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

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

Stakeholder perceptions and scientific evidence linking wildfire mitigation treatments to societal outcomes

A number of watershed partnerships have emerged in the western US to address the impacts of wildfire through investing in wildfire mitigation activities. To motivate collective action and design effective risk mitigation programs, these stakeholders draw on evidence linking wildfire mitigation to outcomes of interest. To advance...

Author(s): Ryan M. Roberts, Kelly W. Jones, Esther Duke, Xoco Shinbrot, Erin E. Harper, Erin Fons, Anthony S. Cheng, Brett Wolk
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Risk factor as a strategy to validate the prioritization of areas for wildfire protection

The limited availability of resources for wildfire management necessitates prioritizing forest areas for protection. For this purpose, criteria such as fire risk are used to generate thematic maps intended to support decision-making. However, prior to this, the information must be validated under a statistically robust process....

Author(s): José G. Flores Garnica, Alejandra Macías, Uri D. Casillas
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Beyond ICS: how should we govern complex disasters in the United States?

The complexity of large-scale disasters requires governance structures that can integrate numerous responders quickly under often chaotic conditions. Complex disasters – by definition – span multiple jurisdictions and activate numerous response functions carried out by numerous legally autonomous public, nonprofit, and private...

Author(s): Branda Nowell, Toddi A. Steelman
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Fine-scale assessment of cross-boundary wildfire events in the western United States

We report a fine-scale assessment of cross-boundary wildfire events for the western US. We used
simulation modeling to quantify the extent of fire exchange among major federal, state, and private land tenures and mapped locations where fire ignitions can potentially affect populated places. We examined how parcel size affects...

Author(s): Palaiologos Palaiologou, Alan A. Ager, Cody Evers, Max W. Nielsen-Pincus, Michelle A. Day, Haiganoush K. Preisler
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

A Socio-Ecological Approach to Mitigating Wildfire Vulnerability in the Wildland Urban Interface: A Case Study from the 2017 Thomas Fire
www.nrfirescience.org/resource/19058
Wildfire disasters are one of the many consequences of increasing wildfire activities globally, and much effort has been made to identify strategies and actions for reducing human vulnerability to wildfire. While many individual homeowners and communities have enacted such strategies, the number subjected to a subsequent wildfire is...

Author(s): Crystal A. Kolden, Carol Henson
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Wildfire exposure to the wildland urban interface in the western US
www.nrfirescience.org/resource/20189
Predicting wildfire disasters presents a major challenge to the field of risk science, especially when fires propagate long distances through diverse fuel types and complex terrain. A good example is in the western US where large tracts of public lands routinely experience large fires that spread from remote wildlands into developed...

Author(s): Alan A. Ager, Palaiologos Palaiologou, Cody Evers, Michelle A. Day, Chris Ringo, Karen C. Short
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Tradeoffs between US national forest harvest targets and fuel management to reduce wildfire transmission to the wildland urban interface
www.nrfirescience.org/resource/19031
US public land management agencies are faced with multiple, often conflicting objectives to meet management targets and produce a wide range of ecosystem services expected from public lands. One example is managing the growing wildfire risk to human and ecological values while meeting programmatic harvest targets for economic...

Author(s): Alan A. Ager, Rachel M. Houtman, Michelle A. Day, Chris Ringo, Palaiologos Palaiologou
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Dynamic wildfire navigation system
www.nrfirescience.org/resource/19498
Wildfire, a natural part of many ecosystems, has also resulted in significant disasters impacting ecology and human life in Australia. This study proposes a prototype of fire propagation prediction as an extension of preceding research; this system is called “Cloud computing based bushfire prediction”, the computational...
Fine scale assessment of cross boundary wildfire events in the Western United States

www.nrfirescience.org/resource/20028

We report a fine scale assessment of cross-boundary wildfire events for the western US. We used simulation modeling to quantify the extent of fire exchange among major federal, state, and private land tenures and mapped locations where fire ignitions can potentially affect populated places. We examined how parcel size effects the...

Managing for Fire Refugia in the Northwestern United States

www.nrfirescience.org/resource/19399

Fire refugia are defined as areas less frequently or less severely affected by wildfire relative to the surrounding landscape and important for the persistence of biota. Land managers and researchers were invited to participate in a two half-day workshop to gain insight on the factors that influence land management strategies on...

Severe Fire Danger Index: A Forecastable Metric to Inform Firefighter and Community Wildfire Risk Management

www.nrfirescience.org/resource/20001

Despite major advances in numerical weather prediction, few resources exist to forecast wildland fire danger conditions to support operational fire management decisions and community early-warning systems. Here we present the development and evaluation of a spatial fire danger index that can be used to assess historical events....

Thermal characterization of firebrand piles

www.nrfirescience.org/resource/19225

The cause of the majority of structure losses in wildland-urban interface fires is ignition via firebrands, small pieces of burning material generated from burning vegetation and structures. To understand the mechanism of these losses, small-scale experiments designed to capture heating from firebrand piles and to describe the...
Exploring influences on intended evacuation behaviors during wildfire: what roles for pre-fire actions and event-based cues?

www.nrfirescience.org/resource/19902

Fire management professionals across multiple countries advocate evacuation as the safest action residents can take when threatened by a wildfire. However, existing research notes that while some residents may opt to evacuate to a safer place, others may choose alternatives to evacuation, including staying and actively defending...

Author(s): Catrin Edgeley, Travis B. Paveglio
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Near-future forest vulnerability to drought and fire varies across the western United States

www.nrfirescience.org/resource/19196

Recent prolonged droughts and catastrophic wildfires in the western United States have raised concerns about the potential for forest mortality to impact forest structure, forest ecosystem services, and the economic vitality of communities in the coming decades. We used the Community Land Model (CLM) to determine forest...

Author(s): Polly C. Buotte, Samuel Levis, Beverly E. Law, Tara W. Hudiburg, David E. Rupp, Jeffrey J. Kent
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Deriving forest fire probability maps from the fusion of visible/infrared satellite data and geospatial data mining

www.nrfirescience.org/resource/19818

Information on fire probability is of vital importance to environmental and ecological studies as well as to fire management. This study aimed at comparing two forest fire probability mapping techniques, one based primarily on freely distributed EO (Earth observation) data from Landsat imagery, and another one based purely on GIS...

Author(s): Prashant K. Srivastava, George P. Petropoulos, Manika Gupta, Sudhir K. Singh, Tanvir Islam, Dimitra Loka
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Burn probability simulation and subsequent wildland fire activity in Alberta, Canada – Implications for risk assessment and strategic planning

www.nrfirescience.org/resource/20395

Burn probability maps produced by Monte Carlo methods involve repeated simulations of fire ignition and spread across a study area landscape to identify locations that burn more frequently than others. These maps have achieved broad acceptance for research investigations and strategic fire management planning. In this study, we...

Author(s): Jennifer L. Beverly, Neal McLoughlin
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Archetypes of community wildfire exposure from national forests of the western US
Risk management typologies and their resulting archetypes can structure the many social and biophysical drivers of community wildfire risk into a set number of strategies to build community resilience. Existing typologies omit key factors that determine the scale and mechanism by which exposure from large wildfires occur. These...

Impacts of wildland fire effects on resources and assets through expert elicitation to support fire response decisions

A modelling framework to spatially score the impacts from wildland fire effects on specific resources and assets was developed for and applied to the province of Ontario, Canada. This impact model represents the potential ‘loss’, which can be used in the different decision-making methods common in fire response operations (e.g....

Perception and management of sociopolitical risks on large fires

This work examines the perceived impact of sociopolitical factors on large fire decision making. The study is based on a set of 74 large fires in USDA Forest Service Regions 5 and 6 for the years 2009-2013. All participants were fire managers, some as part of units affected by incidents and others associated with incident management...

We’re not doing enough prescribed fire in the western United States to mitigate wildfire risk

Prescribed fire is one of the most widely advocated management practices for reducing wildfire hazard and has a long and rich tradition rooted in indigenous and local ecological knowledge. The scientific literature has repeatedly reported that prescribed fire is often the most effective means of achieving such goals by reducing...

Defining “Resilient Landscapes” From Multiple Stakeholder Perspectives in a Wildland Urban Interface (WUI) Area - Final Report for JFSP

Fuel treatment projects in wildland urban interface (WUI) areas are highly visible to public scrutiny, which can lead to intractable conflicts between land managers and the public that could block the implementation of those treatments. If agencies and publics are not able to reach adequate consensus
Engaging the fire before it starts: A case study from the 2017 Pinal Fire (Arizona)

www.nrfirescience.org/resource/19069

How did the forest and community get to the point where they were willing to take on managing a fire of this size and duration for resource benefit and hazard reduction? Science has recognized for decades that many forested ecosystems of the American West are shifting away from historically fire-adapted conditions. Beginning in the...

