

## **Monetising the savings of remotely sensed data and information in Burn Area Emergency Response (BAER) wildfire assessment**

[www.nrfirescience.org/resource/22536](http://www.nrfirescience.org/resource/22536)

We used a value of information approach to demonstrate the cost-effectiveness of using satellite imagery as part of the Burn Area Emergency Response (BAER), a US federal program that identifies imminent post-wildfire threats to human life and safety, property and critical natural or cultural resources. We compared the costs...

Author(s): Richard Bernknopf, Yusuke Kuwayama, Reily Gibson, Jessica Blakely, Bethany Mabee, T. J. Clifford, Brad Quayle, Justin Epting, Terry Hardy, David C. Goodrich

Year Published: 2021

Type: Document

Book or Chapter or Journal Article

## **Cost-effective fuel treatment planning: a theoretical justification and case study**

[www.nrfirescience.org/resource/20657](http://www.nrfirescience.org/resource/20657)

Modelling the spatial prioritisation of fuel treatments and their net effect on values at risk is an important area for applied work as economic damages from wildfire continue to grow. We model and demonstrate a cost-effective fuel treatment planning algorithm using two ecosystem services as benefits for which fuel treatments are...

Author(s): Jason Kreitler, Matthew P. Thompson, Nicole M. Vaillant, Todd J. Hawbaker

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

## **How to measure the economic health cost of wildfires – A systematic review of the literature for northern America**

[www.nrfirescience.org/resource/22214](http://www.nrfirescience.org/resource/22214)

There has been an increasing interest in the economic health cost from smoke exposure from wildfires in the past 20 years, particularly in the north-western USA that is reflected in an emergent literature. In this review, we provide an overview and discussion of studies since 2006 on the health impacts of wildfire smoke and of...

Author(s): Ruth Dittrich, Stuart McCallum

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

## **Landscape and Wildfires Seminary: Diagnosis and suppression, methodological advances**

[www.nrfirescience.org/resource/21839](http://www.nrfirescience.org/resource/21839)

In 2015, researchers from the U.S. Department of Agriculture Forest Service, Rocky Mountain Research Station, Human Dimensions Program (hereafter U.S. Forest Service), and the University of Córdoba, Forest Engineering Department, Forest Fire Laboratory, Spain (hereafter University of Cordoba), entered into an official Memorandum of...

Author(s): Francisco Rodríguez y Silva, Juan Ramón Molina Martínez, Matthew P. Thompson, Kit O'Connor

Year Published: 2020

Type: Document

Technical Report or White Paper

## **The Biggest Bang for the Buck: Cost-Effective Vegetation Treatment Outcomes Across Drylands of the Western USA**

[www.nrfirescience.org/resource/21607](http://www.nrfirescience.org/resource/21607)

Restoration and rehabilitation treatments that manipulate vegetation can be expensive to implement but are infrequently evaluated to determine whether spending more improves intended outcomes. We assessed commonly implemented vegetation treatments and costs relative to their outcomes across sagebrush shrublands and pinyon?juniper...

Author(s): Seth Munson, Ethan O. Yackulic, Lucas S. Bair, Stella M. Copeland, Kevin L. Gunnell

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

### **Assessing preferences for wildfire prevention policies in Spain**

[www.nrfirescience.org/resource/21461](http://www.nrfirescience.org/resource/21461)

Recent data show that fire concentration is becoming rather predominant in Southern European areas. Specifically, 2017–2018 were some of the worst years on record for fires in Europe. We conduct a survey among households in order to understand citizens' preferences towards fire prevention programs in Spain, aiming to reduce the...

Author(s): Maria Alló, Maria L. Loureiro

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

### **Bark beetle infestation of western US forests: A context for assessing and evaluating impacts**

[www.nrfirescience.org/resource/21007](http://www.nrfirescience.org/resource/21007)

Bark beetles are primary disturbance agents in western US forests. Outbreaks affect goods and services associated with forest ecosystems including timber, water, fish and wildlife habitats and populations, recreation opportunities, and many others. They can also affect wildfire behavior and its intensity. Assessments and evaluations...

Author(s): Daniel W. McCollum, John E. Lundquist

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

### **A review of post-incident studies for wildland-urban interface fires**

[www.nrfirescience.org/resource/21973](http://www.nrfirescience.org/resource/21973)

Post-incident studies provide direct and valuable information to further the scientific understanding of Wildland-Urban Interface (WUI) fires. Most post-incident studies involve data collection in the field (i.e. a 'research field deployment'). In this review, technical reports of post-incident studies for WUI fire and other natural...

Author(s): Benjamin Gaudet, Albert Simeoni, Steven M. V. Gwynne, Erica D. Kuligowski, Nouredine Bénichou

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

### **Managing fire risk at the wildland-urban interface requires reconciliation of tradeoffs between regulating and cultural ecosystem services**

[www.nrfirescience.org/resource/21796](http://www.nrfirescience.org/resource/21796)

Forest fires at the wildland-urban interface are generating increasing losses due to the expansion of cities into adjacent forests. At the same time, urban green open spaces are highly valuable as sources of recreational, educational and aesthetic benefits. Tradeoffs may arise between the desire to preserve peri-urban forests for...

Author(s): Yaella Depietri, Daniel E. Orenstein

Year Published: 2020  
Type: Document  
Book or Chapter or Journal Article

### **Evaluating wildland fire liability standards – does regulation incentivise good management?**

[www.nrfirescience.org/resource/21585](http://www.nrfirescience.org/resource/21585)

Fire spread on forested landscapes depends on vegetation conditions across the landscape that affect the fire arrival probability and forest stand value. Landowners can control some forest characteristics that facilitate fire spread, and when a single landowner controls the entire landscape, a rational landowner accounts for spatial...

Author(s): Christopher J. Lauer, Claire A. Montgomery, Thomas G. Dietterich

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

### **Where to prescribe burn: the costs and benefits of prescribed burning close to houses**

[www.nrfirescience.org/resource/21068](http://www.nrfirescience.org/resource/21068)

Prescribed burning is used in Australia as a tool to manage fire risk and protect assets. A key challenge is deciding how to arrange the burns to generate the highest benefits to society. Studies have shown that prescribed burning in the wildland–urban interface (WUI) can reduce the risk of house loss due to wildfires, but the...

Author(s): Veronique Florec, Michael P. Burton, David J. Pannell, Joel K. Kelso, George J. Milne

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

### **Valuation of the economic impact of wildland fires on landscape and recreation resources: a proposal to incorporate them on damages valuation**

[www.nrfirescience.org/resource/19075](http://www.nrfirescience.org/resource/19075)

Even when they account for a large part of damages caused by forest fires on environmental and landscape services they are seldom included in the valuation of damage assessments. Some fires within natural parks have caused significantly larger impacts on these environmental and landscape services (nonmarket) than on market services...

Author(s): Juan Ramón Molina, Francisco Rodriguez y Silva

Year Published: 2019

Type: Document

Conference Proceedings

### **The role of previous fires in the management and expenditures of subsequent large wildfires**

[www.nrfirescience.org/resource/20409](http://www.nrfirescience.org/resource/20409)

Previously burned areas can influence the occurrence, extent, and severity of subsequent wildfires, which may influence expenditures on large fires. We develop a conceptual model of how interactions of fires with previously burned areas may influence fire management, fire behavior, expenditures, and test hypotheses using regression...

Author(s): Erin J. Belval, Christopher D. O'Connor, Matthew P. Thompson, Michael S. Hand

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

### **Economic benefits of wildfire prevention education**

[www.nrfirescience.org/resource/20012](http://www.nrfirescience.org/resource/20012)

From mid-2002 to mid-2007, the State of Florida spent an average of \$500,000 annually on fire prevention education to reduce four main types of fires ignited by humans: 1. debris-burning escapes, 2. campfire escapes, 3. children playing with fire, and 4. wildfires associated with smoking materials.

Author(s): L. Annie Hermansen-Baez, Jeffrey P. Prestemon, David T. Butry, Karen L. Abt, Ronda Sutphen

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

### **Wildfire, national park visitation, and changes in regional economic activity**

[www.nrfirescience.org/resource/19797](http://www.nrfirescience.org/resource/19797)

The visibility, safety, and health effects of seasonal wildfires may affect recreational visits to national parks (NPs), even if fires occur outside of park boundaries. This study statistically quantifies the effect of nearby wildfire on tourist flows to each of Utah's five NPs (Arches, Bryce Canyon, Canyonlands, Capitol Reef, and...

Author(s): Man-Kuen Kim, Paul M. Jakus

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

### **Evolution of nonmarket values valuation in wildland fires: an intertemporal analysis**

[www.nrfirescience.org/resource/19312](http://www.nrfirescience.org/resource/19312)

Forest fires and their legacy form an inherently dynamic relationship between ecology and human uses of the forest. This paper provides an overview of the dynamic dimensions that are present in the aftermath of a fire. These include the evolution of social benefits as the ecology recovers and the role of discounting.

Author(s): Jeffrey Englin

Year Published: 2019

Type: Document

Conference Proceedings

### **Modeling the cost effectiveness of fire protection resource allocation in the United States: models and a 1980-2014 case study**

[www.nrfirescience.org/resource/19184](http://www.nrfirescience.org/resource/19184)

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

### **Econometric model for the diagnosis and evaluation of costs in the planning of prescribed fires in the forest landscape**

[www.nrfirescience.org/resource/19079](http://www.nrfirescience.org/resource/19079)

The increasing use of prescribed fires, as a fire management technique for preventing wildfires and reducing their impact, demands the development of tools that enable performing the necessary studies for determining application opportunities in the territory. The generation of interesting uses of this technique not only directed to...

Author(s): Francisco Rodriguez y Silva  
Year Published: 2019  
Type: Document  
Conference Proceedings

### **Economic analysis of risk and choice under uncertainty in landscape planning in relation to wildfires**

[www.nrfirescience.org/resource/19076](http://www.nrfirescience.org/resource/19076)

Economic decision-making in wildfire defense and fire management programs is not easy when performed under efficiency criteria. The determination of variables to be considered and the lack of data analyzed in relation to the results achieved by the action plans adopted to reduce the impact of fires condition the adoption of...

