forest water balance. Hydrologic responses to drought can be either mitigated or exacerbated by forest vegetation depending upon vegetation water use and...

Author(s): James M. Vose, Chelcy Ford Miniati, Charles H. Luce, Heidi Asbjornsen, Peter V. Caldwell, John L. Campbell, Gordon E. Grant, Daniel J. Isaak, Steven P. Loheide II, Ge Sun

Year Published: 2016

Type: Document
Book or Chapter or Journal Article

Controls on interannual variability in lightning-caused fire activity in the western US

www.nrfirescience.org/resource/15601

Lightning-caused wildfires account for a majority of burned area across the western United States (US), yet lightning remains among the more unpredictable spatiotemporal aspects of the fire environment and a challenge for both modeling and managing fire activity. A data synthesis of cloud-to-ground lightning strikes, climate and...

Author(s): John T. Abatzoglou, Crystal A. Kolden, Jennifer Balch, Bethany A. Bradley

Year Published: 2016

Type: Document
Book or Chapter or Journal Article

A stochastic mixed integer program to model spatial wildfire behavior and suppression placement decisions with uncertain weather

www.nrfirescience.org/resource/13931

Wildfire behavior is a complex and stochastic phenomenon that can present unique tactical management challenges. This paper investigates a multistage stochastic mixed integer program with full recourse to model spatially explicit fire behavior and to select suppression locations for a wildland fire. Simplified suppression decisions...

Author(s): Erin J. Belval, Yu Wei, Michael Bevers

Year Published: 2016

Type: Document
Book or Chapter or Journal Article

Verification of Spot Fire Weather Forecasts

www.nrfirescience.org/resource/15563

Software was developed to evaluate National Weather Service (NWS) spot forecasts. Fire management officials request spot forecasts from the NWS to provide detailed guidance as to atmospheric conditions in the vicinity of planned prescribed burns as well as wildfires that do not have incident meteorologists on site. A multi-year set...

Author(s): John D. Horel, Timothy J. Brown

Year Published: 2015

Type: Document
Technical Report or White Paper

Modeling spatial and temporal dynamics of wind flow and potential fire behavior following a mountain pine beetle outbreak in a lodgepole pine forest

www.nrfirescience.org/resource/13298

Patches of live, dead, and dying trees resulting from bark beetle-caused mortality alter spatial and temporal variability in the canopy and surface fuel complex through changes in the foliar moisture content of attacked trees and through the redistribution of canopy fuels. The resulting heterogeneous fuels complexes alter within...

Author(s): Chad M. Hoffman, Rodman Linn, Russell A. Parsons, Carolyn Hull Sieg, Judith Winterkamp

Year Published: 2015

Type: Document
Book or Chapter or Journal Article

Projected changes in snowfall extremes and interannual variability of snowfall in the western

U.S.

www.nrfirescience.org/resource/15647

Projected warming will have significant impacts on snowfall accumulation and melt, with implications for water availability and management in snow-dominated regions. Changes in snowfall extremes are confounded by projected increases in precipitation extremes. Downscaled climate projections from 20 global climate models were bias-

Author(s): A.C. Lute, John T. Abatzoglou, Katherine C. Hegewisch

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Climate-induced variations in global wildfire danger from 1979 to 2013

www.nrfirescience.org/resource/15322

Climate strongly influences global wildfire activity, and recent wildfire surges may signal fire weather-induced pyrogeographic shifts. Here we use three daily global climate data sets and three fire danger indices to develop a simple annual metric of fire weather season length, and map spatio-temporal trends from 1979 to 2013. We...

Author(s): William Matt Jolly, Mark A. Cochrane, Patrick H. Freeborn, Zachary A. Holden, Timothy J. Brown, G.J. Williamson, David M. J. S. Bowman

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

The potential impact of regional climate change on fire weather in the United States

www.nrfirescience.org/resource/13208

Climate change is expected to alter the frequency and severity of atmospheric conditions conducive for wildfires. In this study, we assess potential changes in fire weather conditions for the contiguous United States using the Haines Index (HI), a fire weather index that has been employed operationally to detect atmospheric...

Author(s): Ying Tang, Shiyuan Zhong, Lifeng Luo, Xindi Bian, Warren Heilman, Julie Winkler

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Seasonal reversal of the influence of El Niño–Southern Oscillation on very large wildfire occurrence in the interior northwestern United States

www.nrfirescience.org/resource/15643

Satellite-mapped fire perimeters and the multivariate El Niño–Southern Oscillation index were used to examine the impact of concurrent El Niño–Southern Oscillation (ENSO) phase on very large fire (VLF) occurrences over the intermountain northwestern United States (U.S.) from 1984 to 2012. While the warm phase of ENSO promotes...

Author(s): Renaud Barbero, John T. Abatzoglou, Timothy J. Brown

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Daily weather and other factors influencing burn severity in central Idaho and western Montana

www.nrfirescience.org/resource/15316

Burn severity as inferred from satellite-derived differenced Normalized Burn Ratio (dNBR) is useful for evaluating fire impacts on ecosystems but the environmental controls on burn severity across large forest fires are both poorly understood and likely to be different than those influencing fire extent. We

related dNBR to...

