

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

Spatially explicit measurements of forest structure and fire behavior following restoration treatments in dry forests

www.nrfirescience.org/resource/15044

Restoration treatments in dry forests of the western US often attempt silvicultural practices to restore the historical characteristics of forest structure and fire behavior. However, it is suggested that a reliance on non-spatial metrics of forest stand structure, along with the use of wildland fire behavior models that lack the...

Author(s): J. Ziegler, Chad M. Hoffman, Michael A. Battaglia, William E. Mell

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

Spatiotemporal dynamics of simulated wildfire, forest management, and forest succession in central Oregon, USA

www.nrfirescience.org/resource/15134

We use the simulation model Envision to analyze long-term wildfire dynamics and the effects of different fuel management scenarios in central Oregon, USA. We simulated a 50-year future where fuel management activities were increased by doubling and tripling the current area treated while retaining existing treatment strategies in...

Author(s): Ana M. G. Barros, Alan A. Ager, Michelle A. Day, Haiganoush K. Preisler, Thomas A. Spies, Eric M. White, Robert J. Pabst, Keith A. Olsen, Emily K. Platt, John D. Bailey, John P. Bolte

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

An uncertainty analysis of wildfire modeling [Chapter 13]

www.nrfirescience.org/resource/14997

Before fire models can be understood, evaluated, and effectively applied to support decision making,

model-based uncertainties must be analyzed. In this chapter, we identify and classify sources of uncertainty using an established analytical framework, and summarize results graphically in an uncertainty matrix. Our analysis...

Author(s): Karen L. Riley, Matthew P. Thompson

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Burning rates of wood cribs with implications for wildland fires

www.nrfirescience.org/resource/14684

Wood cribs are often used as ignition sources for room fire tests and the well characterized burning rates may also have applications to wildland fires. The burning rate of wildland fuel structures, whether the needle layer on the ground or trees and shrubs themselves, is not addressed in any operational fire model and no simple...

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

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

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

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

Autoignition of wood under combined convective and radiative heating

www.nrfirescience.org/resource/15781

Many wildland fire models assume radiation heat transfer controls fuel particle ignition. However, evidence suggests that radiation is insufficient to ignite the predominantly small, thin fuel particles in wildlands and that convective heating by flame contact is a critical component. Here, convective ignition was studied using an...

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

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

A comparison of level set and marker methods for the simulation of wildland fire front propagation

www.nrfirescience.org/resource/13803

Simulating an advancing fire front may be achieved within a Lagrangian or Eulerian framework. In the former, independently moving markers are connected to form a fire front, whereas in the latter, values representing the moving front are calculated at points within a fixed grid. Despite a mathematical equivalence between the two...

Author(s): Anthony S. Bova, William E. Mell, Chad M. Hoffman

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

The net benefits of human-ignited wildfire forecasting: the case of tribal land units in the United States

www.nrfirescience.org/resource/14196

Research shows that some categories of human-ignited wildfires may be forecastable, owing to their temporal clustering, with the possibility that resources could be predeployed to help reduce the incidence of such wildfires. We estimated several kinds of incendiary and other human-ignited wildfire forecast models at the weekly time...

Author(s): Jeffrey P. Prestemon, David T. Butry, Douglas S. Thomas

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Predicting large wildfires across western North America by modeling seasonal variation in soil

water balance

www.nrfirescience.org/resource/14021

A lengthening of the fire season, coupled with higher temperatures, increases the probability of fires throughout much of western North America. Although regional variation in the frequency of fires is well established, attempts to predict the occurrence of fire at a spatial resolution <10 km² have generally been unsuccessful. We...

Author(s): Richard H. Waring, Nicholas C. Coops

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Quantifying the influence of previously burned areas on suppression effectiveness and avoided exposure: a case study of the Las Conchas Fire

www.nrfirescience.org/resource/13919

We present a case study of the Las Conchas Fire (2011) to explore the role of previously burned areas (wildfires and prescribed fires) on suppression effectiveness and avoided exposure. Methodological innovations include characterisation of the joint dynamics of fire growth and suppression activities, development of a fire line...

Author(s): Matthew P. Thompson, Patrick H. Freeborn, Jon D. Rieck, David E. Calkin, Julie W.

Gilbertson-Day, Mark A. Cochrane, Michael S. Hand

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Near-term probabilistic forecast of significant wildfire events for the western United States

www.nrfirescience.org/resource/14704

Fire danger and potential for large fires in the United States (US) is currently indicated via several forecasted qualitative indices. However, landscape-level quantitative forecasts of the probability of a large fire are currently lacking. In this study, we present a framework for forecasting large fire occurrence – an extreme...

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

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Deriving fundamental statistical shrub fuel models by laser scanning and combustion experimentation

www.nrfirescience.org/resource/15558

We exploited the measurement capacity of a terrestrial laser scanner to precisely characterize shrub fuel matrices in a laboratory setting, to abstract fuel elements for fire behavior modeling, and to identify strengths and limitations of TLS for these purposes. Simultaneously, we produced statistical distributions of combustion...

Author(s): Carl A. Seielstad, Thomas H. Fletcher, David R. Weise

Year Published: 2015

Type: Document

Technical Report or White Paper

Evaluating crown fire rate of spread predictions from physics-based models

www.nrfirescience.org/resource/13614

Modeling the behavior of crown fires is challenging due to the complex set of coupled processes that

drive the characteristics of a spreading wildfire and the large range of spatial and temporal scales over which these processes occur. Detailed physics-based modeling approaches such as FIRETEC and the Wildland Urban Interface Fire...

Author(s): Chad M. Hoffman, J. Ziegler, Rodman Linn, William E. Mell, Carolyn Hull Sieg, F. Pimont

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Experimental analysis of fire spread across a two-dimensional ridge under wind conditions

www.nrfirescience.org/resource/13382

Results from a laboratory-scale investigation of a fire spreading on the windward face of a triangular-section hill of variable shape with wind perpendicular to the ridgeline are reported. They confirm previous observations that the fire enlarges its lateral spread after reaching the ridgeline, entering the leeward face with a much...

Author(s): J. R. Raposo, S. Cabiddu, Domingos Xavier Viegas, M. Salis, J. Sharples

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

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

Warning signals for eruptive events in spreading fires

www.nrfirescience.org/resource/13265

Spreading fires are noisy (and potentially chaotic) systems in which transitions in dynamics are notoriously difficult to predict. As flames move through spatially heterogeneous environments, sudden shifts in temperature, wind, or topography can generate combustion instabilities, or trigger self-stabilizing feedback loops, that...

Author(s): Jerome M. Fox, George M. Whitesides

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Emerging concepts in wildfire risk assessment and management

www.nrfirescience.org/resource/13948

A quantitative measure of wildfire risk across a landscape-expected net change in value of resources and assets exposed to wildfire was established nearly a decade ago. Assessments made using that measure have been completed at spatial extents ranging from an individual county to the continental United States. The science of...

Author(s): Joe H. Scott, Matthew P. Thompson

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

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

Decision making under uncertainty: recommendations for the Wildland Fire Decision Support System (WFDSS)

www.nrfirescience.org/resource/13947

The management of wildfire is a dynamic, complex, and fundamentally uncertain enterprise. Fire managers face uncertainties regarding fire weather and subsequent influence on fire behavior, the effects of fire on socioeconomic and ecological resources, and the efficacy of alternative suppression actions on fire outcomes. In these...

Author(s): Matthew P. Thompson

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

Large wildfire trends in the western United States, 1984-2011

www.nrfirescience.org/resource/12971

We used a database capturing large wildfires (> 405 ha) in the western U.S. to document regional trends in fire occurrence, total fire area, fire size, and day of year of ignition for 1984-2011. Over the western U.S. and in a majority of ecoregions, we found significant, increasing trends in the number of large fires and/or total...

Author(s): Philip E. Dennison, Simon C. Brewer, James D. Arnold, Max A. Moritz

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

Crown fire potential in lodgepole pine forests during the red stage of mountain pine beetle attack

www.nrfirescience.org/resource/12926

Mountain pine beetle (MPB) outbreaks within the previous 10-15 years have affected millions of hectares of lodgepole pine forests in western North America. Concerns about the influence of recent tree mortality on changes in fire behaviour amongst firefighters and fire managers have led researchers to attempt to quantify the effects...

Author(s): Wesley G. Page, Michael J. Jenkins, Martin E. Alexander

Year Published: 2014

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

Tables for estimating canopy fuel characteristics from stand variables in four interior west conifer forest types

www.nrfirescience.org/resource/12975

Tables have been constructed for use in making quick estimates of canopy base height, canopy fuel load, and canopy bulk density from visual observations or field measurements of stand height, basal area, and stand density for pure stands of ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.), lodgepole pine (*Pinus contorta* Dougl. ex...)

