

Fostering collective action to reduce wildfire risk across property boundaries in the American West

www.nrfirescience.org/resource/20879

Large-scale, high-severity wildfires are a major challenge to the future social-ecological sustainability of fire-adapted forest ecosystems in the American West. Managing forests to mitigate this risk is a collective action problem requiring landowners and stakeholders within multi-ownership landscapes to plan and implement...

Author(s): Susan Charnley, Erin C. Kelly, A. Paige Fischer

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Cross-boundary wildfire and community exposure: A framework and application in the western U.S.

www.nrfirescience.org/resource/19663

In this report we provide a framework for assessing cross-boundary wildfire exposure and a case study application in the western U.S. The case study provides detailed mapping and tabular decision support materials for prioritizing fuel management investments aimed at reducing wildfire exposure to communities located proximal to...

Author(s): Alan A. Ager, Michelle A. Day, Palaiologos Palaiologou, Rachel M. Houtman, Chris Ringo, Cody Evers

Year Published: 2019

Type: Document

Technical Report or White Paper

Marshall Woods Restoration Project - Challenges to building consensus and conveying fire hazard mitigation and ecological restoration needs to the public

www.nrfirescience.org/resource/19686

The 28,000-acre Rattlesnake National Recreation Area (RNRA) lies immediately northwest of Missoula, Montana, and is a highly popular recreation destination with an estimated 60,000 annual visitors. The immediate area also contains thousands of residences situated within the Wildland Urban Interface (WUI). In 2005, Missoula County'...

Author(s): Megan P. Keville

Year Published: 2018

Type: Document

Research Brief or Fact Sheet

A review of challenges to determining and demonstrating efficiency of large fire management

www.nrfirescience.org/resource/16145

Characterizing the impacts of wildland fire and fire suppression is critical information for fire management decision-making. Here, we focus on decisions related to the rare larger and longer-duration fire events, where the scope and scale of decision-making can be far broader than initial response efforts, and where determining and...

Author(s): Matthew P. Thompson, Francisco Rodriguez y Silva, David E. Calkin, Michael S. Hand

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

An empirical machine learning method for predicting potential fire control locations for pre-fire planning and operational fire management

www.nrfirescience.org/resource/15490

During active fire incidents, decisions regarding where and how to safely and effectively deploy resources to meet management objectives are often made under rapidly evolving conditions, with limited time to assess management strategies or for development of backup plans if initial efforts prove unsuccessful. Under all but the most...

Author(s): Christopher D. O'Connor, David E. Calkin, Matthew P. Thompson

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Uncertainty and probability in wildfire management decision support: An example from the United States [Chapter 4]

www.nrfirescience.org/resource/14998

Wildfire risk assessment is increasingly being adopted to support federal wildfire management decisions in the United States. Existing decision support systems, specifically the Wildland Fire Decision Support System (WFDSS), provide a rich set of probabilistic and risk-based information to support the management of active wildfire...

Author(s): Matthew P. Thompson, David E. Calkin, Joe H. Scott, Michael S. Hand

Year Published: 2017

Type: Document

Technical Report or White Paper

A framework for developing safe and effective large-fire response in a new fire management paradigm

www.nrfirescience.org/resource/16144

The impacts of wildfires have increased in recent decades because of historical forest and fire management, a rapidly changing climate, and an increasingly populated wildland urban interface. This increasingly complex fire environment highlights the importance of developing robust tools to support risk-informed decision making....

Author(s): Christopher J. Dunn, Matthew P. Thompson, David E. Calkin

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Towards enhanced risk management: planning, decision making and monitoring of US wildfire response

www.nrfirescience.org/resource/15485

This paper is the preface to a special issue focused on US wildfire response. The nine papers included build from a 2016 conference special session on monitoring, modelling and accountability of fire management policies and practices. Here we provide the unifying theme for these papers, summarise each from this perspective, and...

Author(s): Christopher J. Dunn, David E. Calkin, Matthew P. Thompson

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Risk management: core principles and practices, and their relevance to wildland fire

www.nrfirescience.org/resource/14411

The Forest Service, U.S. Department of Agriculture faces a future of increasing complexity and risk, pressing financial issues, and the inescapable possibility of loss of human life. These issues are perhaps most acute for wildland fire management, the highest risk activity in which the Forest Service engages. Risk management (RM)...

Author(s): Matthew P. Thompson, Donald G. MacGregor, David E. Calkin
Year Published: 2016
Type: Document
Technical Report or White Paper

Application of wildfire risk assessment results to wildfire response planning in the southern Sierra Nevada, California, USA

www.nrfirescience.org/resource/14351

How wildfires are managed is a key determinant of long-term socioecological resiliency and the ability to live with fire. Safe and effective response to fire requires effective pre-fire planning, which is the main focus of this paper. We review general principles of effective federal fire management planning in the U.S., and...