Author(s): Donovan Birch, Penelope Morgan, Crystal A. Kolden, John T. Abatzoglou, Gregory K. Dillon, Andrew T. Hudak, Alistair M. S. Smith

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

The changing strength and nature of fire-climate relationships in the northern Rocky Mountains, U.S.A., 1902-2008

www.nrfirescience.org/resource/15636

Time-varying fire-climate relationships may represent an important component of fire-regime variability, relevant for understanding the controls of fire and projecting fire activity under global-change scenarios. We used time-varying statistical models to evaluate if and how fire-climate relationships varied from 1902-2008, in one...

Author(s): Philip E. Higuera, John T. Abatzoglou, Jeremy S. Littell, Penelope Morgan

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Wildland fire as a self-regulating mechanism: the role of previous burns and weather in limiting fire progression

www.nrfirescience.org/resource/12770

Theory suggests that natural fire regimes can result in landscapes that are both self-regulating and resilient to fire. For example, because fires consume fuel, they may create barriers to the spread of future fires, thereby regulating fire size. Top-down controls such as weather, however, can weaken this effect. While empirical...

Author(s): Sean A. Parks, Lisa M. Holsinger, Carol Miller, Cara R. Nelson

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Observations of distributed snow depth and snow duration within diverse forest structures in a maritime mountain watershed

www.nrfirescience.org/resource/14278

Spatially distributed snow depth and snow duration data were collected over two to four snow seasons during water years 2011–2014 in experimental forest plots within the Cedar River Municipal Watershed, 50 km east of Seattle, Washington, USA. These 40 × 40 m forest plots, situated on the western slope of the Cascade Range,...

Author(s): Susan E. Dickerson-Lange, James A. Lutz, Rolf Gersonde, Kael A. Martin, Jenna E. Forsyth, Jessica D. Lundquist

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Forecasting integrated lightning and fuels ignition potentials in a system with real-time analysis of fire weather prediction accuracy

www.nrfirescience.org/resource/15557

Weather forecasts can help identify environmental conditions conducive to prescribed burning or to increased fire danger. These conditions are important components of fire management tools such as fire ignition potential maps, fire danger rating systems, fire behavior predictions, and smoke dispersion modeling. Fire managers use...

Author(s): Miriam L. Rorig, Stacy Drury
Year Published: 2015
Type: Document
Technical Report or White Paper

A wildfire-relevant climatology of the convective environment of the United States

www.nrfirescience.org/resource/13270

Convective instability can influence the behaviour of large wildfires. Because wildfires modify the temperature and moisture of air in their plumes, instability calculations using ambient conditions may not accurately represent convective potential for some fire plumes. This study used the North American Regional Reanalysis to...

Author(s): Brian E. Potter, Matthew A. Anaya
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Development of soil moisture drought index (SODI) to characterize droughts

www.nrfirescience.org/resource/15645

A new drought index termed the "soil moisture drought index (SODI)" is developed to characterize droughts. The premise of the index is based on how much water is required to attain soil moisture at field capacity. SODI captures variations of precipitation, temperature, and soil moisture over time. Three widely used drought...

Author(s): Mohammad Sohrabi, Jae H. Ryu, John T. Abatzoglou, John Tracy
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Implications of climate change on wind erosion of agricultural lands in the Columbia plateau

www.nrfirescience.org/resource/15642

Climate change may impact soil health and productivity as a result of accelerated or decelerated rates of erosion. Previous studies suggest a greater risk of wind erosion on arid and semi-arid lands due to loss of biomass under a future warmer climate. There have been no studies conducted to assess the impact of climate change on...

Author(s): B.S. Sharratt, J. Tatarko, John T. Abatzoglou, F.A. Fox, D. Huggins
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Regional projections of the likelihood of very large wildland fires under a changing climate in the contiguous western United States

www.nrfirescience.org/resource/13006

Seasonal changes in the climatic potential for very large wildfires (VLWF > or = 50,000 ac ~20,234 ha) across the western contiguous United States are projected over the 21st century using generalized linear models and downscaled climate projections for two representative concentration pathways (RCPs). Significant ($p < 0.05$)...

Author(s): E. Natasha Stavros, John T. Abatzoglou, Donald McKenzie, Narasimhan K. Larkin
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Seasonal climate variability and change in the Pacific Northwest of the United States

www.nrfirescience.org/resource/15671

Observed changes in climate of the U.S. Pacific Northwest since the early twentieth century were examined using four different datasets. Annual mean temperature increased by approximately 0.6°–0.8°C from 1901 to 2012, with corroborating indicators including a lengthened freeze-free season, increased temperature of the coldest...

Author(s): John T. Abatzoglou, David E. Rupp, Philip W. Mote

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Role of extreme snowfall events in interannual variability of snowfall accumulation in the western United States

www.nrfirescience.org/resource/15661

Water resources in the western United States are contingent on interannual variations in snow-pack. Interannual snowpack variability has been attributed to large-scale climate patterns including the El Niño ~ no-Southern Oscillation (ENSO), however, the contribution of snowfall frequency and extreme snowfall events to this...