Author(s): Martin E. Alexander, Miguel G. Cruz

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Future Forests Webinar Series, webinar proceedings and summary: ongoing research and management responses to the mountain pine beetle outbreak

www.nrfirescience.org/resource/12963

The Future Forest Webinar Series facilitated dialogue between scientists and managers about the challenges and opportunities created by the mountain pine beetle (MPB) epidemic. The series consisted of six webinars facilitated by the USFS Rocky Mountain Research Station, the Northern and Rocky Mountain Regions, and the Colorado Forest...

Year Published: 2014

Type: Document

Conference Proceedings

Defining extreme wildland fires using geospatial and ancillary metrics

www.nrfirescience.org/resource/12953

There is a growing professional and public perception that 'extreme' wildland fires are becoming more common due to changing climatic conditions. This concern is heightened in the wildland-urban interface where social and ecological effects converge. 'Mega-fires', 'conflagrations', 'extreme' and 'catastrophic' are descriptors...

Author(s): Karen O. Lannom, Wade T. Tinkham, Alistair M. S. Smith, John T. Abatzoglou, Beth A. Newingham, Troy E. Hall, Penelope Morgan, Eva K. Strand, Travis B. Paveglio, John Anderson, Aaron M. Sparks
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Understanding stochastic wildfire simulation results

www.nrfirescience.org/resource/12758

Stochastic simulations of wildfire occurrence and growth have become an integral part of both wildfire incident management and land management planning applications. The FSPRO simulation system, implemented in the online Wildland Fire Decision Support System (WFDSS), acknowledges that weather inputs to wildfire growth...

Author(s): Joe H. Scott
Year Published: 2014
Type: Document
Technical Report or White Paper

Representation and evaluation of wildfire propagation simulations

www.nrfirescience.org/resource/12390

This paper provides a formal mathematical representation of a wildfire simulation, reviews the most common scoring methods using this formalism, and proposes new methods that are explicitly designed to evaluate a forest fire simulation from ignition to extinction. These scoring or agreement methods are tested with synthetic cases in...

Author(s): Jean-Baptiste Filippi, Vivien Mallet, Bahaa Nader
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Spectroscopic analysis of seasonal changes in live fuel moisture content and leaf dry mass

www.nrfirescience.org/resource/13001

Live fuel moisture content (LFMC), the ratio of water mass to dry mass contained in live plant material, is an important fuel property for determining fire danger and for modeling fire behavior. Remote sensing estimation of LFMC often relies on an assumption of changing water and stable dry mass over time. Fundamental understanding...

Author(s): Yi Qi, Philip E. Dennison, William Matt Jolly, Rachel C. Kropp, Simon C. Brewer
Year Published: 2014
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

Surface fire intensity influences simulated crown fire behavior in lodgepole pine forests with

recent mountain pine beetle-caused tree mortality

www.nrfirescience.org/resource/12138

Recent bark beetle outbreaks have had a significant impact on forests throughout western North America and have generated concerns about interactions and feedbacks between beetle attacks and fire. However, research has been hindered by a lack of experimental studies and the use of fire behavior models incapable of accounting for the...

Author(s): Chad M. Hoffman, Penelope Morgan, William E. Mell, Russell A. Parsons, Eva K. Strand, Stephen Cook

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Optimising fuel treatments over time and space

www.nrfirescience.org/resource/12039

Fuel treatments have been widely used as a tool to reduce catastrophic wildland fire risks in many forests around the world. However, it is a challenging task for forest managers to prioritise where, when, and how to implement fuel treatments across a large forest landscape. In this study, an optimisation model was developed for...

Author(s): Woodam Chung, J. Greg Jones, Kurt Krueger, Jody Bramel, Marco A. Contreras

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

A study of flame spread in engineered cardboard fuelbeds: part II: scaling law approach

www.nrfirescience.org/resource/12419

In this second part of a two part exploration of dynamic behavior observed in wildland fires, time scales differentiating convective and radiative heat transfer is further explored. Scaling laws for the two different types of heat transfer considered: Radiation-driven fire spread, and convection-driven fire spread, which can both...

Author(s): Brittany A. Adam, Nelson K. Akafuah, Mark A. Finney, Jason M. Forthofer, Kozo Saito

Year Published: 2013

Type: Document

Conference Proceedings

Modelling conditional burn probability patterns for large wildland fires

www.nrfirescience.org/resource/12005

We present a technique for modelling conditional burn probability patterns in two dimensions for large wildland fires. The intended use for the model is strategic program planning when information about future fire weather and event durations is unavailable and estimates of the average probabilistic shape and extent of large fires...

Author(s): Pamela S. Ziesler, Douglas B. Rideout, Robin Reich

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Are the applications of wildland fire behaviour models getting ahead of their evaluation again?

www.nrfirescience.org/resource/12417

Evaluation is a crucial component for model credibility and acceptance by researchers and resource managers. The nature and characteristics of free-burning wildland fires pose challenges to acquiring the kind of quality data necessary for adequate fire behavior model evaluation. As a result, in some circles it has led to a research...

Author(s): Martin E. Alexander, Miguel G. Cruz
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Relationships between climate and macroscale area burned in the western United States

www.nrfirescience.org/resource/12027

Increased wildfire activity (e.g. number of starts, area burned, fire behaviour) across the western United States in recent decades has heightened interest in resolving climate-fire relationships. Macroscale climate-fire relationships were examined in forested and non-forested lands for eight Geographic Area Coordination Centers in...

Author(s): John T. Abatzoglou, Crystal A. Kolden
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Combustibility of a mixture of live and dead fuel components

www.nrfirescience.org/resource/12427

The problem of predicting the rate of spread of a linear fire front in a fuel bed composed of one live and one dead fuel component in no-slope and no-wind conditions is addressed. Two linear models based on the mass fraction of each fuel component are proposed to predict the rate of spread of a fire front as a function of the mass...

Author(s): Domingos Xavier Viegas, J. Soares, Miguel Almeida
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Models for predicting fuel consumption in sagebrush-dominated ecosystems

www.nrfirescience.org/resource/11978

Fuel consumption predictions are necessary to accurately estimate or model fire effects, including pollutant emissions during wildland fires. Fuel and environmental measurements on a series of operational prescribed fires were used to develop empirical models for predicting fuel consumption in big sagebrush (*Artemisia tridentata*...

Author(s): Clinton S. Wright
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Analyzing the transmission of wildfire exposure on a fire-prone landscape in Oregon, USA

www.nrfirescience.org/resource/12755

We develop the idea of risk transmission from large wildfires and apply network analyses to understand its importance on a 0.75 million ha US national forest. Wildfires in the western US frequently burn over long distances (e.g., 20-50 km) through highly fragmented landscapes with respect to ownership, fuels, management intensity,...

Author(s): Alan A. Ager, Michelle A. Day, Mark A. Finney, Ken W. Vance-Borland, Nicole M. Vaillant
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Fuel Characteristic Classification System version 3.0: technical documentation

www.nrfirescience.org/resource/12407

The Fuel Characteristic Classification System (FCCS) is a software module that records wildland fuel characteristics and calculates potential fire behavior and hazard potentials based on input environmental variables. The FCCS 3.0 is housed within the Integrated Fuels Treatment Decision Support System (Joint Fire Science Program...

Author(s): Susan J. Prichard, David V. Sandberg, Roger D. Ottmar, Ellen Eberhardt, Anne Andreu, Paige C. Eagle, Kjell Swedin

Year Published: 2013

Type: Document

Technical Report or White Paper

Uncertainty associated with model predictions of surface and crown fire rates of spread

www.nrfirescience.org/resource/12418

The degree of accuracy in model predictions of rate of spread in wildland fires is dependent on the model's applicability to a given situation, the validity of the model's relationships, and the reliability of the model input data. On the basis of a compilation of 49 fire spread model evaluation datasets involving 1278 observations...

Author(s): Miguel G. Cruz, Martin E. Alexander

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Crown fire behavior characteristics and prediction in conifer forests: a state-of-knowledge synthesis - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/12447

Joint Fire Science Program (JFSP) project 09-S-03-1 was undertaken in response to JFSP Project Announcement No. FA-RFA09-0002 with respect to a synthesis on extreme fire behavior or more specifically a review and analysis of the literature dealing with certain features of crown fire behavior in conifer forests in the United States...

Author(s): Martin E. Alexander, Miguel G. Cruz, Nicole M. Vaillant, David L. Peterson

Year Published: 2013

Type: Document

Synthesis, Technical Report or White Paper

A polygon-based modeling approach to assess exposure of resources and assets to wildfire

www.nrfirescience.org/resource/12048

Spatially explicit burn probability modeling is increasingly applied to assess wildfire risk and inform mitigation strategy development. Burn probabilities are typically expressed on a per-pixel basis, calculated as the number of times a pixel burns divided by the number of simulation iterations. Spatial intersection of highly...