A social-ecological network approach for understanding wildfire risk governance

www.nrfirescience.org/resource/20191

Large wildfire events (e.g. >100 square km) highlight the importance of governance systems that address wildfire risk at landscape scales and among multiple land owners and institutions. A growing body of empirical work demonstrates that environmental governance outcomes depend upon how well patterns of interaction among actors...

Could restoration of a landscape to a pre-European historical vegetation condition reduce burn probability?

www.nrfirescience.org/resource/19046

Montane regions throughout western North America have experienced increases in forest canopy closure and forest encroachment into grasslands over the past century; this has been attributed to climate change and fire suppression/exclusion. These changes threaten ecological values and potentially increase probabilities of intense...

Forest Fire Susceptibility and Risk Mapping Using Social/Infrastructural Vulnerability and Environmental Variables

www.nrfirescience.org/resource/20139

Forests fires in northern Iran have always been common, but the number of forest fires has been growing over the last decade. It is believed, but not proven, that this growth can be attributed to the increasing temperatures and droughts. In general, the vulnerability to forest fire depends on infrastructural and social factors...
Modelling the fire propagation from the fuel bed to the lower canopy of ornamental species used in wildland–urban interfaces

www.nrfirescience.org/resource/18999

South-eastern France is strongly affected by wildfires mostly occurring in the wildland–urban interfaces (WUIs). A WUI fire is often initiated in dead surface fuel, then can propagate to shrubs and trees when the lower canopy is close to (or touches) the ground. Whereas a previous study assessed the fire propagation from the fuel...

Author(s): L. Terrei, Aymeric Lamorlette, Anne Ganteaume
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Forest Service fire management and the elusiveness of change

www.nrfirescience.org/resource/19433

Background: There is broad recognition that fire management in the United States must fundamentally change and depart from practices that have led to an over-emphasis on suppression and limited the presence of fire in forested ecosystems. In this paper, we look at competing problem definitions in US Forest Service policy for fire...

Author(s): Courtney Schultz, Matthew P. Thompson, Sarah M. McCaffrey
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Interactions between Resident Risk Perceptions and Wildfire Risk Mitigation: Evidence from Simultaneous Equations Modeling

www.nrfirescience.org/resource/20003

Fire science emphasizes that mitigation actions on residential property, including structural hardening and maintaining defensible space, can reduce the risk of wildfire at a home. Accordingly, a rich body of social science literature investigates the determinants of wildfire risk mitigation behaviors of residents living in fire-....

Author(s): James R. Meldrum, Hannah Brenkert-Smith, Patricia A. Champ, Jamie Gomez, Lilia C. Falk, Christopher M. Barth
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Interagency Standards for Fire and Fire Aviation Operations

www.nrfirescience.org/resource/18907

Scope: The Interagency Standards for Fire and Fire Aviation Operations states, references, or supplements policy for Bureau of Land Management, U.S. Forest 6 Service, U.S. Fish and Wildlife Service, National Park Service, and Bureau of Indian Affairs fire and fire aviation program management. Original source policy is stated or...

Author(s): Interagency Standards for Fire and Fire Aviation Operations Group
Year Published: 2019
Type: Document
Technical Report or White Paper

Designing operationally relevant daily large fire containment strategies using risk assessment results
In this study, we aim to advance the optimization of daily large fire containment strategies for ground-based suppression resources by leveraging fire risk assessment results commonly used by fire managers in the western USA. We begin from an existing decision framework that spatially overlays fire risk assessment results with pre-...

Author(s): Yu Wei, Matthew P. Thompson, Joe H. Scott, Christopher D. O'Connor, Christopher J. Dunn
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Rethinking resilience to wildfire
Record-breaking fire seasons are becoming increasingly common worldwide, and large wildfires are having extraordinary impacts on people and property, despite years of investments to support social–ecological resilience to wildfires. This has prompted new calls for land management and policy reforms as current land and fire...

Author(s): Dave McWethy, Tania L. Schoennagel, Philip E. Higuera, Meg A. Krawchuk, Brian J. Harvey, Elizabeth C. Metcalf, Courtney Schultz, Carol Miller, Alexander L. Metcalf, Brian Buma, Arika Virapongse, Judith C. Kulig, Richard C. Stedman, Zakary Ratajczak, Cara R. Nelson, Crystal A. Kolden
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Determinants of perceived risk and liability concerns associated with prescribed burning in the United States
While prescribed burning is a proven tool in the management of forests and grasslands, its use has been limited due, in part, to potential risks that may result in legal liability, property damage, and personal injury. The purpose of this study is to understand the factors that shape landowners' and fire professionals' perceptions...

Author(s): Omkar Joshi, Neelam C. Poudyal, John R. Weir, Samuel D. Fuhlendorf, Thomas O. Ochuodo
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Living with wildfire in Archeluta County, Colorado: 2015 data report
Residents in the wildland-urban interface (WUI) can play an important role in reducing wildfire’s negative effects by performing wildfire risk mitigation on their property. This report offers insight into the wildfire risk mitigation activities and related considerations, such as attitudes, experiences, and concern about wildfire...

Author(s): James R. Meldrum, Hannah Brenkert-Smith, Pamela Wilson, Patricia A. Champ, Christopher M. Barth, Angela Boag
Year Published: 2019
Type: Document
Technical Report or White Paper

Modeling the cost effectiveness of fire protection resource allocation in the United States: models and a 1980-2014 case study
The estimated cost of fire in the United States is about $329 billion a year, yet there are gaps in the literature to measure the effectiveness of investment and to allocate resources optimally in fire protection. This article fills these gaps by creating data-driven empirical and theoretical models to study the effectiveness of...

Author(s): Adam Behrendt, Vineet M. Payyappalli, Jun Zhuang
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Spatial and temporal assessment of responder exposure to snag hazards in post-fire environments
www.nrfirescience.org/resource/19733
Researchers and managers increasingly recognize enterprise risk management as critical to addressing contemporary fire management challenges. Quantitative wildfire risk assessments contribute by parsing and mapping potentially contradictory positive and negative fire effects. However, these assessments disregard risks to fire...

Author(s): Christopher J. Dunn, Christopher D. O'Connor, Matthew J. Reilly, David E. Calkin, Matthew P. Thompson
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Understanding homeowners’ decisions to mitigate wildfire risk and create defensible space
www.nrfirescience.org/resource/20377
This article analyses homeowners’ decisions to undertake fire-safe investments and create defensible space on their property using a unique dataset from 35 wildland–urban interface communities in Nevada. The dataset combines homeowner information from a mail survey with their observed fire-safe investments obtained through...

Author(s): Angelo M. Sisante, Michael H. Taylor, Kimberly Rollins
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Pathways of change: predicting the effects of fire on flammability
www.nrfirescience.org/resource/19090
Impacts of wildfire on humans are increasing as urban populations continue to expand into fire prone landscapes. Effective fire risk management can only be achieved if we understand and quantify how ecosystems change in response to fire and how these changes affect flammability. However, there have been limited studies to this...

Author(s): Sarah C. McColl-Gausden, Trent D. Penman
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Spatial optimization of operationally relevant large fire confine and point protection strategies: Model development and test cases
www.nrfirescience.org/resource/17539
This study introduces a large fire containment strategy that builds upon recent advances in spatial fire planning, notably the concept of potential wildland fire operation delineations (PODs). Multiple PODs can be clustered together to form a “box” that is referred as the “response POD” (or rPOD). Fire lines would be built...
Guidelines for risk management in forest planning — what is risk and when is risk management useful?
www.nrfirescience.org/resource/17158
Managing forest resources occurs under various sources of uncertainty. Depending on the management problem, this uncertainty may have a substantial impact on the quality of the solution. As our knowledge on the sources and magnitude of uncertainty improves, integrating this knowledge into the development of management plans becomes...

Collaboration across boundaries: a policy perspective on the state of wildland fire
www.nrfirescience.org/resource/18283
The topic of collaboration across boundaries is fitting for me and for the Forest Service because our national priorities revolve around just that—collaboration across boundaries—especially when it comes to wildland fire. We are committed to improving the conditions of the Nation's forests, being good neighbors, and sharing...

Values of the public at risk of wildfire and its management
www.nrfirescience.org/resource/18242
Wildfire management agencies increasingly seek to understand what the public values and expects to be protected from wildfire and its management. Recent conceptual development demonstrates the utility of considering values at three levels of abstraction: localised valued entities such as people, places and objects; valued attributes...