Author(s): A.C. Lute, John T. Abatzoglou

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Tracking interannual streamflow variability with drought indices in the U.S. Pacific Northwest

www.nrfirescience.org/resource/15659

Drought indices are often used for monitoring interannual variability in macroscale hydrology. However, the diversity of drought indices raises several issues: 1) which indices perform best and where; 2) does the incorporation of potential evapotranspiration (PET) in indices strengthen relationships, and how sensitive is the choice...

Author(s): John T. Abatzoglou, Renaud Barbero, Jacob W. Wolf, Zachary A. Holden

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Modeling very large-fire occurrences over the continental United States from weather and climate forcing

www.nrfirescience.org/resource/15656

Very large-fires (VLFs) have widespread impacts on ecosystems, air quality, fire suppression resources, and in many regions account for a majority of total area burned. Empirical generalized linear models of the largest fires (>5000 ha) across the contiguous United States (US) were developed at 60 km spatial and weekly...

Author(s): Renaud Barbero, John T. Abatzoglou, E. Ashley Steel, Narasimhan K. Larkin

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

A comparison of three approaches for simulating fine-scale surface winds in support of wildland fire management. Part II. An exploratory study of the effect of simulated winds on fire growth simulations

www.nrfirescience.org/resource/16922

The effect of fine-resolution wind simulations on fire growth simulations is explored. The wind models

are (1) a wind field consisting of constant speed and direction applied everywhere over the area of interest; (2) a tool based on the solution of the conservation of mass only (termed mass-conserving model) and (3) a tool based on...

Author(s): Jason M. Forthofer, Bret W. Butler, Charles W. McHugh, Mark A. Finney, Larry S. Bradshaw, Richard D. Stratton, Kyle S. Shannon, Natalie S. Wagenbrenner

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Climate and very large wildland fires in the contiguous western USA

www.nrfirescience.org/resource/13009

Very large wildfires can cause significant economic and environmental damage, including destruction of homes, adverse air quality, firefighting costs and even loss of life. We examine how climate is associated with very large wildland fires (VLWFs > or =50,000 acres, or ~20,234 ha) in the western contiguous USA. We used composite...

Author(s): E. Natasha Stavros, John T. Abatzoglou, Narasimhan K. Larkin, Donald McKenzie, E. Ashley Steel

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

De-coupling seasonal changes in water content and dry matter to predict live conifer foliar moisture content

www.nrfirescience.org/resource/12959

Live foliar moisture content (LFMC) significantly influences wildland fire behaviour. However, characterising variations in LFMC is difficult because both foliar mass and dry mass can change throughout the season. Here we quantify the seasonal changes in both plant water status and dry matter partitioning. We collected new and old...

Author(s): William Matt Jolly, Ann M. Hadlow, Kathleen Huguet

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Observed changes in false springs over the contiguous United States

www.nrfirescience.org/resource/15668

Climate warming fosters an earlier spring green-up that may bring potential benefits to agricultural systems. However, advances in green-up timing may leave early stage vegetation growth vulnerable to cold damage when hard freezes follow green-up resulting in a false spring. Spatiotemporal patterns of green-up dates, last spring...

Author(s): Alexander G. Peterson, John T. Abatzoglou

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Extent of the rain-snow transition zone in the western U.S. under historic and projected climate

www.nrfirescience.org/resource/15660

This study investigates the extent of the rain-snow transition zone across the complex terrain of the western United States for both late 20th century climate and projected changes in climate by the mid-21st century. Observed and projected temperature and precipitation data at 4 km resolution were used with an empirical...

Author(s): P. Zion Klos, Timothy E. Link, John T. Abatzoglou

Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Observed and projected changes in absolute temperature extremes across the contiguous United States

www.nrfirescience.org/resource/15657

Changes in the extent of absolute, all-time, daily temperature records across the contiguous United States were examined using observations and climate model simulations. Observations from station data and reanalysis from 1980 to 2013 show increased extent of absolute highest temperature records and decreased extent of absolute...

Author(s): John T. Abatzoglou, Renaud Barbero

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Predicting wildfire ignitions, escapes, and large fire activity using Predictive Service's 7-Day Fire Potential Outlook in the western USA

www.nrfirescience.org/resource/13615

Can fire potential forecasts assist with pre-positioning of fire suppression resources, which could result in a cost savings to the United States government? Here, we present a preliminary assessment of the 7-Day Fire Potential Outlook forecasts made by the Predictive Services program. We utilized historical fire occurrence data and...

Author(s): Karen L. Riley, Crystal S. Stonesifer, Haiganoush K. Preisler, David E. Calkin

Year Published: 2014

Type: Document

Conference Proceedings

Questionable evidence of natural warming of the northwestern United States

www.nrfirescience.org/resource/15655

Johnstone and Mantua (1) claim that changes in atmospheric circulation were the primary cause of the observed warming of sea surface temperature around the northeastern Pacific margins and surface air temperature (SAT) in Northern California, Oregon, and Washington from 1901 to 2012. The results of Johnstone and Mantua's report...