Author(s): Matthew P. Thompson, Joe H. Scott, Jeffrey D. Kaiden, Julie W. Gilbertson-Day

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Modeled forest inventory data suggest climate benefits from fuels management

www.nrfirescience.org/resource/13480

As part of a recent synthesis addressing fuel management in dry, mixed-conifer forests, we analyzed more than 5,000 Forest Inventory and Analysis (FIA) plots, a probability sample that represents 33 million acres of these forests throughout Washington, Oregon, Idaho, Montana, Utah, and extreme northern California. We relied on the...

Author(s): Jeremy S. Fried, Theresa B. Jain, Jonathan Sandquist
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Developing a computerized approach for optimizing individual tree removal to efficiently reduce crown fire potential

www.nrfirescience.org/resource/11889

Thinning is a common silvicultural treatment being widely used to restore different types of overstocked forest stands in western U.S. because of its effect on changing fire behavior. Typically, thinning is applied at the stand level using prescriptions derived from sample plots that ignore variability in tree sizes and location...

Author(s): Marco A. Contreras, Woodam Chung
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Angular variation of fire rate of spread

www.nrfirescience.org/resource/12428

Laboratory fire tests were performed in still air, for variable inclinations (10° , 15°) and fuel bed dimensions (1.28 x 2.50-3.0 x 4.6 m²), with homogeneous fuel beds of pine needles and pine wood excelsior. The fire ignition was made at a point, along a closed line with no fuel inside and along a straight edge of the fuel bed...

Author(s): Jorge C. S. Andre, Joao C. Goncalves, Gilberto C. Vaz, Domingos Xavier Viegas
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Evaluating the performance and mapping of three fuel classification systems using Forest Inventory and Analysis surface fuel measurements

www.nrfirescience.org/resource/12015

Fuel Loading Models (FLMs) and Fuel Characteristic Classification System (FCCSs) fuelbeds are used throughout wildland fire science and management to simplify fuel inputs into fire behavior and effects models, but they have yet to be thoroughly evaluated with field data. In this study, we used a large dataset of Forest Inventory and...

Author(s): Robert E. Keane, Jason M. Herynk, Chris Toney, Shawn P. Urbanski, Duncan C. Lutes, Roger D. Ottmar
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Capturing fire: RxCADRE takes fire measurements to whole new level

www.nrfirescience.org/resource/12425

Models of fire behavior and effects do not always make accurate predictions, and there is not enough systematically gathered data to validate them. To help advance fire behavior and fire effects model development, the Joint Fire Science Program is helping fund the RxCADRE, which is made up of scientists from the U.S. Forest Service...

Author(s): Gail Wells
Year Published: 2013
Type: Document
Research Brief or Fact Sheet

The relationship of large fire occurrence with drought and fire danger indices in the western USA, 1984-2008: the role of temporal scale

www.nrfirescience.org/resource/12025

The relationship between large fire occurrence and drought has important implications for fire prediction under current and future climates. This study's primary objective was to evaluate correlations between drought and fire-danger-rating indices representing short- and long-term drought, to determine which had the strongest...

Author(s): Karen L. Riley, John T. Abatzoglou, Isaac C. Grenfell, Anna E. Klene, Faith A. Heinsch

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Current status and future needs of the BehavePlus Fire Modeling System

www.nrfirescience.org/resource/12392

The BehavePlus Fire Modeling System is among the most widely used systems for wildland fire prediction. It is designed for use in a range of tasks including wildfire behaviour prediction, prescribed fire planning, fire investigation, fuel hazard assessment, fire model understanding, communication and research. BehavePlus is based on...

Author(s): Patricia L. Andrews

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Characterizing wildfire hazard and risk in mountain pine beetle-affected stands and how to identify those characteristics at the landscape-scale

www.nrfirescience.org/resource/11977

The transformation of fuels resulting from the mountain pine beetle epidemic is unprecedented in its large geographic extent and the rapid pace of the transformation. This paper describes a proposed fire risk and hazard characterization system, as well as methodology for locating certain stand types on the landscape.

Author(s): Robert W. Gray

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Towards the understanding of extreme wildland fire behavior

www.nrfirescience.org/resource/11092

The author presents a brief discussion of the changing face of extreme fire behavior and an introduction to Synthesis of knowledge of extreme fire behavior: volume I for fire managers.

Author(s): Martin E. Alexander

Year Published: 2012

Type: Document

Research Brief or Fact Sheet

Numerical simulation of crown fire hazard immediately after bark beetle-caused mortality in lodgepole pine forests

www.nrfirescience.org/resource/8325

Quantifying the effects of mountain pine beetle (MPB)-caused tree mortality on potential crown fire hazard has been challenging partly because of limitations in current operational fire behavior models.

Such models are not capable of accounting for fuel heterogeneity resulting from an outbreak. Further, the coupled interactions...

Author(s): Chad M. Hoffman, Penelope Morgan, William E. Mell, Russell A. Parsons, Eva K. Strand, Stephen Cook

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Quantifying the threat of unsuppressed wildfires reaching the adjacent wildland-urban interface on the Bridger-Teton National Forest, Wyoming, USA

www.nrfirescience.org/resource/8349

An important objective for many federal land management agencies is to restore fire to ecosystems that have experienced fire suppression or exclusion over the last century. Managing wildfires for resource objectives (i.e., allowing wildfires to burn in the absence of suppression) is an important tool for restoring such fire-adapted...

Author(s): Joe H. Scott, Don Helmbrecht, Sean A. Parks, Carol Miller

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Do mountain pine beetle outbreaks change the probability of active crown fire in lodgepole pine forests? Comment 1 & 2, Reply 1

www.nrfirescience.org/resource/13342

Comment 1 - Simard et al. (2011) have produced a comprehensive data set and analysis concerning mountain pine beetle (MPB; *Dendroctonus ponderosae*)-caused mortality and associated crown fire feedbacks in lodgepole pine (*Pinus contorta*)-dominated forests. Misapplication of the NEXUS fire modeling system (Scott and...

Author(s): Christopher J. Moran, Mark A. Cochrane, William Matt Jolly, Russell A. Parsons, J. Morgan Varner, Bret W. Butler, Kevin C. Ryan, Corey L. Gucker, Martin Simard, William H. Romme, Monica G. Turner

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Modeling tree-level fuel connectivity to evaluate the effectiveness of thinning treatments for reducing crown fire potential

www.nrfirescience.org/resource/8295

Land managers have been using fire behavior and simulation models to assist in several fire management tasks. These widely-used models use average attributes to make stand-level predictions without considering spatial variability of fuels within a stand. Consequently, as the existing models have limitations in adequately modeling...

Author(s): Marco A. Contreras, Russell A. Parsons, Woodam Chung

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Synthesis of knowledge of extreme fire behavior: Volume 1 for managers

www.nrfirescience.org/resource/12566

The National Wildfire Coordinating Group definition of extreme fire behavior (EFB) indicates a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning/spotting, presence of fire whirls,

and strong...

Author(s): Paul A. Werth, Brian E. Potter, Craig B. Clements, Mark A. Finney, Scott L. Goodrick, Martin E. Alexander, Miguel G. Cruz, Jason M. Forthofer, Sara S. McAllister

Year Published: 2011

Type: Document

Synthesis, Technical Report or White Paper

Linking 3D spatial models of fuels and fire: effects of spatial heterogeneity on fire behavior

www.nrfirescience.org/resource/14161

Crownfire endangers fire fighters and can have severe ecological consequences. Prediction of fire behavior in tree crowns is essential to informed decisions in fire management. Current methods used in fire management do not address variability in crown fuels. New mechanistic physics-based fire models address convective heat transfer...

Author(s): Russell A. Parsons, William E. Mell, Peter McCauley

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

A comparison of statistical downscaling methods suited for wildfire applications

www.nrfirescience.org/resource/11973

Place-based data is required in wildfire analyses, particularly in regions of diverse terrain that foster not only strong gradients in meteorological variables, but also complex fire behaviour. However, a majority of downscaling methods are inappropriate for wildfire application due to the lack of daily timescales and variables such...

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

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

A method for ensemble wildland fire simulation

www.nrfirescience.org/resource/12732

An ensemble simulation system that accounts for uncertainty in long-range weather conditions and two-dimensional wildland fire spread is described. Fuel moisture is expressed based on the energy release component, a US fire danger rating index, and its variation throughout the fire season is modeled using time series analysis of...