Author(s): Francisco Rodriguez y Silva  
Year Published: 2019  
Type: Document  
Conference Proceedings

### **To insure or not to insure? Factors affecting acquisition of prescribed burning insurance coverage**

[www.nrfirescience.org/resource/20471](http://www.nrfirescience.org/resource/20471)

Prescribed burning is a widely used tool in forest and grassland management. However, because fire that escapes from a prescribed burn accidentally may cause property damage, injuries, and even human casualties, purchasing insurance to cover such damages may be beneficial for prescribed burn practitioners. Given that insurance...

Author(s): Rajan Parajuli, Omkar Joshi, Neelam C. Poudyal, Urs P. Kreuter  
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](http://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

### **Do fuel treatments reduce wildfire suppression costs and property damages? Analysis of suppression costs and property damages in U.S. National Forests**

[www.nrfirescience.org/resource/19834](http://www.nrfirescience.org/resource/19834)

This paper reports the results of two hypotheses tests regarding whether fuel reduction treatments using prescribed burning and mechanical methods reduces wildfire suppression costs and property damages. To test these two hypotheses data was collected on fuel treatments, fire suppression costs and property damages associated with...

Author(s): John B. Loomis, José J. Sánchez, Armando Gonzalez-Caban, Douglas B. Rideout, Robin Reich  
Year Published: 2019  
Type: Document

**Improving the uncertainty assessment of economic losses from large destructive wildfires**

[www.nrfirescience.org/resource/19721](http://www.nrfirescience.org/resource/19721)

Currently, as fire risk is considered a high-frequency and low-severity risk, actuarial and underwriting pricing and risk management methods have stuck to methods based purely on historical loss data. In the global context of both increasing fire severity with climate change and increasing wildland–urban interface area, the use of...

Author(s): Bruno Guillaume, Bernard Porterie, Antonio Carlos Batista, Phil Cottle, Armand Albergel

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

**Cost plus net value change (C+NVC) revisited: a sequential formulation of the wildfire economics model**

[www.nrfirescience.org/resource/19207](http://www.nrfirescience.org/resource/19207)

The effectiveness of annual investments in US wildfire management programs has been subject to public criticism. One source of inefficiency may arise from a fragmented budgeting process. In the United States, federal budgets for wildfire management operations are not determined simultaneously by a single decision rule but instead...

Author(s): David J. Rossi, Olli-Pekka Kuusela

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

**International relations for reducing wildfire impacts – some history and some thoughts**

[www.nrfirescience.org/resource/19085](http://www.nrfirescience.org/resource/19085)

In this paper, we describe the international activities that FAO has undertaken with partners over the years and then reflect on the role of international relations in reducing wildfire impacts on ecosystem services. FAO has long had a focus on wildfire management and been one of the international organizations facilitating the...

Author(s): Pieter van Lierop, Peter F. Moore

Year Published: 2019

Type: Document

Conference Proceedings

**Proceedings of the fifth international symposium on fire economics, planning, and policy: ecosystem services and wildfires**

[www.nrfirescience.org/resource/19077](http://www.nrfirescience.org/resource/19077)

These proceedings summarize the results of a symposium designed to address current issues of agencies with wildland fire protection responsibility at the federal and state levels in the United States as well as agencies in the international community. The topics discussed at the symposium included ecosystem services and wildland...

Author(s): Armando Gonzalez-Caban, José J. Sánchez

Year Published: 2019

Type: Document

Conference Proceedings

**Natural Areas Association Fire Compendium 2**

[www.nrfirescience.org/resource/18853](http://www.nrfirescience.org/resource/18853)

The Natural Areas Association Fire Compendium 2 compiles articles published in the Natural Areas Journal from 2010 to 2017. This is a supplement to the NAA Fire Compendium that was compiled in 2010 for articles published from 1983 to 2009. Like the first compendium, articles in the Fire Compendium 2 focus on fire ecology and...

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

### **An Integer Linear Programming Model to Select and Temporally Allocate Resources for Fighting Forest Fires**

[www.nrfirescience.org/resource/18309](http://www.nrfirescience.org/resource/18309)

Optimal planning of the amount and type of resources needed for extinguishing a forest fire is a task that has been addressed in the literature, using models obtained from operational research. In this study, a general integer linear programming model is proposed, which addresses the allocation of resources in different time periods...

Author(s): Jorge Rodríguez-Veiga, María José Ginzo-Villamayor, Balbina Casas-Méndez

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

### **Switching on the Big Burn of 2017**

[www.nrfirescience.org/resource/17761](http://www.nrfirescience.org/resource/17761)

Fuel, aridity, and ignition switches were all on in 2017, making it one of the largest and costliest wildfire years in the United States (U.S.) since national reporting began. Anthropogenic climate change helped flip on some of these switches rapidly in 2017, and kept them on for longer than usual. Anthropogenic changes to the fire...

Author(s): Jennifer Balch, Tania L. Schoennagel, A. Park Williams, John T. Abatzoglou, Megan E. Cattau, Nathan Mietkiewicz, Lise A. St. Denis

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

### **Programmatic Analysis of Fuel Treatments: from the landscape to the national level - Final Report to the Joint Fire Science Program**

[www.nrfirescience.org/resource/16989](http://www.nrfirescience.org/resource/16989)

The importance of cost effective fuel treatment programs has appeared consistently in federal directives (FLAME ACT, National Cohesive Strategy, U.S Department of Interior Office of Policy Analysis) as a priority. Implementing cost effective fuel treatment programs requires a spatially explicit and integrated systematic approach...

Year Published: 2018

Type: Document

Technical Report or White Paper

### **Economic and policy factors driving adoption of institutional woody biomass heating systems in the United States**

[www.nrfirescience.org/resource/16492](http://www.nrfirescience.org/resource/16492)

Abundant stocks of woody biomass that are associated with active forest management can be used as fuel for bioenergy in many applications. Though factors driving large-scale biomass use in industrial settings have been studied extensively, small-scale biomass combustion systems commonly used by institutions for heating have received...

Author(s): Jesse Young, Nathaniel Anderson, Helen T. Naughton, Katrina Mullan

Year Published: 2018  
Type: Document  
Book or Chapter or Journal Article

### **Blueprint for wildland fire science in Canada (2019-2029)**

[www.nrfirescience.org/resource/18910](http://www.nrfirescience.org/resource/18910)

The capacity of wildland fire science and technology in Canada is not keeping pace with the growing complexity of wildland fire. Fire seasons are becoming longer, fire events are becoming more severe, and experts predict that the area burned on an annual basis could double by the end of this century. However, wildfire research...

Year Published: 2018  
Type: Document  
Technical Report or White Paper

### **Use and benefits of NASA's RECOVER for post-fire decision support**

[www.nrfirescience.org/resource/18018](http://www.nrfirescience.org/resource/18018)

Today's extended fire seasons and large fire footprints have prompted state and federal land-management agencies to devote increasingly large portions of their budgets to wildfire management. As fire costs continue to rise, timely and comprehensive fire information becomes increasingly critical to response and rehabilitation...

Author(s): William Toombs, Keith T. Weber, Tesa Stegner, John L. Schnase, Eric Lindquist, Frances Lippitt

Year Published: 2018  
Type: Document  
Book or Chapter or Journal Article

### **Modeling fuel treatment leverage: Encounter rates, risk reduction, and suppression cost impacts**

[www.nrfirescience.org/resource/16521](http://www.nrfirescience.org/resource/16521)

The primary theme of this study is the cost-effectiveness of fuel treatments at multiple scales of investment. We focused on the nexus of fuel management and suppression response planning, designing spatial fuel treatment strategies to incorporate landscape features that provide control opportunities that are relevant to fire...

Author(s): Matthew P. Thompson, Karen L. Riley, Dan R. Loeffler, Jessica R. Haas

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](http://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

### **Effects of wildfire on the value of recreation in western North America**

[www.nrfirescience.org/resource/15023](http://www.nrfirescience.org/resource/15023)

Wildfires play an integral role in forest ecosystems of western North America. In an attempt to measure the level and value of ecosystem damage caused by wildfires, papers employing nonmarket valuation techniques-stated preference, revealed preference, and combined methods-are reviewed. A systematic review of results shows a portion...

Author(s): Ranjit S. Bawa

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

### **Wildland urban interface part II: response of components, systems, and mitigation strategies in the United States**

[www.nrfirescience.org/resource/17715](http://www.nrfirescience.org/resource/17715)

Structure loss in wildland fires has significantly increased over the past few decades, affected by increased development in rural areas, changing fuel management policies, and climate change, all of which are projected to increase in the future. This paper is Part II of a two-part review, which presents a summary of fundamental and...

Author(s): Raquel S. P. Hakes, Sara E. Caton, Daniel J. Gorham, Michael J. Gollner

Year Published: 2017

Type: Document

Synthesis

### **Return on investment from fuel treatments to reduce severe wildfire and erosion in a watershed investment program in Colorado**

[www.nrfirescience.org/resource/17708](http://www.nrfirescience.org/resource/17708)

A small but growing number of watershed investment programs in the western United States focus on wildfire risk reduction to municipal water supplies. This paper used return on investment (ROI) analysis to quantify how the amounts and placement of fuel treatment interventions would reduce sediment loading to the Strontia Springs...

Author(s): Kelly W. Jones, Jeffery B. Cannon, Freddy A. Saavedra, Stephanie Kampf, Rob Addington, Anthony S. Cheng, Lee H. MacDonald, Codie Wilson, Brett Wolk

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

### **Spatiotemporal Evaluation of Fuel Treatment and Previous Wildfire Effects on Suppression Costs - Final Report to the Joint Fire Science Program**

[www.nrfirescience.org/resource/16999](http://www.nrfirescience.org/resource/16999)

This project quantifies the effects of fuel treatments and previously burned areas on daily fire management costs, as well as summarizes recent encounter rates between fuel treatments and wildland fires across the conterminous United States. Using national-scale, spatially explicit data on recent fuel treatments and wildland fires,...