Author(s): John T. Abatzoglou, David E. Rupp, Philip W. Mote

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

A comparison of three approaches for simulating fine-scale surface winds in support of wildland fire management: Part I. Model formulation and comparison against measurements

www.nrfirescience.org/resource/16923

For this study three types of wind models have been defined for simulating surface wind flow in support of wildland fire management: (1) a uniform wind field (typically acquired from coarse-resolution (4 km) weather service forecast models); (2) a newly developed mass-conserving model and (3) a newly developed mass and...

Author(s): Jason M. Forthofer, Bret W. Butler, Natalie S. Wagenbrenner

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Is proportion burned severely related to daily area burned?

www.nrfirescience.org/resource/13018

The ecological effects of forest fires burning with high severity are long-lived and have the greatest impact on vegetation successional trajectories, as compared to low-to-moderate severity fires. The primary drivers of high severity fire are unclear, but it has been hypothesized that wind-driven, large fire-growth days play a...

Author(s): Donovan Birch, Penelope Morgan, Crystal A. Kolden, Andrew T. Hudak, Alistair M. S. Smith

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Development of gridded surface meteorological data for ecological applications and modeling

www.nrfirescience.org/resource/15682

Landscape-scale ecological modelling has been hindered by suitable high-resolution surface meteorological datasets. To overcome these limitations, desirable spatial attributes of gridded climate data are combined with desirable temporal attributes of regional-scale reanalysis and daily gauge-based precipitation to derive a spatially...

Author(s): John T. Abatzoglou

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

The missing mountain water: slower westerlies decrease orographic enhancement in the Pacific Northwest USA

www.nrfirescience.org/resource/15674

Trends in streamflow timing and volume in the Pacific Northwest United States have been attributed to increased temperatures, because trends in precipitation at lower-elevation stations were negligible. We demonstrate that observed streamflow declines are probably associated with declines in mountain precipitation, revealing...

Author(s): Charles H. Luce, John T. Abatzoglou, Zachary A. Holden

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Fire weather case study - Mann Gulch Fire, Montana

www.nrfirescience.org/resource/11976

The intent of this report is to analyze weather conditions to determine if a 'critical fire weather pattern' also contributed to the 'blowup.'

Author(s): Paul A. Werth

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

An evaluation of multi-scalar drought indices in Nevada and eastern California

www.nrfirescience.org/resource/15687

Nevada and eastern California are home to some of the driest and warmest climates, most mountainous regions, and fastest growing metropolitan areas of the United States. Throughout Nevada and eastern California, snow-dominated watersheds provide most of the water supply for both human and environmental demands. Increasing demands on...

Author(s): Daniel J. McEvoy, Justin L. Huntington, John T. Abatzoglou, Laura M. Edwards

Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Climate extremes and their linkage to regional drought over Idaho, USA

www.nrfirescience.org/resource/15683

To investigate consequences of climate extreme and variability on agriculture and regional water resource, twenty-seven climatic indices of temperature and precipitation over Idaho, USA, were computed. Precipitation, mean temperature and maximum temperature, self-calibrated Palmer Drought Index and Standardized Precipitation Index...

Author(s): Mohammad Sohrabi, Jae H. Ryu, John T. Abatzoglou, John Tracy

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Detailed point weather forecasts: how to get them when you need them

www.nrfirescience.org/resource/12441

Detailed point weather forecasts are a critical component of fire management planning. Accurate hour-by-hour forecasts for your exact location are valuable when you are preparing to ignite a prescribed burn and want to compare your prescription with actual conditions. They also provide important weather documentation for your files...

Author(s): Alan J. Long, Annie Oxarart

Year Published: 2011

Type: Document

Research Brief or Fact Sheet

Influence of the PNA on declining mountain snowpack in the western United States

www.nrfirescience.org/resource/15695

The widespread decrease in mountain snowpack across the Western United States is a hallmark indicator of regional climate change. Observed decreases in snowpack across lower-elevation watersheds are broadly consistent with model predictions of anthropogenic climate change; however, the magnitude of the decreases across much of the...

Author(s): John T. Abatzoglou

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

Changes in climatic water balance drive downhill shifts in plant species optimum elevations

www.nrfirescience.org/resource/15690

Uphill shifts of species' distributions in response to historical warming are well documented, which leads to widespread expectations of continued uphill shifts under future warming. Conversely, downhill shifts are often considered anomalous and unrelated to climate change. By comparing the altitudinal distributions of 64 plant...

Author(s): Shawn M. Crimmins, Solomon Z. Dobrowski, Jonathan A. Greenberg, John T. Abatzoglou, Alison R. Mynsberge

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

Empirical downscaling of daily minimum air temperature at very fine resolutions in complex

terrain

www.nrfirescience.org/resource/15692

Available air temperature models do not adequately account for the influence of terrain on nocturnal air temperatures. An empirical model for night time air temperatures was developed using a network of one hundred and forty inexpensive temperature sensors deployed across the Bitterroot National Forest, Montana. A principle...