Author(s): Mark A. Finney, Isaac C. Grenfell, Charles W. McHugh, Robert C. Seli, D. Trethewey, Richard D. Stratton, Stuart Brittain

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

Fuel and fire behavior in high-elevation five-needle pines affected by mountain pine beetle

www.nrfirescience.org/resource/12112

Bark beetle-caused tree mortality in conifer forests affects the quantity and quality of forest fuels and has long been assumed to increase fire hazard and potential fire behavior. In reality, bark beetles and their effects on fuel accumulation and subsequent fire hazard have only recently been described. We have extensively sampled...

Author(s): Michael J. Jenkins

Year Published: 2011

Type: Document

Conference Proceedings

Analyzing wildfire exposure and source-sink relationships on a fire prone forest landscape

www.nrfirescience.org/resource/12736

We used simulation modeling to analyze wildfire exposure to social and ecological values on a 0.6 million ha national forest in central Oregon, USA. We simulated 50,000 wildfires that replicated recent fire events in the area and generated detailed maps of burn probability (BP) and fire intensity distributions. We also recorded the...

Author(s): Alan A. Ager, Nicole M. Vaillant, Mark A. Finney, Haiganoush K. Preisler

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

Simulating fuel treatment effects in dry forests of the western United States: testing the principles of a fire-safe forest

www.nrfirescience.org/resource/8275

We used the Fire and Fuels Extension to the Forest Vegetation Simulator (FFE-FVS) to simulate fuel treatment effects on 45,162 stands in low- to midelevation dry forests (e.g., ponderosa pine (*Pinus ponderosa* Dougl. ex. P....

Author(s): Morris C. Johnson, Maureen C. Kennedy, David L. Peterson

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

A real-time risk assessment tool supporting wildland fire decisionmaking

www.nrfirescience.org/resource/12727

Development of appropriate management strategies for escaped wildland fires is complex. Fire managers need the ability to identify, in real time, the likelihood that wildfire will affect valuable developed and natural resources (e.g., private structures, public infrastructure, and natural and cultural resources). These...

Author(s): David E. Calkin, Matthew P. Thompson, Mark A. Finney, Kevin D. Hyde

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

A tool to estimate the impact of bark beetle activity on fuels and fire behavior

www.nrfirescience.org/resource/12129

Recent bark beetle outbreaks have resulted in the loss of hundreds of thousands of conifers on approximately 74 million acres (30 million hectares) of forest in western North America during the last decade. Stand conditions, drought, and warming temperatures have contributed to the severity of these outbreaks, particularly in high-...

Author(s): Michael J. Jenkins, Elizabeth G. Hebertson, Wesley G. Page, Wanda E. Lindquist

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

Assessing crown fire potential in coniferous forests of western North America: a critique of current approaches and recent simulation studies

www.nrfirescience.org/resource/8187

To control and use wildland fires safely and effectively depends on credible assessments of fire potential, including the propensity for crowning in conifer forests. Simulation studies that use certain fire

modelling systems (i.e. NEXUS, FlamMap, FARSITE, FFE-FVS (Fire and Fuels Extension to the Forest Vegetation Simulator), Fuel...

Author(s): Miguel G. Cruz, Martin E. Alexander

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

Effects of biomass removal treatments on stand-level fire characteristics in major forest types of the Northern Rocky Mountains

www.nrfirescience.org/resource/8189

Removal of dead and live biomass from forested stands affects subsequent fuel dynamics and fire potential. The amount of material left onsite after biomass removal operations can influence the intensity and severity of subsequent unplanned wildfires or prescribed burns. We developed a set of biomass removal treatment scenarios and...

Author(s): Elizabeth D. Reinhardt, Lisa M. Holsinger, Robert E. Keane

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

Fire-climate interactions in the American west since 1400 CE

www.nrfirescience.org/resource/11992

Despite a strong anthropogenic fingerprint on 20th Century wildland fire activity in the American West, climate remains a main driver. A better understanding of the spatiotemporal variability in fire-climate interactions is therefore crucial for fire management. Here, we present annually resolved, tree-ring based fire records for...

Author(s): Valerie Trouet, Alan H. Taylor, Eugene R. Wahl, Carl N. Skinner

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

Evaluation of forest management systems under risk of wildfire

www.nrfirescience.org/resource/8336

We evaluate the economic efficiency of even- and uneven-aged management systems under risk of wildfire. The management problems are formulated for a mixed-conifer stand and approximations of the optimal solutions are obtained using simulation optimization. The Northern Idaho variant of the Forest Vegetation Simulator and its Fire...

Author(s): Kari Hyytiainen, Robert G. Haight

Year Published: 2010

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

Wildland surface fire spread modelling, 1990-2007. 3: Simulation and mathematical analogue models

www.nrfirescience.org/resource/13825

In recent years, advances in computational power have led to an increase in attempts to model the behaviour of wildland fires and to simulate their spread across landscape. The present series of articles endeavours to comprehensively survey and précis all types of surface fire spread models developed during the period 1990-2007....

Author(s): Andrew L. Sullivan

Year Published: 2009

Type: Document

Book or Chapter or Journal Article, Synthesis

Climate and wildfire area burned in western U.S. ecoprovinces, 1916-2003

www.nrfirescience.org/resource/8228

The purpose of this paper is to quantify climatic controls on the area burned by fire in different vegetation types in the western United States. We demonstrate that wildfire area burned (WFAB) in the American West was controlled by climate during the 20th century (1916-2003). Persistent ecosystem-specific correlations between...

Author(s): Jeremy S. Littell, Donald McKenzie, David L. Peterson, Anthony L. Westerling

Year Published: 2009

Type: Document

Book or Chapter or Journal Article

Reciprocal interactions between bark beetles and wildfire in subalpine forests: landscape patterns and the risk of high-severity fire - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11136

The interactions of wildfire and bark beetle outbreaks and their reciprocal influences on fire behavior, bark beetle dynamics, and ecosystem structure are critical research issues in many coniferous forests of the Intermountain West. We combined field studies with new remote sensing methods to address three main questions regarding...

Author(s): Daniel B. Tinker

Year Published: 2009

Type: Document

Technical Report or White Paper

Wildland surface fire spread modelling, 1990-2007. 1: Physical and quasi-physical models

www.nrfirescience.org/resource/13823

In recent years, advances in computational power have led to an increase in attempts to model the behaviour of wildland fires and to simulate their spread across the landscape. The present series of articles endeavours to comprehensively survey and précis all types of surface fire spread models developed during the period 1990-...

Author(s): Andrew L. Sullivan

Year Published: 2009

Type: Document

Book or Chapter or Journal Article, Synthesis

Fuel treatment guidebook: illustrating treatment effects on fire hazard

www.nrfirescience.org/resource/8155

The Guide to Fuel Treatments (Johnson and others 2007) analyzes potential fuel treatments and the potential effects of those treatments for dry forest lands in the Western United States. The guide examines low- to mid-elevation dry forest stands with high stem densities and heavy ladder fuels, which are currently common due to fire...

Author(s): Crystal L. Raymond

Year Published: 2009

Type: Document

Book or Chapter or Journal Article

Wildland surface fire spread modelling, 1990-2007. 2: Empirical and quasi-empirical models

www.nrfirescience.org/resource/13824

In recent years, advances in computational power have led to an increase in attempts to model the behaviour of wildland fires and to simulate their spread across landscape. The present series of articles endeavours to comprehensively survey and précis all types of surface fire spread models developed during the period 1990-2007....

Author(s): Andrew L. Sullivan

Year Published: 2009

Type: Document

Book or Chapter or Journal Article, Synthesis

Bark beetles, fuels, fires, and implications for forest management in the Intermountain West

www.nrfirescience.org/resource/8239

Bark beetle-caused tree mortality in conifer forests affects the quantity and quality of forest fuels and has long been assumed to increase fire hazard and potential fire behavior. In reality, bark beetles, and their effects on fuel accumulation, and subsequent fire hazard, are poorly understood. We extensively sampled fuels in...

Author(s): Michael J. Jenkins, Elizabeth G. Hebertson, Wesley G. Page, C. Arik Jorgensen

Year Published: 2008

Type: Document

Book or Chapter or Journal Article, Synthesis

Fire probability, fuel treatment effectiveness and ecological tradeoffs in Western U.S. public forests

www.nrfirescience.org/resource/12724

Fuel treatment effectiveness and non-treatment risks can be estimated from the probability of fire occurrence. Using extensive fire records for western US Forest Service lands, we estimate fuel treatments have a mean probability of 2.0-7.9% of encountering moderate- or high-severity fire during an assumed 20-year period of...

Author(s): Jonathan J. Rhodes, William L. Baker

Year Published: 2008

Type: Document

Book or Chapter or Journal Article

Temporal and spatial structure in a daily wildfire-start data set from the western United States (1986-96)

www.nrfirescience.org/resource/8201

The temporal and spatial structure of 332 404 daily fire-start records from the western United States for the period 1986 through 1996 is illustrated using several complimentary visualisation techniques. We supplement maps and time series plots with Hovmiller diagrams that reduce the spatial dimensionality of the daily data in order...