Author(s): Helen T. Naughton, Kevin M. Barnett

Year Published: 2017

Type: Document

Technical Report or White Paper

### **Application of an original wildfire smoke health cost benefits transfer protocol to the western US, 2005-2015**

[www.nrfirescience.org/resource/15529](http://www.nrfirescience.org/resource/15529)

Recent growth in the frequency and severity of US wildfires has led to more wildfire smoke and increased public exposure to harmful air pollutants. Populations exposed to wildfire smoke experience a variety of negative health impacts, imposing economic costs on society. However, few estimates of smoke health costs exist and none for...

Author(s): Benjamin A. Jones, Robert P. Berrens

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

### **Do fuel treatment costs affect wildfire suppression costs and property damages? An analysis of costs, damages avoided and return on investment - Final Report to the Joint Fire Science Program**

[www.nrfirescience.org/resource/16993](http://www.nrfirescience.org/resource/16993)

Spatial wildfire suppression costs regressions have been re-estimated at a more disaggregated level for the nine Geographic Area Coordination Center (GACC's) regions using five years of data for fires involving National Forests. Results of these revised regression determined that only in the California GACCs did mechanical fuel...

Author(s): Armando Gonzalez-Caban, John B. Loomis, Robin Reich, Douglas B. Rideout, José J. Sánchez

Year Published: 2017

Type: Document

Technical Report or White Paper

### **Planning for wildfire in the wildland-urban interface: a resource guide for Idaho communities**

[www.nrfirescience.org/resource/14856](http://www.nrfirescience.org/resource/14856)

The price of wildfire has never been higher. Why? And what can local communities do about it? One way to measure the price of wildfire is the dollars spent on suppression alone. In 1995, fire made up 16 percent of the U.S. Forest Service's annual appropriation budget; in 2015, wildfire consumed more than 50 percent of the...

Author(s): Stephen R. Miller, Thomas Wuerzer, Jaap Vos, Eric Lindquist, Molly Mowery, Tyre Holfeltz, Brian Stephens, Alexander Grad

Year Published: 2016

Type: Document

Management or Planning Document

### **Examining heterogeneity and wildfire management expenditures using spatially and temporally descriptive data**

[www.nrfirescience.org/resource/14353](http://www.nrfirescience.org/resource/14353)

Increasing costs of wildfire management have highlighted the need to better understand suppression expenditures and potential tradeoffs of land management activities that may affect fire risks. Spatially and temporally descriptive data is used to develop a model of wildfire suppression expenditures, providing new insights into the...

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

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

### **Wildfires in the United States: a primer**

[www.nrfirescience.org/resource/14226](http://www.nrfirescience.org/resource/14226)

This report examines recent wildfires in the United States, summarizing their frequency, trends, and costs. It documents the increase in large wildfires and shows their concentration in western states. Cost

and budget issues linked to wildfires are also examined. The report recommends ways to reduce the frequency and costs of...

Author(s): Vera Brusentsev, Wayne Vroman

Year Published: 2016

Type: Document

Technical Report or White Paper

### **Production and efficiency of large wildland fire suppression effort: a stochastic frontier analysis**

[www.nrfirescience.org/resource/13841](http://www.nrfirescience.org/resource/13841)

This study examines the production and efficiency of wildland fire suppression effort. We estimate the effectiveness of suppression resource inputs to produce controlled fire lines that contain large wildland fires using stochastic frontier analysis. Determinants of inefficiency are identified and the effects of these determinants...

Author(s): Hari Katuwal, David E. Calkin, Michael S. Hand

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

### **Social preferences toward energy generation with woody biomass from public forests in Montana, USA**

[www.nrfirescience.org/resource/14893](http://www.nrfirescience.org/resource/14893)

In Montana, USA, there are substantial opportunities for mechanized thinning treatments on public forests to reduce the likelihood of severe and damaging wildfires and improve forest health. These treatments produce residues that can be used to generate renewable energy and displace fossil fuels.

The choice modeling method is...

Author(s): Tyron J. Venn, Nathaniel Anderson, Robert M. Campbell

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

### **Fighting fire in the heat of the day: an analysis of operational and environmental conditions of use for large airtankers in United States fire suppression**

[www.nrfirescience.org/resource/14347](http://www.nrfirescience.org/resource/14347)

Large airtanker use is widespread in wildfire suppression in the United States. The current approach to nationally dispatching the fleet of federal contract airtankers relies on filling requests for airtankers to achieve suppression objectives identified by fire managers at the incident level. In general, demand is met if resources...

Author(s): Crystal S. Stonesifer, David E. Calkin, Matthew P. Thompson, Keith Stockmann

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

### **A synthesis of the economic values of wilderness**

[www.nrfirescience.org/resource/14168](http://www.nrfirescience.org/resource/14168)

Early applications of wilderness economic research demonstrated that the values of natural amenities and commodities produced from natural areas could be measured in commensurate terms. To the surprise of many, the economic values of wilderness protection often exceeded the potential commercial values that might result from resource...

Author(s): Thomas P. Holmes, Jeffrey Englin, J. M. Bowker, Evan Hjerpe, John B. Loomis, Spencer Phillips, Robert Richardson

Year Published: 2016

Type: Document  
Book or Chapter or Journal Article, Synthesis

### **Managing the market: how procurement practices impact private sector wildfire response capacity**

[www.nrfirescience.org/resource/15575](http://www.nrfirescience.org/resource/15575)

Effective wildfire management requires significant institutional organization, a skilled workforce, facilities, and equipment. Sustaining sufficient wildfire response capacity is critical to both agencies and communities that are affected by fire. Because fire suppression is seasonal work and demands vary considerably from year to...

Author(s): Heidi Huber-Stearns, Cassandra Moseley, Autumn Ellison

Year Published: 2016

Type: Document

Technical Report or White Paper

### **Rebuilding and new housing development after wildfire**

[www.nrfirescience.org/resource/13201](http://www.nrfirescience.org/resource/13201)

The number of wildland-urban interface communities affected by wildfire is increasing, and both wildfire suppression and losses are costly. However, little is known about post-wildfire response by homeowners and communities after buildings are lost. Our goal was to characterise rebuilding and new development after wildfires across...

Author(s): Patricia M. Alexandre, Miranda H. Mockrin, Susan I. Stewart, Roger B. Hammer, Volker C. Radeloff

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

### **Reduce wildfire risks or we'll continue to pay more for fire disasters**

[www.nrfirescience.org/resource/13048](http://www.nrfirescience.org/resource/13048)

This is a position paper on the true costs of wildfire, collectively published by the Association for Fire Ecology, the International Association of Wildland Fire, and The Nature Conservancy. The goal was to raise awareness of the often unreported total costs of wildfire, and to present a united perspective regarding the...

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

Year Published: 2015

Type: Document

Technical Report or White Paper

### **Development and application of a probabilistic method for wildfire suppression cost modeling**

[www.nrfirescience.org/resource/12762](http://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

### **Wildfires burn science capacity**

[www.nrfirescience.org/resource/13500](http://www.nrfirescience.org/resource/13500)

With just over 3 months remaining, it looks like 2015 could be a record-breaking year for wildfires in the United States. So far this year, more than 8.5 million acres have burned and severe fires often happen in October. For the first time, the U.S. Forest Service will spend over 50% of its budget on fire management. Ironically,...

Author(s): Christopher Topik

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

### **American Fire History, 1960-2013**

[www.nrfirescience.org/resource/15567](http://www.nrfirescience.org/resource/15567)

With support from the U.S. Forest Service, Department of the Interior, and Joint Fire Science Program, I have written a fire history of America from 1960 to 2013. The project will result in two books. Between Two Fires: A Fire History of Contemporary America relates the basic narrative. To the Last Smoke assembles anthologies of...

Author(s): Stephen Pyne, Heidi Neeley

Year Published: 2015

Type: Document

Technical Report or White Paper

### **Operational wildfire suppression modelling: a review evaluating development, state of the art and future directions**

[www.nrfirescience.org/resource/13463](http://www.nrfirescience.org/resource/13463)

Wildfires are an inherent part of the landscape in many parts of the world; however, they often impose substantial economic burdens on human populations where they occur, both in terms of impacts and of management costs. As wildfires burn towards human assets, a universal response has been to deploy fire suppression resources (crews...

Author(s): Thomas J. Duff, Kevin G. Tolhurst

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

### **The economic benefit of localised, short-term, wildfire-potential information**

[www.nrfirescience.org/resource/13384](http://www.nrfirescience.org/resource/13384)

Wildfire-potential information products are designed to support decisions for prefire staging of movable wildfire suppression resources across geographic locations. We quantify the economic value of these information products by defining their value as the difference between two cases of expected fire-suppression expenditures: one...

Author(s): Kimberly Rollins, Laine Christman

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

### **The cost of climate change: ecosystem services and wildland fires**

[www.nrfirescience.org/resource/13074](http://www.nrfirescience.org/resource/13074)

Little research has focused on the economic impact associated with climate-change induced wildland fire on natural ecosystems and the goods and services they provide. We examine changes in wildland fire patterns based on the U.S. Forest Service's MC1 dynamic global vegetation model from 2013 to

2115 under two pre-defined scenarios:...

Author(s): Christine Lee, Claire Schlemme, Jessica Murray, Robert Unsworth

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

### **Modeling fuel treatment impacts on fire suppression cost savings: a review**

[www.nrfirescience.org/resource/13950](http://www.nrfirescience.org/resource/13950)

High up-front costs and uncertain return on investment make it difficult for land managers to economically justify large-scale fuel treatments, which remove trees and other vegetation to improve conditions for fire control, reduce the likelihood of ignition, or reduce potential damage from wildland fire if it occurs. In the short-...

Author(s): Matthew P. Thompson, Nathaniel Anderson

Year Published: 2015

Type: Document

Book or Chapter or Journal Article, Synthesis

### **Prioritization of forest restoration projects: tradeoffs between wildfire protection, ecological restoration, and economic objectives**

[www.nrfirescience.org/resource/13729](http://www.nrfirescience.org/resource/13729)

The implementation of US federal forest restoration programs on national forests is a complex process that requires balancing diverse socioecological goals with project economics. Despite both the large geographic scope and substantial investments in restoration projects, a quantitative decision support framework to locate optimal...