Author(s): Zachary A. Holden, John T. Abatzoglou, Scott L. Baggett, Charles H. Luce

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

Both topography and climate affected forest and woodland burn severity in two regions of the western US

www.nrfirescience.org/resource/15318

Fire is a keystone process in many ecosystems of western North America. Severe fires kill and consume large amounts of above- and belowground biomass and affect soils, resulting in long-lasting consequences for vegetation, aquatic ecosystem productivity and diversity, and other ecosystem properties. We analyzed the occurrence of,...

Author(s): Gregory K. Dillon, Zachary A. Holden, Penelope Morgan, Michael A. Crimmins, Emily K. Heyerdahl, Charles H. Luce

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

Initialization of high resolution surface wind simulations using NWS gridded data

www.nrfirescience.org/resource/16936

WindNinja is a standalone computer model designed to provide the user with simulations of surface wind flow. It is deterministic and steady state. It is currently being modified to allow the user to initialize the flow calculation using National Digital Forecast Database. It essentially allows the user to downscale the coarse scale...

Author(s): Jason M. Forthofer, Bret W. Butler

Year Published: 2010

Type: Document

Conference Proceedings

January 31st 2009 off-season grassland wildfire

www.nrfirescience.org/resource/11145

Wildland fires can be high impact events no matter what the season or fuel type. While the first image that comes to mind of wildland fire suppression is timbered mountainous terrain on a late summer afternoon, this wildland fire occurred in relatively flat grasslands during the overnight and early morning hours, during the...

Author(s): Robert W. Hoenisch

Year Published: 2009

Type: Document

Technical Report or White Paper

How much influence does landscape-scale physiography have on air temperature in a mountain environment?

www.nrfirescience.org/resource/15698

Spatio-temporal patterns of temperature in mountain environments are complex due to both regional synoptic-scale and landscape-scale physiographic controls in these systems. Understanding the nature

and magnitude of these physiographic effects has practical and theoretical implications for the development of temperature datasets...

Author(s): Solomon Z. Dobrowski, John T. Abatzoglou, Jonathan A. Greenberg, S.G. Schladow

Year Published: 2009

Type: Document

Book or Chapter or Journal Article

Seasonal predictions for wildland fire severity

www.nrfirescience.org/resource/11064

The National Fire Danger Rating System (NFDRS) indices deduced from the monthly to seasonal predictions of a meteorological climate model at 50-km grid space from January 1998 through December 2003 were used in conjunction with a probability model to predict the expected number of fire occurrences and large fires over the U.S. West...

Author(s): Shyh-Chin Chen, Haiganoush K. Preisler, Francis M. Fujioka, John W. Benoit, John O. Roads

Year Published: 2009

Type: Document

Conference Proceedings, Technical Report or White Paper

Learning the rhythm of the seasons in the face of global change: phenological research in the 21st century

www.nrfirescience.org/resource/15709

Phenology is the study of recurring life-cycle events, classic examples being the flowering of plants and animal migration. Phenological responses are increasingly relevant for addressing applied environmental issues. Yet, challenges remain with respect to spanning scales of observation, integrating observations across taxa, and...

Author(s): Jeffrey T. Morrisette, Andrew D. Richardson, Alan K. Knapp, Jeremy I. Fisher, Eric A. Graham, John T. Abatzoglou, Bruce E. Wilson, David D. Breshears, Geoffrey M. Henebry, Jonathan M. Hanes, Liang Liang

Year Published: 2009

Type: Document

Book or Chapter or Journal Article

Influence of the Madden Julian Oscillation on summertime cloud-to-ground lightning activity over the continental US

www.nrfirescience.org/resource/15696

Summertime cloud-to-ground lightning strikes are responsible for the majority of wildfire ignitions across vast sections of the seasonally dry western United States. In this study, a strong connection between active phases of the Madden-Julian oscillation (MJO) and regional summertime lightning activity was found across the...

Author(s): John T. Abatzoglou, Timothy J. Brown

Year Published: 2009

Type: Document

Book or Chapter or Journal Article

Climate drivers of regionally synchronous fires in the inland northwest (1651-1900)

www.nrfirescience.org/resource/16892

We inferred climate drivers of regionally synchronous surface fires from 1651 to 1900 at 15 sites with existing annually accurate fire-scar chronologies from forests dominated by ponderosa pine or Douglas-fir in the inland Northwest (interior Oregon, Washington and southern British Columbia). Years with widespread fires (35 years...

Author(s): Emily K. Heyerdahl, Donald McKenzie, Lori D. Daniels, Amy E. Hessler, Jeremy S. Littell, Nathan J. Mantua
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

The fire-climate connection

www.nrfirescience.org/resource/11985

JFSP-funded research is exploring and quantifying relationships among the large-scale drivers of climate and the occurrence and extent of wildfire in the various regions of the western United States.