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

Year Published: 2008
Type: Document
Book or Chapter or Journal Article

Predicted fire behavior in selected mountain pine beetle-infested lodgepole pine

www.nrfirescience.org/resource/12113

Using custom fuel models developed for use with Rothermel's surface fire spread model, we predicted and compared fire behavior in lodgepole pine (*Pinus contorta* Dougl. var. *latifolia* Engelm.) stands with endemic, current epidemic, and postepidemic mountain pine beetle (*Dendroctonus ponderosae* Hopkins) populations using standardized...

Author(s): Wesley G. Page, Michael J. Jenkins

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

On the use of a firebrand generator to investigate the ignition of structures in wildland-urban interface (WUI) fires

www.nrfirescience.org/resource/12439

An experimental apparatus has been constructed to generate a controlled and repeatable size and mass distribution of glowing firebrands. The present study reports on a series of experiments conducted in order to characterize the performance of this firebrand generator. Firebrand generator characterization and subsequent structural...

Author(s): Anthony Manzello, John R. Shields, Jiann C. Yang, Yoshihiko Hayashi, Daisaku Nii

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

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

Guide to fuel treatments in dry forests of the Western United States: assessing forest structure and fire hazard

www.nrfirescience.org/resource/11166

Guide to Fuel Treatments analyzes a range of fuel treatments for representative dry forest stands in the Western United States with overstories dominated by ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), and pinyon pine (*Pinus edulis*). Six silvicultural options (no thinning; thinning from below to 50 trees...

Author(s): Morris C. Johnson, David L. Peterson, Crystal L. Raymond

Year Published: 2007

Type: Document

Technical Report or White Paper

Statistical model for forecasting monthly large wildfire events in the western United States

www.nrfirescience.org/resource/8123

The ability to forecast the number and location of large wildfire events (with specified confidence bounds) is important to fire managers attempting to allocate and distribute suppression efforts during severe fire seasons. This paper describes the development of a statistical model for assessing the forecasting skills of fire-...

Author(s): Haiganoush K. Preisler, Anthony L. Westerling

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

Contingent pacific-atlantic ocean influence on multicentury wildfire synchrony over western North America

www.nrfirescience.org/resource/8293

Widespread synchronous wildfires driven by climatic variation, such as those that swept western North America during 1996, 2000, and 2002, can result in major environmental and societal impacts. Understanding relationships between continental-scale patterns of drought and modes of sea surface temperatures (SSTs) such as El Niño-...

Author(s): Thomas Kitzberger, Peter M. Brown, Emily K. Heyerdahl, Thomas W. Swetnam, Thomas T. Veblen

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

Testing the modeled effectiveness of an operational fuel reduction treatment in a small western Montana interface landscape using two spatial scales

www.nrfirescience.org/resource/8410

Much of the coniferous zones in the Western United States where fires were historically frequent have seen large increases in stand densities and associated forest fuels due to 20th century anthropogenic influences. This condition is partially responsible for contemporary large, uncharacteristically severe wildfires. Therefore,...

Author(s): Michael G. Harrington, Erin Noonan-Wright, Mitchell Doherty

Year Published: 2007

Type: Document

Conference Proceedings

Simulation of long-term landscape-level fuel treatment effects on large wildfires

www.nrfirescience.org/resource/8166

A simulation system was developed to explore how fuel treatments placed in topologically random and

optimal spatial patterns affect the growth and behaviour of large fires when implemented at different rates over the course of five decades. The system consisted of a forest and fuel dynamics simulation module (Forest Vegetation...

Author(s): Mark A. Finney, Robert C. Seli, Charles W. McHugh, Alan A. Ager, Bernhard Bahro, James K. Agee

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

A physics-based approach to modelling grassland fires

www.nrfirescience.org/resource/14842

Physics-based coupled fire-atmosphere models are based on approximations to the governing equations of fluid dynamics, combustion, and the thermal degradation of solid fuel. They require significantly more computational resources than the most commonly used fire spread models, which are semi-empirical or empirical. However, there...

Author(s): William E. Mell, Mary Ann Jenkins, Jim Gould, Phil Cheney

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

A national study of the consequences of fire and fire surrogate treatments

www.nrfirescience.org/resource/15633

We provide highlights of some of the results thus far for the National Fire and Fire Surrogate study (FFS). Highlights summarize work that has been published within the last four years (2003-2006), primarily in theses, proceedings, general technical reports, and peer-reviewed journals (<http://www.fs.fed.us/ffs/>). In the summary, we...

Author(s): James D. McIver, Phil Weatherspoon

Year Published: 2006

Type: Document

Technical Report or White Paper

Comparison of crown fire modeling systems used in three fire management applications

www.nrfirescience.org/resource/11200

The relative behavior of surface-crown fire spread rate modeling systems used in three fire management applications-CFIS (Crown Fire Initiation and Spread), FlamMap and NEXUS- is compared using fire environment characteristics derived from a dataset of destructively measured canopy fuel and associated stand characteristics. Although...

Author(s): Joe H. Scott

Year Published: 2006

Type: Document

Technical Report or White Paper

Evaluation of MM5 model resolution when applied to prediction of National Fire Danger Rating indexes

www.nrfirescience.org/resource/7943

Weather predictions from the MM5 mesoscale model were used to compute gridded predictions of National Fire Danger Rating System (NFDRS) indexes. The model output was applied to a case study of the 2000 fire season in Northern Idaho and Western Montana to simulate an extreme event. To determine the preferred resolution for automating...

Author(s): Jeanne L. Hoadley, Miriam L. Rorig, Larry S. Bradshaw, Sue A. Ferguson, Kenneth Westrick, Scott L. Goodrick, Paul A. Werth

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

Fuel Treatment Evaluator 3.0

www.nrfirescience.org/resource/11078

The Fuel Treatment Evaluator (FTE) 3.0 is a web-based tool that simulates uneven-aged and even-aged silvicultural treatments on timberland in 12 western states. This tool simulates treatments to reduce forest fire hazard to specific target levels and identifies the volume of biomass removed, harvesting costs, and estimated biomass...

Author(s): U.S. Department of Agriculture, Forest Service

Year Published: 2006

Type: Document

Research Brief or Fact Sheet

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, Brandon M. Collins, Philip N. Omi, Phillip L. Chapman

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

The challenge of quantitative risk analysis for wildland fire

www.nrfirescience.org/resource/12715

Quantitative fire risk analysis depends on characterizing and combining fire behavior probabilities and effects. Fire behavior probabilities are different from fire occurrence statistics (historic numbers or probabilities of discovered ignitions) because they depend on spatial and temporal factors controlling fire growth. That is,...

Author(s): Mark A. Finney

Year Published: 2005

Type: Document

Book or Chapter or Journal Article

A web-based information system for estimating fuel characteristics, fire hazard, and treatment

effectiveness - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11879

This project has three objectives: 1) Classify ponderosa pine, Douglas-fir, and dry mixed-conifer forests types in Montana and New Mexico into appropriate fuel characteristic classes (FCC's), and display the results by forest type, density, and structural classes, 2) Develop web-based applications by which users can evaluate the...

Author(s): Carl E. Fiedler, Roger D. Ottmar

Year Published: 2005

Type: Document

Technical Report or White Paper

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

Recent history of large-scale ecosystem disturbances in North America derived from the AVHRR satellite record

www.nrfirescience.org/resource/11506

Ecosystem structure and function are strongly affected by disturbance events, many of which in North America are associated with seasonal temperature extremes, wildfires, and tropical storms. This study was conducted to evaluate patterns in a 19-year record of global satellite observations of vegetation phenology from the advanced...

Author(s): Christopher Potter, Tan Ping-Ning, Vipin Kumar, Chris J. Kucharik, Steven Klooster, Vanessa Genovese, Warren B. Cohen, Sean P. Healey

Year Published: 2005

Type: Document

Book or Chapter or Journal Article

Evaluation of the Experimental Climate Prediction Center's fire danger forecasts with remote automated weather station observations

www.nrfirescience.org/resource/8127

The Scripps Experimental Climate Prediction Center has been routinely making regional forecasts of atmospheric elements and fire danger indices since 27 September 1997. This study evaluates these forecasts using selected remote automated weather station observations over the western USA. Bias and anomaly correlations are computed...

Author(s): Hauss J. Reinbold, John O. Roads, Timothy J. Brown

Year Published: 2005

Type: Document

Book or Chapter or Journal Article

Evaluation of the Experimental Climate Prediction Center's fire danger forecasts with remote automated weather station observations

www.nrfirescience.org/resource/8208

The Scripps Experimental Climate Prediction Center has been routinely making regional forecasts of atmospheric elements and fire danger indices since 27 September 1997. This study evaluates these forecasts using selected remote automated weather station observations over the western USA. Bias and anomaly correlations are computed...