Where wildfires destroy buildings in the US relative to the wildland-urban interface and national fire outreach programs
www.nrfirescience.org/resource/17901
Over the past 30 years, the cost of wildfire suppression and homes lost to wildfire in the US have increased dramatically, driven in part by the expansion of the wildland-urban interface (WUI), where buildings and wildland vegetation meet. In response, the wildfire management community has devoted substantial effort to better...
Human-related ignitions concurrent with high winds promote large wildfires across the USA
www.nrfirescience.org/resource/17823
Large wildfires (>40 ha) account for the majority of burned area across the contiguous United States (US) and appropriate substantial suppression resources. A variety of environmental and social factors influence wildfire growth and whether a fire overcomes initial attack efforts and becomes a large wildfire. However, little is...
Author(s): John T. Abatzoglou, Jennifer Balch, Bethany A. Bradley, Crystal A. Kolden
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Wildfire risk reduction in the United States: Leadership staff perceptions of local fire department roles and responsibilities
www.nrfirescience.org/resource/16481
As wildland fires have had increasing negative impacts on a range of human values, in many parts of the United States (U.S.) and around the world, collaborative risk reduction efforts among agencies, homeowners, and fire departments are needed to improve wildfire safety and mitigate risk. Using interview data from 46 senior officers...
Author(s): Rachel S. Madsen, Hylton J. G. Haynes, Sarah M. McCaffrey
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

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

How does information affect fire risk reduction behaviors? Mediating effects of cognitive processes and subjective knowledge
www.nrfirescience.org/resource/17341
Communicating risk information is crucial in policy making regarding hazardous events. The influencing mechanism of risk information in generating behavioral reactions is considered in the context of fire risk. We investigate homeowners’ responses to risk information and how their cognitive processes influence their risk reduction...
Author(s): Tianzhuo Liu, Huifang Jiao
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Responding to risky neighbors: Testing for spatial spillover effects for defensible space in a fire-
prone WUI community

Often, factors that determine the risk of an environmental hazard occur at landscape scales, and risk mitigation requires action by multiple private property owners. How property owners respond to risk mitigation on neighboring lands depends on whether mitigation actions are strategic complements or strategic substitutes. We test...

Author(s): Travis Warziniack, Patricia A. Champ, James R. Meldrum, Hannah Brenkert-Smith, Christopher M. Barth, Lilia C. Falk
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Wildfire risk mitigation: Local solutions to a national problem

As fire professionals, we talk about suppression tactics, aircraft, and the armies of fearless men and women who risk their lives to save homes and lives. We hear citizens, elected officials, and the media making broad statements like “This was a once-in-a-lifetime event” or “We have never seen anything like this before and it...

Author(s): Jonathan Bruno
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Social Factors in Wildland Fire

The socio-environmental dimension in wildland fire management is critical for moving towards a baseline of firewise planning. Wildland fire risk planning is a land use planning tool that should be able to keep pace with rapid rates of social and environmental change. Changes in land use and climate bring alterations in fire regimes...

Author(s): David Martín Gallego, Eduard Plana Bach, Domingo Molina Terrén
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Incorporating social diversity into wildfire management: proposing 'pathways' for fire adaptation

Existing research suggests that adoption or development of various wildfire management strategies may differ across communities. However, there have been few attempts to design diverse strategies for local populations to better "live with fire." This article extends an existing approach by articulating how characteristic...

Author(s): Travis B. Paveglio, Matthew S. Carroll, Amanda M. Stasiewicz, Daniel R. Williams, Dennis Becker
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

A model-based framework to evaluate alternative wildfire suppression strategies

The complexity and demands of wildland firefighting in the western U.S. have increased over recent decades due to factors including the expansion of the wildland-urban interface, lengthening fire
seasons associated with climate change, and changes in vegetation due to past fire suppression and timber harvest. In light of these...

Author(s): Karen L. Riley, Matthew P. Thompson, Joe H. Scott, Julie W. Gilbertson-Day
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Should I stay or should I go now? Or should I wait and see? Influences on wildfire evacuation decisions
www.nrfirescience.org/resource/16390
As climate change has contributed to longer fire seasons and populations living in fire-prone ecosystems increase, wildfires have begun to affect a growing number of people. As a result, interest in understanding the wildfire evacuation decision process has increased. Of particular interest is understanding why some people leave...

Author(s): Sarah M. McCaffrey, Robyn S. Wilson, Avishek Konar
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Systems thinking and wildland fire management
www.nrfirescience.org/resource/16148
A changing climate, changing development and land use patterns, and increasing pressures on ecosystem services raise global concerns over growing losses associated with wildland fires. New management paradigms acknowledge that fire is inevitable and often uncontrollable, and focus on living with fire rather than attempting to...

Author(s): Matthew P. Thompson, Christopher J. Dunn, David E. Calkin
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Evaluating spatiotemporal tradeoffs under alternative fuel management and suppression policies: measuring returns on investment - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/16996
The primary theme of our study is the cost-effectiveness of fuel treatment at multiple scales, addressing the question of whether fuel treatments can be justified on the basis of saved suppression costs. Our study was designed to track the influence of a dollar invested in fuel treatments on final fire outcomes, and to quantify this...

Author(s): Matthew P. Thompson, Karen L. Riley, Dan R. Loeffler, Jessica R. Haas
Year Published: 2017
Type: Document
Technical Report or White Paper

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
Interacting effects of topography, vegetation, human activities and wildland-urban interfaces on wildfire ignition risk

Effective fire prevention requires a better understanding of the patterns and causes of fire ignition. In this study, we focus on the interacting factors known to influence fire ignition risk, such as the type of vegetation, topographical features and the wildland-urban interface (WUI; i.e. where urban development meet or...

Author(s): María Calviño-Cancela, María L. Chas-Amil, Eduardo D. García-Martínez, Julia Touza
Year Published: 2017
Type: Document

Natural hazard modeling and uncertainty analysis [Chapter 2]

Modeling can play a critical role in assessing and mitigating risks posed by natural hazards. These modeling efforts generally aim to characterize the occurrence, intensity, and potential consequences of natural hazards. Uncertainties surrounding the modeling process can have important implications for the development, application,...

Author(s): Matthew P. Thompson, Jord J. Warmink
Year Published: 2017
Type: Document

Examining the influence of biophysical conditions on wildland-urban interface homeowners’ wildfire risk mitigation activities in fire-prone landscapes

Expansion of the wildland–urban interface (WUI) and the increasing size and number of wildfires has policy-makers and wildfire managers seeking ways to reduce wildfire risk in communities located near fire-prone forests. It is widely acknowledged that homeowners can reduce their exposure to wildfire risk by using nonflammable...

Author(s): Christine Olsen, Jeffrey D. Kline, Alan A. Ager, Keith A. Olsen, Karen C. Short
Year Published: 2017
Type: Document

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

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

Uncertainty and probability in wildfire management decision support: An example from the
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

Markov decision process models were extended to reflect some consequences of the risk attitude of forestry decision makers. One approach consisted of maximizing the expected value of a criterion subject to an upper bound on the variance or, symmetrically, minimizing the variance subject to a lower bound on the expected value.

Author(s): Joseph Buongiorno, Mo Zhou, Craig Johnston
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Uncertainties are pervasive in natural hazards, and it is crucial to develop robust and meaningful approaches to characterize and communicate uncertainties to inform modeling efforts. In this monograph we provide a broad, cross-disciplinary overview of issues relating to uncertainties faced in natural hazard and risk assessment.

Author(s): Karen L. Riley, Matthew P. Thompson, Peter Webley, Kevin D. Hyde
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

In this project we posed the question “Is the whole greater than the sum of its parts?” We focused on homeowner wildfire risk mitigation, community heterogeneity, and fire adaptedness. One of the unique aspects of this project was that the team was a research and practice collaboration. This collaboration facilitated...

Author(s): Patricia A. Champ, Hannah Brenkert-Smith, James R. Meldrum, Christopher M. Barth, Travis Warziniack
Year Published: 2017
Type: Document
Technical Report or White Paper

Modeling can play a critical role in assessing and mitigating risks posed by natural hazards. These modeling efforts generally aim to characterize the occurrence, intensity, and potential consequences of...
natural hazards. Uncertainties surrounding the modeling process can have important implications for the development, application,....

Author(s): Matthew P. Thompson, Jord J. Warmink
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

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

Uncertainty in natural hazards, modeling and decision support: An introduction to this volume [Chapter 1]
www.nrfirescience.org/resource/16565
Given the expanding vulnerability of human populations and natural systems, management professionals are ever more frequently called upon to apply natural hazard modeling in decision support. When scientists enter into predictive services, they share professional, moral, legal, and ethical responsibilities to account for the...

Author(s): Karen L. Riley, Matthew P. Thompson, Peter Webley, Kevin D. Hyde
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

A spatial evaluation of global wildfire-water risks to human and natural systems
www.nrfirescience.org/resource/16561
The large mediatic coverage of recent massive wildfires across the world has emphasized the vulnerability of freshwater resources. The extensive hydrogeomorphic effects from a wildfire can impair the ability of watersheds to provide safe drinking water to downstream communities and high-quality water to maintain riverine ecosystem...

Author(s): Francois-Nicolas Robinne, Kevin D. Bladon, Carol Miller, Marc-Andre Parisien, Jerome Mathieu, Michael D. Flannigan
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Network analysis of wildfire transmission and implications for risk governance
www.nrfirescience.org/resource/16507
We characterized wildfire transmission and exposure within a matrix of large land tenures (federal, state, and private) surrounding 56 communities within a 3.3 million ha fire prone region of central Oregon US. Wildfire simulation and network analysis were used to quantify the exchange of fire among land tenures and communities and...