Author(s): Gail Wells

Year Published: 2007

Type: Document

Research Brief or Fact Sheet

The asymmetry of trends in spring and autumn temperature and circulation regimes over western North America

www.nrfirescience.org/resource/15710

Observational evidence shows that spring temperatures over western North America have undergone significant warming over the past half century, while autumn temperatures have shown relatively little change. Low-frequency modes of atmospheric variability for spring and autumn are demonstrated to account for a great deal of the...

Author(s): John T. Abatzoglou, Kelly T. Redmond

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

Wildfires, weather, and productivity

www.nrfirescience.org/resource/11016

The object of this paper is to show the intercorrelations existing between statistics of wildfires (occurrences: N; areas burned: A), climatic parameters (precipitation: P; temperature: T) and net primary productivity: NPP. To this purpose, statistics of wildfires have been studied in several regions of the world, focusing on...

Author(s): Michel L. Bernard, Nouredine Nimour

Year Published: 2007

Type: Document

Conference Proceedings

Fuel consumption and flammability thresholds in shrub-dominated ecosystems - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11164

Research to quantify fuel consumption and flammability in shrub-dominated ecosystems has received little attention despite the widespread occurrence of fire-influenced, shrub-dominated landscapes across the arid lands of the western United States. While some research has addressed issues relating to fire behavior in some shrub-...

Author(s): Clinton S. Wright, Roger D. Ottmar, Sue A. Ferguson, Robert E. Vihnanek

Year Published: 2007

Type: Document

Technical Report or White Paper

A Computational Method for Optimizing Fuel Treatment Locations

www.nrfirescience.org/resource/20526

Modelling and experiments have suggested that spatial fuel treatment patterns can influence the movement of large fires. On simple theoretical landscapes consisting of two fuel types (treated and untreated), optimal patterns can be analytically derived that disrupt fire growth efficiently (i.e. with less area treated than random...

Author(s): Mark A. Finney

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

Is global warming causing more, larger wildfires?

www.nrfirescience.org/resource/19326

On 3 April 2006, the U.S. weekly news magazine Time ran a report on global warming with the cover title "Be worried, be very worried." Similar coverage of global warming has emerged in other general-interest magazines in recent months, triggered by scientific studies that are finding evidence for adverse impacts of global...

Author(s): Steven W. Running

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

Employing numerical weather models to enhance fire weather and fire behavior predictions

www.nrfirescience.org/resource/11428

This paper presents an assessment of fire weather and fire behavior predictions produced by a numerical weather prediction model similar to those used by operational weather forecasters when preparing their forecasts. The PSU/NCAR MM5 model is used to simulate the weather conditions associated with three fire episodes in June 2005....

Author(s): Joseph J. Charney, Lesley A. Fusina

Year Published: 2006

Type: Document

Conference Proceedings

Windwizard: a new tool for fire management decision support

www.nrfirescience.org/resource/16902

A new software tool has been developed to simulate surface wind speed and direction at the 100m to 300 m scale. This tool is useful when trying to estimate fire behavior in mountainous terrain. It is based on widely used computational fluid dynamics technology and has been tested against measured wind flows. In recent years it has...

Author(s): Bret W. Butler, Mark A. Finney, Larry S. Bradshaw, Jason M. Forthofer, Charles W. McHugh, Rick Stratton, Daniel M. Jimenez

Year Published: 2006

Type: Document

Conference Proceedings

Warming and earlier spring increase western U.S. forest wildfire activity

www.nrfirescience.org/resource/8397

Western United States forest wildfire activity is widely thought to have increased in recent decades, but surprisingly, the extent of recent changes has never been systematically documented. Nor has it been established to what degree climate may be driving regional changes in wildfire. Much of the public and scientific discussion of...

Author(s): Anthony L. Westerling, Hugo G. Hidalgo, Daniel R. Cayan, Thomas W. Swetnam
Year Published: 2006
Type: Document
Book or Chapter or Journal Article

Planetary wave breaking and nonlinear reflection: seasonal cycle and interannual variability

www.nrfirescience.org/resource/15713

Forty-six years of daily averaged NCEP–NCAR reanalysis data are used to identify the occurrence of planetary wave breaking (PWB) in the subtropical upper troposphere. As large-amplitude waves propagate into the subtropics where the zonal flow is weak, they may break. PWB is diagnosed by observing the large-scale meridional...

Author(s): John T. Abatzoglou, Gudrun Magnusdottir

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

Regional relationships between climate and wildfire-burned area in the Interior West, USA

www.nrfirescience.org/resource/11507

Recent studies have linked the Atlantic Multidecadal Oscillation (AMO) and the Pacific Decadal Oscillation (PDO) with drought occurrence in the interior United States. This study evaluates the influence of AMO and PDO phases on interannual relationships between climate and wildfire-burned area during the 20th century. Palmer's...

Author(s): Brandon M. Collins, Philip N. Omi, Phillip L. Chapman

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

Modeling surface winds in complex terrain for wildland fire incident support - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11167

One major source of uncertainty in fire behavior and fire behavior modeling is the spatial variation in wind fields. Mountainsides, valleys, ridges, and the fire itself, influence both the speed and direction of wind flows. Small scale surface wind variations cannot be predicted by synoptic forecasting methods or on-site...