Author(s): Kevin C. Vogler, Alan A. Ager, Michelle A. Day, Michael Jennings, John D. Bailey

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

### **The rising cost of wildfire operations: effects on the Forest Service's non-fire work**

[www.nrfirescience.org/resource/13425](http://www.nrfirescience.org/resource/13425)

Over 100 years ago, President Theodore Roosevelt established the U.S. Forest Service to manage America's 193-million acre national forests and grasslands for the benefit of all Americans. Today, that mission is being consumed by the ever-increasing costs of fighting fires. This report documents the growth over the past 20 years...

Author(s): United States Department of Agriculture

Year Published: 2015

Type: Document

Technical Report or White Paper

### **A comprehensive guide to fuel management practices for dry mixed conifer forests in the northwestern United States: inventory and model-based economic analysis of mechanical fuel treatments**

[www.nrfirescience.org/resource/12921](http://www.nrfirescience.org/resource/12921)

Implementing fuel treatments in every place where it could be beneficial to do so is impractical and not cost effective under any plausible specification of objectives. Only some of the many possible kinds of treatments will be effective in any particular stand and there are some stands that seem to defy effective treatment. In many...

Author(s): Theresa B. Jain, Michael A. Battaglia, Han-Sup Han, Russell T. Graham, Christopher R. Keyes, Jeremy S. Fried, Jonathan Sandquist

Year Published: 2014

Type: Document  
Research Brief or Fact Sheet

### **Large airtanker use and outcomes in suppressing wildland fires in the United States**

[www.nrfirescience.org/resource/13952](http://www.nrfirescience.org/resource/13952)

Wildfire activity in the United States incurs substantial costs and losses, and presents challenges to federal, state, tribal and local agencies that have responsibility for wildfire management. Beyond the potential socioeconomic and ecological losses, and the monetary costs to taxpayers due to suppression, wildfire management is a...

Author(s): David E. Calkin, Crystal S. Stonesifer, Matthew P. Thompson, Charles W. McHugh

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

### **Playing with fire: how climate change and development patterns are contributing to the soaring costs of western wildfires**

[www.nrfirescience.org/resource/12974](http://www.nrfirescience.org/resource/12974)

Strong scientific evidence shows that climate change is producing hotter, drier conditions that contribute to larger fires and longer fire seasons in the American West today. The annual number of large wildfires on federally managed lands in the 11 western states has increased by more than 75 percent: from approximately 140 during...

Author(s): Rachel Cleetus, Kranti Mulik

Year Published: 2014

Type: Document

Technical Report or White Paper

### **Are wildfire management resources in the United States efficiently allocated to protect resources at risk? A case study from Montana**

[www.nrfirescience.org/resource/12909](http://www.nrfirescience.org/resource/12909)

Federal wildfire management agencies in the United States are under substantial pressure to reduce and economically justify their expenditures. To support economically efficient management of wildfires, managers need better estimates of the resource benefits and avoided damage costs associated with alternative wildfire management...

Author(s): Derek T. O'Donnell, Tyron J. Venn, David E. Calkin

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

### **Job growth and loss across sectors and time in the western US: the impact of large wildfires**

[www.nrfirescience.org/resource/12023](http://www.nrfirescience.org/resource/12023)

The link between economic growth and natural hazards has long been studied to better understand the effects of natural hazards on local, regional, and country level growth patterns. However, relatively little generalizable research has focused on wildfires, one of the most common forest disturbances in the western United States (US...

Author(s): Max W. Nielsen-Pincus, Cassandra Moseley, Krista M. Gebert

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

### **Economics of wildfire management: the development and application of suppression**

### **expenditure models**

[www.nrfirescience.org/resource/16161](http://www.nrfirescience.org/resource/16161)

In the United States, increased wildland fire activity over the last 15 years has resulted in increased pressure to balance the cost, benefits, and risks of wildfire management. Amid increased public scrutiny and a highly variable wildland fire environment, a substantial body of research has developed to study factors affecting the...

Author(s): Michael S. Hand, Krista M. Gebert, Jingjing Liang, David E. Calkin, Matthew P. Thompson, Mo Zhou

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

### **The community economic impacts of large wildfires: a case study from Trinity County, California**

[www.nrfirescience.org/resource/21886](http://www.nrfirescience.org/resource/21886)

Wildfires are increasing in severity and frequency in the American West, but there is limited understanding of their economic effects at the community level. We conducted a case study of the impacts of large wildfires in 2008 in Trinity County, California, by examining labor market, suppression spending, and qualitative interview...

Author(s): Emily Jane Davis, Cassandra Moseley, Max W. Nielsen-Pincus, Pamela J. Jakes

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

### **The economics of fuel management: wildfire, invasive plants, and the dynamics of sagebrush rangelands in the western United States**

[www.nrfirescience.org/resource/12134](http://www.nrfirescience.org/resource/12134)

In this article we develop a simulation model to evaluate the economic efficiency of fuel treatments and apply it to two sagebrush ecosystems in the Great Basin of the western United States: the Wyoming sagebrush steppe and mountain big sagebrush ecosystems. These ecosystems face the two most prominent concerns in sagebrush...

Author(s): Michael H. Taylor, Kimberly Rollins, Mimako Kobayashi, Robin J. Tausch

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

### **Effects of wildfire on national park visitation and the regional economy: a natural experiment in the Northern Rockies**

[www.nrfirescience.org/resource/12040](http://www.nrfirescience.org/resource/12040)

Federal wildland fire management policy in the United States directs the use of value-based methods to guide priorities. However, the economic literature on the effect of wildland fire on nonmarket uses, such as recreation, is limited. This paper introduces a new approach to measuring the effect of wildfire on recreational use by...

Author(s): John W. Duffield, Chris J. Neher, David A. Patterson, Aaron M. Deskins

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

### **Quantifying the potential impacts of fuel treatments on wildfire suppression costs volume**

[www.nrfirescience.org/resource/16171](http://www.nrfirescience.org/resource/16171)

This article is a condensed and slightly edited version of a previously published article appearing in the

Journal of Forestry (Thompson et al. 2013). Readers wishing for more detail on study motivation, relevant literature, data sources, modeling methods, and the full presentation of results are encouraged to refer to the article...

Author(s): Matthew P. Thompson, Nicole M. Vaillant, Jessica R. Haas, Krista M. Gebert, Keith Stockmann

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

### **A risk-based approach to wildland fire budgetary planning**

[www.nrfirescience.org/resource/16163](http://www.nrfirescience.org/resource/16163)

The financial impact of wildfire management within the USDA Forest Service challenges the ability of the agency to meet societal demands and maintain forest health. The extent of this financial crisis has been attributed to historical and continuing fire management practices, changing climatic conditions, and increasing human...

Author(s): Matthew P. Thompson, David E. Calkin, Mark A. Finney, Krista M. Gebert, Michael S. Hand

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

### **The efficacy of hazardous fuel treatments: A rapid assessment of the economic and ecologic consequences of alternative hazardous fuel treatments: a summary document for policy makers**

[www.nrfirescience.org/resource/17712](http://www.nrfirescience.org/resource/17712)

The Office of Management and Budget (OMB), Government Accountability Office (GAO) and the United States Congress have repeatedly asked the Office of Wildland Fire in the Department of Interior (DOI) and the United States Forest Service (USFS) to critically examine and demonstrate the role and effectiveness of fuel reduction...

Year Published: 2013

Type: Document

Synthesis

### **Quantifying the potential impacts of fuel treatments on wildfire suppression costs**

[www.nrfirescience.org/resource/16138](http://www.nrfirescience.org/resource/16138)

Modeling the impacts and effects of hazardous fuel reduction treatments is a pressing issue within the wildfire management community. Prospective evaluation of fuel treatment effectiveness allows for comparison of alternative treatment strategies in terms of socioeconomic and ecological impacts and facilitates analysis of tradeoffs...

Author(s): Matthew P. Thompson, Nicole M. Vaillant, Jessica R. Haas, Krista M. Gebert, Keith Stockmann

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

### **Wildland fire management: are actively managed forests more resilient than passively managed forests?**

[www.nrfirescience.org/resource/12434](http://www.nrfirescience.org/resource/12434)

Large areas of federal lands in the western states are currently at high risk of severe wildfire and have many insect and disease problems, indicating a significant decline in forest health and resilience. Although research studies have not been done that would measure whether actively managed forests are more resilient to wildfires...

Author(s): Jay O'Laughlin

Year Published: 2013  
Type: Document  
Technical Report or White Paper

### **The rising cost of wildfire protection**

[www.nrfirescience.org/resource/12409](http://www.nrfirescience.org/resource/12409)

Headwaters Economics produced this report to better understand and address why wildfires are becoming more severe and expensive. The report also describes how the protection of homes in the Wildland-Urban Interface has added to these costs and concludes with a brief discussion of solutions that may help control escalating costs....

Author(s): Ross Gorte  
Year Published: 2013  
Type: Document  
Technical Report or White Paper

### **Wildfire smoke and health impacts: a closer look at fire attributes and their marginal effects**

[www.nrfirescience.org/resource/12143](http://www.nrfirescience.org/resource/12143)

Existing studies on the economic impact of wildfire smoke have focused on single fire events or entire seasons without considering the marginal effect of daily fire progression on downwind communities. In addition, neither approach allows for an examination of the impact of even the most basic fire attributes, such as distance and...

Author(s): K. Moeltner, Man-Kuen Kim, E. Zhu, W. Yang  
Year Published: 2013  
Type: Document  
Book or Chapter or Journal Article

### **Perspectives on disconnects between scientific information and management decisions on post-fire recovery in western US**

[www.nrfirescience.org/resource/12035](http://www.nrfirescience.org/resource/12035)

Environmental regulations frequently mandate the use of 'best available' science, but ensuring that it is used in decisions around the use and protection of natural resources is often challenging. In the Western US, this relationship between science and management is at the forefront of post-fire land management decisions. Recent...

Author(s): Xiaoli Chen, Nathan Emery, Elizabeth S. Garcia, Erin J. Hanan, Heather E. Hodges, Tyronne Martin, Matthew A. Meyers, Lindsey E. Peavey, Hui Peng, Jaime Sainz Santamaria, Kellie A. Uyeda, Sarah E. Anderson, Christina Tague  
Year Published: 2013  
Type: Document  
Book or Chapter or Journal Article

### **The effects of large wildfires on employment and wage growth and volatility in the western United States**

[www.nrfirescience.org/resource/12037](http://www.nrfirescience.org/resource/12037)

We examined the effect of large wildfires on economic growth and volatility in the western United States. We matched wildfire data with quarterly employment and earnings growth data to assess the specific effect of wildfire on employment and wage growth in western US counties. Wildfires generally tended to exhibit positive effects...