Author(s): Matthew P. Thompson, Phil Bowden, April Brough, Julie W. Gilbertson-Day, Alan H. Taylor, Jessica R. Haas
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Enterprise risk management: selected agencies' experiences illustrate good practices in managing risk

www.nrfirescience.org/resource/18860

We performed our work for this report under the authority of the Comptroller General to conduct evaluations to assist Congress with its oversight responsibilities. Our objectives were to (1) update our risk management framework to more fully include evolving requirements and essential elements for federal ERM, and (2) identify good...

Year Published: 2016
Type: Document
Technical Report or White Paper

Wildfire risk as a socioecological pathology

www.nrfirescience.org/resource/14461

Wildfire risk in temperate forests has become a nearly intractable problem that can be characterized as a socioecological 'pathology': that is, a set of complex and problematic interactions among social and ecological systems across multiple spatial and temporal scales. Assessments of wildfire risk could benefit from recognizing and...

Author(s): A. Paige Fischer, Thomas A. Spies, Toddi A. Steelman, Cassandra Moseley, Bart R. Johnson, John D. Bailey, Alan A. Ager, Patrick S. Bourgeron, Susan Charnley, Brandon M. Collins, Jeffrey D. Kline, Jessica E. Leahy, Jeremy S. Littell, James D.A. Millington, Max W. Nielsen-Pincus, Christine Olsen, Travis B. Paveglio, Christopher I. Roos, David M. J. S. Bowman
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Examining alternative fuel management strategies and the relative contribution of National Forest System land to wildfire risk to adjacent homes - a pilot assessment on the Sierra National Forest, California, USA

www.nrfirescience.org/resource/14352

Determining the degree of risk that wildfires pose to homes, where across the landscape the risk originates, and who can best mitigate risk are integral elements of effective co-management of wildfire risk. Developing assessments and tools to help provide this information is a high priority for federal land management agencies such...

Author(s): Joe H. Scott, Matthew P. Thompson, Julie W. Gilbertson-Day
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Resolving future fire management conflicts using multicriteria decision making

www.nrfirescience.org/resource/13893

Management strategies to reduce the risks to human life and property from wildfire commonly involve burning native vegetation. However, planned burning can conflict with other societal objectives such as human health and biodiversity conservation. These conflicts are likely to intensify as fire regimes change under future climates...

Author(s): Don A. Driscoll, Michael Bode, Ross A. Bradstock, David A. Keith, Trent D. Penman, Owen F. Price

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Getting ahead of the wildfire problem: quantifying and mapping management challenges and opportunities

www.nrfirescience.org/resource/14688

Wildfire is a global phenomenon that plays a vital role in regulating and maintaining many natural and human-influenced ecosystems but that also poses considerable risks to human populations and infrastructure. Fire managers are charged with balancing the short-term protection of human assets sensitive to fire exposure against the...

Author(s): Christopher D. O'Connor, Matthew P. Thompson, Francisco Rodriguez y Silva

Year Published: 2016

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

A mixed integer program to model spatial wildfire behavior and suppression placement decisions

www.nrfirescience.org/resource/13272

Wildfire suppression combines multiple objectives and dynamic fire behavior to form a complex problem for decision makers. This paper presents a mixed integer program designed to explore integrating spatial fire behavior and suppression placement decisions into a mathematical programming framework. Fire behavior and suppression...

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

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

Development and application of a geospatial wildfire exposure and risk calculation tool

www.nrfirescience.org/resource/13271

Applying wildfire risk assessment models can inform investments in loss mitigation and landscape restoration, and can be used to monitor spatiotemporal trends in risk. Assessing wildfire risk entails the integration of fire modeling outputs, maps of highly valued resources and assets (HVRAs), characterization of fire effects, and...

Author(s): Matthew P. Thompson, Jessica R. Haas, Julie W. Gilbertson-Day, Joe H. Scott, Paul G. Langowski, Elise M. Bowne, David E. Calkin

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

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

www.nrfirescience.org/resource/13615

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

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

Year Published: 2014

Type: Document

Conference Proceedings

Assessing the expected effects of wildfire on vegetation condition on the Bridger-Teton National Forest, Wyoming, USA

www.nrfirescience.org/resource/12759

Characterizing wildfire risk to a fire-adapted ecosystem presents particular challenges due to its broad spatial extent, inherent complexity, and the difficulty in defining wildfire-induced losses and benefits. Our approach couples stochastic wildfire simulation with a vegetation condition assessment framework to estimate the...

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

Year Published: 2014

Type: Document

Technical Report or White Paper

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

Decision making for wildfires: a guide for applying a risk management process at the incident level

www.nrfirescience.org/resource/12748

This publication focuses on the thought processes and considerations surrounding a risk management process for decision making on wildfires. The publication introduces a six element risk management cycle designed to encourage sound risk-informed decision making in accordance with Federal wildland fire policy, although the process is...