Author(s): Alan A. Ager, Cody Evers, Michelle A. Day, Haiganoush K. Preisler, Ana M. G. Barros, Max W. Nielsen-Pincus
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

Relational risk assessment and management: investigating capacity in wildfire response networks - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/14925
Relational Risk Assessment and Management (RRAM) is about developing a new set of concepts and rapid assessment tools for assessing risk for problems that occur in inter-agency communication and coordination on complex fire events. Failures in effective communication and coordination within the network of responding organizations...
Author(s): Branda Nowell, Sarah M. McCaffrey, Toddi A. Steelman
Year Published: 2017
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

Risk terminology primer: basic principles and a glossary for the wildland fire management community
www.nrfirescience.org/resource/14409
Risk management is being increasingly promoted as an appropriate method for addressing wildland fire management challenges. However, a lack of a common understanding of risk concepts and terminology is hindering effective application. In response, this General Technical Report provides a set of clear, consistent, understandable, and...
Author(s): Matthew P. Thompson, Tom Zimmerman, Dan Mindar, Mary A. Taber
Year Published: 2016
Polishing the prism: improving wildfire mitigation planning by coupling landscape and social dimensions

www.nrfirescience.org/resource/19560

Effectively addressing wildfire risk to communities on large multi-owner landscapes requires an understanding of the biophysical factors that influence risk, such as fuel loads, topography, and weather, and social factors such as the capacity and willingness for communities to engage in fire-mitigation activities. Biophysical and...

Author(s): Geoffrey Koch
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Uncertainty is information, too

www.nrfirescience.org/resource/16151

How accounting for doubt helps inform decision making.

Author(s): Bruce G. Marcot, Matthew P. Thompson, Thomas W. Bonnot, Frank R. Thompson
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

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

Wicked Problem, New Solutions: Our Fire, Our Problem

www.nrfirescience.org/resource/18393

This conference is being presented to bring focus to the many issues associated with fuels, fire behavior, large wildfires, and the future of fire management. Much attention is being given to wildland fire management. It seems with each passing year we recognize escalating complexity, increasing risk, and mounting challenges....

Year Published: 2016
Type: Document
Conference Proceedings

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

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

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

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
Is seeing believing? Perceptions of wildfire risk over time
www.nrfirescience.org/resource/14317
Ongoing challenges to understanding how hazard exposure and disaster experiences influence perceived risk lead us to ask: Is seeing believing? We approach risk perception by attending to two components of overall risk perception: perceived probability of an event occurring and perceived consequences if an event occurs. Using a two-
Author(s): Patricia A. Champ, Hannah Brenkert-Smith
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Achievable future conditions as a framework for guiding forest conservation and management
www.nrfirescience.org/resource/13788
We contend that traditional approaches to forest conservation and management will be inadequate given the predicted scale of social-economic and biophysical changes in the 21st century. New approaches, focused on anticipating and guiding ecological responses to change, are urgently needed to ensure the full value of forest ecosystem...
Author(s): Stephen W. Golladay, Katherine L. Martin, James M. Vose, David N. Wear, Alan P. Covitch, Richard J. Hobbs, Kier D. Klepzig, Gene E. Likens, Robert J. Naiman, Allan W. Shearer
Year Published: 2016
Type: Document
Book or Chapter or Journal Article, Synthesis

Risk perception, sense-making and resilient performance: the sounds of wildland firefighting in action - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/15572
Managing wildland fire is an exercise in risk perception, sensemaking and resilient performance. Risk perception begins with individual size up of a wildfire to determine a course of action, and then becomes collective as the fire management team builds and continuously updates their common perception of risk. Karl Weick has called...
Author(s): Anne E. Black, David Thomas, J. Ziegler, Elena Gabor, Rebekah L. Fox
Year Published: 2016
Type: Document
Technical Report or White Paper

Using risk analysis to reveal opportunities for the management of unplanned ignitions in wilderness
www.nrfirescience.org/resource/16049
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. We capitalize on recent advances in fire risk analysis to...
Author(s): Kevin M. Barnett, Carol Miller, Tyron J. Venn
Year Published: 2016
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

Risk preferences, probability weighting, and strategy tradeoffs in wildfire management
www.nrfirescience.org/resource/16154
Wildfires present a complex applied risk management environment, but relatively little attention has been paid to behavioral and cognitive responses to risk among public agency wildfire managers. This study investigates responses to risk, including probability weighting and risk aversion, in a wildfire management context using a...
Author(s): Michael S. Hand, Matthew J. Wibbenmeyer, David E. Calkin, Matthew P. Thompson
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Development and application of a probabilistic method for wildfire suppression cost modeling
www.nrfirescience.org/resource/12762
Wildfire activity and escalating suppression costs continue to threaten the financial health of federal land management agencies. In order to minimize and effectively manage the cost of financial risk, agencies need the ability to quantify that risk. A fundamental aim of this research effort, therefore, is to develop a process for...
Author(s): Matthew P. Thompson, Jessica R. Haas, Mark A. Finney, David E. Calkin, Michael S. Hand, Mark J. Browne, Martin Halek, Karen C. Short, Isaac C. Grenfell
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

Catching fire? Social interactions, beliefs, and wildfire risk mitigation behaviors
www.nrfirescience.org/resource/13419
Social interactions are widely recognized as a potential influence on risk-related behaviors. We present a mediation model in which social interactions (classified as formal/informal and generic/fire-specific)
are associated with beliefs about wildfire risk and mitigation options, which in turn shape wildfire mitigation behaviors.

Author(s): Patricia A. Champ, Katherine L. Dickinson, Hannah Brenkert-Smith, Nicholas Flores
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Wildfires: systemic changes required
www.nrfirescience.org/resource/16155
There needs to be a deeper, systems-level understanding of the fire management system. The behavior of fire managers is a direct and logical result of the structure of the system in which they operate, influenced by factors such as incentives, culture, and capacity. If managers are judged by fire exclusion, that will become the...
Author(s): Matthew P. Thompson, Christopher J. Dunn, David E. Calkin
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

Integrating pixel- and polygon-based approaches to wildfire risk assessment: application to a high-value watershed on the Pike and San Isabel National Forests, Colorado, USA
www.nrfirescience.org/resource/16153
We develop a novel risk assessment approach that integrates complementary, yet distinct, spatial modeling approaches currently used in wildfire risk assessment. Motivation for this work stems largely from limitations of existing stochastic wildfire simulation systems, which can generate pixel-based outputs of fire behavior as well...
Author(s): Matthew P. Thompson, Julie W. Gilbertson-Day, Joe H. Scott
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Proceedings of the large wildland fires conference
www.nrfirescience.org/resource/18395
Large fires or “megafires” have been a major topic in wildland fire research and management for over a decade. There is great debate regarding the impacts of large fires. Many believe that they (1) are occurring too frequently, (2) are burning abnormally large areas, (3) cause uncharacteristically adverse ecological harm, and (4)...
Coupling the biophysical and social dimensions of wildfire risk to improve wildfire mitigation planning
www.nrfirescience.org/resource/19558
We describe recent advances in biophysical and social aspects of risk and their potential combined contribution to improve mitigation planning on fire-prone landscapes. The methods and tools provide an improved method for defining the spatial extent of wildfire risk to communities compared to current planning processes. They also...
Author(s): Alan A. Ager, Jeffrey D. Kline, A. Paige Fischer
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

Wildland fire management futures: Insights from a foresight panel - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/18891
Wildland fire management faces unprecedented challenges in the 21st century: the increasingly apparent effects of climate change, more people and structures in the wildland-urban interface, growing costs associated with wildfire management, and the rise of high-impact fires, to name a few. Given these significant and growing...
Author(s): Robert L. Olson, David N. Bengston, Leif A. DeVaney, Trevor A.C. Thompson
Year Published: 2015
Type: Document
Technical Report or White Paper

Understanding gaps between the risk perceptions of wildland-urban interface (WUI) residents and wildfire professionals
www.nrfirescience.org/resource/13447
Research across a variety of risk domains finds that the risk perceptions of professionals and the public differ. Such risk perception gaps occur if professionals and the public understand individual risk factors differently or if they aggregate risk factors into overall risk differently. The nature of such divergences, whether...
Author(s): James R. Meldrum, Patricia A. Champ, Hannah Brenkert-Smith, Travis Warziniack, Christopher M. Barth, Lilia C. Falk
Year Published: 2015
Type: Document
Book or Chapter or Journal Article
Developing an aviation exposure index to inform risk-based fire management decisions
www.nrfirescience.org/resource/16159
Wildland firefighting is an inherently dangerous activity, and aviation-related accidents in particular comprise a large share of firefighter fatalities. Due to limited understanding of operational factors that lead to aviation accidents, it is unclear how local decisionmakers, responsible for requesting aviation support, can...
Author(s): Crystal S. Stonesifer, David E. Calkin, Matthew P. Thompson, Jeffrey D. Kaiden
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Risk savvy: how to make good decisions
www.nrfirescience.org/resource/18883
In the age of Big Data we often believe that our predictions about the future are better than ever before. But as risk expert Gerd Gigerenzer shows, the surprising truth is that in the real world, we often get better results by using simple rules and considering less information. In Risk Savvy, Gigerenzer reveals that most of us,...
Author(s): Gerd Gigerenzer
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