Author(s): Mark A. Finney, Larry S. Bradshaw, Bret W. Butler

Year Published: 2005

Type: Document

Technical Report or White Paper

Climatic controls of fire in the western United States: from the atmosphere to ecosystems - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11155

The objective of this project is to conduct a diagnostic analysis of the variations in climate that govern the characteristics of the fire season in the western United States on intra-annual through decadal and longer time scales. We propose a retrospective, model-based analysis to understand better the role of climate as a control...

Author(s): Steven W. Hostetler, Patrick J. Bartlein, Allen M. Solomon, J. O. Holman, Richard T. Busing, Sarah L. Shafer

Year Published: 2005

Type: Document

Technical Report or White Paper

The impact of twenty-first century climate change on wildland fire danger in the western United States: an applications perspective

www.nrfirescience.org/resource/8343

High-temporal resolution meteorological output from the Parallel Climate Model (PCM) is used to assess changes in wildland fire danger across the western United States due to climatic changes projected in the 21st century. A business-as-usual scenario incorporating changing greenhouse gas and aerosol concentrations until the year...

Author(s): Timothy J. Brown, Beth L. Hall, Anthony L. Westerling

Year Published: 2004

Type: Document

Book or Chapter or Journal Article

'Brewer fire mystery' discussion

www.nrfirescience.org/resource/8288

Occasionally, Fire Management Today publishes comments from readers on topics of concern, offering authors a chance to respond. Stephen A. Eckert contends that the 'Brewer fire mystery' is not so mysterious. He says that the conditions were ripe for extreme fire behavior, and that under those conditions, the fire quickly went from a...

Author(s): Stephen A. Eckert, Martin E. Alexander

Year Published: 2004

Type: Document

Book or Chapter or Journal Article

Comparison of 2-D wind fields and simulated wildland fire growth

www.nrfirescience.org/resource/11019

The paper discusses wildfire growth simulated by the FARSITE model using high-resolution wind fields over complex terrain extracted from operational runs of the MM5 weather forecast model supported by the USDA FS Rocky Mountain Center (RMC: <http://www.fs.fed.us/rmc/>). The original 12-km resolution wind field (simulated by MM5) has...

Author(s): Karl F. Zeller, Ned Nikolov, John S. Snook, Mark A. Finney, Jason M. Forthofer

Year Published: 2003

Type: Document

Conference Proceedings

An initial analysis of relationships between 2- and 10-minute averaged winds at 10, 6, and 1.8 meters: implications for fire behavior and danger applications

www.nrfirescience.org/resource/8424

Recently there has been discussion in the National Wildland Fire Coordination Group (NWCG) fire danger and fire weather working teams about the impact of observations from different anemometer heights and more importantly, averaging times, on inputs to fire management systems such as National Fire Danger Rating System (Deeming and...

Author(s): Larry S. Bradshaw, Eugene Petrescu, Isaac C. Grenfell

Year Published: 2003

Type: Document

Conference Proceedings

Statistical forecasts of the 2003 western wildfire season using canonical correlation analysis

www.nrfirescience.org/resource/8193

Experimental forecasts for the 2003 fire season indicate low area burned in most western deserts and

basins, high area burned in the southern Rocky Mountains and at higher elevations in Arizona and New Mexico, and mid to high area burned in the Sierra Nevada. This pattern - largely a continuation of that seen in 2002 - is the result...

Author(s): Anthony L. Westerling, Alexander Gershunov, Daniel R. Cayan

Year Published: 2003

Type: Document

Book or Chapter or Journal Article

Predicting surface winds in complex terrain for use in fire spread models

www.nrfirescience.org/resource/8438

Fire behavior predictions and forecasts are vital to tactical planning on wildland firefighting incidents. One major source of uncertainty in fire behavior predictions is spatial variation in the wind fields used in the fire models. In most cases wind data are limited to only a few specific locations, none of which may be actually...

Author(s): Jason M. Forthofer, Bret W. Butler, Kyle S. Shannon, Mark A. Finney, Larry S. Bradshaw, Richard D. Stratton

Year Published: 2003

Type: Document

Conference Proceedings

Long lead statistical forecasts of area burned in western U.S. wildfires by ecosystem province

www.nrfirescience.org/resource/8377

A statistical forecast methodology exploits large-scale patterns in monthly U.S. Climatological Division Palmer Drought Severity Index (PDSI) values over a wide region and several seasons to predict area burned in western U.S. wildfires by ecosystem province a season in advance. The forecast model, which is based on canonical...

Author(s): Anthony L. Westerling, Alexander Gershunov, Daniel R. Cayan, Tim P. Barnett

Year Published: 2002

Type: Document

Book or Chapter or Journal Article

The 2000 fire season: lightning-caused fires

www.nrfirescience.org/resource/8141

A large number of lightning-caused fires burned across the western United States during the summer of 2000. In a previous study, the authors determined that a simple index of low-level moisture (85-kPa dewpoint depression) and instability (85-50-kPa temperature difference) from the Spokane, Washington, upper-air soundings was very...