Author(s): Hauss J. Reinbold, John O. Roads, Timothy J. Brown

Year Published: 2005

Type: Document

Book or Chapter or Journal Article

Visualizing a forest landscape today and tomorrow

www.nrfirescience.org/resource/11102

Description not entered

Author(s): J. Greg Jones

Year Published: 2005

Type: Document

Research Brief or Fact Sheet

Cumulative effects of fuel management on landscape-scale fire behavior and effects - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11157

The project is concerned with modeling the long-term effects of landscape fuel treatment patterns on wildfire sizes and severity. The work was initiated based on theoretical fuel treatment patterns that appeared effective at changing fire growth across large landscapes, thus reducing the acreage burned and the chances that large...

Author(s): Mark A. Finney

Year Published: 2005

Type: Document

Technical Report or White Paper

Optimizing landscape treatments for reducing wildfire risk and improving ecological sustainability of ponderosa pine forests with mixed severity fire regimes - Part 2 - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11169

A mixed severity fire regime historically created complex landscape structures in ponderosa pine forests of the Colorado Front Range. Mitigating present wildfire risks and restoring these forests to ecologically sustainable conditions requires new guidelines for landscape treatment. However, vast acreages need treatment while only...

Author(s): Merrill R. Kaufmann, Jimmie D. Chew, J. Greg Jones

Year Published: 2005

Type: Document

Technical Report or White Paper

Climate drivers of fire and fuel in the Northern Rockies: past, present & future - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11154

This 3-year research project is identifying the climate drivers of regional fire and fuel dynamics in the Northern Rockies in the past, present, and future. We are identifying regional fire years from two sources: multicentury tree-ring reconstructions and multidecadal fire atlases. To elucidate the climate forcing of past fires, we...

Author(s): Penelope Morgan, Emily K. Heyerdahl, Carol Miller, Matthew G. Rollins

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

Forest fuel treatments in western North America: merging silviculture and fire management

www.nrfirescience.org/resource/7948

In order to accomplish complex and multiple management objectives related to forest structure, fuels, and fire disturbance, these two disciplines must be effectively integrated in science and practice. The authors have linked scientific and management tools to develop an analytical approach that allows resource managers to quantify...

Author(s): Morris C. Johnson, David L. Peterson

Year Published: 2005

Type: Document

Book or Chapter or Journal Article

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

Probability based models for estimation of wildfire risk

www.nrfirescience.org/resource/12709

We present a probability-based model for estimating fire risk. Risk is defined using three probabilities: the probability of fire occurrence; the conditional probability of a large fire given ignition; and the unconditional probability of a large fire. The model is based on grouped data at the 1 km²-day cell level. We fit a...

Author(s): Haiganoush K. Preisler, David R. Brillinger, Robert E. Burgan, John W. Benoit

Year Published: 2004

Type: Document

Book or Chapter or Journal Article

A comment on models and modelling in fire/fuel management

www.nrfirescience.org/resource/12394

'Modeling is fine as long as you know what you are doing.' General remark made to the author by a retired University of Alberta forestry professor a few years ago. The April 1988 issue of the Journal of Forestry published an article by John J. Garland that I have often handed out at various training courses and workshops to impress...

Author(s): Martin E. Alexander

Year Published: 2004

Type: Document

Technical Report or White Paper

MODIS Applications in 2003 Fire Management - Slide presentation

www.nrfirescience.org/resource/11516

Powerpoint presentation MODIS Applications in 2003 Fire Management

Author(s): C. A. Ryan, Bryce L. Nordgren, James P. Menakis, Mark A. Finney, Wei Min Hao

Year Published: 2004

Type: Document

Conference Proceedings

Climate and wildfire in the western United States

www.nrfirescience.org/resource/8184

A 21-yr gridded monthly fire-starts and acres-burned dataset from U.S. Forest Service, Bureau of Land Management, National Park Service, and Bureau of Indian Affairs fire reports recreates the seasonality and interannual variability of wildfire in the western United States. Despite pervasive human influence in western fire regimes,...

Author(s): Anthony L. Westerling, Timothy J. Brown, Alexander Gershunov, Daniel R. Cayan, M. D. Dettinger

Year Published: 2003

Type: Document

Book or Chapter or Journal Article

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

Performance of the Haines Index during August 2000 for Montana

www.nrfirescience.org/resource/10997

The Haines Index, introduced by Haines (1988) as the Lower Atmosphere Severity Index, is designed to gauge how readily the lower mid-troposphere (500 to 4500 m AGL) will spur an otherwise fairly predictable fire to become erratic and unmanageable. Based on stability and moisture, the Haines Index (hereafter, HI) takes on integer...

Author(s): Brian E. Potter, Scott L. Goodrick

Year Published: 2003

Type: Document

Assessing the value of increased model resolution in forecasting fire danger

www.nrfirescience.org/resource/10969

The fire season of 2000 was used as a case study to assess the value of increasing mesoscale model resolution for fire weather and fire danger forecasting. With a domain centered on Western Montana and Northern Idaho, MM5 simulations were run at 36, 12, and 4-km resolutions for a 30 day period at the height of the fire season....

Author(s): Jeanne L. Hoadley, Miriam L. Rorig, Kenneth Westrick, Larry S. Bradshaw, Sue A. Ferguson, Scott L. Goodrick, Paul A. Werth

Year Published: 2003

Type: Document

Conference Proceedings

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

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

Assessing canopy fuel stratum characteristics in crown fire prone fuel types of western North America

www.nrfirescience.org/resource/7917

Application of crown fire behavior models in fire management decision-making have been limited by the difficulty of quantitatively describing fuel complexes, specifically characteristics of the canopy fuel stratum. To estimate canopy fuel stratum characteristics of four broad fuel types found in the western United States and...

Author(s): Martin E. Alexander, Ronald H. Wakimoto

Year Published: 2003

Type: Document

Book or Chapter or Journal Article

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

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

Using FVS and its fire and fuels extension in the context of uncertain climate

www.nrfirescience.org/resource/11011

While the prospect of a static climate is no longer tenable, the direction of change for particular localities is not yet clear. Modelling vulnerability of silvicultural options to various scenarios of climate change requires a modelling system that can represent major processes affected by climatic variability. The Forest...

Author(s): Albert R. Stage

Year Published: 2002

Type: Document

Conference Proceedings

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

Statistical forecast of the 2001 western wildfire season using principal components regression

www.nrfirescience.org/resource/8396

Description not entered

Author(s): Anthony L. Westerling, Daniel R. Cayan, Alexander Gershunov, M. D. Dettinger, Timothy J. Brown

Year Published: 2001

Type: Document

The Mann Gulch Fire and the Canadian Forest Fire Danger Rating System

www.nrfirescience.org/resource/8408

The year 1999 marks the 50th anniversary of the Mann Gulch Fire that occurred in western Montana on August 5, 1949 (Matthews 1999). There has been considerable interest amongst the Canadian wildland fire community in the 1949 Mann Gulch Fire ever since the publishing of MacLean's (1992) book 'Young Men and Fire' and Rothermel's (...)

Author(s): Martin E. Alexander

Year Published: 2000

Type: Document

Conference Proceedings

An overview of the fire and fuels extension to the forest vegetation simulator

www.nrfirescience.org/resource/11037

The Fire and Fuels Extension (FFE) to the Forest Vegetation Simulator (FVS) has been developed to assess the risk, behavior, and impact of fire in forest ecosystems. This extension to the widely-used stand-dynamics model FVS simulates the dynamics of snags and surface fuels as they are affected by stand management (of trees or fuels...)

Author(s): Sarah J. Beukema, Elizabeth D. Reinhardt, Werner A. Kurz, Nicholas L. Crookston

Year Published: 2000

Type: Document

Conference Proceedings

Fire-climate interactions in the Selway-Bitterroot Wilderness area

www.nrfirescience.org/resource/11887

Tree-ring reconstructed summer drought was examined in relation to the occurrence of 15 fires in the Selway-Bitterroot Wilderness Area (SBW). The ten largest fire years between 1880 and 1995 were selected from historical fire atlas data; five additional fire years were selected from a fire history completed in a subalpine forest...

Author(s): Kurt F. Kipfmüller, Thomas W. Swetnam

Year Published: 2000

Type: Document

Conference Proceedings

Stevensville West Central Study

www.nrfirescience.org/resource/10981

This paper reports on an application of two modeling systems in the assessment and planning effort for a 58,038-acre area on the Bitterroot National Forest: SIMulating Vegetative Patterns and Processes at Landscape ScaLEs (SIMPPLLE), and Multi-resource Analysis and Geographic Information System (MAGIS). SIMPPLLE was a useful model...