Examining fire-prone landscapes as coupled human and natural systems
www.nrfirescience.org/resource/18899
Fire-prone landscapes are not well studied as coupled human and natural systems (CHANS) and present many challenges for understanding and promoting adaptive behaviors and institutions. Here, we explore how heterogeneity, feedbacks, and external drivers in this type of natural hazard system can lead to complexity and can limit the...
Author(s): Thomas A. Spies, Eric M. White, Jeffrey D. Kline, A. Paige Fischer, Alan A. Ager, John D. Bailey, John P. Bolte, Jennifer Koch, Emily K. Platt, Christine Olsen, Derric B. Jacobs, Bruce A. Shindler, Michelle M. Steen-Adams, Roger B. Hammer
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Post-epidemic fire risk and behavior
www.nrfirescience.org/resource/13708
Citizens, government officials, and natural resource managers are greatly concerned about potential impacts of the mountain pine beetle (MPB) epidemic on fire hazards and risk. Some mountain towns are surrounded by dead and dying trees. In the Rocky Mountain Region of the Forest Service, the MPB
epidemic threatens over 250,000 acres...
Author(s): Russell A. Parsons, William Matt Jolly, Paul G. Langowski, Megan Matonis, I. Sue Miller
Year Published: 2014
Type: Document
Conference Proceedings

Wildfire risk transmission in the Colorado Front Range, USA
www.nrfirescience.org/resource/16162
Wildfires are a global phenomenon that in some circumstances can result in human casualties, economic loss, and ecosystem service degradation. In this article we spatially identify wildfire risk transmission pathways and locate the areas of highest exposure of human populations to wildland fires under severe, but not uncommon,...
Author(s): Jessica R. Haas, David E. Calkin, Matthew P. Thompson
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Objective and perceived wildfire risk and its influence on private forest landowners fuel reduction activities in Oregon's (USA) ponderosa pine ecoregion
www.nrfirescience.org/resource/19562
Policymakers seek ways to encourage fuel reduction among private forest landowners to augment similar efforts on federal and state lands. Motivating landowners to contribute to landscape-level wildfire protection requires an understanding of factors that underlie landowner behaviour regarding wildfire. We developed a conceptual...
Author(s): A. Paige Fischer, Jeffrey D. Kline, Alan A. Ager, Susan Charnley, Keith A. Olsen
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

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

The shape of ecosystem management to come: Anticipating risks and fostering resilience
www.nrfirescience.org/resource/16831
Global change is increasingly challenging the sustainable provisioning of ecosystem services to society. Addressing future uncertainty and risk has therefore become a central problem of ecosystem management. With risk management and resilience-based stewardship, two contrasting approaches have been proposed to address this issue....
Author(s): Rupert Seidl
Year Published: 2014
Type: Document
Book or Chapter or Journal Article
Managing wildland fire incidents can be fraught with complexity and uncertainty. Myriad human factors can exert significant influence on incident decision making, and can contribute additional uncertainty regarding programmatic evaluations of wildfire management and attainment of policy goals. This article develops a framework...

Author(s): Matthew P. Thompson
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

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

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

Wildfire is one of the two most significant disturbance agents (the other being insects) in forest ecosystems of the Western United States, and in a warmer climate, will drive changes in forest composition, structure, and function (Dale et al. 2001, McKenzie et al. 2004). Although wildfire is highly stochastic in space and time,...

Author(s): David L. Peterson, Jeremy S. Littell
Year Published: 2013
Type: Document
Technical Report or White Paper

Substantial investments in fuel management activities on national forests in the western US are part of
A national strategy to reduce human and ecological losses from catastrophic wildfire and create fire resilient landscapes. Prioritizing these investments within and among national forests remains a challenge, partly because a...

Author(s): Alan A. Ager, Michelle A. Day, Charles W. McHugh, Karen C. Short, Julie W. Gilbertson-Day, Mark A. Finney, David E. Calkin
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

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

Modeling wildfire incident complexity dynamics
www.nrfirescience.org/resource/16137
Wildfire management in the United States and elsewhere is challenged by substantial uncertainty regarding the location and timing of fire events, the socioeconomic and ecological consequences of these events, and the costs of suppression. Escalating U.S. Forest Service suppression expenditures is of particular concern at a time of...
Author(s): 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

Research and development supporting risk-based wildfire effects prediction for fuels and fire management: status and needs
www.nrfirescience.org/resource/12743
Wildland fire management has moved beyond a singular focus on suppression, calling for wildfire management for ecological benefit where no critical human assets are at risk. Processes causing direct
effects and indirect, long-term ecosystem changes are complex and multidimensional. Robust risk-assessment tools are required that...

Author(s): Kevin D. Hyde, Matthew B. Dickinson, Gil Bohrer, David E. Calkin, Louisa Evers, Julie W. Gilbertson-Day, Tessa Nicolet, Kevin C. Ryan, Christina Tague
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Wildfire risk and optimal investments in watershed protection
www.nrfirescience.org/resource/16172
Following what was then one of the most destructive fire years on record, President Bush signed into law the Healthy Forests Restoration Act of 2003. The law requires no less than fifty percent of all funds allocated for hazardous fuels reductions to occur in the wildland-urban interface (WUI), with the aim of enhancing the...
Author(s): Travis Warziniack, Matthew P. Thompson
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

Simulating effects of land use policies on extent of the wildland urban interface and wildfire risk in Flathead County, Montana
www.nrfirescience.org/resource/12036
This study used a wildfire loss simulation model to evaluate how different land use policies are likely to influence wildfire risk in the wildland urban interface (WUI) for Flathead County, Montana. The model accounts for the complex socio-ecological interactions among climate change, economic growth, land use change and policy,...
Author(s): Travis B. Paveglio, Tony Prato, Michael Hardy
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
How risk management can prevent future wildfire disasters in the wildland-urban interface
www.nrfirescience.org/resource/12757
Recent fire seasons in the western United States are some of the most damaging and costly on record. Wildfires in the wildland-urban interface on the Colorado Front Range, resulting in thousands of homes burned and civilian fatalities, although devastating, are not without historical reference. These fires are consistent with the...
Author(s): David E. Calkin, Jack D. Cohen, Mark A. Finney, Matthew P. Thompson
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

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

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
A national approach for integrating wildfire simulation modeling into wildland urban interface risk assessments within the United States
www.nrfirescience.org/resource/12739
Ongoing human development into fire-prone areas contributes to increasing wildfire risk to human life. It is critically important, therefore, to have the ability to characterize wildfire risk to populated places, and to identify geographic areas with relatively high risk. A fundamental component of wildfire risk analysis is...
Author(s): Jessica R. Haas, David E. Calkin, Matthew P. Thompson
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

A wildfire risk assessment framework for land and resource management
www.nrfirescience.org/resource/12445
Wildfires can result in significant, long-lasting impacts to ecological, social, and economic systems. It is necessary, therefore, to identify and understand the risks posed by wildland fire, and to develop cost-effective mitigation strategies accordingly. This report presents a general framework with which to assess wildfire risk...
Author(s): Joe H. Scott, Matthew P. Thompson, David E. Calkin
Year Published: 2013
Type: Document
Technical Report or White Paper

Hazardous fuel treatments, suppression cost impacts, and risk mitigation
www.nrfirescience.org/resource/16170
Land management agencies face uncertain tradeoffs regarding investments in preparedness and fuels management versus future suppression costs and impacts to valued resources and assets. Prospective evaluation of fuel treatments allows for comparison of alternative treatment strategies in terms of socioeconomic and ecological impacts...
Author(s): Matthew P. Thompson, Michael S. Hand, Julie W. Gilbertson-Day, Nicole M. Vaillant, Derek J. Nalle
Year Published: 2013
Type: Document
Conference Proceedings

Risk complexity and the wildland firefighter
www.nrfirescience.org/resource/16402
Between 2000 and 2010 the US Forest Service and the Department of the Interior experienced 82 wildland fire fatalities. Our most recent organizational focus has been to eliminate fatalities. The chief of the USFS, in a letter to all employees, asked us to "suspend disbelief" with regard to the concept of a "zero fatality..."
Author(s): Ivan Pupulidy
Year Published: 2012
Type: Document
Conference Proceedings