Author(s): Miriam L. Rorig, Sue A. Ferguson

Year Published: 2002

Type: Document

Book or Chapter or Journal Article

Critical fire weather patterns of the United States

www.nrfirescience.org/resource/12780

Descriptions of critical fire weather patterns from across the United States. Watch out conditions discussed.

Year Published: 1999

Type: Document

Research Brief or Fact Sheet

Making sense of fire weather

www.nrfirescience.org/resource/8122

This paper analyzes data from 339 large wildland fires that occurred in the Continental United States from 1971 through 1984. Each fire burned 1,000 acres (400 ha) or more. Each fire was associated with the nearest upper-air weather station and classified according to its season (spring, summer, autumn, or winter). Results of this...

Author(s): Brian E. Potter

Year Published: 1997

Type: Document

Book or Chapter or Journal Article

A statistical-topographic model for mapping climatological precipitation over mountainous terrain

www.nrfirescience.org/resource/8361

The demand for climatological precipitation fields on a regular grid is growing dramatically as ecological and hydrological models become increasingly linked to geographic information systems that spatially represent and manipulate model output. This paper presents an analytical model that distributes point measurements of monthly...

Author(s): Christopher Daly, Ronald P. Neilson, Donald L. Phillips

Year Published: 1994

Type: Document

Book or Chapter or Journal Article

Probability of fire-stopping precipitation events

www.nrfirescience.org/resource/11933

Fire managers in the Northwestern United States are often confronted by the problem of determining when precipitation might stop an ongoing fire. The possibility that a useful probability for fire-stopping precipitation could be developed from historical weather records was investigated. Persons familiar with weather and fire...

Author(s): Donald J. Latham, Richard C. Rothermel

Year Published: 1993

Type: Document

Research Brief or Fact Sheet

The relationship between mean monthly fire potential indices and monthly fire severity

www.nrfirescience.org/resource/10970

Thirty-day forecasts of fire potential are needed, and can be computed using a variety of monthly fire weather indices. But which indices are most related to monthly fire severity? Correlation analysis was used to determine the relationships between mean monthly fire potential indices and monthly measures of fire severity at 16...

Author(s): M. H. McCutchan, William A. Main

Year Published: 1989

Type: Document

Conference Proceedings

Stream shading, summer streamflow and maximum water temperature following intense wildfire in headwater streams

www.nrfirescience.org/resource/18470

Adjacent headwater streams were monitored for postfire shade, summer streamflow and maximum water temperature following the 40,000 ha Silver Complex fire in southern Oregon. Average postfire shade (30 percent) for the three streams was considerably less than prefire shade (est.>90 percent).

Dramatic increases in direct solar...

Author(s): Michael Amaranthus, Howard Jubas, David Arthur

Year Published: 1989

Type: Document

Conference Proceedings

Changes in fire weather distributions: effects on predicted fire behavior

www.nrfirescience.org/resource/11221

Data that represent average worst fire weather for a particular area are used to index daily fire danger; however, they do not account for different locations or diurnal weather changes that significantly affect fire behavior potential. To study the effects that selected changes in weather databases have on computed fire behavior...

Author(s): Lucy A. Salazar, Larry S. Bradshaw

Year Published: 1984

Type: Document

Technical Report or White Paper

Lightning direction-finding systems for forest fire detection throughout the western United States and Alaska

www.nrfirescience.org/resource/7958

Extensive networks of magnetic direction-finding (DF) stations have been installed throughout the western United States and Alaska to facilitate early detection of lightning-caused fires. Each station contains a new wideband direction-finder that responds primarily to cloud-to-ground lightning and discriminates against cloud...

Author(s): E. Philip Krider, R. C. Noggle, A. E. Pifer, Dale L. Vance

Year Published: 1980

Type: Document

Book or Chapter or Journal Article

Progress toward locating lightning fires

www.nrfirescience.org/resource/12120

Systems to enable land managers to locate, evaluate, and counter the fire threat of lightning storms are in the early stages of development. In the western U.S. and Alaska, the Bureau of Land Management has established networks of instruments that locate lightning strikes by means of recorded azimuths. Further research could add...

Author(s): Donald J. Latham

Year Published: 1979

Type: Document

Research Brief or Fact Sheet

Meteorological conditions affecting the Freeman Lake (Idaho) Fire

www.nrfirescience.org/resource/8305

[Excerpt from text] Measurements of meteorological conditions prevailing during the rapid spread of forest fires are greatly needed so that when their recurrence seems probable, fire weather forecasters may issue warnings of the danger.

Author(s): George M. Jemison

Year Published: 1932

Type: Document

Book or Chapter or Journal Article

Meteorological factors in the Quartz Creek forest fire

www.nrfirescience.org/resource/8304

[Excerpted from text] It is not often that a large forest fire occurs conveniently near a weather station specially equipped for measuring forest-fire weather. The 13,000-acre Quartz Creek fire on the Kaniksu National Forest during the summer of 1936 was close enough to the Priest River Experimental...

Author(s): Harry T. Gisborne

Year Published: 1927

Type: Document

Book or Chapter or Journal Article