Author(s): J. Greg Jones, Jimmie D. Chew, Nan K. Christianson, D. J. Silvieus, Catherine A. Stewart

Year Published: 2000

Type: Document

Conference Proceedings

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

Development of input data layers for the FARSITE fire growth model for the Selway-Bitterroot Wilderness Complex, USA

www.nrfirescience.org/resource/11240

Fuel and vegetation spatial data layers required by the spatially explicit fire growth model FARSITE were developed for all lands in and around the Selway-Bitterroot Wilderness Area in Idaho and Montana. Satellite imagery and terrain modeling were used to create the three base vegetation spatial data layers of potential vegetation,...

Author(s): Robert E. Keane, Janice L. Garner, Kirsten M. Schmidt, Donald G. Long, James P. Menakis, Mark A. Finney

Year Published: 1998

Type: Document

Technical Report or White Paper

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

Intermountain West lightning-caused fires: climatic predictors of area burned

www.nrfirescience.org/resource/11460

An increase in continuous fine fuels promoted by the expansion of aggressive annual exotic grasses in the Intermountain West has altered the region's fire regimes, with both ecologic and economic ramifications. I examine the predictive nature of seasonal climatic variables, seasonal precipitation and temperature data up to 2 years...

Author(s): Paul A. Knapp

Year Published: 1995

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

Mann Gulch fire: a race that couldn't be won

www.nrfirescience.org/resource/11196

The Mann Gulch fire, which over ran 16 firefighters in 1949, is analyzed to show its probable movement with respect to the crew. The firefighters were smokejumpers who had parachuted near the fire on August 5, 1949. While they were moving to a safer location, the fire blocked their route. Three survived, the foreman who ignited...

Author(s): Richard C. Rothermel

Year Published: 1993

Type: Document

Technical Report or White Paper

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 evaluation of Idaho wildfire growth using the Haines Index

www.nrfirescience.org/resource/8307

An atmospheric index specifically designed to be related to the growth of wildland fires is evaluated for two recent Idaho fires. The index includes terms related to high midlevel lapse rates and low-level dry air. In the cases examined, the index performs well at pinpointing the time of the most explosive fire growth. Long-term...

Author(s): Paul A. Werth, Richard Ochoa

Year Published: 1993

Type: Document

Book or Chapter or Journal Article

Predicting behavior of the 1988 Yellowstone fires: projections versus reality

www.nrfirescience.org/resource/8252

An account is presented of the initial long range, 30-day, projections of fire growth of the wildfires in the Greater Yellowstone Area in 1988. The request for information, the method of prediction, and the actual fire growth are discussed and documented with maps. The difficulties and uncertainties of long-range fire prediction...

Author(s): Richard C. Rothermel

Year Published: 1991

Type: Document

Book or Chapter or Journal Article

Predicting behavior and size of crown fires in the northern Rocky Mountains

www.nrfirescience.org/resource/11195

Assessment of crown fire conditions calls for two important judgments: (1) identifying conditions for the onset of severe fires, and (2) predicting the spread rate, intensity, and size of expected crown fires. This paper addresses the second problem and provides methods for making a first approximation of the behavior of a running...

Author(s): Richard C. Rothermel
Year Published: 1991
Type: Document
Technical Report or White Paper

Fuel moisture as measured and predicted during the 1988 fires in Yellowstone National Park

www.nrfirescience.org/resource/11109

Fine fuel moisture content, relative humidity, air temperature, and fire behavior were observed hourly for 48 hours on the North Fork Fire in Yellowstone National Park from August 25 to August 27, 1988. Fine fuel reached minimum moisture content of 3 to 5 percent late in the afternoon, remained below 8 percent until after midnight,...

Author(s): Roberta A. Hartford, Richard C. Rothermel
Year Published: 1991
Type: Document
Research Brief or Fact Sheet

The Haines Index and Idaho fire growth

www.nrfirescience.org/resource/8306

[Excerpted from text] The growth of wildfires is related to three broad factors: fuel type, topography and weather. The National Fire Danger Rating System and the Fire Behavior Prediction System combine these factors to predict the probability and severity of wildland fires. However, these systems have mixed results in predicting...

Author(s): Paul A. Werth, Richard Ochoa
Year Published: 1990
Type: Document
Book or Chapter or Journal Article

FIRESUM-an ecological process model for fire succession in western conifer forests

www.nrfirescience.org/resource/11917

Describes an ecological process model of succession that simulates long-term stand dynamics in forests of the Northern Rocky Mountains. This model is used to evaluate the effects of various fire regimes, including prescribed burning and fire suppression, on the vegetation and fuel complex of a simulation stand. This report documents...

Author(s): Robert E. Keane, Stephen F. Arno, James K. Brown
Year Published: 1989
Type: Document
Technical Report or White Paper

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

Help with making crown fire hazard assessments

www.nrfirescience.org/resource/11046

This paper offers some suggestions and field guides with respect to the operational application of C.E. Van Wagner's (1997, Can. J. For. Res. 7:23-34) theory to calculate the threshold conditions for the start and spread of crown fires in conifer forests. Three categories of crowning are recognized (passive, active, and independent...

Author(s): Martin E. Alexander

Year Published: 1988

Type: Document

Conference Proceedings, Technical Report or White Paper

Appraising fuels and flammability in western aspen: a prescribed fire guide

www.nrfirescience.org/resource/11132

Describes a method for appraising fuels and fire behavior potential in aspen forests to guide the use of prescribed fire and the preparation of fire prescriptions. Includes an illustrated classification of aspen fuels; appraisals of fireline intensity, rate of spread, adjective ratings for fire behavior and probability of burn...

Author(s): James K. Brown, Dennis Simmerman

Year Published: 1986

Type: Document

Technical Report or White Paper

Predicting duff and woody fuel consumed by prescribed fire in the Northern Rocky Mountains

www.nrfirescience.org/resource/11265

Relationships for predicting duff reduction, mineral soil exposure, and consumption of downed woody fuel were determined to assist in planning prescribed fires. Independent variables included lower and entire duff moisture contents, loadings of downed woody fuels, duff depth, National Fire-Danger Rating System 1,000-hour moisture...

Author(s): James K. Brown, Michael A. Marsden, Kevin C. Ryan, Elizabeth D. Reinhardt

Year Published: 1985

Type: Document

Technical Report or White Paper

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

Wildland fires: predicting the behavior of wildland fires-among nature's most potent forces-can save lives, money, and natural resources

www.nrfirescience.org/resource/8315

During a period of three days in mid-February 1983, bushfires swept over 400,000 ha in southern Australia, killing 74 people, destroying more than 2,000 homes, and burning out 7 towns. This tragic repetition of the fires of January 1939, in which 71 people perished, was foretold by Noble (1977), whose monograph on the 1939 fires...

Author(s): Frank A. Albini

Year Published: 1984
Type: Document
Book or Chapter or Journal Article

Fuel and fire behavior prediction in big sagebrush

www.nrfirescience.org/resource/11957

Relationships between height of big sagebrush and crown area, fuel loading, bulk density, size distribution of foliage and stemwood, and fraction dead stemwood are presented. Based upon these relationships, modeled rate-of-fire spread and fireline intensity are shown for sagebrush ranging in height from 20 to 120 cm and in coverage...

Author(s): James K. Brown
Year Published: 1982
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

Fire danger rating network density

www.nrfirescience.org/resource/11969

Conventional statistical techniques are used to answer the question, "What is the necessary station density for a fire danger network?" The Burning Index of the National Fire-Danger Rating System is used as an indicator of fire danger. Results are presented as station spacing in tabular form for each of six regions in the western...

Author(s): Rudy M. King, R. William Furman
Year Published: 1976
Type: Document
Technical Report or White Paper

Smoke column height related to fire intensity

www.nrfirescience.org/resource/11946

Height of slash fire smoke columns, commonly thought to be a function of atmospheric conditions alone, through a series of 10-acre experimental fires is shown to be strongly related to fire intensity. By conducting intense fires, land managers can possibly burn forest debris and still maintain air quality when atmospheric conditions...

Author(s): Rodney A. Norum

Year Published: 1974

Type: Document

Technical Report or White Paper

Conversion tables for use with the National Fire-Danger Rating System in the Intermountain Area

www.nrfirescience.org/resource/11919

Two tables prepared for use with the National Fire-Danger Rating System replace 10 tables previously used with the Model-8 Fire-Danger Rating System. They provide for the conversion of Spread Index values at various altitudes, aspects, and times of day. A rate of spread table facilitates converting Spread Index values to chains per...

Author(s): Dwight S. Stockstad, Richard J. Barney

Year Published: 1964

Type: Document

Research Brief or Fact Sheet

Calculating the National Fire-Danger Rating spread index by computer

www.nrfirescience.org/resource/11918

Changeover from use of the Intermountain Model-8 Burning Index Meter to use of the Spread Index of the National Fire-Danger Rating System required a comparative analysis of both systems. This note describes a program written in SPS to calculate various indexes of both systems on an IBM 1620 computer.