Wildfire triage: targeting mitigation based on social, economic, and ecological values
www.nrfirescience.org/resource/16178
Evaluating the risks of wildfire relative to the valuable resources found in any managed landscape requires an interdisciplinary approach. Researchers at the Rocky Mountain Research Station and Western Wildland Threat Assessment Center developed such a process, using a combination of
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

The science and opportunity of wildfire risk assessment (Chapter 6)
www.nrfirescience.org/resource/16179
Wildfire management within the United States continues to increase in complexity, as the converging drivers of (1) increased development into fire-prone areas, (2) accumulated fuels from historic management practices, and (3) climate change potentially magnify threats to social and ecological values (Bruins et al., 2010; Gude et al...)
Author(s): Matthew P. Thompson, Alan A. Ager, Mark A. Finney, David E. Calkin, Nicole M. Vaillant
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Estimating US federal wildland fire managers' preferences toward competing strategic suppression objectives
www.nrfirescience.org/resource/16174
Wildfire management involves significant complexity and uncertainty, requiring simultaneous consideration of multiple, non-commensurate objectives. This paper investigates the tradeoffs fire managers are willing to make among these objectives using a choice experiment methodology that provides three key advancements relative to...
Author(s): David E. Calkin, Tyron J. Venn, Matthew J. Wibbenmeyer, Matthew P. Thompson
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
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

Managing wildfire events: risk-based decision making among a group of federal fire managers
www.nrfirescience.org/resource/18959
Managing wildfire events to achieve multiple management objectives involves a high degree of decision complexity and uncertainty, increasing the likelihood that decisions will be informed by experience-based heuristics triggered by available cues at the time of the decision. The research reported here tests the prevalence of three...
Author(s): Robyn S. Wilson, Patricia L. Winter, Lynn A. Maguire, Timothy Ascher
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

Progress towards and barriers to implementation of a risk framework for US federal wildland fire policy and decision making
www.nrfirescience.org/resource/16180
In this paper we review progress towards the implementation of a risk management framework for US federal wildland fire policy and operations. We first describe new developments in wildfire simulation
technology that catalyzed the development of risk-based decision support systems for strategic wildfire management. These systems...

Author(s): David E. Calkin, Mark A. Finney, Alan A. Ager, Matthew P. Thompson, Krista M. Gebert
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

Proceedings of the Second Conference on the Human Dimensions of Wildland Fire
www.nrfirescience.org/resource/17808
This proceedings contains articles, posters, and abstracts of presentations from the second Human Dimensions of Wildland Fire Conference held 27-29 April 2010 in San Antonio, Texas. The conference covered the social issues at the root of wildland fire management's most serious challenges. Specific topics included: firefighter and...
Year Published: 2011
Type: Document
Conference Proceedings

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
The exposure index: developing firefighter safety performance measures
www.nrfirescience.org/resource/16182
A cornerstone of effective institutional learning and accountability is the development, tracking, and analysis of informative performance measures. In a previous issue of Fire Management Today ("A New Look at Risk Management," Winter 2011), a series of articles highlighted the importance of organizational safety and risk management...
Author(s): David E. Calkin, John Phipps, Thomas P. Holmes, Jon D. Rieck, Matthew P. Thompson
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

Primer on risk analysis: decision making under uncertainty
www.nrfirescience.org/resource/18895
In every decision context there are things we know and things we do not know. Risk analysis uses science and the best available evidence to assess what we know—and it is intentional in the way it addresses the importance of the things we don’t know. Primer on Risk Analysis: Decision Making Under Uncertainty lays out the tasks of...
Author(s): Charles Yoe
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

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

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

Wildfire risk and hazard: procedures for the first approximation
www.nrfirescience.org/resource/12726
This report was designed to meet three broad goals: (1) evaluate wildfire hazard on Federal lands; (2) develop information useful in prioritizing where fuels treatments and mitigation measures might be proposed to address significant fire hazard and risk; and (3) develop risk-based performance measures to document the effectiveness...
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

Evaluating wildland fire danger and prioritizing vegetation and fuels treatments
www.nrfirescience.org/resource/11465
We present a prototype decision support system for evaluating wild-land fire danger and prioritizing subwatersheds for vegetation and fuels treatment. We demonstrate the use of the system with an example from the Rocky Mountain region in the State of Utah, which represents a planning area of about 4.8 million ha and encompasses 575...

Author(s): Paul F. Hessburg, Keith M. Reynolds, Robert E. Keane, Kevin M. James, R. Brion Salter
Year Published: 2010
Type: Document
Technical Report or White Paper

A comparison of landscape fuel treatment strategies to mitigate wildland fire risk in the urban interface and preserve old forest structure
www.nrfirescience.org/resource/12725
We simulated fuel reduction treatments on a 16,000 ha study area in Oregon, US, to examine tradeoffs between placing fuel treatments near residential structures within an urban interface, versus treating stands in the adjacent wildlands to meet forest health and ecological restoration goals. The treatment strategies were evaluated...

Author(s): Alan A. Ager, Nicole M. Vaillant, Mark A. Finney
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Science and decisions: advancing risk assessment
www.nrfirescience.org/resource/18890
Risk assessment has become a dominant public policy tool for making choices, based on limited resources, to protect public health and the environment. It has been instrumental to the mission of the U.S. Environmental Protection Agency (EPA) as well as other federal agencies in evaluating public health concerns, informing regulatory...

Author(s): National Research Council
Year Published: 2009
Type: Document
Book or Chapter or Journal Article
A new process for organizing assessments of social, economic, and environmental outcomes: case study of wildland fire management in the USA

www.nrfirescience.org/resource/12416

Ecological risk assessments typically are organized using the processes of planning (a discussion among managers, stakeholders, and analysts to clarify ecosystem management goals and assessment scope) and problem formulation (evaluation of existing information to generate hypotheses about adverse ecological effects, select...

Author(s): Randall J. F. Bruins, Wayne R. Munns, Stephen J. Botti, Steve Brink, David Cleland, Larry Kapustka, Danny C. Lee, Valerie Luzadis, Laura Falk McCarthy, Naureen Rana, Douglas B. Rideout, Matthew G. Rollins, Peter Woodbury, Mike Zupko
Year Published: 2009
Type: Document
Book or Chapter or Journal Article, Management or Planning Document

Risk management - principles and guidelines

www.nrfirescience.org/resource/18885

ISO 31000:2018 provides guidelines on managing risk faced by organizations. The application of these guidelines can be customized to any organization and its context. ISO 31000:2018 provides a common approach to managing any type of risk and is not industry or sector specific. ISO 31000:2018 can be used throughout the life of the...

Author(s): Geneva Switzerland International organization for standardization
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

The Key Decision Log: facilitating high reliability and organizational learning

www.nrfirescience.org/resource/16399

If you were involved in the 2008 fire season in the West, you may have heard the term "Key Decision Log" or "KDL." This article describes the KDL concept, its intent (past and present), how it was applied in 2008, and where the practice is heading.

Author(s): Anne E. Black
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

Mapping tradeoffs in values at risk at the interface between wilderness and non-wilderness lands

www.nrfirescience.org/resource/11063

On the Flathead Indian Reservation in Montana, U.S., the Mission Mountains Tribal Wilderness is bordered by a buffer zone. To successfully improve forest health within that buffer zone and restore fire in the wilderness, the managing agency and the public need to work together to find solutions to increasingly threatening fuel...

Author(s): Alan E. Watson, Roian Matt, Tim Waters, Kari Gunderson, Stephen J. Carver, Brett Davis
Year Published: 2009
Type: Document
Conference Proceedings

Managing fire risk in the forests of the U.S. inland Northwest: a classic "wicked problem" in public land policy

www.nrfirescience.org/resource/11066
In their classic article published in the Journal of Forestry in 1986, Gerald Allen and Ernest Gould stated that the most daunting problems associated with public forest management have a "wicked" element: "Wicked problems share characteristics. Each can be considered as simply a symptom of some higher order problem-The definition...

Forests at risk: integrating risk science into fuel management strategies
www.nrfirescience.org/resource/11089
The threat from wildland fire continues to grow across many regions of the Western United States. Drought, urbanization, and a buildup of fuels over the last century have contributed to increasing wildfire risk to property and highly valued natural resources. Fuel treatments, including thinning overly dense forests to reduce fuel...

Managing the unexpected: resilient performance in an age of uncertainty
www.nrfirescience.org/resource/15972
Thousands of firefighters across the United States have been influenced by the first edition of "Managing the Unexpected". In this second edition, the authors continue their analysis of high reliability organizations (HRO's), which are organizations that routinely operate in high risk environments (where the consequences of...

The next catastrophe: reducing our vulnerabilities to natural, industrial, and terrorist disasters
www.nrfirescience.org/resource/15885
Perrow, developer of normal accident theory, argues here that we must reduce the size of targets that are vulnerable to disasters because organizations, including political ones, cannot completely prevent all the risks associated with the potential disasters that a society might face. A basic tenant of Perrow's argument is that...