Author(s): Max W. Nielsen-Pincus, Cassandra Moseley, Krista M. Gebert  
Year Published: 2013  
Type: Document  
Book or Chapter or Journal Article

### **Hazardous fuel treatments, suppression cost impacts, and risk mitigation**

[www.nrfirescience.org/resource/16170](http://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

### **Criteria and methodology for evaluating aerial wildfire suppression**

[www.nrfirescience.org/resource/12414](http://www.nrfirescience.org/resource/12414)

Aircraft are often used to drop suppressants and retardants to assist wildfire containment. Drop effectiveness has rarely been measured due to the difficulties in collecting data from wildfires and running field experiments and the absence of definitions and measures. This paper presents a set of criteria and methodologies for...

Author(s): Matt P. Plucinski, Elsa Pastor

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

### **Modeled forest inventory data suggest climate benefits from fuels management**

[www.nrfirescience.org/resource/13480](http://www.nrfirescience.org/resource/13480)

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

Author(s): Jeremy S. Fried, Theresa B. Jain, Jonathan Sandquist

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

### **Estimating US federal wildland fire managers' preferences toward competing strategic suppression objectives**

[www.nrfirescience.org/resource/16174](http://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

### **Airtankers and wildfire management in the US Forest Service: examining data availability and exploring usage and cost trends**

[www.nrfirescience.org/resource/16173](http://www.nrfirescience.org/resource/16173)

Evaluating the effectiveness and efficiency of fixed- and rotary-wing aircraft is a crucial component of strategic wildfire management and planning. In this manuscript, we focus on the economics of fire and aviation management within the US Forest Service. Substantial uncertainties challenge comprehensive analysis of airtanker use,...

Author(s): Matthew P. Thompson, David E. Calkin, Jason M. Herynk, Charles W. McHugh, Karen C. Short

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

### **Economic and social impacts of wildfires and invasive plants in American deserts: lessons from the Great Basin**

[www.nrfirescience.org/resource/11463](http://www.nrfirescience.org/resource/11463)

Research on the impacts of wildfire and invasive plants in rangelands has focused on biophysical rather than human dimensions of these environmental processes. We offer a synthetic perspective on economic and social aspects of wildfire and invasive plants in American deserts, focusing on the Great Basin because greater research...

Author(s): Mark W. Brunson, John A. Tanaka

Year Published: 2011

Type: Document

Book or Chapter or Journal Article, Synthesis

### **What is limiting more flexible fire management-public or agency pressure?**

[www.nrfirescience.org/resource/21908](http://www.nrfirescience.org/resource/21908)

Conventional wisdom within American federal fire management agencies suggests that external influence such as community or political pressure for aggressive suppression are key factors circumscribing the ability to execute less aggressive fire management strategies. Thus, a better understanding of external constraints on fire...

Author(s): Toddi A. Steelman, Sarah M. McCaffrey

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

### **A synthesis of current knowledge on forests and carbon storage in the United States**

[www.nrfirescience.org/resource/12598](http://www.nrfirescience.org/resource/12598)

Using forests to mitigate climate change has gained much interest in science and policy discussions. We examine the evidence for carbon benefits, environmental and monetary costs, risks and trade-offs for a variety of activities in three general strategies: (1) land use change to increase forest area (afforestation) and avoid...

Author(s): Duncan C. McKinley, Michael G. Ryan, Richard A. Birdsey, Christian P. Giardina, Mark E. Harmon, Linda S. Heath, Richard A. Houghton, Robert B. Jackson, James F. Morrison, Brian C. Murray, Diane E. Pataki, Kenneth E. Skog

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

### **Recent trends in post-wildfire seeding in western US forests: costs and seed mixes**

[www.nrfirescience.org/resource/8284](http://www.nrfirescience.org/resource/8284)

Broadcast seeding is one of the most commonly used post-fire rehabilitation treatments to establish ground cover for erosion control and mitigation of non-native plant species invasions. Little quantitative information is available on overall trends of post-fire seeding expenditures and seed mixes used over

time in forested...

Author(s): Donna Peppin, Peter Z. Fule, Carolyn Hull Sieg, Jan L. Beyers, Molly E. Hunter, Peter R. Robichaud

Year Published: 2011

Type: Document

Book or Chapter or Journal Article, Synthesis

### **Progress towards and barriers to implementation of a risk framework for US federal wildland fire policy and decision making**

[www.nrfirescience.org/resource/16180](http://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

### **Forest road erosion control using multiobjective optimization**

[www.nrfirescience.org/resource/16187](http://www.nrfirescience.org/resource/16187)

Forest roads are associated with accelerated erosion and can be a major source of sediment delivery to streams, which can degrade aquatic habitat. Controlling road-related erosion therefore remains an important issue for forest stewardship. Managers are faced with the task to develop efficient road management strategies to achieve...

Author(s): Matthew P. Thompson, Jeff Sessions, Kevin Boston, Arne Skaugset, David Tomberlin

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

### **Economic analysis of geospatial technologies for wildfire suppression**

[www.nrfirescience.org/resource/8398](http://www.nrfirescience.org/resource/8398)

Geospatial technologies used to fight large fires are becoming increasingly available, yet no rigorous study exists of their effects on suppression costs or fire losses, nor do we know whether these technologies allow more efficient combination of firefighting assets used to suppress fires. The high cost of these technologies merits...

Author(s): Hayley Hessel, Gregory S. Amacher, Aaron M. Deskins

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

### **Evaluation of forest management systems under risk of wildfire**

[www.nrfirescience.org/resource/8336](http://www.nrfirescience.org/resource/8336)

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

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

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

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

[www.nrfirescience.org/resource/11468](http://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

**The economic cost of adverse health effects from wildfire: a review**

[www.nrfirescience.org/resource/14534](http://www.nrfirescience.org/resource/14534)

The economic costs of adverse health effects associated with exposure to wildfire smoke should be given serious consideration in determining the optimal wildfire management policy. Unfortunately, the literature in this research area is thin. In an effort to better understand the nature of these economic costs, we review and...

Author(s): Ikuho Kochi, Geoffrey H. Donovan, Patricia A. Champ, John B. Loomis

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

**A synthesis of the science on forests and carbon for U.S. forests**

[www.nrfirescience.org/resource/12589](http://www.nrfirescience.org/resource/12589)

Forests play an important role in the U.S. and global carbon cycle, and carbon sequestered by U.S. forest growth and harvested wood products currently offsets 12-19% of U.S. fossil fuel emissions. The cycle of forest growth, death, and regeneration and the use of wood removed from the forest complicate efforts to understand and...

Author(s): Michael G. Ryan, Mark E. Harmon, Richard A. Birdsey, Christian P. Giardina, Linda S. Heath, Richard A. Houghton, Robert B. Jackson, Duncan C. McKinley, James F. Morrison, Brian C. Murray, Diane E. Pataki, Kenneth E. Skog

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

**Willingness-to-pay function for two fuel treatments to reduce wildfire acreage burned: a scope test and comparison of white and hispanic households**

[www.nrfirescience.org/resource/11065](http://www.nrfirescience.org/resource/11065)

We estimate a marginal benefit function for using prescribed burning and mechanical fuel reduction programs to reduce acres burned by wildfire in three states. Since each state had different acre reductions, a statistically significant coefficient on the reduction in acres burned is also a split sample scope test frequently used as...

Author(s): John B. Loomis, Le Trong Hung, Armando Gonzalez-Caban

Year Published: 2009

Type: Document

Conference Proceedings, Technical Report or White Paper

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

## lands

[www.nrfirescience.org/resource/11063](http://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

## **Challenges of socio-economically evaluating wildfire management on non-industrial private and public forestland in the western United States**

[www.nrfirescience.org/resource/8334](http://www.nrfirescience.org/resource/8334)

Non-industrial private forests (NIPFs) and public forests in the United States generate many non-market benefits for landholders and society generally. These values can be both enhanced and diminished by wildfire management. This paper considers the challenges of supporting economically efficient allocation of wildfire suppression...

Author(s): Tyron J. Venn, David E. Calkin

Year Published: 2009

Type: Document

Book or Chapter or Journal Article

## **Estimating harvest costs for fuel treatments in the west**

[www.nrfirescience.org/resource/8172](http://www.nrfirescience.org/resource/8172)

ANNOTATION: The costs for harvesting timber for forest fire fuel reduction purposes were estimated for 12 states in the West. These simulation inputs were used to estimate average costs for 12,039 Forest inventory and Analysis plots in the West, and then that FRCS output was used develop regression equations that estimated costs as...

Author(s): Rodrigo Arriagada, Fred W. Cabbage, Karen L. Abt, Robert J. Huggett

Year Published: 2008

Type: Document

Book or Chapter or Journal Article

## **A synthesis of biomass utilization for bioenergy production in the western United States**

[www.nrfirescience.org/resource/8179](http://www.nrfirescience.org/resource/8179)

This study examines the use of woody residues, primarily from forest harvesting or wood products manufacturing operations as a feedstock for direct-combustion bioenergy systems for electrical or thermal power applications. Opportunities for utilizing biomass for energy at several scales, with an emphasis on larger scale electrical...

Author(s): David L. Nicholls, Robert A. Monserud, Dennis P. Dykstra

Year Published: 2008

Type: Document

Book or Chapter or Journal Article

## **Contingent valuation of fuel hazard reduction treatments**

[www.nrfirescience.org/resource/11988](http://www.nrfirescience.org/resource/11988)

This chapter presents a stated preference technique for estimating the public benefits of reducing wildfires to residents of California, Florida, and Montana from two alternative fuel reduction programs: prescribed burning, and mechanical fuels reduction. The two fuel reduction programs under study are quite relevant to people...

Author(s): John B. Loomis, Armando Gonzalez-Caban  
Year Published: 2008  
Type: Document  
Book or Chapter or Journal Article

### **Wood product and market trends influencing residue utilization**

[www.nrfirescience.org/resource/8176](http://www.nrfirescience.org/resource/8176)

ANNOTATION: The potential markets for forest residues can be classified into four primary categories. This paper deals with each of these categories separately, and attempts to indicate some of the major influences which are expected to change the trend of forest residue utilization for each of the potential uses. Of the four major...