Author(s): Mary A. Taber, Lisa M. Elenz, Paul G. Langowski

Year Published: 2013

Type: Document

Technical Report or White Paper

Risk preferences in strategic wildfire decision making: a choice experiment with U.S. wildfire managers

www.nrfirescience.org/resource/12752

Federal policy has embraced risk management as an appropriate paradigm for wildfire management. Economic theory suggests that over repeated wildfire events, potential economic costs and risks of ecological damage are optimally balanced when management decisions are free from biases, risk aversion, and risk seeking. Of primary...

Author(s): Matthew J. Wibbenmeyer, Michael S. Hand, David E. Calkin, Tyron J. Venn, Matthew P. Thompson

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Assessing watershed-wildfire risks on national forest system lands in the Rocky Mountain region of the United States

www.nrfirescience.org/resource/12750

Wildfires can cause significant negative impacts to water quality with resultant consequences for the environment and human health and safety, as well as incurring substantial rehabilitation and water treatment costs. In this paper we will illustrate how state-of-the-art wildfire simulation modeling and geospatial risk assessment...

Author(s): Matthew P. Thompson, Joe H. Scott, Paul G. Langowski, Julie W. Gilbertson-Day, Jessica R. Haas, Elise M. Bowne

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Escape probability: an alternative risk metric to support and evaluate wilderness fire management decisions

www.nrfirescience.org/resource/13478

A goal of fire management in wilderness is to allow fire to play its natural ecological role without intervention. Unfortunately, most unplanned ignitions in wilderness are suppressed, in part because of the risk they might pose to values outside of the wilderness. Although the fire management community has embraced the concept of...

Author(s): Kevin M. Barnett

Year Published: 2013

Type: Document

Dissertation or Thesis

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

Integrated wildfire risk assessment: framework development and application on the Lewis and Clark National Forest in Montana, USA

www.nrfirescience.org/resource/12751

The financial, socioeconomic, and ecological impacts of wildfire continue to challenge federal land management agencies in the United States. In recent years, policymakers and managers have increasingly turned to the field of risk analysis to better manage wildfires and to mitigate losses to highly valued resources and...

Author(s): Matthew P. Thompson, Joe H. Scott, Don Helmbrecht, David E. Calkin

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

Probabilistic assessment of wildfire hazard and municipal watershed exposure

www.nrfirescience.org/resource/12737

The occurrence of wildfires within municipal watersheds can result in significant impacts to water quality and ultimately human health and safety. In this paper, we illustrate the application of geospatial analysis and burn probability modeling to assess the exposure of municipal watersheds to wildfire. Our assessment of wildfire...

Author(s): Joe H. Scott, Don Helmbrecht, Matthew P. Thompson, David E. Calkin, Kate Marcille

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Integrated national-scale assessment of wildfire risk to human and ecological values

www.nrfirescience.org/resource/12735

The spatial, temporal, and social dimensions of wildfire risk are challenging U.S. federal land management agencies to meet societal needs while maintaining the health of the lands they manage. In this paper we present a quantitative, geospatial wildfire risk assessment tool, developed in response to demands for improved risk-based...

Author(s): Matthew P. Thompson, David E. Calkin, Mark A. Finney, Alan A. Ager, Julie W. Gilbertson-Day

Year Published: 2011
Type: Document
Book or Chapter or Journal Article

Advancing effects analysis for integrated, large-scale wildfire risk assessment

www.nrfirescience.org/resource/12729

In this article, we describe the design and development of a quantitative, geospatial risk assessment tool intended to facilitate monitoring trends in wildfire risk over time and to provide information useful in prioritizing fuels treatments and mitigation measures. The research effort is designed to develop, from a strategic view,...

Author(s): Matthew P. Thompson, David E. Calkin, Julie W. Gilbertson-Day, Alan A. Ager

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

Uncertainty and risk in wildland fire management: a review

www.nrfirescience.org/resource/12431

Wildland fire management is subject to manifold sources of uncertainty. Beyond the unpredictability of wildfire behavior, uncertainty stems from inaccurate/missing data, limited resource value measures to guide prioritization across fires and resources at risk, and an incomplete scientific understanding of ecological response to...

Author(s): Matthew P. Thompson, David E. Calkin

Year Published: 2011

Type: Document
Book or Chapter or Journal Article, Synthesis

A simulation of probabilistic wildfire risk components for the continental United States

www.nrfirescience.org/resource/12734

This simulation research was conducted in order to develop a large-fire risk assessment system for the contiguous land area of the United States. The modeling system was applied to each of 134 Fire Planning Units (FPUs) to estimate burn probabilities and fire size distributions. To obtain stable estimates of these quantities, fire...