Improving wildfire preparedness: lessons from communities across the US
www.nrfirescience.org/resource/7947
Communities across the U.S. have been taking action to adapt to the wildfire risk they face. In a series of case studies conducted in 15 communities, researchers identified and described four elements that form the foundation for community wildfire preparedness: landscape, government, citizens, and community.

Author(s): Matthew S. Carroll, Keith A. Blatner, Patricia J. Cohn, Charles E. Keegan, Todd A. Morgan
Year Published: 2008
Type: Document

Author(s): Jonathan Thompson
Year Published: 2008
Type: Document
Research Brief or Fact Sheet

Author(s): Karl E. Weick, Kathleen Sutcliffe
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Author(s): Charles Perrow
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Author(s): Pamela J. Jakes, Linda E. Kruger, Martha C. Monroe, Kristen C. Nelson, Victoria Sturtevant
Year Published: 2007
Type: Document
Citizen-Agency Interactions in Planning and Decisionmaking After Large Fires
www.nrfirescience.org/resource/17810
This report reviews the growing literature on the concept of agency-citizen interactions after large wildfires. Because large wildfires have historically occurred at irregular intervals, research from related fields has been reviewed where appropriate. This issue is particularly salient in the West where excess fuel conditions...
Author(s): Christine Olsen, Bruce A. Shindler
Year Published: 2007
Type: Document
Technical Report or White Paper

An analytical framework for quantifying wildland fire risk and fuel treatment benefit
www.nrfirescience.org/resource/12720
Federal wildland fire management programs have readily embraced the practice of fuel treatment. Wildland fire risk is quantified as expected annual loss ($ yr⁻¹ or $ yr⁻¹ ac⁻¹). Fire risk at a point on the landscape is a function of the probability of burning at that point, the relative frequency of fire behaviors expected if the...
Author(s): Joe H. Scott
Year Published: 2006
Type: Document
Conference Proceedings

Shared mindfulness in cockpit crisis situations
www.nrfirescience.org/resource/15912
Research reveals that human error contributes 60 to 80 percent of error in aviation accidents and disasters. Thus, despite innovations in technology and safety materials, individuals must be able to make speedy yet intelligent decisions and be able to communicate those decisions in an efficient manner. Krieger explores the...
Author(s): Janice L. Krieger
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

On becoming an artist: reinventing yourself through mindful creativity
www.nrfirescience.org/resource/15831
In this book, Langer augments her previous work on mindfulness and artistic nature with insights on creativity. Langer discusses how creativity is not a rare trait, but a part of every person’s makeup. While all people have the ability to express themselves creatively, many people undervalue themselves, which serves to undermine...
Author(s): Ellen J. Langer
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

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
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

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

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

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
Surviving the age of risk: a call for ethical management
www.nrfirescience.org/resource/15903
Ewing and Lee look at some of the ways to consider ethical risk management in a corporate context, which have changed because of recent scandals such as Enron. They give six ways to create an ethical risk management environment (the six Cs): 1) Champions: find a spokesperson, someone to “champion” risk management; 2) Commitment... 
Author(s): Lance J. Ewing, Ryan B. Lee
Year Published: 2004
Type: Document
Book or Chapter or Journal Article

Private and tribal forest landowners and fire risk: a two-county case study in Washington state
www.nrfirescience.org/resource/16114
This study focused on the role of fire both as a perceived threat and a management tool of nonindustrial private forest and tribal forest landowners or managers in two counties in northeastern Washington State. Using qualitative social research methods and a risk perception conceptual frame, we identified distinct categories of... 
Author(s): Matthew S. Carroll, Patricia J. Cohn, Keith A. Blatner
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. Benoît
Year Published: 2004
Type: Document
Book or Chapter or Journal Article

A new accident model for engineering safer systems
www.nrfirescience.org/resource/15959
Leveson argues that most accident models are designed for simple systems. Newer accident models are needed because of the changing landscape of organizational systems and the changing contexts in which they are developed. Fast-paced technological change, new types of digital failure and hazards, decreasing tolerance for failure, and... 
Author(s): Nancy Leveson
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
A review of prescribed burning effectiveness in fire hazard reduction

Wildfire hazard abatement is one of the major reasons to use prescribed burning. Computer simulation, case studies, and analysis of the fire regime in the presence of active prescribed burning programs in forest and shrubland generally indicate that this fuel management tool facilitates fire suppression efforts by reducing the...

Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality

Risk assessment is often viewed as a logical, cause-effect process that uses mathematics and gives little credence to feelings. Without discounting the need for a rational approach to categorizing risk analysis, the authors show how affect, feelings, and emotions (the perceived “goodness” and the “badness” of a risky...

Inviting disaster: lessons from the edge of technology

While technology has provided the means for achieving unprecedented control over land, air, and sea, it has also become increasingly complex. As a result of this complexity, disasters are difficult to predict, and they are even more difficult to prevent. This book exposes many common mistakes that have culminated in unnecessary...

Preventing disaster: home ignitability in the wildland-urban interface

Wildland-urban interface (W-UI) fires are a significant concern for federal, state, and local land management and fire agencies. Research using modeling, experiments, and W-UI case studies indicates that home ignitability during wildland fires depends on the characteristics of the home and its immediate surroundings. These findings...
Lessons from Longford: the Esso Gas Plant explosion
www.nrifirescience.org/resource/15906
The Esso gas plant explosion of 1998 represents a series of organizational failures that resulted in devastating consequences, including two deaths. This book examines those organizational failures through the findings of the Royal Commission. The author argues that the accident was preventable and was caused by a number of failures...
Author(s): Andrew Hopkins
Year Published: 2000
Type: Document
Book or Chapter or Journal Article

Decisions: making the right ones. Learning from the wrong ones.
www.nrifirescience.org/resource/16230
This article critiques two predominant forms of decision making: rational-choice and the intuitive approach. The authors suggest a more productive approach to decision making is the experiential, or “recognize/react,” approach. The experiential approach asserts that experience provides decision makers the ability to size up...
Author(s): Gary Klein, Karl E. Weick
Year Published: 2000
Type: Document
Book or Chapter or Journal Article

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

Sequential use of simulation and optimization in analysis and planning
www.nrifirescience.org/resource/11045
Management activities are analyzed at landscape scales employing both simulation and optimization. SIMPPLLLE, 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

Managing major hazards: the lessons of the Moura Mine disaster
www.nrifirescience.org/resource/15905
In every organization, things go wrong. For the most part, these errors are minor and often go unnoticed. However, when disaster occurs, external pressure often forces the exposure of many of the failures that occur within an organization. Thus, a disaster can offer an opportunity for in-depth analysis of the internal workings of an...
Author(s): Andrew Hopkins
Applying simulation and optimization to plan fuel treatments at landscape scales

Fuel treatment activities are analyzed at the landscape scale by using both simulation and optimization. Simulating vegetative patterns and processes at landscape scales (SIMPPLLE), a stochastic simulation modeling system, is initially applied to assess wildfire risks on the current landscape without management treatments but with...

Author(s): J. Greg Jones, Jimmie D. Chew, Hans R. Zuuring
Year Published: 1999
Type: Document
Conference Proceedings, Technical Report or White Paper

Risk management for ecological stewardship

This comprehensive chapter documents, from a management perspective, the knowledge base on risk assessments and risk management. The previous chapter in the book is a companion article that provides the scientific foundation for the concepts and terminology used by Cleaves and Haynes. In this chapter, Cleaves and Haynes provide a...

Author(s): D.A. Cleaves, R. W. Haynes
Year Published: 1999
Type: Document
Book or Chapter or Journal Article

Normal accidents: living with high-risk technologies

Many of the accidents that organizations face are a result of complex interactions between multiple events and with multiple actors. They cannot be explained as being only one group or individual’s “fault”. In this book, Perrow investigates the complexity of accidents as events that are inevitable because of the complex...

Author(s): Charles Perrow
Year Published: 1999
Type: Document
Book or Chapter or Journal Article

Organizational learning activities in high-hazard industries: the logics underlying self-analysis

Carroll begins by discussing how different staff members in an organization know different things about how work is accomplished. For an organization to run properly, these staff members must engage in organizational learning, which means facilitating the development of organizational knowledge by supporting each other and...

Author(s): John S. Carroll
Year Published: 1998
Type: Document
Book or Chapter or Journal Article

Managing the risks of organizational accidents

www.nrfirescience.org/resource/15960
This book focuses on the causes, consequences, and possible means of avoiding organizational accidents. While individual accidents are more frequent and often target the individual for blame, organizational accidents are deep rooted errors in the daily function of organizations that increase the likelihood for disaster. The author...

Author(s): James Reason
Year Published: 1997
Type: Document
Book or Chapter or Journal Article

Managing environmental uncertainty with legitimate authority: a comparative analysis of the Mann Gulch and Storm King Mountain Fires

www.nrfirescience.org/resource/15893

Alder recognizes two decisions common to both the Mann Gulch and Storm King Mountain fires that influenced the behavior of firefighters during critical moments: 1) failing to question authority and 2) failing to obey authority. He argues that these failures are based on individual perceptions of legitimate authority. There are four...