Author(s): Rhodes Yepsen  
Year Published: 2008  
Type: Document  
Book or Chapter or Journal Article

### **Potential for future development on fire-prone lands**

[www.nrfirescience.org/resource/12009](http://www.nrfirescience.org/resource/12009)

Most studies of wildland fire and residential development have focused on the cost of firefighting and solutions such as fuel reduction and fire-safe home building. Although some studies quantify the number of homes being built near forests, little research has indicated the potential magnitude of the problem in the future. This...

Author(s): Patricia Gude, Ray Rasker, Jeff van den Noort  
Year Published: 2008  
Type: Document  
Book or Chapter or Journal Article

### **Climate and forest wildfire in the western US**

[www.nrfirescience.org/resource/8183](http://www.nrfirescience.org/resource/8183)

This chapter has three goals. First, to define what climate, as opposed to weather, is, and to explain what this implies for climate versus weather forecasts. Second, to describe the scientific community's current understanding of the relationships between climate variability and forest wildfire in the western United States. And...

Author(s): Anthony L. Westerling  
Year Published: 2008  
Type: Document  
Book or Chapter or Journal Article, Synthesis

### **Synthesis of knowledge from woody biomass removal case studies**

[www.nrfirescience.org/resource/12631](http://www.nrfirescience.org/resource/12631)

Woody biomass-usually logging slash, tops and limbs, or trees that cannot be sold as timber-is the lowest valued material removed from the forest and presents economic and logistical challenges. This report brings together 45 case studies of how biomass is removed from forests and used across the country to demonstrate the wide...

Author(s): Alexander M. Evans  
Year Published: 2008  
Type: Document  
Synthesis, Technical Report or White Paper

### **Market impacts of a multiyear mechanical fuel treatment program in the U.S.**

[www.nrfirescience.org/resource/8125](http://www.nrfirescience.org/resource/8125)

We describe a two-stage model of global log and chip markets that evaluates the spatial and temporal economic effects of government- subsidized fire-related mechanical fuel treatment programs in the U.S. West and South. The first stage is a goal program that allocates subsidies according to fire risk and location priorities, given a...

Author(s): Jeffrey P. Prestemon, Karen L. Abt, Robert J. Huggett

Year Published: 2008

Type: Document

Book or Chapter or Journal Article

### **Paying our way: thinking strategically to offset the cost of reducing fire hazard in western forests**

[www.nrfirescience.org/resource/11087](http://www.nrfirescience.org/resource/11087)

The fire hazard in many western forests is unacceptably high, posing risks to human health and property, wildlife habitat, and air and water quality. Cost is an inhibiting factor for reducing hazardous fuel, given the amount of acreage needing treatment. Thinning overly dense forests is one way to reduce fuel loads. Much of the...

Author(s): Rhonda L. Mazza

Year Published: 2008

Type: Document

Research Brief or Fact Sheet

### **A report on conceptual advances in roll on/off technology in forestry**

[www.nrfirescience.org/resource/8173](http://www.nrfirescience.org/resource/8173)

ANNOTATION: This study looks into increasingly severe fire seasons over the last two decades that have led policymakers to recognize the need for thinning overgrown stands of trees. Thinning presents a financial challenge and the problem is that hazardous fuel reduction projects-especially projects in the Wildland/Urban Interface-...

Author(s): Dave Atkins, Robert B. Rummer, Beth Dodson, Craig E. Thomas, Andy Horcher, Ed Messerlie, Craig Rawlings, David Haston

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

### **A comparison of CVM response rates, protests, and willingness to pay of Native Americans and general population for fuels reduction policies**

[www.nrfirescience.org/resource/7932](http://www.nrfirescience.org/resource/7932)

A contingent valuation method (CVM) study was used to compare survey response rates, protest refusals to pay, and median willingness-to-pay (WTP) of Native American communities in Montana compared to Montana's general population for two wildland fire mitigation strategies. Understanding differences in response rates, protest...

Author(s): Armando Gonzalez-Caban, John B. Loomis, Andrea Rodriguez, Hayley Hesseln

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

### **Fuel Treatment Evaluator 3.0**

[www.nrfirescience.org/resource/11078](http://www.nrfirescience.org/resource/11078)

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

harvesting costs, and estimated biomass...  
Author(s): U.S. Department of Agriculture, Forest Service  
Year Published: 2006  
Type: Document  
Research Brief or Fact Sheet

### **Timber markets and fuel treatments in the western U.S.**

[www.nrfirescience.org/resource/7905](http://www.nrfirescience.org/resource/7905)

ANNOTATION: This paper presents a model of interrelated timber markets in the U.S. West to assess the impacts of large-scale fuel reduction programs on these markets, and concomitant effects of the market on the fuel reduction programs. The model maximizes area treated, given fire regime-condition class priorities, maximum increases...

Author(s): Karen L. Abt, Jeffrey P. Prestemon  
Year Published: 2006  
Type: Document  
Book or Chapter or Journal Article, Synthesis

### **Paying for hazardous fuel treatments with revenue from removed biomass**

[www.nrfirescience.org/resource/11079](http://www.nrfirescience.org/resource/11079)

We use Fuel Treatment Evaluator (FTE) 3.0 to estimate how many acres might be treated near three western communities (Pagosa Springs, Colorado; Hamilton, Montana; Colville, Washington) for which the value of biomass removed covers the treatment cost.

Author(s): U.S. Department of Agriculture, Forest Service  
Year Published: 2006  
Type: Document  
Research Brief or Fact Sheet

### **Financial analysis of fuel treatments on national forests in the Western United States**

[www.nrfirescience.org/resource/12020](http://www.nrfirescience.org/resource/12020)

The purpose of this note is to provide a starting point for discussion of fire hazard reduction treatments that meet the full range of management objectives, including budget priorities. Thoughtful design requires an understanding not only of the physical and biological outcomes, but also the costs and potential revenues of applying...

Author(s): Roger D. Fight, R. James Barbour  
Year Published: 2006  
Type: Document  
Research Brief or Fact Sheet

### **Mastication: a fuel reduction and site preparation alternative**

[www.nrfirescience.org/resource/10959](http://www.nrfirescience.org/resource/10959)

During the fall of 2005, a study was conducted at Priest River Experimental Forest (PREF) in northern Idaho to investigate the economics of mastication used to treat activity and standing live fuels. In this study, a rotary head masticator was used to crush and chop activity fuels within harvest units on 37.07 acres. Production...

Author(s): Jeff Halbrook, Han-Sup Han, Russell T. Graham, Theresa B. Jain, Robert Denner  
Year Published: 2006  
Type: Document  
Conference Proceedings

### **Wildfire, timber salvage, and the economics of expediency**

[www.nrfirescience.org/resource/8124](http://www.nrfirescience.org/resource/8124)

Administrative planning rules and legal challenges can have significant economic impacts on timber salvage programs on public lands. This paper examines the costs of the delay in salvage caused by planning rules and the costs associated with the volume reductions forced by legal challenges in one case study. The fires on the...

Author(s): Jeffrey P. Prestemon, David N. Wear, Fred J. Stewart, Thomas P. Holmes

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

### **Modeling fuel treatment costs on Forest Service lands in the western United States**

[www.nrfirescience.org/resource/7915](http://www.nrfirescience.org/resource/7915)

This report intends to increase the accuracy of cost data available for planning and prioritizing fuel management in national forests. A survey of fire management officers was used to develop regression models that may be used to estimate the cost of hazardous fuel reduction treatments. The model was based on the USDA Forest Service...

Author(s): David E. Calkin, Krista M. Gebert

Year Published: 2006

Type: Document

Book or Chapter or Journal Article, Synthesis

### **Two-aged silvicultural treatments in lodgepole pine stands can be economically viable**

[www.nrfirescience.org/resource/11103](http://www.nrfirescience.org/resource/11103)

Economically viable silvicultural options are critical for management activities that provide wood products, reduce forest fuels, improve forest health, and enhance wildlife habitat. The Tenderfoot Research Project was developed in the late 1990s to evaluate and quantify ecological and biological effects of two-aged silvicultural...

Author(s): Ward W. McCaughey, Steven J. Martin, Dean A. Blomquist

Year Published: 2006

Type: Document

Research Brief or Fact Sheet

### **Intermountain region wood utilization and wood energy application program**

[www.nrfirescience.org/resource/8180](http://www.nrfirescience.org/resource/8180)

ANNOTATION: In 1978 the U.S. Forest Service initiated a National Wood Utilization and Wood Energy Application Program to focus attention on application of existing and developing technology. In this paper, the mission and goals of this program are discussed. Additionally, problems such as access, economic feasibility, and long-term...

Author(s): Dan R. Loeffler, David E. Calkin, Robin P. Silverstein

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

### **Estimating timber harvesting costs for fuel treatment in the West: preliminary results**

[www.nrfirescience.org/resource/8427](http://www.nrfirescience.org/resource/8427)

Preliminary estimates of harvesting costs for forest fuel reduction treatments in the West are presented. Cost estimates were made for typical stands based on Forest Inventory and Analysis (FIA) plots that represented forest stands in 12 western states, using the ST Harvest spreadsheet system. Costs were estimated for a range of...

Author(s): Rodrigo Arriagada, Fred W. Cabbage, Karen L. Abt

Year Published: 2006

Type: Document  
Conference Proceedings

**A web-based information system for estimating fuel characteristics, fire hazard, and treatment effectiveness - Final Report to the Joint Fire Science Program**

[www.nrfirescience.org/resource/11879](http://www.nrfirescience.org/resource/11879)

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

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

Year Published: 2005

Type: Document

Technical Report or White Paper

**Testing transferability of willingness to pay for forest fire prevention among three states of California, Florida, and Montana**

[www.nrfirescience.org/resource/7960](http://www.nrfirescience.org/resource/7960)

The equivalency of willingness to pay between the states of California, Florida and Montana is tested. Residents in California, Florida and Montana have an average willingness to pay of \$417, \$305, and \$382 for prescribed burning program, and \$403, \$230, and \$208 for mechanical fire fuel reduction program, respectively. Due to wide...