Author(s): Richard J. Barney

Year Published: 1964

Type: Document

Research Brief or Fact Sheet

The relationship of jet streams to forest fires

www.nrfirescience.org/resource/11470

Problems being encountered in implementing fire prevention programs were explored by studying the organization for fire prevention at the Fish Lake, Uinta, and Wasatch National Forests in Utah. The study focused on role congruency in fire prevention activities and on the social and organizational obstacles to effective programs. The...

Author(s): V. J. Schaefer

Year Published: 1957

Type: Document

Book or Chapter or Journal Article

Fire behavior in Northern Rocky Mountain Forests

www.nrfirescience.org/resource/11133

The main purpose of this publication is to summarize the most important aspects of fire behavior as we now know them. The author recognizes that there are still many unknowns in the behavior of forest and range fires. These unknowns will be the targets of future research. In the meantime it is important that the best available...

Author(s): Jack S. Barrows

Year Published: 1951
Type: Document
Technical Report or White Paper

Fire Modeling in the Wildland Fire Decision Support System - WFDSS

www.nrfirescience.org/resource/59

Mediasite video presentation given by Sam Amato, (National Fire Decision Support Center) at the 2011 Southwest Interagency Fuels Workshop, Flagstaff, AZ on March 10, 2011. The Wildland Fire Decision Support System (WFDSS) model uses different fire models to provide landscape scale fire modeling. This presentation defines the model...

Type: Media

Video

Computer models for wildland and wildland-urban interface fires

www.nrfirescience.org/resource/13808

Hosted by the Northwest Fire Science Consortium. Ruddy Mell from the USFS Pacific Wildland Fire Sciences Lab in Seattle, WA provides an overview of the current state, limitations, and future developments in wildland and wildland-urban interface fire behavior models.

Type: Media

Webinar

A dynamic, severe fire weather potential mobile mapping program

www.nrfirescience.org/resource/14536

Goal of this tool is to provide spatial, dynamic fire danger and fire behavior assessment tools so that firefighters can abide by the Standard Fire Orders 1 and 3: "Keep informed of fire weather conditions and forecasts" and "Base all action on current and expected fire behavior".

Type: Media

Video

National and global fire danger rating systems: development, applications, and improvements

www.nrfirescience.org/resource/14335

Wildland fire potential is best described as a combination of available fuels, suitable weather conditions and sources of ignitions and weather is the most spatially and temporally variable of these three components. Weather variables such as temperature, relative humidity, precipitation and wind speed...

Type: Media

Webinar

Fundamental research on how wildfires spread

www.nrfirescience.org/resource/15228

About half of the Forest Service budget is spent on fire suppression, yet we still can't explain exactly how wildland fires spread. In order to make more informed decisions and improve fire fighter safety, a new research program at the Missoula Fire Lab is going back to the basics. This webinar with Sara McAllister discusses the...

Type: Media

Webinar

Effects of complex terrain on extreme fire behavior

www.nrfirescience.org/resource/12822

This webinar, presented on January 27, 2015 by Craig Clements and Neil Lareau from the Fire

Weather Research Laboratory at San Jose State University, provides a discussion of wind systems in mountainous terrain, modeling fire behavior on slopes, and wind modeling tools.

Type: Media

Webinar

WFDSS modeling and weather

www.nrfirescience.org/resource/14131

This webinar was facilitated by Tom St. Clair, Fairbanks, Alaska, and focused on WFDSS modeling and weather. The agenda items covered included: how to pick RAWS to get the best data for wind and fuels, using predicted weather, ERC classes tab in WFDSS, ERC streams tab in WFDSS, winds tab in WFDSS, dealing with weather forecast...

Type: Media

Webinar

STANDFIRE: a prototype 3-D fuels and fire modeling platform for fuel treatment analysis

www.nrfirescience.org/resource/14872

Across the country, hundreds of millions of dollars have been spent, and tens of millions of acres of fuels have been treated with the intention of altering fire behavior, either to mitigate threats to firefighters and communities, or to maintain or restore healthy ecosystems. While some case studies have shown...

Type: Media

Webinar

Demonstration of Canadian fire behavior calculator REDApp

www.nrfirescience.org/resource/13238

REDapp is a universal fire behavior calculator developed with financial support from the Canadian Interagency Forest Fire Centre (CIFFC), and in-kind support from fire management agencies across Canada. This application is currently in a beta stage of development, with public release expected in early 2015. Unlike WFDSS, Behave,...

Type: Media

Webinar

Predicting Burn Severity Patterns in Yosemite National Park and the Douglas Complex Fires in Oregon

www.nrfirescience.org/resource/15798

Mountainous topography creates fine-scale environmental mosaics that vary in precipitation, temperature, insolation, and slope position. This mosaic in turn influences fuel accumulation, moisture, and forest structure that in turn influence patterns of burn severity. We studied the effects of varying environmental conditions on burn...

Type: Media

Seminar

The fire lab

www.nrfirescience.org/resource/14664

Massive wildfires cost billions of dollars and burn millions of acres in the U.S. every year, but we know surprisingly little about the basic science of how they spread. At the Fire Lab in Missoula, Montana, researchers reverse-engineer spreading fires using wind tunnels, fire-whirl generators, and giant combustion chambers. They're...

Type: Media

Video

Fuel particle heat exchange

www.nrfirescience.org/resource/14336

This seminar was recorded by the RMRS Fire Sciences Laboratory.

Type: Media

Seminar

A topographically resolved wildfire danger and drought monitoring system for the conterminous United States

www.nrfirescience.org/resource/15242

Patterns of energy and available moisture vary over small distances in mountainous regions and available climate data are too coarse to resolve these terrain-mediated effects. This seminar focused on efforts to improve the physical template we use to analyze vegetation patterns and post-fire ecological effects, including what has...

Type: Media

Seminar

Introduction to FlamMap5

www.nrfirescience.org/resource/12850

FlamMap is a fire behavior mapping and analysis program that computes potential fire behavior characteristics (spread rate, flame length, fireline intensity, etc.) over an entire FARSITE landscape for constant weather and fuel moisture conditions. Since 2006 FlamMap3 has been widely used by the U.S. Forest Service, National Park...

Type: Media

Webinar

Provision of science-based information and technology in support of the Canadian wildland fire strategy

www.nrfirescience.org/resource/14137

erry Anderson of the Canadian Forest Service, begins this presentation on the current fire research in Canada. The Canadian Forest Service provides national monitoring, model and software development, mapping, and decision support systems, but is not in the business of fire suppression, since natural resources are owned by the...

Type: Media

Video

Critical fire weather patterns - Western United States

www.nrfirescience.org/resource/12820

In this webinar, presented on February 11, 2015, Paul Werth, a fire weather meteorologist with Weather Research and Consulting Services, LLC, provides a discussion of weather elements that promote extreme fire behavior, regional critical fire weather patterns, and forecast products that are useful in determining areas at risk for...

Type: Media

Webinar

Influence of buoyant dynamics on wildfire spread

www.nrfirescience.org/resource/13251

Technology has improved our utilization of existing fire models but has contributed little to advancing knowledge of fire spread. The knowledge of physical processes, and their organization in producing fire

spread, is essential to reliably modeling wildland fire behaviors beyond current capabilities (crown fire, thresholds etc.)....

Type: Media

Webinar

Modeling Dynamic Fuels with an Index System: MoD-FIS in the Great Basin and Southwest U.S.

www.nrfirescience.org/resource/15947

This webinar is co-hosted by LANDFIRE and members of the Joint Fire Science Program: Great Basin Fire Science Exchange, Southwest Fire Science Consortium, and the Northern Rockies Fire Science Network. Content will address challenges that managers of large landscapes deal with in these regions. The LANDFIRE Program strives to...

Type: Media

Webinar

Vortices and wildland fire

www.nrfirescience.org/resource/13222

Scott Goodrick, a research meteorologist with the USDA Forest Service, and Jason Forthofer, a mechanical engineer with the USDA Forest Service, present a summary of vortices and wildland fire. Vortices are almost always present in the wildland fire environment and can sometimes interact with the fire in unpredictable ways, causing...

Type: Media

Webinar

Development of a Fully Integrated Meteorological/Fire Behavior/Smoke Modeling

www.nrfirescience.org/resource/15793

An modeling/science team of the US Forest Service Washington Office, Rocky Mountain Research Station, and Pacific Northwest Research Station is conducting a proof-of-concept study integrating meteorological, fire behavior, fuels, and air quality models to improve the accuracy of smoke model dispersion forecasts. The atmospheric...

Type: Media

Seminar