Author(s): G. Stoney Alder
Year Published: 1997
Type: Document
Book or Chapter or Journal Article

Man-made disasters

www.nrfirescience.org/resource/15889

To understand and avoid future calamities, decision makers must have a more accurate way of understanding past calamities. Most of what we know about calamities comes from eye witness accounts that favor relief efforts and damage reports rather than the specific events that come together initially to form a disaster. This suggests...

Author(s): Barry A. Turner, Nick F. Pidgeon
Year Published: 1997
Type: Document
Book or Chapter or Journal Article

Learning from mistakes is easier said than done: group and organizational influences on the detection and correction of human error

www.nrfirescience.org/resource/15878

Researchers have often studied and discussed errors and accidents within an organizational setting in two ways. The first focuses on the individual, while the second looks at the system in which the individual operates. Edmondson argues for a third perspective, one that looks at both the individual and the system, and specifically...

Author(s): Amy Edmondson
Year Published: 1996
Type: Document
Book or Chapter or Journal Article

The Challenger launch decision: risky technology, culture, and deviance at NASA

www.nrfirescience.org/resource/16255

In the wake of the explosion of the 1986 space shuttle Challenger, a conventional explanation for the tragedy emerged: the economic strain on NASA caused managers to withhold information about safety violations in order to maintain the launch schedule. In her book, Diane Vaughan contradicts this conventional explanation by providing...

Author(s): Diane Vaughan
Beyond aviation human factors: safety in high technology systems
www.nrfirescience.org/resource/15883
Aviation human factors investigations have typically blamed individual behavior as the primary cause of serious work accidents. However, this book argues that organizations are responsible for two aspects that contribute to work related accidents: 1) the local working conditions that restrict how workers can behave and 2) the...
Author(s): Daniel E. Maurino, James Reason, Neil Johnston, Rob B. Lee
Year Published: 1995
Type: Document
Book or Chapter or Journal Article

Sensemaking in organizations
www.nrfirescience.org/resource/16258
Sensemaking is about how people make sense of situations. When faced with problems, people construct meaning. This constructive process plays a key role in the ultimate understanding that is developed. The meaning of a situation is both created and interpreted through sensemaking. Weick lists seven distinguishing characteristics of...
Author(s): Karl E. Weick
Year Published: 1995
Type: Document
Book or Chapter or Journal Article

Causes of disaster: sloppy management
www.nrfirescience.org/resource/15891
Turner argues that while the best way to avoid disasters is primarily “for managers to establish, to strengthen, and then to assert control,” management control only addresses part of the problem, and there are limitations that affect management in disaster situations. Turner advocates examining three interrelated factors in a...
Author(s): Barry Turner
Year Published: 1994
Type: Document
Book or Chapter or Journal Article

The textual approach: risk and blame in disaster sensemaking
www.nrfirescience.org/resource/16261
This article investigates responses to a gas pipeline explosion as a means of uncovering the methods that organizations and other participants use to make sense during disaster and to change situations. Sensemaking deals with how organizations and individuals explain or “make sense of” what goes on around them. Gephart is...
Author(s): Robert P. Gephart Jr.
Year Published: 1993
Type: Document
Book or Chapter or Journal Article

Organizational communication imperatives: lessons of the space program
www.nrfirescience.org/resource/15970
Drawing upon experience working for NASA during the Apollo Missions and his studies of organizational communication, Tompkins illustrates that taking a communication perspective can help with understanding organizational problems. This book takes a narrative approach in which Tompkins discusses his visits to the Marshall Space...

Author(s): Phillip K. Tompkins
Year Published: 1993
Type: Document
Book or Chapter or Journal Article

Military misfortunes: the anatomy of failure in war
www.nrfirescience.org/resource/15876
Military misfortunes are complex and involve not only individual failures in judgment or action, but also organizational failures rooted in the values each military organization upholds. This book uses examples from several military battles to highlight the need for military operations and organizations that: 1) learn from past...

Author(s): Eliot A. Cohen, John Gooch
Year Published: 1990
Type: Document
Book or Chapter or Journal Article

Conservatism, efficiency, and the value of life
www.nrfirescience.org/resource/15868
Many organizations are faced with unavoidable dangers that may harm employees during their regular work. However, despite organizational efforts, it is often unrealistic for employees to be responsible for avoiding all possible risk. Employees must get the job done despite the dangers they may face. In this chapter, MacLean and...

Author(s): Douglas MacLean, Claudia Mills
Year Published: 1990
Type: Document
Book or Chapter or Journal Article

Overcoming organizational defenses: facilitating organizational learning
www.nrfirescience.org/resource/15810
Organizations often suffer because workers and managers avoid embarrassment by turning a blind eye toward mistakes. This book focuses on errors that are consciously buried in order to avoid situations that might damage individual reputations. Using examples from businesses across the United States and government errors like the...

Author(s): Chris Argyris
Year Published: 1990
Type: Document
Book or Chapter or Journal Article

On risk communication as interorganizational control: the case of the aviation safety reporting system
www.nrfirescience.org/resource/15969
Focusing on the 1974 Trans World Airlines (TWA) Flight 514 crash, Tompkins discusses the National Transportation Safety Board’s (NTSB) investigation of the crash and points to communication between the pilot and controllers and communication between airline organizations as principle contributors to the tragedy. Using this...

Author(s): Phillip K. Tompkins
Year Published: 1990
The history and politics of disaster management in the United States
www.nrfirescience.org/resource/15870
This chapter overviews the history of hazard management in the United States, and defines what constitutes a “disaster” by federal standards. Popkin provides a history of federal and state policies and programs established and maintained in the United States since 1803. Despite historic moves to ensure federally funded hazard...
Author(s): Roy S. Popkin
Year Published: 1990
Type: Document
Book or Chapter or Journal Article

Uncertainty: a guide to dealing with uncertainty in quantitative risk and policy analysis
www.nrfirescience.org/resource/18888
The authors explain the ways in which uncertainty is an important factor in the problems of risk and policy analysis. This book outlines the source and nature of uncertainty, discusses techniques for obtaining and using expert judgment, and reviews a variety of simple and advanced methods for analyzing uncertainty. Powerful computer...
Author(s): M. Granger Morgan, Max Henrion
Year Published: 1990
Type: Document
Book or Chapter or Journal Article

Decision traps: the ten barriers to brilliant decision-making and how to overcome them
www.nrfirescience.org/resource/18893
Make Every Decision Your Best Decision Executives rate decision-making ability as the most important business skill, but few people have the training they need to make good decisions consistently. Becoming a good decision-maker is like training to be a top athlete: Just as the best coaches use training methods to help athletes...
Author(s): J. Edward Russo, Paul J. H. Schoemaker
Year Published: 1989
Type: Document
Book or Chapter or Journal Article

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

Searching for safety
www.nrfirescience.org/resource/15871
Safety and danger are usually seen as opposites that exclude one another in practice. Safety is often seen as the absence of danger, and danger is often seen as the absence of safety. This book, however, argues that the two conditions are unavoidably and unconditionally connected and that continued safety must encourage the...

Author(s): Aaron Wildavsky
Year Published: 1987
Type: Document
Book or Chapter or Journal Article

**Judgment under uncertainty: heuristics and biases**

This is a classic textbook written by three well known authors (Kahneman recently won the Nobel Prize for economics) who have spent their careers working in the psychological fields of understanding how people make decisions under uncertainty. The introduction to this edited volume identifies three heuristics (in other words, rules...)

Year Published: 1986
Type: Document
Book or Chapter or Journal Article

**Risk and culture: an essay on the selection of technological and environmental dangers**

Perceptions of risk and danger are largely based on what society and organizations choose to value and what they choose to fear. Often, these values are shaped by larger organizational and political interests that bias perceptions of risk, danger, and responses that reinforce the values they match. Scientific disagreement on what...

Author(s): Mary Douglas, Aaron Wildavsky
Year Published: 1982
Type: Document
Book or Chapter or Journal Article

**Threat rigidity effects in organizational behavior: a multilevel analysis**

This article addresses how organizations deal with adversity and how organizations adapt within adverse conditions. The authors comment that most research emphasizes “organizational and not individual or group responses to adversity,” and those studies tend to “take a functional stance”. What those approaches leave out is...

Author(s): Barry Staw, Lance Sandelands, Jane Dutton
Year Published: 1981
Type: Document
Book or Chapter or Journal Article

**Proceedings of the fourth fire behavior and fuels conference**

The Fourth Fire Behavior and Fuels Conference was held in Raleigh, North Carolina, USA, February 18-22, 2013. The theme for this conference was At The Crossroads: Looking Toward the Future in a Changing Environment. Joint sponsorship of the conference was by the International Association of Wildland Fire (IAWF) and the International...