Author(s): John B. Loomis, Le Trong Hung, Armando Gonzalez-Caban

Year Published: 2005

Type: Document

Book or Chapter or Journal Article

**Economics research unit explores biomass utilization opportunities on the Bitterroot National Forest**

[www.nrfirescience.org/resource/11100](http://www.nrfirescience.org/resource/11100)

Almost a million tons of biomass left over after thinning designed to reduce hazardous fuels and increase tree vigor, thus decreasing susceptibility to insects and disease, could provide significant small business opportunities in the Bitterroot Valley. Researchers with the Forest Service Economics Research Work Unit and the...

Author(s): David E. Calkin

Year Published: 2005

Type: Document

Research Brief or Fact Sheet

**Comparing resource values at risk from wildfires with Forest Service fire suppression expenditures: examples from 2003 western Montana wildfire season**

[www.nrfirescience.org/resource/11099](http://www.nrfirescience.org/resource/11099)

Determining the economic effectiveness of wildfire suppression activities is complicated by difficulties in identifying the area that would have burned and the associated resource value changes had suppression resources not been employed. We developed a case study using break-even analysis for two large wildfires from the 2003 fire...

Author(s): David E. Calkin, Kevin D. Hyde, Krista M. Gebert, J. Greg Jones

Year Published: 2005

Type: Document

Research Brief or Fact Sheet

### **Thinning and prescribed fire and projected trends in wood product potential, financial return, and fire hazard in Montana**

[www.nrfirescience.org/resource/11177](http://www.nrfirescience.org/resource/11177)

This work was undertaken under a joint fire science project 'Assessing the need, costs, and potential benefits of prescribed fire and mechanical treatments to reduce fire hazard.' This paper compares the future mix of timber products under two treatment scenarios for the state of Montana. We developed and demonstrated an analytical...

Author(s): R. James Barbour, Roger D. Fight, Glenn A. Christensen, Guy L. Pinjuv, Rao V. Nagubadi  
Year Published: 2004

Type: Document

Technical Report or White Paper

### **The Effects of Fire on Recreation Demand in Montana**

[www.nrfirescience.org/resource/17485](http://www.nrfirescience.org/resource/17485)

Wildfire and prescribed fire have the potential to affect user demand and value for recreation, making such information important to the decision-making process for fire managers. However, such information is not always readily available. We conducted surveys on 22 sites within four national forests in western Montana to determine...

Author(s): Hayley Hessel, John B. Loomis, Armando Gonzalez-Caban

Year Published: 2004

Type: Document

Book or Chapter or Journal Article

### **Strategic assessment of biofuels potential for the western U.S.**

[www.nrfirescience.org/resource/11210](http://www.nrfirescience.org/resource/11210)

ANNOTATION: This is a short summary of an effort addressing the technical feasibility of producing biofuels in the western United States is described using spatially explicit biomass resource supply curves, a detailed transportation network model for the region, and costs for converting biomass to refined biofuels. This paper...

Author(s): Craig Rawlings, Robert B. Rummer, Chuck Seeley, Craig E. Thomas, Dave Morrison, Han-Sup Han, Levi Cheff, Dave Atkins, Dean Graham, Keith Windell

Year Published: 2004

Type: Document

Technical Report or White Paper

### **Break-even point: suppression-cost analyses in Montana weigh resource values as determined by tax records and available GIS data**

[www.nrfirescience.org/resource/8154](http://www.nrfirescience.org/resource/8154)

Over the past decade, an increase in larger wildland fires has converged with rapid growth in the wildland-urban interface. Suppression resources, including firefighters, equipment and money, are pressed to their limits. Attacking every fire with equal priority is not an option, as some play an essential role in keeping forests...

Author(s): David E. Calkin, Kevin D. Hyde

Year Published: 2004

Type: Document

Book or Chapter or Journal Article

### **Fuels planning: science synthesis and integration; economic uses fact sheet 8: prescribed fire costs**

[www.nrfirescience.org/resource/14941](http://www.nrfirescience.org/resource/14941)

Although the use of prescribed fire as a management tool is widespread, there is great variability and uncertainty in the treatment costs. Given specific site variables and management objectives, how much will it cost to use prescribed fire? This paper describes the FASTRACS database, a tool that has been developed to aid managers...

Author(s): Geoffrey H. Donovan

Year Published: 2004

Type: Document

Research Brief or Fact Sheet

### **The effects of fire on hiking demand: a travel cost study of Colorado and Montana**

[www.nrfirescience.org/resource/10968](http://www.nrfirescience.org/resource/10968)

Surveys were conducted on 33 sites within National Forests in Colorado and Montana to test how forest fires affected recreation demand in the two states. Data were collected on the actual number of visits and on the intended number of visits if the area had been subject to a recent high intensity crown fire, a recent prescribed fire...

Author(s): Hayley Hesseln, John B. Loomis, Armando Gonzalez-Caban

Year Published: 2003

Type: Document

Conference Proceedings

### **The economic availability of forest residue in the northern Rocky Mountains: a preliminary analysis**

[www.nrfirescience.org/resource/8182](http://www.nrfirescience.org/resource/8182)

ANNOTATION: The goal of this project is to estimate the cost of harvesting and transporting forest residues to processing centers in the northern Rocky Mountains. Regionwide estimates are to be made based on the detailed analyses of the volumes and types of forest residues available to selected individual manufacturing centers. The...

Author(s): Charles E. Keegan, Michael J. Niccolucci, Carl E. Fiedler, J. Greg Jones, Roy W. Regel

Year Published: 2002

Type: Document

Book or Chapter or Journal Article

### **A strategic assessment of biofuels development in the western states**

[www.nrfirescience.org/resource/8177](http://www.nrfirescience.org/resource/8177)

ANNOTATION: This paper focuses on describing the methods used to estimate forest biomass supply curves and describing selected overall results of the analysis, including information on all forest and agricultural supply sources and maps indicating the estimated location of biofuels plants using cellulosic feedstocks that would...

Author(s): Bruce R. Hartsough, Xiaoshan Zhang, Roger D. Fight

Year Published: 2001

Type: Document

Book or Chapter or Journal Article

### **The dynamic path of recreational values following a forest fire: a comparative analysis of states in the Intermountain West**

[www.nrfirescience.org/resource/7924](http://www.nrfirescience.org/resource/7924)

This analysis examines the dynamic path of recreational values following a forest fire in three different states in the intermountain western United States. The travel cost demand analysis found that annual recreation values after a fire follow a highly nonlinear intertemporal path. The path is S-shaped, providing a range of...

Author(s): Jeffrey Englin, John B. Loomis, Armando Gonzalez-Caban

Year Published: 2001  
Type: Document  
Book or Chapter or Journal Article

**Protecting people and sustaining resources in fire-adapted ecosystems: a cohesive strategy**

[www.nrfirescience.org/resource/11223](http://www.nrfirescience.org/resource/11223)

This strategy is based on the premise that sustainable resources are predicated on healthy, resilient ecosystems. In fire-adapted ecosystems, some measure of fire use-at appropriate intensity, frequency, and time of year-should be included in management strategies intended to protect and sustain watersheds, species, and other...

Author(s): Lyle Laverty, Gerald W. Williams

Year Published: 2000

Type: Document

Technical Report or White Paper

**Testing transferability of forest recreation demand in three intermountain states with application to forest fire effects**

[www.nrfirescience.org/resource/11052](http://www.nrfirescience.org/resource/11052)

Surveys of visitors to National Forests in Colorado, Idaho, and Wyoming were conducted to determine whether non-motorized recreation visitation responded to different fire ages and fire intensities. Actual and intended behavior data was combined using a negative binomial count data travel cost model. The intended behavior trip...

Author(s): John B. Loomis, Jeffrey Englin, Jared McDonald, Armando Gonzalez-Caban

Year Published: 2000

Type: Document

Conference Proceedings

**Appropriate management responses to wildland fire: options and costs**

[www.nrfirescience.org/resource/11068](http://www.nrfirescience.org/resource/11068)

The Federal Wildland Fire Management Policy and Program Review, chartered and completed in 1995, represents the latest stage in the evolution of wildland fire management. The concept of appropriate management response is central to this policy. Through this approach, management responses are developed to reflect resource management...

Author(s): G. Thomas Zimmerman

Year Published: 1999

Type: Document

Conference Proceedings, Technical Report or White Paper

**The budgetary, ecological, and managerial impacts of pinyon-juniper and cheatgrass fires**

[www.nrfirescience.org/resource/12108](http://www.nrfirescience.org/resource/12108)

The 1996 fire season illustrated the potential impacts of wildland fires on the Bureau of Land Management (BLM) administered lands through numerous western states. During the 1996 fire season, over six million acres burned in the United States through unplanned ignitions (wildfires). Over two million acres burned on BLM administered...

Author(s): Thomas C. Roberts

Year Published: 1999

Type: Document

Conference Proceedings

**Effects of fire on the economic value of forest recreation in the Intermountain West: preliminary**

## **results**

[www.nrfirescience.org/resource/11051](http://www.nrfirescience.org/resource/11051)

Visitors to National Forests in Colorado, Idaho, and Wyoming were asked how their visitation rates would change with the presence of a high-intensity crown fire, prescribed fire, and a 20-year-old high-intensity fire at the area they were visiting. By using pairwise t-tests, visitors to forests in Colorado showed a statistically...

Author(s): John B. Loomis, Jeffrey Englin, Armando Gonzalez-Caban

Year Published: 1999

Type: Document

Conference Proceedings, Technical Report or White Paper

## **Managerial and institutional factors affect prescribed burning costs**

[www.nrfirescience.org/resource/7931](http://www.nrfirescience.org/resource/7931)

Prescribed burning costs are extremely variable, even if conditions are similar. This variability complicates planning and evaluation of prescribed burning programs and budgets, resulting in imprecise projections of their economic benefits. Evaluating the worth of prescribed burning efforts in objective terms is difficult, but the...