Author(s): Mark A. Finney, Charles W. McHugh, Isaac C. Grenfell, Karen L. Riley, Karen C. Short

Year Published: 2011

Type: Document
Book or Chapter or Journal Article

A comparative risk assessment framework for wildland fire management: the 2010 cohesive strategy science report

www.nrfirescience.org/resource/12728

The FLAME Act of 2009 requires the U.S. Department of Agriculture Forest Service and the U.S. Department of Interior to submit to Congress a Cohesive Wildfire Management Strategy. In this report, we explore the general science available for a risk-based approach to fire and fuels management and suggest analyses that may be applied...

Year Published: 2011

Type: Document

Technical Report or White Paper

Ranching, invasive annual grasses, and the external costs of wildfire in the Great Basin: a stochastic dynamic programming approach

www.nrfirescience.org/resource/11468

The spread of invasive annual grasses and resulting escalation of wildfire frequency and severity pose a significant and growing threat to the economic and ecological viability of the rangelands in the Great Basin. While private ranchers have the option to limit the severity of wildfires through fuels removal treatments, few...

Author(s): Mimako Kobayashi, Michael H. Taylor

Year Published: 2010

Type: Document

Conference Proceedings

Managing risk in government: an introduction to enterprise risk management

www.nrfirescience.org/resource/18859

Risk management is not a new concept within the federal sector. What is new is the need to integrate risk management into the strategic and decisionmaking processes that cut across the organization, and abandon the outdated practice of managing risks within functional silos and stovepipes. The purpose of this paper is to provide...

Author(s): Karen Hardy

Year Published: 2010

Type: Document

Technical Report or White Paper

Wildland fire hazard and risk: problems, definitions and context

www.nrfirescience.org/resource/12716

The risks, hazards, and relative severity of wildland fires are presented here within the ecological context of historical natural fire regimes, time, space, and process. As the public dialogue on the role and impacts of wildland fire increases, it is imperative for all partners to converge on clear and concise terminology that...

Author(s): Colin C. Hardy

Year Published: 2005

Type: Document

Book or Chapter or Journal Article

Accepting uncertainty, assessing risk: decision quality in managing wildfire, forest resource values, and new technology

www.nrfirescience.org/resource/12711

The risks, uncertainties, and social conflicts surrounding uncharacteristic wildfire and forest resource values have defied conventional approaches to planning and decision-making. Paradoxically, the adoption of technological innovations such as risk assessment, decision analysis, and landscape simulation models by land management...

Author(s): Jeffrey G. Borchers

Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Can behavioral decision theory explain risk-averse fire management decisions?

www.nrfirescience.org/resource/12719

Organizations managing forest land often make fire management decisions that seem overly risk-averse in relation to their stated goals for ecosystem restoration, protection of sensitive species and habitats, and protection of water and timber resources. Research in behavioral decision theory has shown that people faced with...

Author(s): Lynn A. Maguire, Elizabeth A. Albright
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Predicting risks of uncharacteristic wildfires: application of the risk assessment process

www.nrfirescience.org/resource/12714

The National Environmental Policy Act (NEPA) mandates that the U.S. Forest Service (USFS) conduct an Environmental Impact Assessment (EIA) as its fire management policy evolves to cope with a legacy of over 100 years of fire suppression on national forest lands and an increasing occurrence of uncharacteristically large, intense...

Author(s): Anne Fairbrother, Jessica G. Turnley
Year Published: 2005
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

The spatial context of fire: a new approach for predicting fire occurrence

www.nrfirescience.org/resource/10993

Across North America, decades of fire suppression and recent patterns of human settlement have combined to increase the risks that wildland fires pose to human life, property, and natural resource values. Various methods can be used to reduce fuel hazards and mitigate these risks, but funding and other constraints require that these...

Author(s): Carol Miller
Year Published: 2003
Type: Document
Conference Proceedings, Technical Report or White Paper

Sequential use of simulation and optimization in analysis and planning

www.nrfirescience.org/resource/11045

Management activities are analyzed at landscape scales employing both simulation and optimization. SIMPPLE, a stochastic simulation modeling system, is initially applied to assess the risks associated with a specific natural process occurring on the current landscape without management treatments, but with fire suppression. These...

Author(s): Hans R. Zuuring, Jimmie D. Chew, J. Greg Jones

Year Published: 2000

Type: Document

Conference Proceedings

Economic efficiency and risk character of fire management programs, northern Rocky Mountains

www.nrfirescience.org/resource/11218

Economic efficiency and risk have long been considered during the selection of fire management programs and the design of fire management polices. The risk considerations was largely subjective, however, and efficiency has only recently been calculated for selected portions of the fire management program. The highly stochastic...

Author(s): Thomas J. Mills, Frederick W. Bratten

Year Published: 1988

Type: Document

Technical Report or White Paper