Author(s): Armando Gonzalez-Caban

Year Published: 1997

Type: Document

Book or Chapter or Journal Article

## **The ecological implications of fire in Greater Yellowstone, proceedings of the second biennial conference on the Greater Yellowstone Ecosystem**

[www.nrfirescience.org/resource/11989](http://www.nrfirescience.org/resource/11989)

Proceedings of the second biennial conference on the Greater Yellowstone Ecosystem.

Author(s): Jason Greenlee

Year Published: 1996

Type: Document

Conference Proceedings

## **Harvest cost collection approaches and associated equations for restoration treatments on national forests**

[www.nrfirescience.org/resource/8181](http://www.nrfirescience.org/resource/8181)

ANNOTATION: This article provides several harvest cost estimation methods for forest managers. Methods discussed include elements of stump-to-truck timber harvest cost estimation methods in ecosystem restoration prescriptions. Particular attention is focused on cost estimation models for tractor and skyline systems in Montana with...

Author(s): Charles E. Keegan, Carl E. Fiedler, Fred J. Stewart

Year Published: 1995

Type: Document

Book or Chapter or Journal Article

## **A technical comparison model: class A foam compared to water as an example**

[www.nrfirescience.org/resource/12153](http://www.nrfirescience.org/resource/12153)

Water has been used to fight fire for centuries. The Bureau of Land Management (BLM) relies on a fleet of over 400 water engines as its primary fire suppression technology in Great Basin fuels. Class A foam is a relatively new approach to fire suppression. The foam concentrates were introduced in the early 1980's (Schlobohm and...

Author(s): Paul M. Schlobohm

Year Published: 1994

Type: Document  
Conference Proceedings, Technical Report or White Paper

### **Some economic impacts of the 1988 fires in the Yellowstone area**

[www.nrfirescience.org/resource/11934](http://www.nrfirescience.org/resource/11934)

Four types of economic impacts associated with the 1988 fires in and around Yellowstone National Park were studied. The park was headed for a record attendance year in 1988. Based on projections in this study, summer visitation would have increased from about 2.1 million visits in 1987 to 2.3 million in 1988 and 2.5 million in 1989...

Author(s): Paul E. Polzin, Michael S. Yuan, Ervin G. Schuster

Year Published: 1993

Type: Document

Research Brief or Fact Sheet

### **Effects of the Gates Park Fire on recreation choices**

[www.nrfirescience.org/resource/11094](http://www.nrfirescience.org/resource/11094)

The 1988 Gates Park Fire, along the North Fork of the Sun River in the Bob Marshall Wilderness, provided an opportunity to explore fire effects on wilderness visitor choices. Recreation visitors along the North and South Fork drainages were interviewed to assess the effects of 1988 fires on their 1989 visits. The Gates Park fire had...

Author(s): Timothy G. Love, Alan E. Watson

Year Published: 1992

Type: Document

Research Brief or Fact Sheet

### **Protecting people and homes from wildfire in the interior West: proceedings of the symposium and workshop**

[www.nrfirescience.org/resource/11968](http://www.nrfirescience.org/resource/11968)

Includes 25 invited papers and panel discussions, 6 workshop reports, and 15 poster papers that focus on the escalating problem of wildfire in wildland residential areas throughout the western United States and Canada.

Author(s): William C. Fischer, Stephen F. Arno

Year Published: 1988

Type: Document

Conference Proceedings, Technical Report or White Paper

### **Estimating cost of large-fire suppression for three Forest Service Regions**

[www.nrfirescience.org/resource/11110](http://www.nrfirescience.org/resource/11110)

The annual costs attributable to large fire suppression in three Forest Service Regions (1970-1981) were estimated as a function of fire perimeters using linear regression. Costs calculated on a per chain of perimeter basis were highest for the Pacific Northwest Region, next highest for the Northern Region, and lowest for the...

Author(s): Eric L. Smith, Armando Gonzalez-Caban

Year Published: 1987

Type: Document

Research Brief or Fact Sheet

### **Using prescribed fire to reduce the risk of large wildfires: a break-even analysis**

[www.nrfirescience.org/resource/11397](http://www.nrfirescience.org/resource/11397)

Nearly all wildfires are extinguished when they are still small. The 3-5% that get out of control cause

95% of all wildfire-related costs and damages (Dodge 1972, Wilson 1985). There are two ways to deal with these problem fires. One practice is to limit fire by suppressing fires as soon as possible after they are detected....

Author(s): James M. Saveland

Year Published: 1987

Type: Document

Conference Proceedings

### **Watershed modeling for fire management planning in the Northern Rocky Mountains**

[www.nrfirescience.org/resource/11220](http://www.nrfirescience.org/resource/11220)

Water yield and sediment production almost always increase after wildfire has destroyed vegetative cover. The value of water generally is not as much appreciated in the water-rich northern Rocky Mountains as it is elsewhere. Increased water yield becomes economically beneficial, however, when its potential for consumptive and...

Author(s): Donald F. Potts, David L. Peterson, Hans R. Zuuring

Year Published: 1985

Type: Document

Technical Report or White Paper

### **Timber net value and physical output changes following wildfire in the northern rocky mountains: estimates for specific fire situations**

[www.nrfirescience.org/resource/11219](http://www.nrfirescience.org/resource/11219)

In the last decade, the fire management program of the Forest Service, U.S. Department of Agriculture, has come under closer scrutiny because of ever-rising program costs. The Forest Service has responded by conducting several studies analyzing the economic efficiency of its fire management program. Some components of the analytical...

Author(s): Patrick J. Flowers, Patricia B. Shinkle, Daria A. Cain, Thomas J. Mills

Year Published: 1985

Type: Document

Technical Report or White Paper

### **Changes in recreation values after fire in the Northern Rocky Mountains**

[www.nrfirescience.org/resource/11111](http://www.nrfirescience.org/resource/11111)

Changes in recreation values after wildfire in the northern Rocky Mountains were determined by estimating the difference in the present net value of recreation activity with and without fire. To estimate the value of recreation activity at burned and unburned sites, a contingent market valuation approach was used. Hypothetical...

Author(s): Patrick J. Flowers, Henry J. Vaux, Philip D. Gardner, Thomas J. Mills

Year Published: 1985

Type: Document

Research Brief or Fact Sheet

### **Costs of fire suppression forces based on cost-aggregation approach**

[www.nrfirescience.org/resource/11230](http://www.nrfirescience.org/resource/11230)

A cost-aggregation approach has been developed for determining the cost of Fire Management Inputs (FMIs)-the direct fireline production units (personnel and equipment) used in initial attack and large-fire suppression activities. All components contributing to an FMI are identified, computed, and summed to estimate hourly costs....

Author(s): Armando Gonzalez-Caban, Charles W. McKetta, Thomas J. Mills

Year Published: 1984

Type: Document

Technical Report or White Paper

### **Estimating postfire changes in production and value of northern rocky mountain-intermountain rangelands**

[www.nrfirescience.org/resource/11222](http://www.nrfirescience.org/resource/11222)

A simulation model was developed to estimate postfire changes in the production and value of grazing lands in the Northern Rocky Mountain-Intermountain region. Ecological information and management decisions were used to simulate expected changes in production and value after wildfire in six major rangeland types: permanent forested...

Author(s): David L. Peterson, Patrick J. Flowers

Year Published: 1984

Type: Document

Technical Report or White Paper

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

[www.nrfirescience.org/resource/8315](http://www.nrfirescience.org/resource/8315)

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

Author(s): Frank A. Albin

Year Published: 1984

Type: Document

Book or Chapter or Journal Article

### **Monoammonium phosphate: effect on flammability of excelsior and pine needles**

[www.nrfirescience.org/resource/11959](http://www.nrfirescience.org/resource/11959)

The study quantified differences between fire-retarding abilities of monoammonium phosphate samples from five different sources. Ponderosa pine needles and aspen excelsior fuel beds were spray-treated with different levels of chemical solutions, dried, and burned under controlled laboratory conditions.

Flame spread and energy...

Author(s): Aylmer D. Blakely

Year Published: 1983

Type: Document

Technical Report or White Paper

### **Intensive utilization with conventional harvesting systems**

[www.nrfirescience.org/resource/11130](http://www.nrfirescience.org/resource/11130)

ANNOTATION: Forest residues utilization research has included case studies of the efficiency of existing harvesting systems in achieving close fiber utilization. Field evaluations included the use of in-woods chipping systems in gentle terrain; crawler skidder systems in gentle terrain; and skyline systems in steep terrain. In each...

Author(s): Roland L. Barger, Robert E. Benson

Year Published: 1981

Type: Document

Conference Proceedings, Technical Report or White Paper

### **Fuel management opportunities on the Lolo National Forest: an economic analysis**

[www.nrfirescience.org/resource/11925](http://www.nrfirescience.org/resource/11925)

Examines economic feasibility of managing nonslash fuels in mature timber to reduce the costs and damages of wildfire. A 1.2-million-acre (496,000 hectare) study area is stratified by timber value, fire occurrence rate, and fuel hazard. Maximum potential fuel management benefits-based on the elimination of expected class E+ fires-...

Author(s): Donald Brent Wood

Year Published: 1979

Type: Document

Research Brief or Fact Sheet

### **Lodgepole pine logging residues: management alternatives**

[www.nrfirescience.org/resource/12125](http://www.nrfirescience.org/resource/12125)

The dollar and nondollar effects of alternative levels of residue utilization in mature lodgepole pine are compared. Net dollar returns were greater in conventional logging (removal of green sawlogs to a 6-inch top, with slash piled and burned) than in near-complete harvesting (sawlog removal followed by field chipping of remaining...

Author(s): Robert E. Benson

Year Published: 1974

Type: Document

Technical Report or White Paper

### **The Impacts of Wildfire Characteristics and Employment on the Adaptive Management Strategies in the Intermountain West**

[www.nrfirescience.org/resource/18758](http://www.nrfirescience.org/resource/18758)

Widespread development and shifts from rural to urban areas within the Wildland-Urban Interface (WUI) has increased fire risks to local populations, as well as introduced complex and long-term costs and benefits to communities. We use an interdisciplinary approach to investigate how trends in fire characteristics influence adaptive...

Author(s): Liana Prudencio, Ryan Choi, Emily Esplin, Muyang Ge, Natalie Gillard, Jeffrey Haight, Patrick Belmont, Courtney Flint

Type: Document

Book or Chapter or Journal Article